Stato Maggiore della Difesa

Cosmo Colavito Filippo Cappellano

THE SECRET WAR ON THE ITALIAN FRONT IN WWI (1915 - 1918)

The Italian army Intelligence Service and the birth of Communication Intelligence

Cosmo Colavito, an engineer specialised in Information and Communication Technology, has a Ph.D. to teach Radiocommunications in Italian Universities.
He worked for a long time in those sectors within the STET group, later Telecom Italia, where he performed technical and managerial functions. Later, he acted as a Senior Advisor for leading national and international bodies. He is member of the Board of *Quadrato della Radio*, a non-profit association that contributes to the development and progress of telecommunications.
Mr. Colavito has authored several technical and historical publications in the Telecommunication field.

Filippo Cappellano, born in Florence in 1963, is Political Science and Strategic Science doctor.
As officer in the Italian Army Tank Corps, Colonel Cappellano served as Head of the Historical Office of the Army General Staff.
He collaborates with several Italian magazines, museums and defence industries in the field of military history and authored many publications on armaments, equipment and tactical doctrines of the Armed Forces.

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Cover:
Detail of one of the early Italian radio interception stations
(Luigi Sacco's Photo Archive preserved by Paolo Bonavoglia)

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Salita di San Nicola da Tolentino, 1/b – 00187 Roma
quinto.segrstorico@smd.difesa.it
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In Memory of
Michele Colavito
Lieutenant General, Carabinieri

PREFACE

The significant evolution of the Italian army Intelligence during World War I took place in several complex stages, sometimes further complicated by the conflicting views on the functions of the Intelligence Service. The present book provides a detailed analysis on this subject and, thanks to substantial archive documentation, reveals aspects that have been hardly known until now.
On the other hand, the attention devoted by Italian historiography on WWI to the technological/industrial aspects of the war rarely focuses on the employment of highly advanced technologies for intelligence operations which, by the way, found applications in civil sectors during the post-war era. In this regard, air-to-ground radio communications, photographic recordings from airplanes, new chemical substances utilized for invisible inks, and even hidden microphones used for prisoners' 'indirect' interrogation, can be mentioned.
For certain, one of the important novelties during the conflict was the support given by wire and wireless technologies to Communication Intelligence for intercepting and interpreting enemy dispatches. This subject, which constitutes the core of this volume, had not yet found adequate attention in the Italian historiographical literature unlike what happened in publications of other Countries involved in the conflict.
A deep analysis of the documentation available in the Italian Armed Forces archives combined with the study of Austro-Hungarian accounts was therefore appropriate to shed light on that topic, adopting a unified vision and a modern interpretation of the events on the Italian-Austrian operational theater.
Some of the achieved results may be considered unexpected, but this preface is not the place to reveal them, leaving the reader the pleasure of the discovery. I would only remark that the updated picture on the Italian army cryptography referring to the events of the 12th Isonzo battle, has allowed a critical review of the evaluations of the Caporetto Commission of Inquiry which assessed an alleged Italian inferiority in this field but was not founded on a precise knowledge of real events.
It is also important to underscore the collaboration, documented in some passages of the book, between the Italian army and navy cryptographic departments for the interpretation of Austro-Hungarian naval fleet and German submarines encrypted radiotelegraphic communications, highlighting an important and innovative joint approach.
Lastly, this work provides a very deep analysis of the Italian Army Information Service evolution from the foundation of the Kingdom of Italy until the end of the World War I, showing how it reached operational capabilities in some advanced techniques of information collection, comparable with those of enemy and allied Armies.

This volume issued by the Defense General Staff Historical Office represents an important contribution to the Intelligence Service history and a valuable scientific tool now available to the community of scholars and history lovers, providing them with an organic reconstruction, based on accurate research, not yet attempted by any other Italian historical work.
In the wake of the success achieved in Italy by the present book, witnessed by the need to reprint it a year after the first edition, this English version has been published, based on the expectation of a larger international audience.

The Chief of the Historical Office
Captain ITN Michele SPEZZANO

INTRODUCTION

A number of factors combined,
beginning in the late 1800s,
to transform spying into Intelligence[1].

In modern warfare, as the belligerents belatedly
realized, communication was inseparable from
its nemesis, communication intelligence[2].

The Intelligence Management

During the World War I, even the covert and silent conflict that the Intelligence Services ruthlessly fought in parallel with the battlefield struggle, required profound changes in operational methods and, above all, in the way of conceiving Intelligence.
The multiplicity and extension of combat fronts, together with the refinement of investigation methods generated an overwhelming variety and quantity of data to be analysed, selected, and integrated for providing the Armed Forces Headquarters with a useful and timely framework of predictable enemy intents. The need to quickly match the emerging challenges contributed to produce profound qualitative and quantitative changes in the organisation and management of the intelligence services that, at the end of the war, turned out to be extremely different with respect to the beginning.
To work effectively, the information systems also needed to be supported by 'networks' capable of transferring the information gathered by various, numerous, and even remotely located 'sensors' toward bodies that selected and fused data before sending them to the decision-making centres. At a first glance, one can easily spot the analogy between the information structures set up during the war and some data networks that were implemented several years later to meet needs already evident during WWI.
Since all the above changes were rather unpredictable when the war broke out, one can understand the difficulties encountered by Intelligence Services in addressing the new defies and in changing mentalities and structures. In the warring armies, the innovation occurred gradually, at a different pace and efficiency, depending on several factors such as the expertise in the field gained in previous wars and during peace times, the readiness to change shown by decision-making structures and, last but not least, the awareness of national and military leaders regarding the increasing importance of the new aspects of Intelligence.
Speaking about the Italian army, Odoardo Marchetti, head of the Intelligence Service during the last phase of the war, wrote in his book: "when the Intelligence Office joined the campaign, it shared the narrow outlook of several other organisations mobilised during 'our' war. But, especially at a later stage, it willingly or unwillingly had to broaden its horizons around its centre of activities

[1] Michael Warner, *The rise and falls of intelligence. An International Security History*, Georgetown University Press, Washington DC, 2014, p. 8.
[2] Daniel R. Headrick, *The Invisible Weapon, Telecommunications and International Politics*, Oxford University Press, 1991, p.153.

with the purpose of including not only all War Theatres but also all countries where the interests of the belligerents could collide"[3]. However, this evolution addressed not only the geographical expansion of investigative systems, but also the modernisation of information structures through the implementation and/or improvement of processes and tools not adequately developed before going to war.

On the other hand, at the beginning of the conflict, the entities dealing with information activities and interrelations in the Italian army were the result of a process which started in the Sardinian army even before the unification of Italy, and reached maturity in the late 19th century when up to date intelligence organizations replaced traditional espionage-based behaviors. Nowadays the events that determined this complex development deserve an adequate in-depth analysis also aimed at clarifying the Italian army Intelligence structure, culture, and practice in 1915. In fact, when Italy entered the WWI, the Intelligence Office was already a long-established institution, but as in the previous decades, the Army continued to assign intelligence tasks to different military bodies, which were at times in competition with each other. The resulting critical condition - not immune from misoneism and personalism - was gradually overcome during the war, but it required several progressive and difficult reorganisations at the cost of operational uncertainties and some crisis periods.

The history of these troubled events also outlines the context in which the Italian army provided itself with one of the main new 'branches' of Intelligence, namely the exploitation of the enemy telecommunication by means of information tools offrered by technological advances which influenced the Intelligence evolution during the war.

New Technologies

The impressive spreading of telecommunications in the armed forces during the WWI was due to the undisputable achievable advantages such as the extension of Headquarters' command and control action over the ever-growing troops deployed in wide operational areas and the possibility to communicate with naval units navigating in oceans far-away from their bases.

The growth of military telephone and radiotelegraphic communications[4], encouraged all Intelligence Services to implement adequate techniques and layouts to extract the greatest amount of intel from the enemies' communication systems, by relying on some inherent weaknesses of those media namely the relative ease of interception. Even the earliest episodes of the war, which took place on both Western and Eastern fronts in 1914 showed, often surprisingly, what type of impact the eavesdropping and interpretation of the enemy's transmissions could have on military operations. Because this new information technology was widely used and improved during the war, we can assume the beginning at that time of the intelligence category today commonly known as COMINT or 'Communication Intelligence', primarily understood as a collection of information gathered and analysed through the interception and interpretation of enemy voice signals and text messages.

The techniques employed to attack the enemy's communication differ according to the type of system involved. In radiotelegraphy, intelligence on the enemy could be achieved by signals eavesdropping, analysis of traffic and finally by cryptanalysis techniques exploited to interpret the

[3] Odoardo Marchetti, *Il Servizio Informazioni dell'Esercito Italiano nella Grande Guerra,* Tipografia Regionale, Rome, 1937, p.102.

[4] Wired telephone communications were largely used in the front line and eavesdropped by enemies. Wired telegraph communications were especially useful in the rear lines. The transmission of voice via radio, whose experimentation started even before the beginning of the hostilities, found limited application on the battlefields only towards the end of the conflict.

encoded messages. For telephone dispatches snooping, some preliminary activities are required to allow the listening of conversations and phonograms, followed by the translation and eventual interpretation of concealed languages or, in some cases, by the solution of coding.
The results obtained from COMINT activity should be compared and integrated with all other available data for creating consistent and meaningful overall pictures. Moreover, as every other kind of information, those results must be accurately evaluated before being confirmed, since the enemy often tries implement deceptive activities also by means of telephone and radiotelegraphic communications.
With the purpose of reacting to the enemy offensive actions, the belligerents struggled to increase the security of their transmissions by preventing unauthorized access to the communication links and to the messages transmitted over them, as well as protecting dispatches by codes and ciphers. Today this kind of defensive actions - widely exploited by all belligerents during WWI - go under the name of COMSEC or 'Communication Security'.
To effectively perform each of the accomplishments mentioned above, several technical and managerial undertakings were required, such as the eavesdropping services arrangement along the entire front line, the development of ability in decrypting enemy dispatches and, finally the training of many operators.
It is understandable that, during the war, the organisation needed to effectively perform all the tasks outlined above took shape gradually within the various armies, with ups and downs in the framework of the tremendous efforts produced by the bitterly competing belligerents. Delays in innovation implementation, mistakes or simply inaccuracy in new tools usage sometimes led to grievous losses.

Limits of the Historical and Literary Production

The account of the war fought on the Austrian-Italian front in the fields of Communication Intelligence and Security has generally followed, until now, a one-sided view, due to the lack of studies and researches in the Italian archives investigating, for instance, the work of the Army's Cryptographic Units as well as the strategy for telecommunications usage on both fronts and its consequence on Communication Intelligence performances.
Among Italian publications some significant passages can be found only in the book by O. Marchetti, published in 1937, and in the 1947 edition of the *Manuale di Crittografia* (Manual of Cryptography) by Luigi Sacco[5] who headed the Italian army's Cryptographic Unit from its creation up to the Armistice. Brief references are also contained in works dealing with other topics. On the other hand, some publications, mainly of Austrian origin, cover cryptology issues often overlooking the contributions to intelligence by other already mentioned COMINT components.
Therefore, we saw the opportunity to conduct a research including all the aspects of Communication Intelligence and Security, analysing the documents preserved in the archives and museums of Italy and Austria, the memoirs written by the main protagonists in this field and other publications on the topic that are quite scarce.
Moreover, the literary production on the overall performance of the Italian army's Intelligence during WWI does not show a complete and shared view. Very few publications take into due account factors like the information flow provided by the Intelligence branches of the Armies

[5] Luigi Sacco, *Manuale di Crittografia - terza edizione aggiornata e aumentata* (3rd edition, updated and augmented), Rome, 1947,

and the significant contributions delivered by other entities belonging to the Italian Supreme Command, such as the Situation Office.

Objectives

Therefore, it seems useful to analyze the various aspects of the entire Italian army Intelligence during the war, including its organisational structure and performance which, still today, are subject of debates, raise questions and lead to conflicting assessments. Our goal is not to perpetuate sterile discussions, but rather to investigate the real results achieved by that service, especially on the eve of the most important war events.
In addition, it seems appropriate to describe the development process of the Intelligence branches before WWI, also to dispute studies that have frequently underestimated it and to show how the pre-war organization and experiences affected the Intelligence results, especially in the first period of the conflict.
The other main purpose of the volume concerns the development of the Italian army COMINT and its contribution to Intelligence as well as the activities aimed at protecting the integrity of communication and information channels from the enemy's intrusion attempts. This study includes an in-depth analysis of the origin, evolution and results of the Italian Cryptographic Unit as well as a description of codes and ciphers used by the Italian army, trying to distinguish which were not compromised during the war and the time required to break some of the remaining ones.
The real technical and operational conditions concerning telecommunications and cryptology, on both sides of the front, in October 1917, are investigated in depth with the aim of verifying the validity of the well-known, severe judgment regarding Italian cryptography expressed by the *Commissione d'inchiesta su Caporetto* (Commission of enquiry on the Battle of Caporetto) in its final report, which several publications on the topic often mentioned until recently.
More in general, the extraordinary qualitative and quantitative developments in radio communication systems are examined also with the purpose of clarifying the close correlation between their evolution and the COMINT results.
Finally, we could not but include an analysis of the Intelligence contribution originated from telephone interceptions on both sides of the front, illustrating the methods and the technical means implemented as well as the results achieved.

Contents

The first chapter of the book summarises the debates that have arisen after the end of the war - and continued until today - on the effectiveness of the Italian army's Intelligence Service and its Communication Intelligence and Security.
The remaining part of the book is divided into two parts. The first one, written by Filippo Cappellano, exposes the story of the Italian Intelligence from the second half of the nineteenth century up to 1918.
Cosmo Colavito wrote the second part concerning the history of the technologies and activities relating to COMINT and COMSEC, from the mobilisation period up to the end of the conflict. This part includes a contribution by Paolo Bonavoglia, Luigi Sacco's grandson, who explains the content of some pages written by his grandfather in a personal notebook during the summer and the autumn of 1916.
Some passages of this volume illustrate the link between COMINT and what we today call HUMINT (Human Intelligence), including interrogations of prisoners and deserters, examination of documents taken from the enemy in various ways, etc. One of the relations between these two

Intelligence sectors may be found in the activities carried out by some intelligence services to achieve the codes and ciphers of the enemy, bought before the war on the illegal market or obtained tanks to clever stratagems. During the war they were captured during actions on the frontline or recovered from sunken ships.

Sources

Most documents utilised for the research conducted to write this book is preserved in the 'Historical Archives, Army General Staff' (AUSSME). Those Archives keeps significant documentation which also includes information about the intelligence activities performed by the Situation Office during WWI as well as by the Colonial Office and by the so-called *Scacchieri* (Operational Theatres)[6] during the pre-war period.
Another relevant source of information on Communication Intelligence was the 'Historical Archive of the 1915-1918 Italian-Austrian War' housed at the Institute of History and Culture of the Corps of Engineers (ISCAG). In the library of this Institute, hitherto unknown codes and ciphers deposited there by Luigi Sacco were also found. Material from the Archives of the Historical Offices of the Navy (AUSSMM) and of the Airforce (AUSSMA) deserves also to be mentioned.
The documentation preserved in the above archives is so vast that it was impossible to analyse it thoroughly. Therefore, we cannot rule out that future researchers may find, for example, Italian codes and ciphers overlooked during the research for this book.
The memoirs of the Austrians authors who played a major role in the intelligence and cryptologic war on the Italian front also resulted helpful since they provided a vast amount of information on the Italian codes and ciphers and allowed to make significant comparisons.
Among the original information sources, it is worth to mention, in addition to the Luigi Sacco's notebook, the significant report made by the Italian Intelligence Service, preserved by the American cryptologist and diplomat J. Rives Childs. Today this report is at the McGraw Page Library of the Randolph-Macon College in Ashland, Virginia.
A lot of information is also derived from books and articles, listed in the bibliography, and scattered in several libraries such as the Central Military Library of the Italian army, the Bibliothèque Nationale 'Françoise Mitterrand' in France, the Österreichische Nationalbibliothek of Vienna and the Communications Library of MISE (Italian Ministry of Economic Development).
A large part of the pictures comes from the ISCAG photographic archive or from the Museum of that Institute. Wherever not otherwise specified, the remaining pictures were taken from AUSSME documentation or elaborated by the Authors.

[6] Organization structures dealing with geographical areas which are simply called 'Theatres' in the following parts of this book.

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– Filippo Sinagra, who allowed us to publish some codes and ciphers contained in a book to be published.

Special thanks go to Professor Mariano Gabriele and to the ‘Quadrato della Radio’ Association for their encouragement given from the beginning and during the long, laborious research on Communication Intelligence in WWI.
Worth mentioning is the helpfulness shown by the McGraw Page Library that allowed us to publish some pictures from the mentioned Childs’ collection.
The authors would also like to emphasize that this book would have never seen the light of day without the active cooperation of AUSSME personnel, such as Alessandro Gionfrida, and of ISCAG personnel, Maria Quintiliani and Francesco Vincenzi.
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CHAPTER ONE

Debates still heated

1.1 THE CONTROVERSY ON THE ITALIAN INTELLIGENCE SERVICE

The Austrian Thesis

Although not completely independent of the debate in Italy[1], the first Austrian work that openly asserted the lack of effectiveness and efficiency of the Italian Intelligence Service was written by Maximilian Ronge and published in 1930. The book was promptly translated into Italian with the title *Spionaggio* (Espionage)[2].

At the time the book was published, Ronge was Major General of the Austrian Army; he had served, since 1907, in the Imperial Military Intelligence Service, the so-called *Evidenzbureau*, where he created a cryptographic service in 1911. In April 1917, he became director of the *Evidenzbureau* and, at the same time, of the *Nachrichten Abteilung* (Intelligence Department) of the General Staff.

Ronge's book provides a wide picture and, in many respects, an in-depth analysis of the activities his Intelligence Service conducted within the military and political context of the war that the Austro-Hungarian Empire fought on the Balkan, Russian and Italian frontlines.

In several passages, General Ronge criticises the work of the Italian Intelligence Service and how the Italian Supreme Command used it. In his opinion, the operational inadequacy of the Service led to some serious consequences, such as the lack of reliable information about the real size of Austro-Hungarian troops deployed on the front at the beginning of the war and the deficiency of forecasting the *Strafexpedition* (Punitive expedition) that took the Italians "by surprise" in the spring of 1916[3].

Conversely, he praises the successful results that the *Evidenzbureau* achieved, also on the Italian frontline, especially in a field that he defined "the soul of war's espionage: radio interception"[4]. In particular, he highlighted the positive results achieved in intercepting radio telegraphic dispatches and in breaking Italian ciphers.

We cannot rule out that most of the cryptologic information referred to by Ronge probably comes from the handwritten memoirs by Colonel Andreas Figl, as we shall return to below. Figl - the top cryptologist of the Austrian Army during the war - started to deal with Italian ciphers in 1911 and continued this kind of activity on the Italian-Austrian front, from 1915 to 1918.

Ultimately, despite his one-sided views on the matter, we must acknowledge that Ronge's labours, including the memoirs written after his book, are a sizable source of information which, compared with data coming from other sources, helps to rebuild the history of the intelligence activities and of interception and cryptography on the Italian front during WWI.

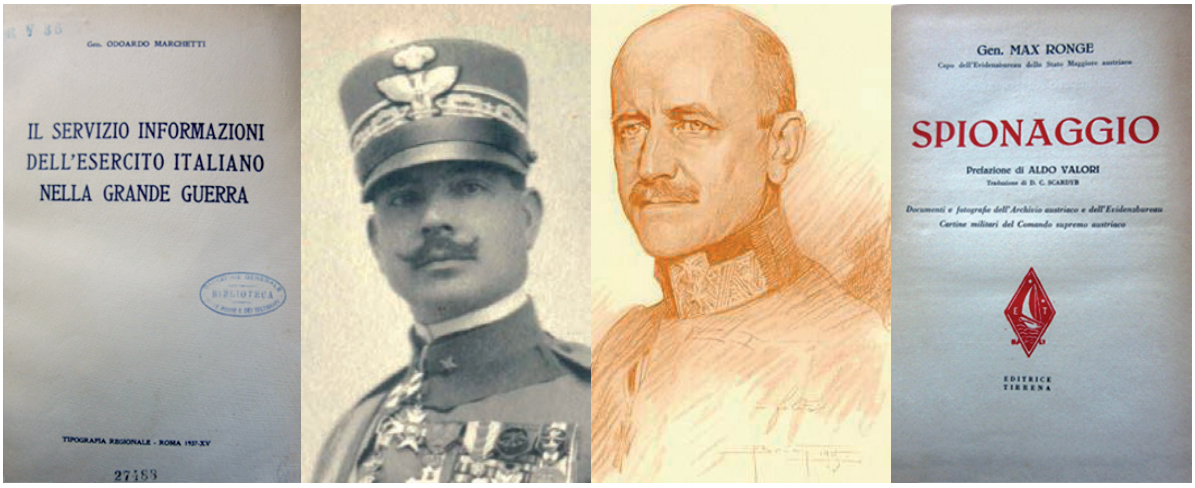
[1] Several publications and memoirs about WWI appeared in Italy from the end of the war up to 1930. They were also written by top-ranked Army officers such as General Luigi Cadorna and General Luigi Capello. Some publications stood out for their polemical stances.
[2] M. Ronge, *Kriegs- und Industrie-Spionage, Zwölf Jahre Kundschaftsdienst*, Amalthea, Vienna, 1930, Italian edition: M. Ronge, *Spionaggio - Prefazione di A. Valori*, Ed. Tirrenia, Naples, 1930. In the following, we will refer to the Italian edition.
[3] *Spionaggio, op. cit.,* p. 179 - 182 and p. 232 - 233.
[4] *ibid.,* p.125

However, in evaluating Ronge's book, one should not ignore Aldo Valori's general remarks contained in the foreword to the Italian translation of the volume. Valori points out that "Ronge wrote his book several years after the war and had the opportunity to consult all the Italian stories about the conflict" contained in publications often mentioned by the Author. Valori concludes that "therefore, at least a part of his science could be a hindsight science"[5].

Finally, an Answer

About seven years later, General Odoardo Marchetti responded to Ronge's criticisms through a book where he described the history of the Italian Intelligence Service from the creation of the Kingdom of Italy to the end of WWI[6]. Marchetti was a member of the Italian Supreme Command's Intelligence Service, which he had led from September 1917.

In describing the organisational evolution of the whole structure appointed to collect, process, and transmit information to the Italian army leaders during WWI, he highlighted the role and contribution of the Intelligence Service, which was, in fact, only one component of the organisation.



1.1 General Max Ronge and General Odoardo Marchetti with their respective books

The Marchetti answer to Ronge's accusations against the Italian Service can be summarised by reporting the statement included in the preface to his book, where he wrote: "Our Intelligent Service was far from perfect, but all things considered and taking into account the due differences in terms of skills, times and places, the other great armies that came into contact and clashed during WWI did not enjoy better corresponding intelligence services"[7]. With specific reference to the book by the Austrian General and rival Ronge, Marchetti added, "Most of the criticisms that [Ronge (A/N)] was pleased to hold against us could be held against our rivals on at least the same grounds"[8].

Then, with respect to Ronge's comments regarding the contribution made to the intelligence services by the opposing sides' cryptography and interception technologies, Marchetti highlighted not only the successful results achieved by using telephone interceptions against the Austro-Hungarians,

[5] *ibid.,* p.13.
[6] O. Marchetti, *op. cit.*
[7] *ibid.,* p. 7-8.
[8] *ibid.,* p.102.

but also the great effort made by the Italian army to decrypt enemy radio telegraphic dispatches. The author fails to explicitly mention the name of the key player in this undertaking, i.e., Engineer Corps Officer Luigi Sacco, but provides some useful material to reconstruct the work done by Sacco and his co-workers.

It should be noted that in Marchetti's work - instructive in many regards - the description of information flow and filters in WWI's Intelligence operations is not always fully consistent and the history of the Italian Intelligence during the pre-war period is outlined in an incomplete and, in some respects, simplistic manner.

The Lacks in Historical Studies About the Italian Army Intelligence Branch

Even the time frame of the Italian army's Intelligence Service birth is a frequently discussed topic but rarely analysed in adequate depth. The booklet about the history of the Service, published by SIFAR (the previous Armed Forces Intelligence Service) in 1957, says: "The origins of our Intelligence Service are relatively recent. They date back little more than fifty years, more precisely to the year 1900, when information activities stopped being fragmentary and rudimentary. Up until then, intelligence activities were conducted without a clear policy and coordination and there were no specialised and qualified organisations"[9].

Since AISI (the Home Intelligence and Security Agency) has recently backdated the origin of the Army General Staff's Intelligence Office to 1855[10], it is not of secondary importance to clearly identify the circumstances that led to the beginning of Intelligence activities and their evolution in the Italian army.

In this last regard, most historians - starting with O. Marchetti and SIFAR itself - commonly highlighted the limited human and financial resources as well as the reduced efficiency and operational capacity of the Italian Intelligence Office from its origin to the eve of WWI[11].

Throughout the 20th century, it was accepted without criticism what O. Marchetti wrote in 1937 about this matter:

> The Intelligence Office was unknown to most officers at that time and thereafter. It was the terror and disgust of non-experts, who associated it with *spies,* in the worst meaning of the term, and was perhaps commiserated by competent allies, friends and enemies. It almost always lived through difficult times and its creation was not quite justified. It was housed in two ridiculously small rooms and, for a long time, consisted of a colonel, who was the head of

[9] SIFAR, *Il servizio informazioni militare italiano dalla sua costituzione alla fine della Seconda guerra mondiale,* no place of printing, 1957, p. 5. Please, see also: Giuseppe Conti, *Una guerra segreta. Il SIM nel secondo conflitto mondiale,* Il Mulino, Bologna, 2009. Cesare Amè, who was Head of the Service in the 1940-1943 period, also dates to 1900 the "official establishment of a simple but central governing and coordinating body" (*Guerra segreta in Italia 1940-1943,* Casini, Roma, 1954).

[10] Ambrogio Viviani is of the same opinion as shown in *I servizi segreti italiani 1815-1985,* Adn Kronos, Rome, 1985, p. 86: "The birth certificate of Italy's secret military intelligence services probably dates back to 1855".

[11] In the 1960 book titled *Ventotto anni nel servizio informazioni militari (Esercito)*, Tullio Marchetti, who was Head of the Intelligence Office of the First Army, wrote as follows, "The Intelligence Office of the General Staff Corps in Rome was the central body that had to galvanize the whole organisation. […] But it was created late, only at the end of 1900, under the direction of Knight and Colonel of General Staff Felice De Chaurand di S. Eustache. It vegetated until 1902 when Knight and Colonel of General Staff Vincenzo Garioni took over its direction. Since then, it has started living, but what a hard life! Despite all his good intentions, Garioni accomplished nothing. In 1905 he was succeeded by Knight and Colonel of General Staff Silvio Negri, who died in office in 1912. Negri also did what he could, but the performance of the office was completely inadequate to the situation needs".

> the office, a captain, who acted as secretary, and a Carabinieri officer, who performed military police and counterintelligence duties[12].

Other authors were even more concise. For example, De Lutiis, in referring to what happened after the Battle of Custoza, wrote: "Military Intelligence Services were never mentioned for 34 years. The Intelligence Office was re-established in September 1900"[13].
These remarks were mainly based on personal memories and accounts instead of archive research and were perhaps due to the intention of justifying some uncertainties of the Intelligence Office at the beginning of WWI. They did not consider the complex structure of the Intelligence organization inside the General Staff Corps, which, as of the last decades of the 19th century, had included not only the Intelligence Office with its truly limited personnel, but also the 'Colonial Office' and two Offices called *Scacchieri* (War Theatres). Moreover, as early as the end of the 19th century, the information structure had subsidiary bodies inside the Army Corps Headquarters located on the Alpine borders, in Sicily, and in Apulia.
Only in recent times the great amount of documentation produced by the 'Theatres' and housed in three separate collections of the Historical Archives of the Army General Staff, has gained emphasis[14].
Also, the historical research on the events of the war involving the Intelligence Office/Service[15] does not extend much beyond the book by O. Marchetti, despite the significant number of documents filed in the Historical Office including the daily diaries of the central bodies of the Intelligence and a substantial number of papers pertaining to the activities performed by the Intelligence Offices of the Armies.
The historiography has superficially emphasized only the poor performance of the Office/Service under the command of Cadorna, and the improvement of the intelligence organisation which occurred in 1918. However, just as the studies on the pre-war period have neglected to analyse the activities of the 'Theatres', likewise the works on the 1915-18 war have ignored the activities of the Situation Office, which for most of the war, acted as the main body of the Supreme Command Intelligence, assessing and interpreting the information gathered by the Intelligence Office and many other military/civilian intelligence institutions operating in Italy and abroad.
The archive analysis shows the profound knowledge on the Austro-Hungarian army acquired by the Situation Office and through the work of Armies Intelligence Branches which provided prompt and complete information even on the eve of the major feats of arms, as shown in the following chapters.

[12] Odoardo Marchetti, *op.cit.*, p. 14-15. The almost complete text of this evaluation was also mentioned in the afore mentioned booklet by SIFAR.
[13] Giuseppe De Lutiis, *Storia dei servizi segreti in Italia,* Editori Riuniti, Rome, 1984, p. 4.
[14] AUSSME, Series: G-22 Eastern Theatre; G-23 Western Theatre; G-33 Southern Theatre – Colonial Office. This set of documents - contained in 162 envelopes filed in approximately 30 linear metres - proves the intense and productive work done by the personnel in charge of the 'Theatres' in the effort delivered to acquire and study information about the war equipment of the European countries between the last decades of the 19th century and 1915. See also: Filippo Cappellano, *L'imperial regio esercito austro-ungarico sul fronte italiano 1915-1918 dai documenti del servizio informazioni dell'Esercito Italiano,* War Museum in Rovereto, 2002; Maria Gabriella Pasqualini, *Carte segrete dell'Intelligence italiana 1861-1918,* RUD, Rome, 2006.
[15] The name of the Intelligence Office was changed to Intelligence Service during the war, as described in the following chapters of this book.

1.2 THE ORIGIN OF THE DEBATE OVER THE ITALIAN MILITARY CRYPTOLOGY

A "Rash" Judgement

The real origin of the debate can be identified in the report issued in 1919 by the Commission of enquiry on the Battle of Caporetto. In the section pertaining to "information on the enemy", this report essentially exonerates the Intelligence Service of any responsibility for failing to provide correct information to the Supreme Command bodies about the Austro-German preparations for the attack of 24 October 1917. However, with the aim of explaining the "extreme difficulties faced by the Situation Office" in gathering and filtering available information, the report mentions:

> the improvements achieved by the enemy's Intelligence Services (it is enough to remember the developments in the field of radiotelegraphic interceptions, supported by an extraordinary cryptographic service),

and, in a footnote, explains that,

> during the (Italian N/A) retreat (from the Isonzo to the Piave N/A), the Austrian Staff detected our radiotelegraphic stations and decrypted our radio cryptograms to identify our retreat line. The documents captured after the armistice revealed that the enemy had found the keys to nearly all our codes, even the most protected and complex ones. Therefore, it is easy to understand that our military and diplomatic performances were conditioned by terrible inferiority with respect to the enemy[16].

The Italian press gave great prominence to this passage of the report. The *Corriere della Sera*[17] published it, obviously eliciting satisfaction among the Austrian Intelligence Service chiefs who were employed in the Cryptographic Units during the war and promptly spread the news among their ex-subordinates[18]. Ronge too welcomed the unexpected recognition of his work' success expressed by the Commission[19] and actually, the issues of *Corriere della Sera* containing a summary of the Commission's report were found among the Austrian General's papers preserved in the *Kriegsarchiv* (War archives) in Vienna.
In the following years, the Commission judgement gained great international diffusion and reputation, also because quoted by several historians, contributing in a decisive way to supporting a still widespread thesis that tends to attribute cryptologic superiority to Austria-Hungary over Italy throughout the entire Great War.
The general silence of the Italian historians and their uncritical acceptance of this idea were contested only by Osvaldo Marchetti in 1930 and Luigi Sacco in 1947. The former, in his book, rejected the statements made by the Commission and ironically asked:

[16] Rapporto della Commissione d'inchiesta, R.D. 12 gennaio 1919, N° 35, *Dall'Isonzo al Piave 24 ottobre – 9 novembre 1917*, Stabilimento Poligrafico per l'Amministrazione della Guerra, Rome, MCMXIX, Vol. II, p. 50 ff.
[17] Beginning 12 August 1919, the *Corriere della Sera* began publishing daily articles summarizing the contents of the Commission's report.
[18] Johann Prikowitschy, *Drahtlose Telegraphie in der k.(u)k. Armee und Marine,* Heeres Geschichtliches Museum, Vienna. 2016*,* p. 386 - 387.
[19] *ibid.,* p. 316.

> nearly all our codes? What ciphers? *Diplomatic codes*, the *Red Code*, a few *Mengarini codes* or the *Pocket Military Cipher*? Or the keys to our most secret and protected codes and ciphers that, as far as we know, the enemy did not find promptly?[20]

The belief of a deep inferiority of Italian cryptology continues to circulate today thanks to various publications, especially by Austrian authors, as shown below by the analysis of some works published on this subject from the post-war period up to the present day.

The Publications by Luigi Sacco and Andreas Figl

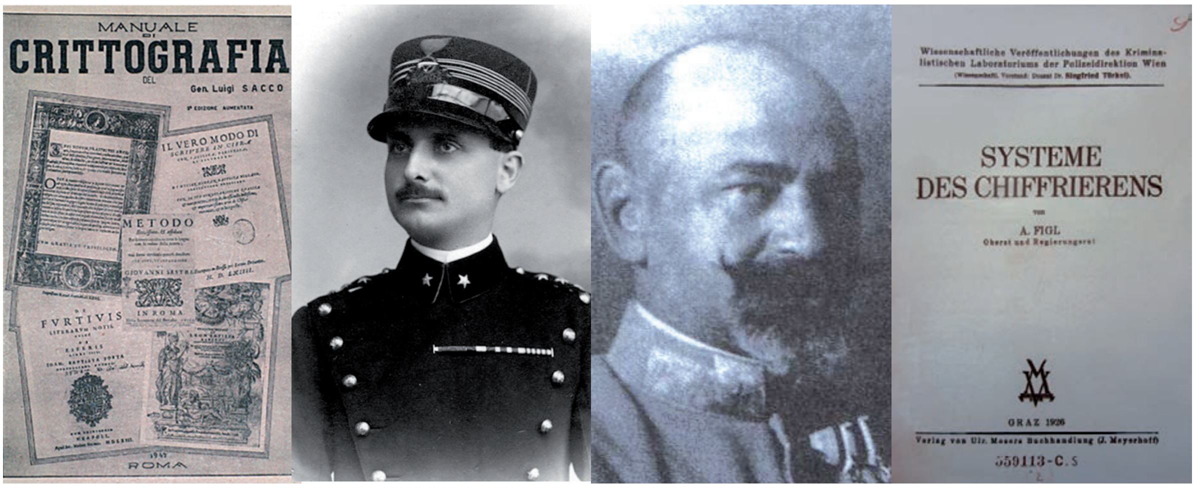
Considering the secrecy that should surround these topics, it surprises that so many books on cryptology and, more in general, on Radio Intelligence events on the Western and partly on the Eastern Front were published in the 1920s[21]. Conversely, the great number of books and articles on the WWI' events on the Italian-Austrian front, which were published before Ronge's work, rarely referred to the cryptology, with the exception of Sacco's and Figl's books.
Luigi Sacco and Andreas Figl were the two main figures of the cryptologic war that they fought on opposing sides of the Italian-Austrian front. Their two works, completed in the mid-20s of the past century, are mainly technical books that illustrate the lessons learned and the ideas developed during the war, but, for reasons of secrecy, they contain very scant information about the vicissitudes lived and the results achieved at that time.
The book authored by Luigi Sacco titled *Nozioni di Crittografia* (Notions of Cryptography) was published by the Italian Army General Staff in 1925 and freely marketed in 1930. Later editions were released in 1936 and then in 1947, the latter under the title of *Manuale di Crittografia* (Manual of Cryptography). Only in this last edition, Sacco added some information about codes and ciphers used by the belligerent armies during WWI. His *Manual* was widely and internationally disseminated thanks to its translation into several languages, including English and French, and it is still useful for training purposes[22].
Among the complimentary comments Sacco received for his book, we mention those made by David Kahn. In the preface to the first edition of his monumental work on the history of cryptology, Kahn recommends that those who want to examine in depth the methods for solving ciphers should only consult two books, one of which is the *Manual* by Sacco[23]. Twenty-seven years after

[20] O. Marchetti, *op. cit.,* p. 182.
[21] Here is a list of publications by:
- French authors: M. Givierge, *Questions de Chiffre*, Revue Militaire Française, Paris, 01/06/1924; M. Givierge, *Course de Cryptographie*, Berger-Levrault, Paris, 1925; F. Cartier, *Le service d'écoute pendant la guerre*, Radioélectricité, Paris, 01/11/1923; 15/11/1923; F. Cartier, *Les secrètes en Radiotélégraphie*, Radioélectricité, Paris, 10/12/1925; 25/12/1925; 01/01/1926;
- British authors: J. A. Ewing, *Some Special War Work at the Admiralty*, December 13, 1927, Cryptologia, Vo l. 4, N°4, p.1 93 – 203 and Vol. 5 N° 1, p. 33 – 39; W. S. Churchill, *The world crisis*, Charles Scraiber's Sons, New York, 1923;
- American author: William S. Sims, Burton J. Hendrick, *The Victory at Sea*, Doubleday, Garden City, N.Y., 1921;
- German author: W. Nicolai, *Geheime Mächte, Internationale Spionage und ihre Bekämpfung im Weltkrieg und heute,* Koehler, Leipzig, 1925.

[22] Luigi Sacco, *Nozioni di crittografia*, *lezioni tenute al primo corso Informatori*, Army General Staff, Situation Office, Rome, 1925; Generale Luigi Sacco, *Manuale di crittografia,* Second edition, Rome,1936; the updated and augmented third edition dates back to 1947. A digitized and expanded fourth edition was published in 2014. The second edition was translated into English by Helen F. Gaines in 1938 (registered in Kent State University Library, Cryptography Manuscripts, 1915 - 1961) and printed in restricted edition by the War Department of the United States of America in 1941. The third edition of 1947 was translated into French in 1951. The English edition, published in 1977 by Laguna Hills, Calif: Agean Park Press, reproduces the 1938 translation by Helen F. Gaines. In the following pages, we will always refer to the Italian edition of 1947.
[23] David Kahn, *The Codebreakers – The Story of Secret Writing*, Macmillan, New York, 1967; last expanded edition: D. Kahn, *The Codebreakers: The Comprehensive History of Secret Communication from Ancient Times to the Internet,* Scribner, New

the *Manual* 1947 edition, Kahn restated his conviction that the Sacco book was still "the best one volume work, on the technical aspects of cryptology. Sacco was thus a major figure in the pantheon of cryptology"[24].

The book *Systeme des Chiffrierens* by Alfred Figl is mainly focused on technical issues and rarely refers to the ciphers and codes used by the Italians and the Austrians[25]. Figl lists several cipher systems and only discusses at length the weaknesses of the Italian *Pocket Military Cipher*, dealt with later in this volume[26]. It seems that the book was not translated into languages other than German and did not achieve international diffusion.



1.2 Luigi Sacco and Andreas Figl with their respective books

In another unpublished manuscript, probably written in 1924 and titled *Kryptographischen Erinnerungen* (Cryptographic Memories), Figl describes in detail the work he did, especially at the Italian front, to solve codes and ciphers and to decrypt enemy dispatches. There are only a few copies left of Figl's original script since the Germans, after the annexation of Austria to the Third Reich, allegedly confiscated the script in the office of General Ronge, Figl's former chief, and sent it to Berlin where it went missing without any trace[27]. The text of one of the copies, which includes the preface written by Figl in 1947, has been elaborated in a recent book by O.J. Horak which we will often refer to later[28].

Figl's manuscript may be considered one of the sources for the Ronge' book since it contains a large amount of information about the Italian army cryptology during WWI. The detailed record of the events allows the identification of the Italian codes and ciphers solved by the Austrians

York, 1996. In the following pages, we will refer to this last edition.

[24] D. Kahn, *Interviews with cryptologists*, in Cipher Deavours, et alii, *Cryptology: Machines, History and Methods*, Artech House, Norwood, 1989, p. 41. In his 2011 book, titled *'Les Codes Secrets décryptés',* Didier Muller likewise wrote:'A mon avis, c'est le meilleur corse de cryptographie de la première moitié du XX siècle'.

[25] A. Figl, *Systeme des Chiffrierens (Wissenschaftliche Veröffentlichungen des Kriminalistischen Laboratoriums der Polizeidirektion Wien),* Moser Bucchandlung, Gratz, 1926. Andreas Figl also wrote a book titled *Systeme des Dechiffrierens*, whose publication was allegedly banned at the time, for security reasons.

[26] *ibid.,* p. 77, 85 and Annex 29.

[27] *ibid.,* p.42 - 56.

[28] Otto J. Horak, *Oberst a. D. Andreas Figl und der k.u.k. Radiohorch - und Dechiffrier dienst. Die "Kryptographischen Erinnerungen"*, Ares Verlag, Graz 2011, p. 60 - 228.

and sometimes even the time required to decrypt some dispatches completely or partially, also providing useful information to identify codes and ciphers that withstood their attacks.

Poorly Documented Criticisms

Ronge's statements concerning the Italian Intelligence Service and, particularly Italian cryptology, spread internationally, also due to the volume's translation into French and to a remarkable work by Yves Gylden, a Swedish cryptology expert who summarised in a book the contents of the essays and memoirs which appeared until 1930 about interception and cryptology activities on the Western, Eastern and Italian Fronts during WWI[29].

For Gylden, there was certainly no shortage of information sources because of the several papers published in the 20s, as pointed out above, by cryptanalysts operating during the war on all the fronts with exception of the Italian - Austrian one. As a matter of fact, he admitted that his information about the Italian-Austrian front was exclusively originated from the books by Ronge, adding: "Having access to reliable Italian documentation and using it to make comparisons would have been really interesting, but unfortunately, as far as this author could ascertain, to date, there are no published documents on these activities"[30].

Nevertheless, the Swedish cryptographer accepts as correct the negative statements made by Ronge about the deficiencies of the Italian military cryptographic service without making any critical analysis. This often leads him to regard the Italian cryptographic service's performance as a bad example.

In order to provide general indications and suggestions about cryptologic methods and techniques, Gylden goes beyond the information given by Ronge's book since he sometimes draws inferences and formulates hypotheses not supported by the information contained in that book.

One of his mistakes, possibly based on a misinterpretation of some Ronge's statements, concerns the assumed Austrian failure to decrypt Italian radio dispatches since the beginning of 1918, shortly after the arrival of the British and French troops in Italy, in November 1917[31]. On these grounds, Gylden argued that the Italian cryptology changed more considerably during the last year of the war in comparison to what happened on other fronts because "the highly experienced French and English experts effected a radical reorganisation of the Italian cryptographic service" and therefore "the Austrians had to confront adversaries who were cleverer than the Italians"[32].

However, Ronge himself openly states that the Austrian decrypting of Italian radio dispatches decreased in 1918 but did not cease entirely[33], and in the 1947 edition of his 'Manual', Luigi Sacco strongly criticised the statements made by the Swedish author, claiming that the progress achieved during the last part of the war originated only from within the Italian Cryptographic Unit itself[34].

Among the controversial aspects of Gylden's work, we cannot but remember the sharp contrast between his admiration for the "splendid Austrian cryptographic and cryptanalytic services" and

[29] Y. Gylden, *Chifferbyrliâernas Insatser I Varldskriget Till Lands* (Contribution of the Cryptographic Bureaus in WWI), Stockolm, 1931. The Gylden book became internationally known after its publication in abridged form on the *Revue Militaire Française* in August 1931 and its complete translation into English, which appeared in instalments on the *Signal Corps Bulletins* from the end of 1933 up to and including 1934. The integral English version is titled *The Contribution of the Cryptographic Bureaus in the World War* and was published in instalments in the Signal Corps Bulletins Nos. 75 - 81, November 1933 - November 1934, with notes by Major W. F. Friedman, who was one of the major American cryptologists.
[30] Y. Gylden, *op. cit.,* Publications of Riverbank Laboratories, p. 77.
[31] *ibid.,* p.81.
[32] *ibid.,* p.77, 82.
[33] M. Ronge, *Spionaggio, op. cit.*, p. 354, 355, which mentions some cryptanalysis operations carried out in October 1918.
[34] L. Sacco, *Manuale di Crittografia*, *op. cit.*, p.309.

the extremely negative assessments about the Austria-German cryptologic school expressed in other parts of the book. In his opinion, that school showed lack of in-depth scientific knowledge and proposed complex encoding methods that "facilitated the solution of ciphers instead of making it difficult"[35]. In the preface to his Cryptographic Memories of 1947, Figl strongly questioned Gylden's criticisms.

Despite these remarks and some other comments contained in the notes written by Gylden's commentator, the renowned American cryptologist William F. Friedman, the book undoubtedly has merits that justify its international success since it aims at summarising in an organised way several useful lessons that previously could be found scattered in other publications.

It is noteworthy too that Gylden does not absolve any of the belligerents. About the Russians who, at the beginning of the war, sent plain radio dispatches acting with great negligence, he writes: "Russia was not the only warring nation guilty of such carelessness. The armies of all the belligerents were guilty, some to a greater extent, such as those of Italy and Germany, and others to a lesser extent, such as those of France, England and Austria"[36].

1.3 UP TO THE PRESENT

Ronge' Memoirs

In 1943, when World War II raged on all fronts involving the remaining forces of Austria which had become an integral part of the Third Reich, retired General Maximilian Ronge, who was almost 70, devoted himself to revising the history of WWI cryptology, telephone, and radio interception and to writing new reports, also to support the description of events contained in his book.

General Ronge's memoirs, preserved in the *Kriegsarchiv* of Vienna, include a report about the radio interception and cryptanalysis service against Italy, together with the translation into German of a few passages on the same subject from the book by Osvaldo Marchetti[37]. Another report concerns the telephone eavesdropping on the Italian front[38].

The first report, which includes 78 annexes, also deals with the events which occurred on the Balkan front, focusing on the activities performed on that battlefield by the Italian troops. In particular, the author goes into a detailed description of the cryptanalysis activities performed in 1918, as if to provide adequate documentation that could disprove Gylden's thesis which by then Ronge probably knew well.

In addition to what he had already reported in his book, Ronge includes several other documentation and details while maintaining a tone of superiority, sometimes even of mockery, in relation to the Italian Intelligence Service and especially to the Italian cryptographic capacities. He concludes his writing with the well-known statement contained in the report of the Commission of enquiry on the Battle of Caporetto, to demonstrate the Austrian supremacy recognised by the enemy.

[35] Y. Gilden, *op. cit.,* p. 6 ff. Basically, the author accused the German cryptologic school of relying exclusively on empirical and intuitive methods, which inevitably led to complex and ineffective ciphers and cryptanalyses, instead of following the example of the French, who used mathematical and scientific tools, such as statistical tables of code groups.

[36] Y. Gylden, *op. cit*., p.1.

[37] M. Ronge, *Der Radiohorch und Dechiffrier - Dienst Gegen Italien und am Balkan, 15/III/1943; Das Italienische Ciffrenwessen*, Wien Kriegsarchiv, Ronge Nachlaß, B126:3/II, p. 1 - 52a. The Ronge reports and several annexes are signed by the author and dated 1943.

[38] M. Ronge, *Die Telefon Abhorchdienst*, 1/III/1943, Vienna, Kriegsarchiv, Nachlaß, B126:3/IV, p. 1 – 54.

The Austrian General most likely probably uses again the Cryptographic Memories by Figl, without making explicit reference to it, but adds many original documents, especially in the annexes. He also does not abstain from mentioning some of the failures of the Austrian cryptography and Intelligence Services that Figl ignored completely. In describing the organisational evolution of the interception/cryptanalysis services and the debate over their effectiveness raised by some Austrian high commands, Ronge provides some hints for making a more balanced evaluation of the pros and cons of the Communication Intelligence strategies adopted on both sides of the Austro - Italian front.

Ronge's memoirs have been consulted more often than Figl's ones - known for a long time only to a small number of scholars - and were used as a source by publications which support the supremacy of the Austrians over the Italians in the field of cryptography throughout the entire conflict.

The Maximilian Ronge's papers and the republications of Andreas Figl's Memoirs, are generally quoted in this volume by the terms 'Austrian sources'.

Sacco's 1947 Manual

The 'Historical Note', which Sacco added to the 1947 edition of his 'Manual of Cryptography', deals with WWI in very few pages that include references to paragraphs in the text describing the methods adopted to solve a few Austrian ciphers such as a field cipher, and a diplomatic code[39]. Some interesting information about the same topic can be found in other parts of the same Historical Note[40].

Sacco, who only knew Ronge's book but not his recent memoirs, participated in the debate in a cautious and measured way, but with incisiveness. In a brief and concise way, he traced the history of the Cryptographic Unit, whose command was entrusted to him. His historical reconstruction is fully confirmed by the documents found in the archives which allow to enrich it with several details.

Sacco also made a brief list of some Austrian and German ciphers solved during WWI without indulging in self-aggrandizement. On the contrary, he radically limited the length of the list that could have been longer, as we will show later.

Eventually, he contested what he called a "deduction" made by Gylden, who thought that the Allies had reorganised the Italian Army cryptographic service in early 1918. The "complete silence of the Italians", which still persists today, led Sacco to rectify Gylden's assessments by explaining that the remarkable cryptographic improvement reached after the 1917 retreat was due to the adoption of "new cryptographic methods that were considered too complex and therefore avoided until then"[41].

The Cautious American Revisionism

A first sign of appreciation for Italian cryptography can be found in a book written by Herbert Yardley, a well-known North American cryptologist, who had served as an army captain during

[39] L. Sacco, *Manuale, op. cit*., p. 308 – 309. The paragraphs that illustrate the solutions were included in the previous edition without revealing the code.

[40] *ibid.,* p. 285.

[41] L. Sacco, *Manuale, op. cit*., p. 309.

the war and wrote a famous book where he also mentioned the results of a visit to Rome in March 1919[42].

Yardley was on mission in Paris at the French Army's Cryptographic Unit and, although there were reasons of urgency that required him to return quickly to Washington, his superiors ordered him to include a few days stay in Rome on the journey home, for the purpose of getting information about codes and ciphers, since the Italians were considered to be "good at cryptography"[43]. However, Yardley failed to get in-depth information about the methods used by the Italians who appeared to be quite 'reticent'. After all, the French adopted the same behaviour when he tried to interfere in their diplomatic Black Chamber probably because both Italians and French systematically decrypted the diplomatic dispatches of the Americans Embassies, and had to prevent anyone from discovering this activity[44].

Yardley concluded the narration of his mission to Rome by saying that the good standard of the Italian military cryptology could not be compared with the English and French ones that he regarded as the best in the world.

A more precise testimony can be found in the already mentioned book by David Kahn, titled *The Codebreakers* and published in the 60s[45].

While preparing his book, Kahn travelled across Europe to interview the leading figures in the field of cryptology during the First and Second World Wars and to consult the archives containing the memoirs about the two world conflicts[46]. He described that activity as a "race against death" since many of the people he wanted to interview, with the aim of rebuilding the history of WWI, had already died. Kahn especially regretted not having interviewed Andreas Figl (1873-1967), whom he thought was surely dead at the time of his first trip to Europe, given the general death rates of that period. Instead, during a following trip to Germany, he discovered that the Austrian cryptologist had recently died at the "incredible [for the time (A/N)] age of 94". However, Kahn probably had a copy of Figl's 'Cryptographic Memories', which was a gift from his German friend Herbert Flesh[47], and had certainly consulted Ronge's memoirs.

In reverse, Kahn succeeded in interviewing Luigi Sacco (1883-1970), who was old as well, on 10 May 1962, in the terrace of the General's apartment located along the Tiber in Rome with a marvellous view of the river. The American historian explained that he recorded all his interviews and therefore we can assume that, when he wrote in his book a concise exposition of the Austrian ciphers solved by the Italians, he also considered the statements made by Luigi Sacco during the meeting.

Ultimately, despite some inaccuracies, for example on the dates of the meetings between Sacco and Cartier in Italy, Kahn's monumental work contains first-hand information that will be useful, also in the present book, to reconstruct the history of interception and cryptanalysis on the Italian front.

In judging the effectiveness of the Austrian and Italian cryptographic services during WWI, Kahn undoubtedly proved to be more balanced than some of the previous authors were. However, in concluding the paragraphs dedicated to this subject, he also mentioned the well-known statement

[42] Herbert O. Yardley, *The American Black Chamber*, Bobbs Merril, Indianapolis, 1931 (original edition). Under the same title, Naval Institute Press Edition, Annapolis, Maryland, 2004, p.238.
[43] *ibid.,* p.225-230.
[44] *ibid.* The Cryptographic Unit of the Italian Army in Rome worked on both military and diplomatic cryptograms, while in France there were two distinct offices that performed the two functions separately.
[45] David Kahn, *The Codebreakers, op. cit.,* p.316 - 320.
[46] These interviews are contained in D. Kahn, *Interviews, op. cit.*, p.36 - 41.
[47] O.J. Horak, *op. cit.* p.53.

made by the Italian Caporetto Commission and recognised that Austria-Hungary was “preponderant in terms of cryptanalysis success on the southern front”, but he admitted it declined during the last year of the war[48].

One Sided Evaluations

The Austrian publications on the cryptographic fight during WWI have continued up to the present, as evidenced by recent books and articles.
A book by Albert Pethö published in 1998 contains detailed documentation selected after a thorough research in the archives, especially of Vienna, and an in-depth analysis of the numerous publications available in the 90s, apart from the Sacco Manual, which is never mentioned[49].
The Pethö’s volume covers the period from the creation of the *Evidenzbureau* in 1850 up to the bitter end of WWI with the “so ill-prepared Armistice of Villa Giusti”[50]. The book devotes a long, detailed chapter to radio and telephone interception, and cryptanalysis of Italian radio dispatches. This part of the work mainly mirrors the concepts expressed by Ronge, as evidenced by the numerous references to Ronge’s 1943 memoirs and tends to demonstrate the undisputed superiority of Austria in the field of military cryptography and the great merits of the *Dechiffrierdienst* (Cipher Service).

The article by J. R. Schindler[51], published in the Cryptologia journal in 2000, should not even be mentioned because of the incredible superficiality of the author who made several historical and cryptographic mistakes. We mention it here only to show that a contentious and sometimes unsound attitude has persisted until recently. Specifically, the author’s statement that the Austrian cryptanalytic service was superior to those of all the countries participating in the war to the point that Austria achieved the most impressive cryptologic successes of the whole conflict, cannot be proven.

Higher-level works are those by Otto J. Horak, a general of the Austrian Army who devoted his attention to the study of Andreas Figl’s life and works. In 2005, Horak published two volumes entitled *Andreas Figl - Leben und Werk -1873-1967* (Andreas Figl’s life and works)[52]. Six years later he released another volume, mentioned in the previous pages, where he reworked Figl’s memoirs[53]. In the following, we will often refer to the contents of the latter book when necessary to mention Figl’s activities.
The article by Herbert Paulis, published in the Cryptologia journal in 2007, took inspiration from the former book by Horak. This article focuses on the description of the apparatuses used to reduce the time required for decrypting dispatches coded by means of some Italian service ciphers[54].

[48] Davis Kahn, *The Codebreakers*, *op. cit.,* p. 320.
[49] A. Pethö, *Agenten für den Doppeladler Österreich-Ungarns geheimer Dienst im Weltkrieg,* Leopold Stocker Verlag, Graz - Stuttgart, 1998. Italian edition: *I Servizi Segreti dell'Austria Ungheria*, LEGUERRE, 2001.
[50] A. Pethö*, I Servizi segreti*, *op, cit.,* p.195.
[51] J. R. Schindler, *A hopeless struggle: Austro-Hungarian cryptology during World War I,* Cryptologia - 24(4), 2000, pp. 339-350.
[52] Otto J. Horak, *Andreas Figl – Leben und Werk -1873-1967,* Universitätsverlag, Rudolf Trauner, 2005.
[53] O. J. Horak, *Oberst a.D. Andreas Figl, op. cit.* We will constantly refer to this publication, except in the cases that expressly refer to the publication mentioned in the previous note.
[54] Herbert Paulis, *The Scheuble Apparatus*, Cryiptologia - 31, 2007, p.164-178.

One of the two valuable and well-documented volumes about *Drahtlose Telegraphie in der k.(u.)k. Armee und Marine* (Wireless telegraphy in the Austro-Hungarian imperial army and navy), written by Colonel Johann Prikowitsch and published in 2016, contains some chapters dedicated to the cryptographic war with, of course, an Austrian perspective[55]. Also in this book, the statement by the Commission of enquiry on the Battle of Caporetto which appeared in the *Corriere della Sera* of 19 August 2019, is shown highlighted in bold[56].

On the need for a comprehensive analysis

In general, from the scrutiny of the publications listed above, it appears that some works are quite biased, and all studies ignore the information contained in the Italian archives which could have modified the overall assessment regarding the cryptographic struggle in WWI.
This type of research could have revealed the codes and ciphers that had remained unknown to the Austrians or those that had been solved long after their introduction into service, as well as the time required to solve the others. As will be seen below, we analyzed those aspects also by comparing the information on the date of introduction of many codes or ciphers contained in the Italian documents with that coming from the Austrian sources.
On the other hand, listing the successes achieved by the Italians in decrypting Austrian messages also required some in-depth archive research, which brought to light general information and provided several concrete examples.
Another noteworthy topic, generally neglected by many authors, was the Italians' ability to analyse radio traffic, facilitated by their mastery of radio-goniometric technologies largely utilized on the land front and in maritime combat much earlier than their adversaries.
With the aim of extending the investigation to every method employed to achieve useful information from the enemy's telecommunications, without omitting for instance eavesdropping of wired telephone communications, it seems appropriate to apply the modern approach offered by the unifying concept of COMINT (Communication Intelligence)[57].

[55] J. Prikowitsch, *op. cit.*
[56] *ibid.,* p.386.
[57] During WWI denominations such as "Radio intelligence" or "Wireless Intelligence" were used in the American army.

Stamps and letterhead of the Italian Intelligence Service, 1915-1918

FIRST PART

History of the Italian Army's Intelligence Service up to 1918

CHAPTER TWO

Origin and first development

2.1 THE PIEDMONTESE GENERAL STAFF AND ITS INTELLIGENCE ACTIVITIES

The Royal Corps of General Staff in the Sardinian Army

The Italian military Intelligence Service derives from that established in the Kingdom of Sardinia by Victor Emmanuel I after the Napoleonic period, when the Savoia family, coming back to Turin in 1814, began to reconstruct the Army and to reform its High Command. The organisation and functions of the Royal Corps of General Staff, created by the Decree of 12 November 1814, were ruled by specific Resolutions, which included instructions about Intelligence activities[1].

A colonel was appointed head of the Corps with the title of Quartermaster-General, while in 1819, this task was entrusted to a major general and in 1830 to a lieutenant general[2].

The Royal Patent of 6 October 1831, entitled *Regolamento pel Real Corpo di Stato Maggiore Generale della Regia Armata* (Rules for the Royal Corps of General Staff of the Royal army)[3], established that in peacetime the Royal Corps' main concerns entailed the collection of information, especially military and topographic by patrolling "the areas of the kingdom that are more vulnerable to attacks from the enemy" and mapping "the most strategic places, mainly in the bordering areas of the state". In wartime, the Corps had to "identify the enemy army's lines, study the enemy's forces, positions, moves, trends, etc., and manage the services provided by guides, scouts, spies, escorts, safeguards, etc."

The Royal Carabinieri Corps established in July 1814, following the examples of the French Gendarmerie and of the Gendarmerie of the Cisalpine Republic, was regulated by the 'General Rules', approved on 12 October 1822, defining the Corps as "a force created to watch over public security and to ensure law and order within the state and, on the battlefield, within the Royal army". The 'Service Rules for Campaign Troops', issued in January 1833 included detailed instructions for the Royal Carabinieri Corps in war operations when its Officers had to "arrest marauders and plunderers, keep unauthorised people away from troops and camps, monitor spies and suspects, prevent unknown people from approaching the army troops and their quarters, chase and arrest outlaws and deserters, […], provide Army Headquarters with all useful data in order to keep them informed about the moves of the enemy"[4].

A whole chapter of the 1833 Rules was devoted to the "parties at war". According to the ancient military terminology, a *partita* or *partito* (party) was a corps of irregulars or of light regular troops

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[1] *Determinazioni di S.M. per la nuova formazione, regolamento e doveri del Corpo dello Stato Maggiore Generale* (King's decisions about new organization, rules and duties of the Corps of General Staff), Act of the Government no. 407, 26 June 1816, pp. 815-837.

[2] By Royal Decree of 18 May 1850, The Royal Corps of General Staff changed its name to Royal Staff Corps and the office of Quartermaster-General was replaced by that of General Commander ("*Giornale Militare*" of 1850, p. 335).

[3] "*Giornale Militare*" of 1831, pp. 95-129.

[4] *Giornale Militare* of 1833, p. 145-146. The Royal Decree of 1 May 1892 approved the new *Regolamento Organico* (Organic Rules) and the *Regolamento d'Istruzione e di Servizio* (Training and Service Rules) for Royal Carabinieri officers that repealed the General Rules of October 1822.

deployed to disturb the enemy troops in the rear. The members of the party were called *partigiani* (partisans). Parties were assigned to set traps for the enemies, mislead them, harass their flanks, intercept their couriers and convoys, disrupt the enemies' communications, and sabotage their supplies, compelling them to deploy several troops to protect their logistic infrastructure. They also conducted propaganda action among the inhabitants of their territories to keep faith and trust alive, and scare the people living in enemy territories by spreading fake news to create fear and uncertainty.

These activities, which were included in the so-called 'small war' operations, required secrecy, speed and energy. According to the Rules, a 'partisan officer' had to compensate for the lack of a regular military unit by using astuteness, inventiveness, courage, and readiness of spirit, resorting to frequent gimmicks.

The 1833 Rules were integrated by the *Istruzioni sulle operazioni secondarie della Guerra* (Instructions on Secondary War Operations) of 1855 that emphasised the importance of conducting exploratory activities, acquiring information about the territory and the enemy, considering how "often in military history misleading information led to tragic consequences". The knowledge achieved by this kind of activities represents "a constant necessity during the war and is of the utmost importance for the operations which have to be organised on the basis of data gathered through reconnaissance missions"[5].

The Creation of the Intelligence Office Within the Royal Corps of General Staff

The year 1855 can be considered as the data of birth of the Intelligence Service in the Sardinian Army, since the *Breve istruzione sul servizio degli Ufficiali del Corpo Reale di Stato Maggiore in tempo di guerra* (Brief Instruction on wartime service for officers belonging to the Royal General Staff Corps), issued by Minister of War, General Alfonso La Marmora, regulates the officer's functions devoted to special missions and secret services[6].

La Marmora's document also included instructions for spies' employment in monitoring the enemy forces as well as the political conditions of foreign provinces. According to the instruction, spies should be selected with great care and the trustworthiness of their reports had to be cross checked, since "spies, lured by double salary, could play both sides of the fence and provide fake reports"[7].

It should be noticed that the '1855 Instruction' continued to entrust the General Staff Corps with executive instead of managerial tasks and did not really establish an intelligence body with specialised personnel who, also in peacetime, should deal exclusively with this complex service. This deficiency was partially overcome, soon thereafter, by the setup of the 'Military Office of the Royal General Staff Corps', with the task of gathering 'at any time' intelligence about the defence forces of Italy's neighbouring powers and writing monographs on topography and statistics about these countries with a military view[8].

During war operations, the Military Office was expected to provide the Headquarters with an 'Intelligence Office' capable to deliver detailed information about the enemy. Already through

[5] Filippo Stefani, *La storia della dottrina e degli ordinamenti dell'Esercito Italiano,* volume I *Dall'Esercito Piemontese all'Esercito di Vittorio Veneto*, AUSSME, Rome, 1984, pp. 99-100.

[6] The document is dated April 1855, coinciding with the departure of the Piedmontese expedition to Crimea.

[7] Spies should be interrogated in complete isolation. Then, they had to answer specific questions about, for example, the location of the enemy's Headquarters, stock of vehicles, lines of battle, reserves, storehouses, and hospitals as well as about the size of the military forces and the names of the main commanders.

[8] This work should be carried out by four Sections which also had intelligence capabilities in common. (AUSSME, L-3 Series*,* env.301).

2.1 Giuseppe Gaetano Govone, who led the Intelligence Office during the Crimea campaign and the Second War of Independence

the expedition to Crimea of 1855-1856, Major Giuseppe Govone was commissioned to organise this Office within the Piedmontese Headquarters[9]. Lieutenant Colonel Govone's service record indicates that, also during the Second Italian War of Independence, more precisely from 24 April 1859, he acted as Head of the Intelligence Office inside the main Headquarters of the Sardinian Army. Govone was able to implement a well-functioning Intelligence Service by resorting to messengers, customs officers, smugglers, plain-clothes soldiers and for the first time also to homing pigeons. He received a promotion on the battlefield for war merits, especially for his "active and effective (information A/N) contribution to Major Generals in the various battlefields".

2.2 THE INTELLIGENCE SERVICE IN THE ARMY OF THE ITALIAN UNITARY STATE

The Battle of Custoza and its Consequences

After the first territorial acquisitions, the Sardinian army gradually expanded up to become the Italian army. In early 1861, the General Staff Corps was reorganised through the creation of an Advisory Committee and a General Staff's 'Superior Office' that also included the Military Office, under the command of Colonel Federico Ceva di Noceto until 1866, when Colonel Edoardo Driquet replaced him.

In March 1866, the Minister of War, General La Marmora, sent General Govone and Colonel Edoardo Driquet to Berlin, where they had to negotiate the alliance with Prussia, leaving the task of the Military Office in the hands of Colonel Enrico Avet. In June 1866, Colonel Driquet returned to Italy, resumed his functions at the Italian Headquarters, and intensified intelligence activities in the Venetian territories in view of the forthcoming war against Austria. In addition, detached offices with Intelligence tasks were created in Brescia and Turin, this last managing the Venetian emigration flow.

However, on the eve of the Battle of Custoza, Colonel Driquet was assigned to the Army Headquarters with new functions, depriving the intelligence organisation of its head and main motivator. General Alberto Pollio remarked that by reassigning the head of the Intelligence Office a few days before the beginning of the war, "the Headquarters failed to give due importance to

[9] Maria Gabriella Pasqualini, *Carte segrete dell'intelligence italiana 1861-1918,* RUD, 2006, Roma, p. 20.

the Intelligence Service, perhaps because of the fatal misconception that Austrians were going to fight an exclusively defensive war"[10].

An informer of the Prefect of Brescia transmitted to the Italian 5th Division the warning that Austrian forces had passed the Adige River. However, the Commander of the Division General Sirtori, was absent and the news was not conveyed to the Army Headquarters[11]. This lack of information contributed to bring about the Custoza defeat.

The experience of the Third Italian War of Independence led to a wide reorganisation of the structure of the high command. In 1867, the Superior Office was replaced by the General Headquarters of the General Staff Corps, having under its authority the Military Office, which included four sections: military statistics and Intelligence; archives, library, and military-historical section; military-topographic section; military publications[12]. For the first time, the term 'Intelligence' was used to better define, also during peacetime, the body of the General Staff Corps engaged in this kind of activities.

In addition, command of the Military Office was given not more to a colonel but to a general, under the direct authority of the Commander of the General Staff Corps. Colonel Avet, who had replaced Driquet as head of the office, was in turn replaced, in November 1867, by General Pompeo Bricola who remained in office until December 1873.

Not by chance, in 1867, military publications emphasised the necessity of a central specialised intelligence organisation since peacetime, asserting that:

> We cannot implement a good, practical intelligence system on the eve of a campaign, or when the war has already begun. At that point, the implementation of each measure turns out to be belated and we are forced to use improvised means with poorly thought-out concepts. A good practical information system must always be in place and ready to intensify investigations and research when a war against one or another country is imminent, that is all[13].

In 1870, the Military Office was reorganised once more, renaming its sections as follows: Section I (Military Topography); Section II (Statistics of Foreign Armies); Section III (Historical affairs); Section IV (Regulations). The new name of the Statistics Section did not refer to 'Intelligence' anymore, even if this activity was still performed mainly by this Section[14].

[10] Alberto Pollio, *Custoza (1866),* Ministry of War - Historical Office, Rome, 1923, p. 332-333.

[11] "Outside of the Army, and even before the Army entered the campaign, the prefect of Brescia arranged an intelligence service on his own initiative and almost completely at his own expense […]. The news coming from Verona and collected by this service about the Austrian advance beyond the River Adige reached the Command of the 5th Division, although the information was kept top secret by any means […]. But the information was not transmitted to the Italian General Headquarter because General Sirtori, Head of the Division was absent. He then was forced into retirement" (Ottavio Zoppi, *Una leggenda sulle informazioni militari nel 1866* (A legend about military intelligence in 1866), "Rivista Militare Italiana", 1906, p. 2155 - 2165).

[12] *Regio decreto per il riordinamento del Corpo di Stato Maggiore dell'11 maggio 1867* (Royal decree for the reorganization of General Staff Corps, 11 March 1867), "Giornale Militare", 1867, pp. 270-280. The General Command of the General Staff included three offices: the Military Office, the Technical Office, and the Accounting Office. It also included the High War School and a detached section of the General Staff Office in Naples.

[13] Ambrogio Viviani, *op. cit*., Vol. 1, p. 109. According to the same author, an Office for Secret and Confidential Affairs was also established within the Ministry of War in 1867.

[14] Agenda of the Chief of the General Staff no.1 of 8 January 1870, AUSSME, Series L-3, env. 298. The figure of the military attaché to diplomatic missions abroad appeared in 1870, too.

The 1882 reform and the operation theatres

One of the most important steps in the evolution of the Intelligence activities of the Italian army was the adoption of the new doctrine conceived and implemented by the German General Moltke the Elder, who put an end to the previously lack of military intelligence strategies and planning during both war and peace times. The Prussian victories in the 1866 and 1870-1871 wars clearly revealed the essential role of the General Staff's preparatory work during peacetime for achieving successful results in war.

This main innovation happened in the Italian army thanks to the 1882 reform that established a real technical-military leadership through the creation of the position of the Chief of the Army Staff, directly under the authority of the Minister of War, with the responsibility of preparing mobilisation/mustering plans, and organising operations against the enemies[15]. General Enrico Cosenz, first Chief of Staff, remained on duty until 1893. Although the defeat in the Third Italian War of Independence was generally ascribed to the inadequacies of the High Command, it took sixteen years to approve a radical reorganisation of the Army leadership, matching basic and urgent requirements. Before 1882, the Italian army General Staff Corps, under the authority of the Secretary-General of the Ministry of War, had no real directive and executive responsibilities. The Chief of the Army Staff, now responsible for war plans, was assisted by a General Staff Corps, under his direct authority, and supported by a second-in-command and by a *Generale Addetto* (General in Charge), who headed the Office of the Chief of Staff as well as the 1st and 2nd Division. The 1st Division, in charge of preparing offensive and defensive war plans, consisted of four Offices, among which the first three were tasked with studies, monitoring and intelligence for the so-called *Scacchieri* (Theatres). The Eastern Theatre entrusted to Office I included Austria, Hungary, Germany, and Russia; the Western Theatre managed by Office II embraced France, Switzerland, Belgium, and England; Southern Theatre of Office III dealt with the Mediterranean countries, except for France and Austria-Hungary[16].

Thereby, the Information branch of the General Staff Corps was significantly enhanced by upgrading to the level of Office the disbanded Sections of the Military Office, while the Intelligence Section was incorporated into the Office of the Chief of the Army Staff. However, new names given to the intelligence bodies of the Headquarters of the General Staff Corps did not change the substance of their work since they continued to perform the activities of the Military Office and its sections, as noted by General Agostino Ricci, second-in-command of the Corps, who also submitted some proposals for the reorganisation of intelligence activities[17].

In his opinion, the commanders of the Army Corps stationed at the borders had to establish trans-boundary relations by employing numerous human resources such as mountain troopers, customs officials, Carabinieri, etc. According to him, some officers operating since peacetime:

> near the borders should collect, check, and select information to draw maximum benefit for the intelligence system. Among the many uses of homing pigeons, ordered by a recent ministerial circular, their employment fort those tasks could be included.

[15] The Law no. 831 of 29 June 1882 established the post of Chief of the Army Staff. Similar tasks were previously assigned to the President of the General Staff Committee, who chaired the Committee and supervised all the studies concerning the defence of the State before submitting them to the scrutiny of the Minister of War, as for Royal Decree of 7 May 1874.

[16] Ministry of War, *Norme di servizio pel Comando del Corpo di Stato Maggiore* (Service Instructions for the Officers of the General Staff Corps) Roma, 25 October 1882, AUSSME, Series L-3, env. 298 - 296. Office IV was responsible for keeping the accounts of the General Staff Corps. The Military Geographical Institute was also under the authority of the 1st Division.

[17] Letter no. 40, 20 December 1882, by General Ricci, AUSSME, G-24.7 Series, env. 3.

> We currently spend 100,000 liras per year to pay four military attachés who, despite their goodwill, cannot perform remarkable services in this era of great advertising. By allocating a smaller sum of money, we could certainly set up a network of secret agents who, during the war, could perform services of the utmost importance[18].

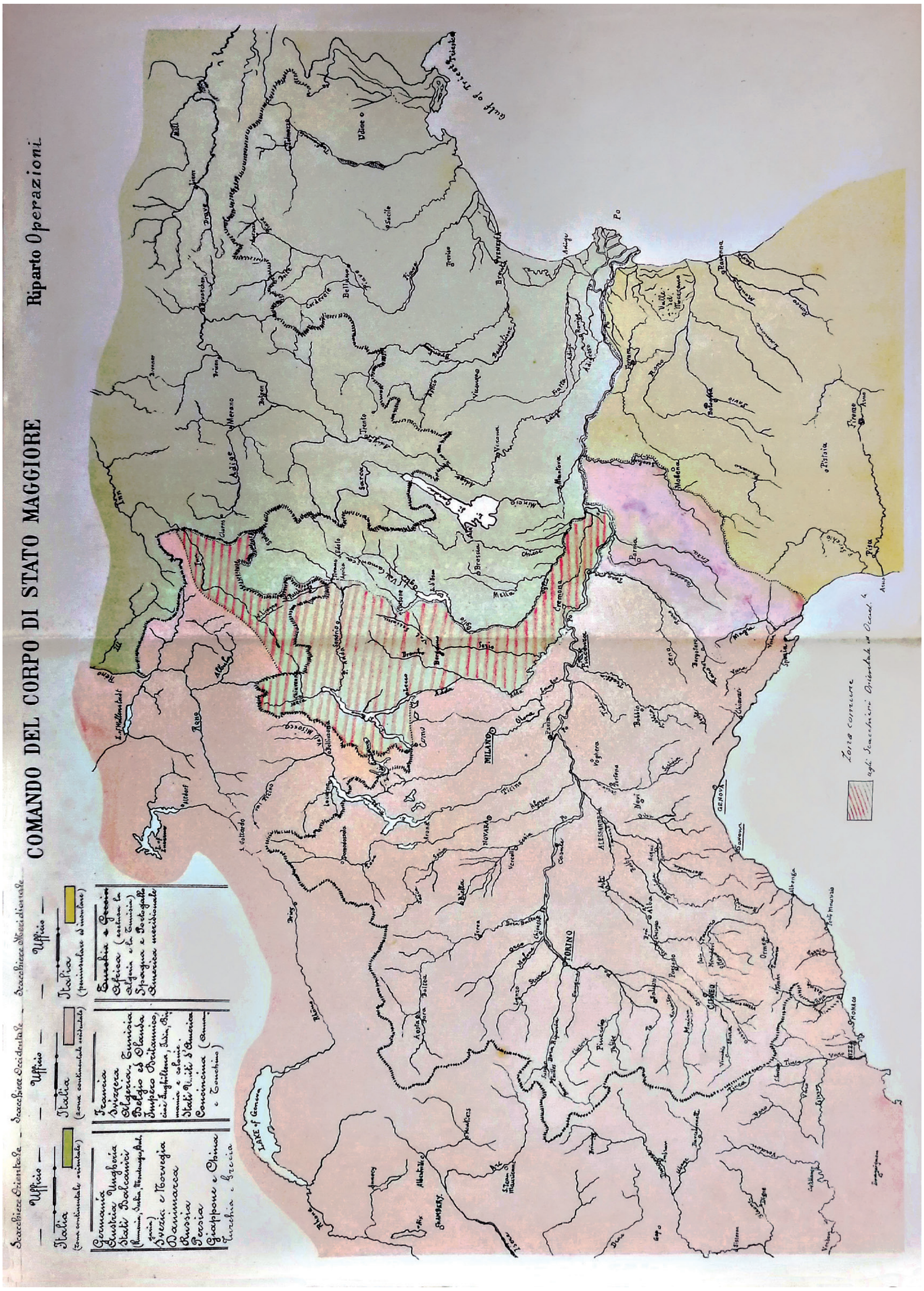
In the same year 1882, the Ministry of War issued the *Regolamento di servizio in guerra* (Wartime Service Regulations) listing the activities to be carried out to collect information about the enemies in the theatres of war, as well as the "special reconnaissance tasks entrusted, in peacetime, to officers from the Headquarters of the General Staff Corps"[19].

2.3 ORGANISATION CHANGES AND COLONIAL WARS

The Operations Division

In 1892, the peacetime organisational structure of the Headquarters of the General Staff Corps was reshaped including the Office of the Chief of the Army Staff and two Divisions, called Operations Division and Intendancy Division. The chief of the Operations Division also "headed the Intelligence Service responsible for neighbouring countries" and could avail himself of three offices, dealing with the Western, Eastern and Southern Theatres[20]. He could also rely on five military attachés serving in Saint Petersburg, Vienna, Berlin, Constantinople, and Paris. Later, other attachés were assigned to the Embassies in Bern (1902), Sofia (1905), Tokyo and Bucharest (1906), Madrid (1909), London (1910), and Belgrade (1914)[21]. The main tasks of the Theatres concerned the collections of political-military information about countries of interest with particular reference to their armed forces and the assemblage of data on foreign armies operating in their area of responsibility[22]. For instance, in 1893 the Western Theatre consisted of four sections that dealt with military studies on the territory and fortifications, statistics and studies on the forces of France and its colonies, as well as on the military power of Britain, USA, Switzerland, Belgium and the Netherlands[23].
The Operations Division, like the 1st Division before it, also dealt with counterespionage activities proposing legislative measures to the Ministry of War to fight against spies of foreign countries operating in Italy[24].

[18] *Ibidem*.
[19] *Regolamento di servizio in guerra* (Service rules in war), Section 1, Servizio delle truppe, Ministry of War, Rome, 26 November 1882. They generally worked in isolation "to collect general information about the shape, the nature and the financial resources of a theatre of war, or part of it. Special reconnaissance activities also include those aimed at establishing defence works or at determining ways and means for attacking fortified locations". Reconnaissance activities were carried out beyond national borders by people who became famous later, such as Giuseppe Perrucchetti, Cesare Battisti, Eugenio De Rossi, Alberico Albricci, Vittorio Zuppelli, Paolo Spingardi and Luigi Cadorna, who, as a captain, explored the Karst region.
[20] Circular no. 46 of 'Military Journal', dated 22 February 1895, re-established the Technical Office within the Operations Division.
[21] Ministry of War, *Norme di servizio pel Comando del Corpo di Stato Maggiore* (Service regulations for Headquarters of the General Staff Corps), Rome, 5 May 1892, AUSSME, L-3 Series, env.298.
[22] In the second half of the 1870s, the Headquarters of the General Staff Corps began to compile monographs on the main routes that allowed access to the Po Valley from France, Switzerland, and Austria. Later, they compiled monographs on other parts of Italy, including island and Apennine regions. All monographs were updated until 1906, depending on the progress of road and fortification construction (Rivista Militare Italiana, 1910, pp. 897-901).
[23] Headquarters of the General Staff Corps - Operations Division, letter no. 595, 4 December 1893, *Documenti posseduti dall'Ufficio Scacchiere Occidentale* (Documents owned by the Western Theatre), AUSSME, G-24.7 Series, env.6.
[24] AUSSME, G-24.7 Series, env.12.

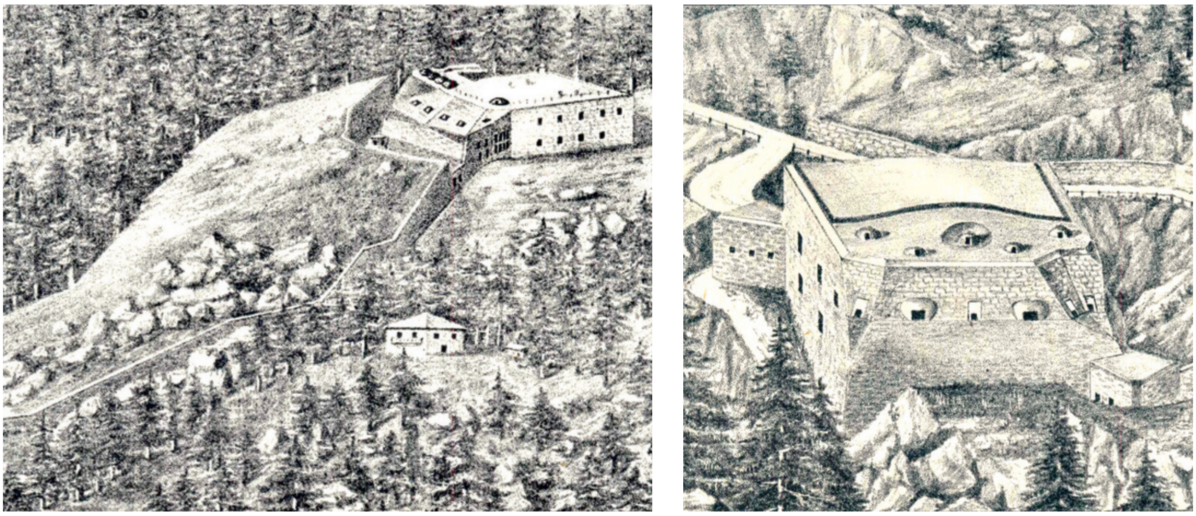


2.2 Relevant territories of the Eastern theatres in 1885

In the 1890s, the territorial Corps' Headquarters located at the frontiers and in Sicily were more involved in the intelligence activities against foreign nations, recognising that:

> in the past, intelligence activities against neighbouring countries were mostly performed by the Headquarters of the General Staff Corps and military attachés, and only in a subsidiary way by Corps deployed at the borders. However, the recent results achieved by Army corps and the ever-increasing difficulties in recruiting clever informers due to the incidents occurred beyond national borders, led to decentralise the Intelligence Service to the Headquarters of the Corps gradually, leaving the leadership of the Service to the Headquarters of the General Staff Corps[25].

In October 1892, the Headquarters of the 12th Corps, located in Sicily was tasked with the intelligence operations in Algeria, Tunisia, and Tripolitania. Two years later, the decentralisation also involved frontier Army Corps, authorised to send abroad officers on leave for performing special tasks.
In June 1894, the sum allocated to Intelligence Service and to the reconnaissance activities amounted to 61,000 liras per year, administered under the direction of the Division Head, who supervised the development of the information activities performed by agents operating abroad, Corps' Headquarters, military attachés, and officers on special missions.



2.3 Dossaccio and Someda Austro-Hungarian forts in a publication of the Eastern theatre, early 1900s

The Eastern African Campaigns

In the last two decades of the 19th Century some colonial ambitions started to arise in Italy. The Italian expansion in Eastern Africa was supported by Great Britain, as demonstrated by the relations between the members of the Italian Intelligence bodies and the British Intelligence Service and by various classified publications provided by the British Intelligence to the Italian Headquarters

[25] Headquarters of the General Staff Corps, letter dated 4 January 1895, *Ordinamento e funzionamento del Reparto Operazioni,* (Regulation and functioning of the Operation Division) AUSSME, G-24.7 Series, env.6.

of the General Staff Corps. These publications contained monographs on African territories and reports about the Anglo-Egyptian operations in Sudan[26].

However, the Italian-Ethiopian campaigns of 1887-1898 and 1894-1895, as well as the most tragic campaign of 1895-1896 which culminated in the Battle of Adwa, were conducted under the command of the civil-military Governor of the Colony of Eritrea, who received direct orders from political authorities, i.e., the Italian Presidency of the Council of Ministers, the Ministry of Foreign Affairs, and the Ministry of War. In fact, after the landing in Massawa, a specific section, later upgraded to office, was established within the Ministry of War, under the authority of the General Staff Division of the Secretariat-General, which dealt with indigenous and national troops deployed in Africa and with various military and intelligence issues relating to the Italian territories in the Red Sea region[27].

The Headquarters of the General Staff Corps was not involved in the direction of operations and in the conduct of intelligence activities. Nevertheless, the Chief of the Army Staff, General Domenico Primerano, who had replaced Cosenz in 1893, was compelled to resign since the Parliament and the press blamed him for being jointly responsible for the disaster of Adwa.

From the Special Intelligence Secretariat to the Intelligence Office

The mobilisation plans of 1896 provided for the creation, in case of war, of a General Headquarters, later called Supreme Command, the elimination of the Theatres, and the formation inside the Operation Division of an Office responsible of the Intelligence activities[28].

In 1897, Colonel Felice De Chaurand de Saint Eustache was called to join the Operations Division with the secret role of Intelligence Service director[29]. The presence of an intelligence cell within the General Staff Corps was undisclosed in peacetime, for reasons of military secrecy, while only after entering the war, an Intelligence Office should formally be established with the task to assist the Army Commander-in-chief in conducting operations.

A paper by General Alberto Pollio in 1914 retraces the history of the Intelligence Office and confirms that it was formally created during peacetime, in 1897:

> For many years, the secret Intelligence Service was concentrated in the hands of the chief of the Secretariat of the second-in-command of the General Staff Corps, who had the task of directing the service and of harmonising the information provided by military attachés. In 1897, when there was a clear need to exempt military attachés from all secret activities, the direction of the service was entrusted to a senior officer who was directly under the authority of the second-in-command […]. However, little by little, the increased workload led to an expansion in staff and a real office was set up alongside the Operations Division Secretariat. This new office was called ‘Special Intelligence Secretariat’[30].

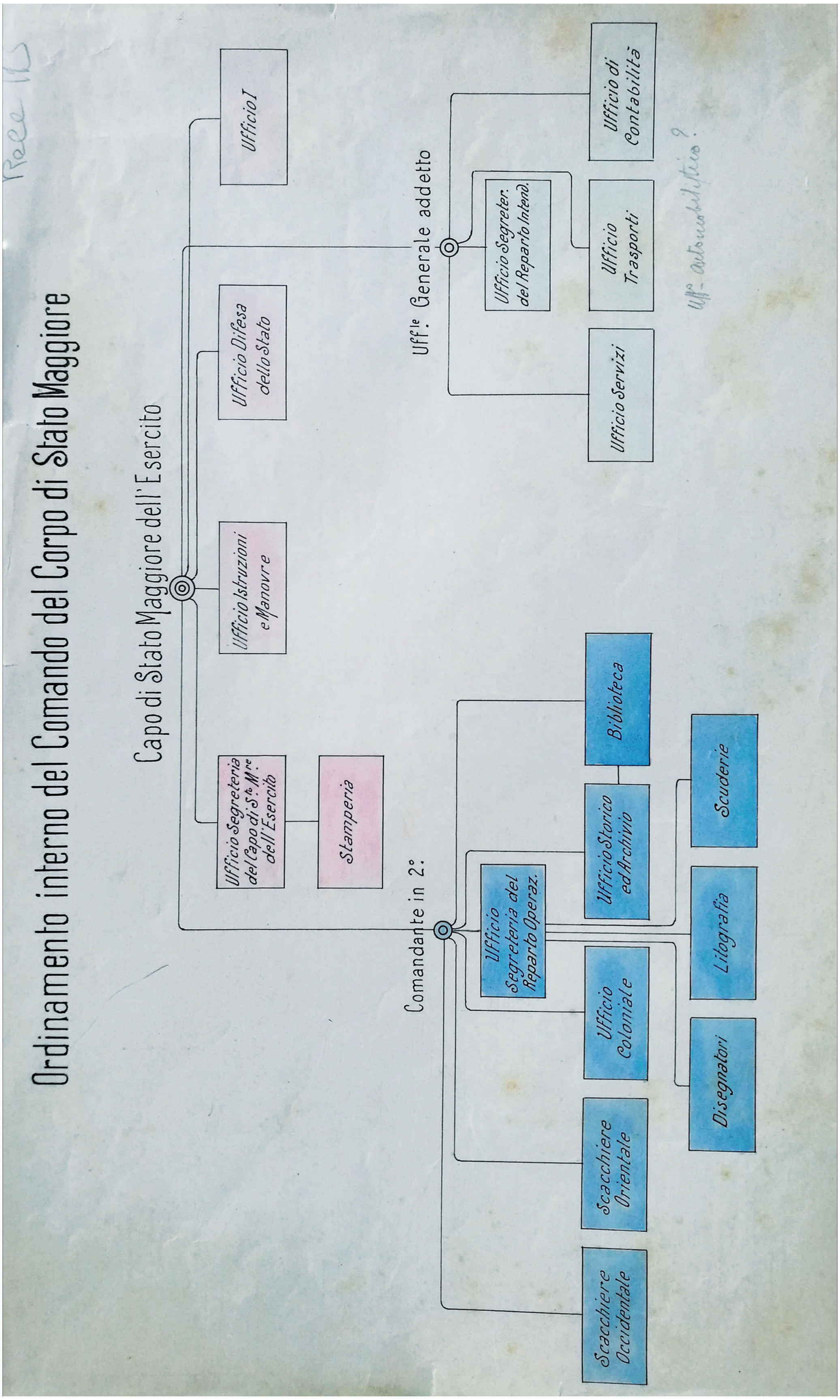
[26] Maria Gabriella Pasqualini, *op. cit*. p. 160-163.

[27] Alessandro Gionfrida, *Le fonti dell'Ufficio Storico relative alla campagna del 1895-1896 in Eritrea,* in *Studi storico-militari 1995,* AUSSME, 1998, p. 174-175. Within the General Staff Division in 1896, there was an Office named ‘Africa' providing information for the decisions of the Minister of War on military issues pertaining to the Eritrean colony.

[28] The General Headquarters included the following offices: Secretary for General and Protocol Affairs; Operations Division incorporating the Intendancy Division and divided into Offices responsible of Intelligence, relations with the Armies; etc.; Military Justice Office; Post Office; Inspectors of Artillery and Engineers.

[29] The Chief of the Army Staff's General Order 2 of 17 January referred only to the assignment of the Colonel to the Division.

[30] Memorandum of the Office of the Chief of the Army Staff, *Proposte per semplificare il funzionamento degli uffici direttamente dipendenti dal Capo di Stato Maggiore dell'Esercito,* (Proposals for simplify the work of Offices addicted to the Chief of the Army General Staff) undated, but of 1914.



2.4 Organization of the Headquarters of the General Staff Corps in 1907

According to the new mobilisation tables, in 1902 the intelligence functions were taken away from the Operations Division and transferred to the 'Intelligence Secretariat', an independent office under the command of Colonel Vincenzo Garioni, who reported to the Secretariat of the Chief of the Army Staff.

In 1903, the Chief of the Army Staff, General Tancredi Saletta, who had replaced Domenico Primerano, reorganised the Headquarters of the General Staff Corps, and transformed the Southern Theatre into a Colonial Office with jurisdiction, among other things, over the Italian colonial possessions. After the bitter experience of the Battle of Adwa, the Headquarters of the General Staff Corps was finally involved in the operational planning process and in the search of information aimed at supporting the Italian forces deployed in Eritrea[31].

From August 1906, the Secretariat of the Chief of the Army Staff included the 'Special Intelligence Secretariat', under the direction of Colonel Silvio Negri, who had replaced Garioni in July 1905[32]. The following November, that Secretariat became an Office as permanent part of the General Staff Corps and embracing a Military Intelligence Section and a Secret Information Section[33]. The Office, gaining larger importance and autonomy, was placed under the direct authority of the Chief of the Army Staff.

The entire structure of the Headquarters of the General Staff Corps, shown in picture 2.4, takes also into account the organisational changes made in 1907, when the *Istruzioni per il Funzionamento Interno del Comando del Corpo di Stato Maggiore* (Instructions for the internal functioning of the Headquarters of the General Staff Corps) came into force to govern every activity of the Army's operational leadership, including Theatres.

The Western Theatre had to deal with fortifications and military forces of France, Switzerland, Belgium, the Netherlands, Spain, Portugal, and their colonies"[34]. The Eastern Theatre carried out the same tasks, for Germany, Austria-Hungary, Russia, Denmark, Sweden, Norway, and their colonies, as well as Asian countries under Russian influence. The Section for Austria-Hungary of this Theatre collected information about "the imperial Austro-Hungarian military forces, reporting and updating the structure of the Austro-Hungarian Army and the most important political-military information about that Country"[35].

The Colonial Office extended its jurisdiction over: the Eritrean colony, Benaadir, independent African countries; colonial troops and troops deployed abroad; the Mediterranean Sea, Albania, Tripolitania; Balkan countries, Britain, the USA and their colonies, South America, Japan, China, and independent Asian countries.

[31] Agenda of the Office of the Chief of Army Staff no.6, 28 March 1903, AUSSME, L-3 Series, env.297.

[32] Office of the Chief of the Army Staff, Agenda no.37, 3 August 1906, *Ripartizione degli uffici e personale che vi è addetto* (Subdivision of Offices and of the addicted personnel), AUSSME, L-3 Series, env.297.

[33] *Istruzione per il funzionamento interno del Comando del Corpo di Stato Maggiore* (Instruction concerning the internal operation of the Headquarters of the General Staff Corps), Ufficio ordinamento 1874-1955, 1907, AUSSME, F-4 Series, env.8.

[34] In 1900, monographs were completely reorganized into two new Series: the former including geographical-strategical monographs, the latter military guidebooks. In November 1913, there was a new reorganisation of the monographs.

[35] Headquarters of the General Staff Corps's, *Promemoria circa i lavori compiuti dalla sezione A/U nel decennio 1897-1907* (Memorandum on the works carried out by section A/U In the years 1897-1907), 2 December 1907.


Avvertenza

Le fortificazioni austriache sulla frontiera italiana, nell'Istria e nella Dalmazia vennero riunite in gruppi, distinti con lettere, come appare dai qui annessi indice grafico ed elenco.

A ciascuna "Memoria" corrispondono uno o più gruppi di opere e ciascuna "Memoria" comprende cenni descrittivi e tavole, illustranti le località e le loro opere di fortificazione.

Roma, 1° Maggio 1903.

Il Capo Ufficio

A	Forte di Nauders	N	Opere a Fodara Vedla e Podestagno (in progetto)
B	Forte di Gomagoi	O	Forti di Landro e Plätzwiese
C.F	Gruppo fortificato del Tonale – Magazzino militare Rocchetta	P	Forti di Sexten
D	Gruppo fortificato di Lardaro	Q	Forte Hensel o di Malborgeth
G	Gruppo fortificato di Riva	R	Sbarramento della Valle del Seebach
E	Campo trincerato di Trento	S	Forti Predil, Hermann, Chiusa di Flitsch
I	Piazza di Franzensfeste	T	Opera a S.Valerio (in progetto)
H	Gruppo fortificato di Levico	U	Piazza forte marittima di Pola
J.K	Forte Dossaccio, Fortino Busi – Forte Someda	V.W	Fortificazioni sulla costa dalmata fra Pola e Cattaro

2.5 Location of permanent fortifications at the Italian border. From a publication of the Eastern theatre

The Strengthening of the Intelligence Office

Also, General Alberto Pollio, the new Chief of the Army Staff who succeeded Saletta, devoted due care to the Intelligence Office that remained under his direct authority[36]. The staff of the Office gradually expanded, but at least until 1914, the personnel of Intelligence Office never outnumbered the staff of other offices of the Corps' Headquarters, keeping the number of its officers under ten[37]. In November 1910, Pollio issued new directives that made Intelligence Office the pivot of all the activities related to foreign countries. On the other hand, the Theatres, and the Colonial Office:

> must conduct essential studies on the organisational structure and equipment of foreign military forces as well as keep up-to-date situation of their finances (budgets of the Army and the Navy); planned or current construction of fortifications; means of communication; technical developments in weapons and fighting techniques; various publications on manoeuvres and prevailing ideas about the conduct of the troops, etc[38].

Pollio was also interested in tactical information and issued the *Norme Generali per l'impiego delle grandi unità di Guerra* (General Rules on the employment of higher combat echelons) published in 1910. The Intelligence Office played a fundamental role also in this mater since it would provide the Commander with data required to devise the manoeuvre concept[39].

2.4 INFORMATION SOURCES

Military attachés

The 1907 Instructions included a confidential appendix containing the instructions for the military attachés[40] who had to provide the Headquarters of the General Staff Corps with information about the military potential of foreign countries, following for instance press news and public debates on military issues and on all the aspects that could be useful to know the conditions and progress of foreign armies as the turnover of top-ranking personnel, the organisation of services and the manoeuvres[41].
While searching for information, military attachés had to remain within the limits of their official duties and had to respect the local environment and customs. They also received information about the special concessions given in Italy to foreign attaché of the Country where they operate to obtain, if necessary, reciprocity of treatment.

[36] Agenda no.11 of 23 June 1910, *Incarichi vari e coordinamento di lavoro tra uffici* (Various tasks and work coordination among Offices), AUSSME, L-3 Series, env.297. As provided for by Agenda no.37 of 23 August 1906, the Intelligence Office was directly under the Chief of the Army Staff.
[37] *Specchio indicante la composizione dello Stato Maggiore del Gran Quartier Generale* (Headquarters of the General Staff Corps orgnization scheme), December 1908, AUSSME, F-4 Series, env.37.
[38] *ibidem.*
[39] Circular no. 400, *Esplorazione vicina e sicurezza* (Nearby scouting and Security), May 1915.
[40] The Chief of the Army Staff submitted the appointments and substitutions of military attachés to the Ministry of War that, in turn, asked the Ministry of Foreign Affairs to carry out the official accreditation procedure. Missions generally lasted 4-6 years. Like all personnel employed by diplomatic missions, military attachés were under the authority of their Heads of Mission, with respect to their contribution to the diplomatic mission and all the relations with foreign authorities.
[41] If there were no naval attachés, the military attachés took on the task of providing up-to-date information about the Navy of the country, in addition to data about ground forces.

Military attachés could not establish or maintain any relation with secret agents (spies, emissaries, information agencies) in the country they were accredited to. If they received any kind of letter, offer or communication pertaining to espionage affairs, they could not reply in any way, keeping informed the Corps' Headquarters. As much as possible, they had to refuse interviews from these people and could never participate in meetings whose purpose was not completely clear. In case their foreign counterparts proposed the joint purchase of documents or search for special information, they could not undertake any commitment, informing the Corps' Headquarters and waiting for directives[42].

Special Missions Abroad

According to the same 1907 Instructions, Italian officers during their reconnaissance activities abroad, had to behave like ordinary travellers or tourists without 'exposing' themselves in any way for the purpose of collecting information and news. The officers who carried out these missions were soldiers on home leave travelling on their own with a regular passport, without hiding their position. Therefore, military authorities were not responsible for possible incidents due to their carelessness.

Before leaving, officers had to gather all necessary information from the Intelligence Office with respect to the limitations and prohibitions of the country of arrival, to avoid espionage accusations and respect the country's rules while travelling through it. They could not carry compromising documents neither take notes that could be compromising.

After completing their missions or reconnaissance activities, officers had to submit specific reports within the following thirty days, in order to concur to the building of: updated pictures about roads and permanent defence structures along the border; eventual sabotage activities and surprise attacks against sensitive targets in Austria and France; actions aiming to take the enemy by surprise and occupy significant positions, such as alpine mountain passes, immediately after the declaration of war[43].

[42] Military attachés' tasks were specified in the Publication of September 1913, no. 704-R of the Secretariat Office of the Operations Division of the Headquarters of the General Staff Corps, titled *Raccolta delle norme e disposizioni per gli addetti militari presso le rappresentanze diplomatiche estere* (Rules collection for Military attachés accredited at diplomatic representatives abroad).

[43] AUSSME, F-4 Series, Ufficio Ordinamento 1874-1955, env.8. In 1907-1908, the Austro-Hungarian and the Italian governments signed a Series of diplomatic agreements that governed reconnaissance activities beyond national borders through specific regulations (Headquarters of the General Staff Corps - Operations Division, letter no. 66 dated 7 April 1909, *Viaggi di ufficiali austriaci in Italia,* AUSSME, G-22 Series). New rules for Italian officers travelling to Austria-Hungary were introduced in 1911-1912.

CHAPTER THREE

The end of a peace epoch

3.1 INTERNATIONAL ACTIVITIES OF THE INTELLIGENCE OFFICE

The Careful Attitude During the Preparation of the Libyan War

The interest of the intelligence services towards Tripolitania and Cyrenaica dated as far back as at least 1883 when, after the French invasion of Tunisia, the Chief of the Army Staff, General Enrico Cosenz, ordered Captain Carini of the General Staff Corps to draft an in-depth analysis of those North African territories. The Carini report, in addition to a description of the Libyan territories, included comments on the military preparation of the Turks and warned about the possible danger of an Arab revolt in case of an Italian invasion. According to this paper, "the Arabs could side with the Turks against the aggression of a Christian country. The sect of Senussi (the Jesuits of Islam) is a powerful moral force that deserves careful attention. […] In Cyrenaica, the Senussi have several Zaniè, which are schools, cloisters, and extremist centres at the same time, especially against Christianity"[1].
The Colonial Office restated those warnings in October 1911, when the Italian landing in Tripoli was imminent, by writing:

> We cannot close our eyes and believe in the intel that often comes from Tripolitania. This information, which seems too optimistic about the feelings that the Arabs of Tripolitania have for us, comes from informers who almost belong to the *Banco di Roma,* which is interested in forcing us to war and represents it as a quite easy option. This Office believes imprudent to rely on the help of the Senussi and the Arab tribes, while it would be suggestible to take precautions against their possible alliance with the Turkish troops[2].

The well-disposed or at least neutral attitude the Arab peoples allegedly had toward the Italian occupation was therefore an incorrect tale that circulated in the political and diplomatic environment, whose members acted - probably in bad faith - in order to urge the national government to undertake a war in Libya[3]. However, the Chief of the Army Staff and the General Caneva, head of the expedition, failed to pay attention to the information of the Colonial Office, as they preferred to rely on those provided by the Presidency of the Council of Ministers and the Ministry of Foreign Affairs, wrongly assuming the Arabs had a favourable attitude towards the Italian occupation.

[1] Captain Alfonso Carini's report, 1883, AUSSME, L-8 Libia Series, env.6.
[2] Operations Division - Colonial Office, Memorandum no. 1296, 1 September 1911, *Informazioni circa una eventuale spedizione in Tripolitania e Cirenaica* (Information about a possible expedition against Tripolitania and Cyrenaica), AUSSME, L-8 Series, env.128.
[3] Incorrectly, SIFAR emphasized the mistake made by the intelligence service while preparing the war in Libya: "Unfortunately, the euphoric expectations in the autumn of 1911 disappointed everybody, without distinction, when faced with the unexpected hostile and proud attitude of the Arabs […]. It was undoubtedly a mistake" (SIFAR, *Il servizio informazioni militare italiano dalla sua costituzione alla fine della Seconda guerra mondiale, op. cit.,* pp. 8-9).

On the imminence of the landing, Captain Pietro Verri was sent to Tripoli under cover as a postal service officer with the task of organising a local Intelligence Service. He arrived in Tripoli on 21 September 1911 and started to send several dispatches to Rome until he died on the battlefield on 26 October 1911.

In December of that year, a Politico-Military Office was created in Libya with purpose of carrying out intelligence activities, monitoring against enemy espionage, negotiating with tribes' leaders, establishing relations with native peoples and setting up an indigenous militia[4].

The Intelligence Service section of the Politico-Military Office established a network of military informers from troops' commands up to regiment level, who in turn engaged indigenous emissaries to obtain information from "local inhabitants, especially in markets and cafés, from soldiers and from people arriving from the outside, in occasion of parades, operations, etc."[5]

General Tommaso Salsa, head of the Office, provided the guidelines for the relations with local tribes' leaders, and "informed the troops' commands about the policy established by the Governor specifying how soldiers had to behave with locals."[6] The Politico-Military Office was also authorised to entrust reconnaissance missions to military aviators and aerostat pilots.

The Redl Affair

Between 1910 and 1913, thanks to an exemplary espionage operation, Italy obtained confidential documents belonging to the Austro-Hungarian General Staff, including General Conrad's war plans of 1909. The documents firstly received in December 1910 included 23 photographs of a report containing various war plans of the Austro-Hungarian monarchy and the related deployment of forces. It was translated in the same month and reproduced in eight copies (see picture 3.1)[7].

After the documents check-up, the Intelligence Office avowed their authenticity, as per following statements: "I examined the documents carefully and ordered an officer to do the same. We are both convinced that these are photographs of authentic and recent draft documents. […] The enclosed documents show such a degree of reliability that may become a useful starting point for studying the Austrian war gathering (against Italy N/A), in the case that all European countries, except Serbia and Montenegro, remain neutral (as predicted by Conrad in his famous memoir)."[8]

This success, overlooked until today, can be regarded as the most important of the Italian military Intelligence Service in the first years of the new century[9], and was due to Colonel Alfred Redl, former deputy chief of the *Evidenzbureau*, who betrayed his Country by selling the most secret documents of the Vienna General Staff to Russia, France, and Italy. Redl, an Official highly esteemed within the Austrian military entourage because of his presumed moral integrity and

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[4] Military Political Office, *Relazione sulla campagna di Libia, ottobre 1911 - agosto 1912* (Report on the Lybia campaign, October 1911- August 1912). Memoria 6ª, AUSSME, L-8, env.132.

[5] Circular no.123, 27 December 1911, *Norme per i signori ufficiali informatori* (Rules for informing Officers), AUSSME, L-8 Series, env.134.

[6] Agenda no.47, 16 December 1911, AUSSME, L-8 Series, env.128.

[7] The copies were distributed as follows: one to the King, one to the Chief of the Army Staff, two to the Eastern Theatres and four to the designated Headquarters of the Armies.

[8] Intelligence Office, Memorandum no.14, 12 January 1911, *Specchi di radunata della I e II armata dell'esercito austro-ungarico* (Gathering schemes of the 1st and the 2nd Austro-Hungarian Army), AUSSME, G-22 Series.

[9] Odoardo Marchetti mentions the Redl affair in a few lines (p. 23, *op. cit.*) without giving it the consideration it deserves. Gatti seemed to have a better knowledge of the facts. He interviewed General Garruccio who said, "In 1912 we had the luck to get our hand on Colonel Redl from the Austrian General Staff, a debt-ridden homosexual who provided us with lots of documents. He was perfectly correct with us and received at most 60,000 kronen. […]. He gave us documents about the Austrian mobilisation", (Angelo Gatti, *Caporetto. Dal diario di guerra inedito - maggio-dicembre 1917,* il Mulino, Bologna, 1964, p. 159).

professional skills, after gaining a fortune through his long espionage activity, was compelled to kill himself in a hotel room by counterespionage agents who had exposed him[10].

3.1 Frames of Conrad's memoir with various Austrio-Hungarian war hypotheses (from an envelope of Colonel Negri, Chief of Intelligence Office)

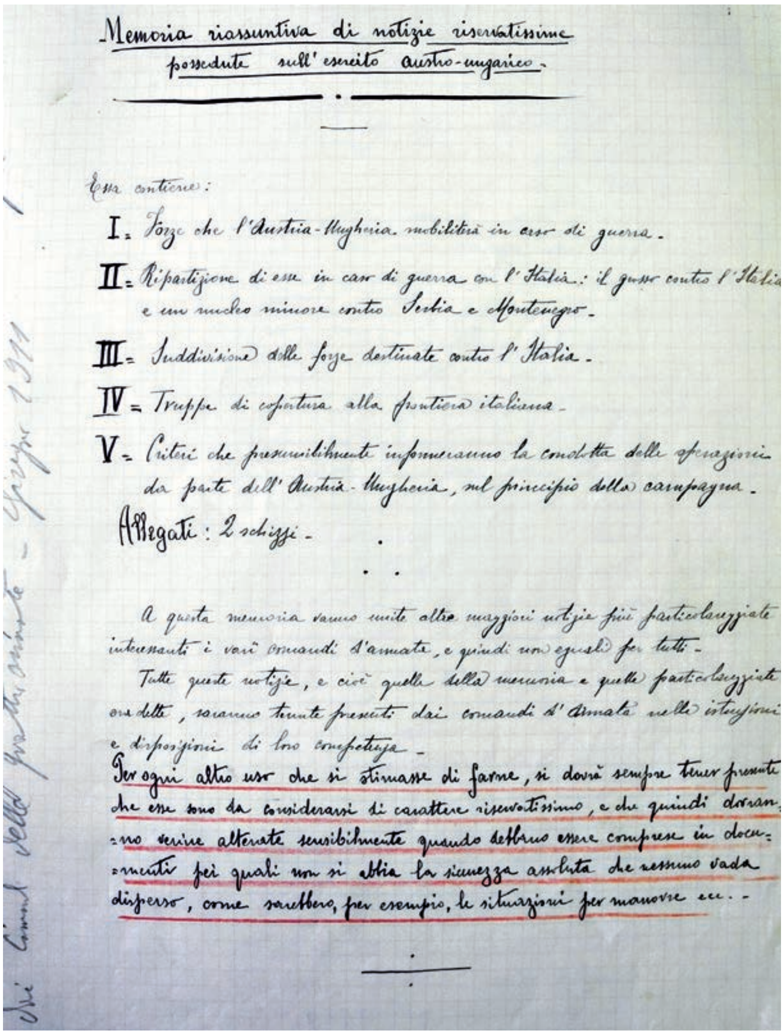
The photograms provided by Redl from 1910, included the most secret documents belonging to the Austro-Hungarian army, such as: classified instructions for mobilisation; instructions for the defence of strongholds; orders of battle; an appendix to the mobilisation order of the Landwehr; a war memoir ascribed to the Austrian Chief of the Army Staff; tables with the gatherings of the 1st and 2nd Army along the Isonzo; instructions for backup troops in case of alarm; instructions for setting up accommodations in massing areas, etc.

Nevertheless, the Intelligence Office, still not fully satisfied, decided to try to obtain further secret information, by directly approaching Redl. A meeting between the spy and an officer of the Headquarters of the General Staff Corps was arranged in Munich - Germany, on 20 September 1912 and took place at the 'Hotel de l'Europe' between 09.15 am - 01.30 pm. Lieutenant Colonel Carlo Montanari, chief of the Section dealing with Austro-Hungarian Army Affairs in the Eastern Theatre[11], interviewed Redl, who had assumed the pseudonym of Jakob Jasmith.

[10] For the counter-espionage action that led to the identification of the spy see Max Ronge, *Spionaggio, op.cit.,* pp. 80-85.

[11] Memorandum of the Eastern Theatre, *Missione a Monaco di Baviera, 29 settembre 1912. Colloquio con Jakob Jasmith - colonnello di stato maggiore Redl* (Mission to Munich, 29 September 1912. Interview witth Jakob Jasmith. Staff Colonel Redl), AUSSME, G-22 Series. The document contains the draft notes written by Montanari on the headed paper of the hotel: "Hotel de l'Europe München, Bayerstrasse 31".

They talked about the Austro-Hungarian military policy of the time, the organisational structure of the Austro-Hungarian Army and the Double Monarchy's defensive strategy (see pictures 3.2 and 3.3). In his post-mission report, Montanari explained the reasons of the failure of Alfred Conrad von Hötzendorf Austro-Hungarian Chief of General Staff, against Italy before 1912, writing: "Conrad wanted a war against Italy and all military authorities approved his intentions, which depended on military and political needs and not on the animosity against the Italian people. […] Italy is troubled and unstable. It is a source of tension and the current war with Turkey, which no one could predict, proves it. Once and for all, we need to settle our situation in the Balkans. Hence, we need to eliminate the danger Italy poses. But Conrad failed, since the Emperor and the political parties refused a war against Italy and part of the public, especially the Hungarians, were on their side"[12].


Memoria riassuntiva di notizie riservatissime possedute sull'esercito austro-ungarico.

Essa contiene:

I. Forze che l'Austria-Ungheria mobiliterà in caso di guerra.

II. Ripartizione di esse in caso di guerra con l'Italia: il grosso contro l'Italia e un nucleo minore contro Serbia e Montenegro.

III. Suddivisione delle forze destinate contro l'Italia.

IV. Truppe di copertura alla frontiera italiana.

V. Criteri che presumibilmente informeranno la condotta delle operazioni da parte dell'Austria-Ungheria, nel principio della campagna.

Allegati: 2 schizzi.

A questa memoria vanno unite altre maggiori notizie più particolareggiate interessanti i vari comandi d'armata, e quindi non eguali per tutti.

Tutte queste notizie, e cioè quelle della memoria e quelle particolareggiate ora dette, saranno tenute presenti dai comandi d'armata nelle istruzioni e disposizioni di loro competenza.

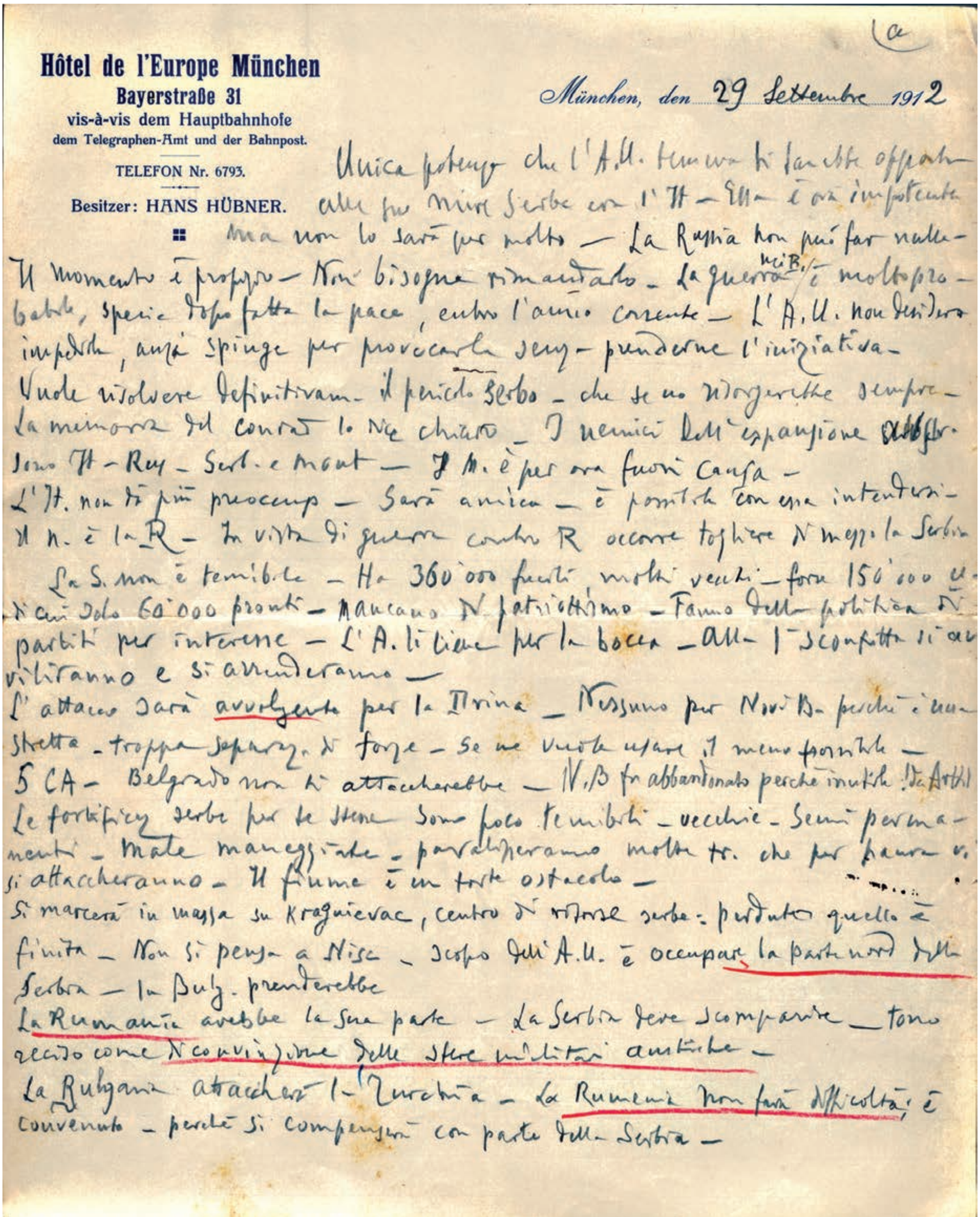
Per ogni altro uso che si stimasse di farne, si dovrà sempre tener presente che esse sono da considerarsi di carattere riservatissimo, e che quindi dovranno venire alterate sensibilmente quando debbano essere comprese in documenti pei quali non si abbia la sicurezza assoluta che nessuno vada disperso, come sarebbero, per esempio, le situazioni per manovre ecc.

3.2 Summary of Austro-Hungarian operational planning for the war against Italy obtained through espionage

The disclosure of Conrad's war scheme, foreseeing a preventive attack against Italy, Serbia and Montenegro at the same time, greatly alarmed the Italian military leaders during the partial mobilisation of the Austro-Hungarian army, which occurred in occasion of the Balkan wars.

However, in January 1914, during a conference in the presence of the Austrian ministers of war and foreign affairs, Count Sternberg, listing the main reasons for the Austro-Hungarian non-participation in the first Balkan war, admitted: "Now we can openly say that the Army was not well equipped, and we knew of the presence of elusive traitors among top-ranking officers. Colonel

[12] Conrad was the Chief of Austro-Hungarian General Staff, according to his memoir of 1909, Austria had to attack Italy, Serbia, and Montenegro at the same time, in case of situation worsening in the Balkans. (Eastern Theatre Report, *Atteggiamento dell'Austria verso l'Italia: mire dell'Austria Ungheria nei Balcani nel momento attuale* (Attitude of Austria toward Italy, aims of Austria-Hungary in Balkans at present time), October 1912, AUSSME, G-22 Series).



(a

Hôtel de l'Europe München
Bayerstraße 31
vis-à-vis dem Hauptbahnhofe
dem Telegraphen-Amt und der Bahnpost.
TELEFON Nr. 6793.
Besitzer: HANS HÜBNER.

München, den 29 Settembre 1912

Unica potenza che l'A.U. temeva si facesse opposizione alle sue mire serbe era l'It. — Essa è ora impotente ma non lo sarà per molto — La Russia non può far nulla —
Il momento è propizio — Non bisogna rimandarlo — La guerra nei B. è molto probabile, specie dopo fatta la pace, entro l'anno corrente — L'A.U. non desidera impedirla, anzi spinge per provocarla senza prenderne l'iniziativa —
Vuole risolvere definitivam. il pericolo serbo — che se no risorgerebbe sempre — la memoria del conrad lo rie chiaro — I nemici dell'espansione [illegible] sono It. — Russ. — Serb. e Mont. — Il M. è per ora fuori causa —
L'It. non dà più preoccup. — Sarà amica — è possibile con essa intendersi —
Il n. è la R. — In vista di guerra contro R. occorre togliere di mezzo la Serbia
La S. non è temibile — Ha 360'000 fucili molti vecchi — forse 150'000 u. di cui solo 60'000 pronti — Mancano di patriottismo — Fanno della politica di partiti per interesse — L'A. li tiene per la bocca — Alla 1ª sconfitta si avviliranno e si arrenderanno —
L'attacco sarà avvolgente per la Drina — Nessuno per Novi B. perché è una stretta — troppa separaz. di forze — Se ne vuole usare il meno possibile —
5 CA — Belgrado non si attaccherebbe — N. B. fu abbandonato perché inutile! [illegible]
Le fortificaz. serbe per se stesse sono poco temibili — vecchie — semi permanenti — mal maneggiate — paralizzeranno molte tr. che per paura vi si attaccheranno — Il fiume è un forte ostacolo —
Si marcerà in massa su Kraguievac, centro di risorse serbe — perduto quello è finita — Non si pensa a Nisc — Scopo dell'A.U. è occupare la parte nord della Serbia — la Bulg. prenderebbe
La Rumania avrebbe la sua parte — La Serbia deve scomparire — tono reciso come di convinzione delle sfere militari austriache —
La Bulgaria attaccherà la Turchia — La Rumenia non farà difficoltà; è convenuto — perché si compenserà con parte della Serbia —

3.3 Colonel Montanari's notes taken during Redl's interview

Redl's activities were notorious, but he had not been unmasked yet. Therefore, the Minister of foreign affairs was compelled to implement a lenient policy, even toward Montenegro"[13].

The betrayal of Redl caused significant internal and international consequences. After searching Colonel Redl's house and office, the Austrian intelligence services admitted that "the State suffered huge moral and material damage that cannot be quantified in numbers. […] A wave of snide and indignant remarks and suspicious insinuations overwhelmed the Army. In Galicia, a serious hunt for officers was provoked by anonymous agents and in Hungary, a campaign against Vienna and the General Staff arose"[14].

This historical event, which inspired several movies, provoked a great deal of interest in the press all over Europe, causing great scandal and embarrassing the Double Monarchy. The Italian military attaché in Vienna described the event as follows:

> This case caused great sensation. Probably exaggerate rumours are circulating about possible accomplices who are under suspicion or at the verge of standing trial. To have a clear idea of the disgust and astonishment caused by this fact, we must consider that the General Staff was largely esteemed here. […] Redl was regarded as an officer with a great future and General Conrad trusted him completely. He held the position of deputy chief of the General Staff's *Evidenzbureau*, which is seen here as the most important post[15].

Information Sources Abroad

In the early 1900s, the intelligence activities conducted abroad, previously almost unknown even to military leaders, finally lost their long-standing shroud of secrecy and acquired their own dignity within the Headquarters of the General Staff Corps, rising to the level of other activities such as war plans, operations, logistics, etc.

The inclusion of the Intelligence activities among the subjects taught in the Official' training schools, as a part of military arts, confirms this approach. The subject was also mentioned in the synopsis used by the trainees who attended the courses, where the information sources that could be deployed abroad even in peacetime are specified together with their degree of reliability and efficiency:

> Military attachés assigned to the embassies are not a significant source of information since they cannot collect confidential information due to their delicate position. Italians abroad can sometimes provide information, but the largest part of them are poorly skilled and therefore inaccurate. […] The government employees, especially who carry out police services at the border could help, but their field of action and skills are limited. Well-paid foreign citizens could sometimes provide useful news, but given their doubtful morals, it is generally better to distrust them. [...] Emissaries, i.e., individuals sent on a mission abroad, may guarantee success in peacetime, especially if they are selected with wisdom. [...] The press is another

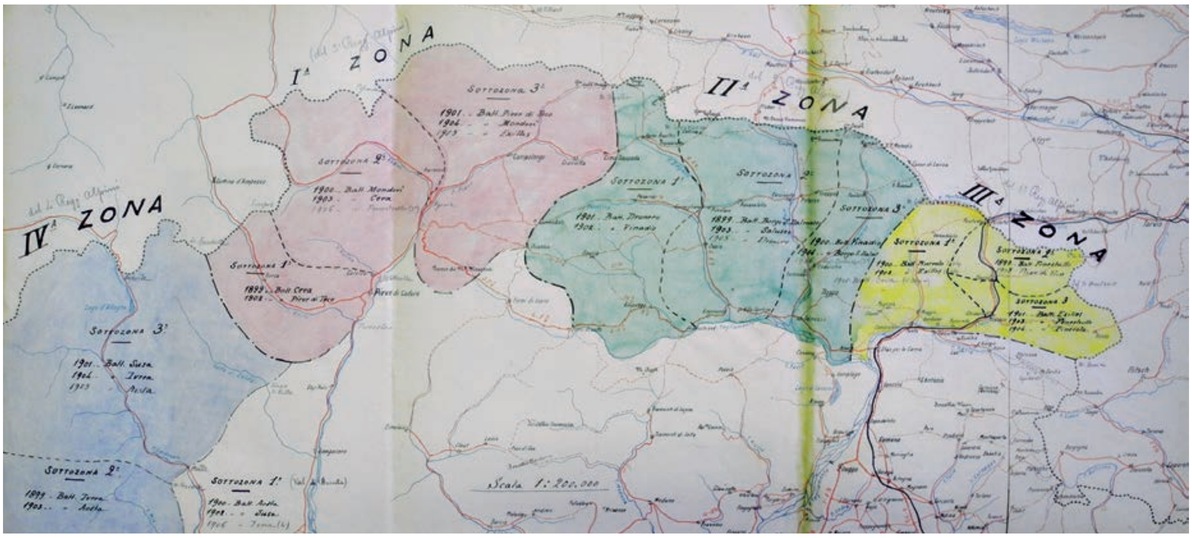
[13] Memorandum of 9 January 1914, *La politica estera austro-ungarica in una conferenza del conte Sternberg* (Austro-Hungarian Foreign policy at a Conference by Count Stenberg), Eastern Theatre, AUSSME, G-22 Series.
[14] Albert Pethö, *op. cit.,* p. 249, 252.
[15] Report no.58/140, dated 31 May 1913, Military attaché to the Royal Embassy of Italy in Vienna, *Spionaggio Redl,* AUSSME, G-22 Series, The Redl affair had further consequences and led to the dismissal of Colonel Augusto Urbanski, chief of the Austrian intelligence service.

good source of information that can provide news about armaments, change, and increase in garrisons, works, fortifications, etc[16].

3.4 Numbering of monographs regarding the territories on the Eastern border

[16] Scuola Militare, *Sinossi di arte militare,* Modena, 1912, Library of CESIVA - Civitavecchia.

The achievements of the intelligence activities were summarised in the territorial monographs concerning bordering areas (picture 3.4). In 1913, General Alberto Pollio decided to reorganise the monographs production and established the Office for Monographs & Military Territorial Guidebooks within the Divisional Headquarters in Milan. The office was headed by General Carlo Porro - future Deputy Chief of the Army Staff - under the direct authority of the Chief of the Army Staff[17]. In October 1914, Lieutenant Colonel Giovanni Garruccio, the future Chief of the Intelligence Office of the Supreme Command, took command of the Office for Monographs.
At the time, this Office could rely on the help of agents who, on behalf of the Intelligence Office, had been working in Austria-Hungary for some years or had been sent there with the aim of acquiring information about military fieldworks, communication routes and infrastructure.



3.5 Areas of the Eastern border involved in mountain troops regiments' reconnaissance

Financial Issues

The efficiency of the Intelligence Office in peacetime also relied on the network of agents scattered abroad. However, the recruitment of spies and informers, the trips, and accommodations in foreign countries of officers who carried out reconnaissance activities and the bribery of foreign officials required a considerable amount of money, while Intelligence Office always had limited resources available. All service heads, and sometimes even the Chiefs of Army Staff, complained to the Minister of War about this situation, but the frequent requests for greater financial resources were usually met only partially. The allocation of 61,000 liras in 1894 was increased to 98,000 liras in 1913, despite the demand of at least 200,000 liras, "which was seen as essential to meet all the needs of the service"[18]. With respect to this shortage of money, in October 1912, Colonel Rosolino Poggi, who replaced Colonel Negri as director of the Intelligence Service, reported to Cadorna that, "the service was limited due to scarce available resources that the Ministry did not increase, in spite of the continuous demands made by the Headquarters of the General Staff Corps"[19].

[17] Headquarters of the General Staff Corps - Secretariat Office, Circular no. 225, 10 November 1913, AUSSME, F4 Series.
[18] Intelligence Office, Memorandum n. 642, 18 November 1913, *Aumento dell'assegno ordinario pel servizio informazioni (Increase of the ordinary allowance for Information service),* AUSSME, F-4 Series.
[19] Ministerial Dispatches no.81 of 23 October 1913 and no.29 of 18 June 1914.

3.2 COUNTERINTELLIGENCE

Military Police

In a publication of the War Ministry of December 1912, the most common categories of enemy espionage agents, along with their behaviours and tricks, were illustrated[20].
The Royal Carabinieri Corps, and the Territorial Corps' Headquarters were tasked with counter espionage activities, working in parallel with judicial, administrative, and political police forces[21].
The vast ramifications of the Royal Carabinieri in every part of the country, especially in fortified and border areas, allowed them to exercise a vast, continuous, and effective control over people of doubtful morals or of unknown origin, including enemy informers[22].
An extract from the war service regulations issued in 1914 for the engagement of Royal Carabinieri Officers in counterespionage activities, reads:

> Espionage suspects must be meticulously checked and immediately arrested. Then they must be taken to the Carabinieri station with all their belongings, papers and any other items which might provide evidence or clues regarding their guilt. Spies are people who clandestinely, or with false motivations, collect or try to collect data about our troops for providing information to the enemy. A soldier who is wearing his army uniform is not a spy[23].

The *Royal Guardia di Finanza* - i.e., the Italian financial police - also played an important role in intelligence and counterespionage activities, as demonstrated by the *Istruzioni per lo impiego in Guerra della R.G. di Finanza* (Instructions for the employment in war of Royal Guardia di Finanza) and by the directives for the units deployed near the borders for protecting the mobilisation and the gathering of the bulk of the Army. Once the mobilisation of the Army was declared, the units of *Guardia di Finanza* had to cooperate with the Intelligence Service by carrying out military police tasks (monitoring and countering of espionage) and by patrolling the borders.
The Headquarters of the General Staff Corps was responsible for the collection of all available data on the espionage activities of the enemy and had to "ascertain with enough certainty the importance and the reliability of each piece of information in order, when appropriate, to steer investigations in the right direction"[24].

[20] Ministry of War - General Staff Division, Circular no. 24684, 28 December 1912, *Provvedimenti per impedire lo spionaggio in tempo di pace. Istruzioni di polizia militare* (Measures for preventing military espionage in peacetime. Instructions for military police), which updated the 1902 edition regarding counterespionage policy. The most common categories of enemy agents were journalists; priests and members of monastic order, deserters; alpine guides and porters; notorious individuals who were hostile to their country and national institutions; people known for their fanatic ideas and their hate against the current social orders; condemned and dismissed soldiers; people, especially women, who led a comfortable life without having an apparent source of income and loved leading a social life. issued a publication titled.
[21] Royal Army Troops, who patrolled border areas or were there for drills or works, indirectly became military police forces. They monitored suspects or travellers either staying or in transit, preventing them from collecting information or conducting reconnaissance activities.
[22] Ministry of War, *Regolamento pel servizio territoriale,* volume I, Rome, 8 July 1883.
[23] General Headquarters of Royal Carabinieri Corps, *Stralcio del servizio in guerra, Sezione I, Servizio delle truppe riguardante l'Arma dei Carabinieri Reali,* Roma, 1914.
[24] Ministry of War - General Staff Division, Circular no. 24684, 28 December 1912, *Provvedimenti, op. cit.,* In peacetime, espionage activities were prosecuted by applying the Military Penal Code, the Maritime Penal Code, the common Penal Code (Articles 107,108, 109 and 110) and Articles 7 and 11 of the *Testo unico delle leggi sulle servitù militari*, 16 May 1900.

The Inadequacy of the Laws and Measures Against Espionage

Before his death, one of Pollio's last initiatives though without success, was the proposal to introduce harsher police measures against espionage activities by means of a royal decree, which could condem unauthorised dissemination of news about military forces and operations; restrict the freedom of press; introduce new regulations for foreigners who wanted to stay in the Kingdom; and forbid the use of private radiotelegraphic stations.

Polio claimed that in analogy to the development of the military Intelligence Services by other Powers who expanded and improved their information capabilities, it should be compulsory to implement new measures aimed at "preventing the diffusion of data and news that deserve the utmost secrecy"[25].

He also asked the Government to replace the old regulation of April 1901 with new ones aimed at censoring letters sent from Italy during the mobilisation[26]. Luigi Cadorna who replaced the deceased Pollio on 26 July 1914, becoming Chief of the Army Staff, also tried without success to establish a postal censorship[27].

Cadorna required the government authorities to carry out stricter police controls on foreign citizens who lived or arrived in Italy during the neutrality period, checking "their nationality, their exact number and the reasons why they live in the kingdom" and proposed that:

> Public security authorities should control activities on deserters who are authorised to live in their jurisdictions to ascertain violations and expel transgressors. All foreigners suspected of carrying out espionage activities should be treated in the same manner […].

He also highlighted that:

> The lack of special laws, the over-indulgence of the judiciary, the lack of personnel, especially of military police officers, place Italy in a position of clear inferiority with respect to other countries regarding the delicate and important area of state security[28].

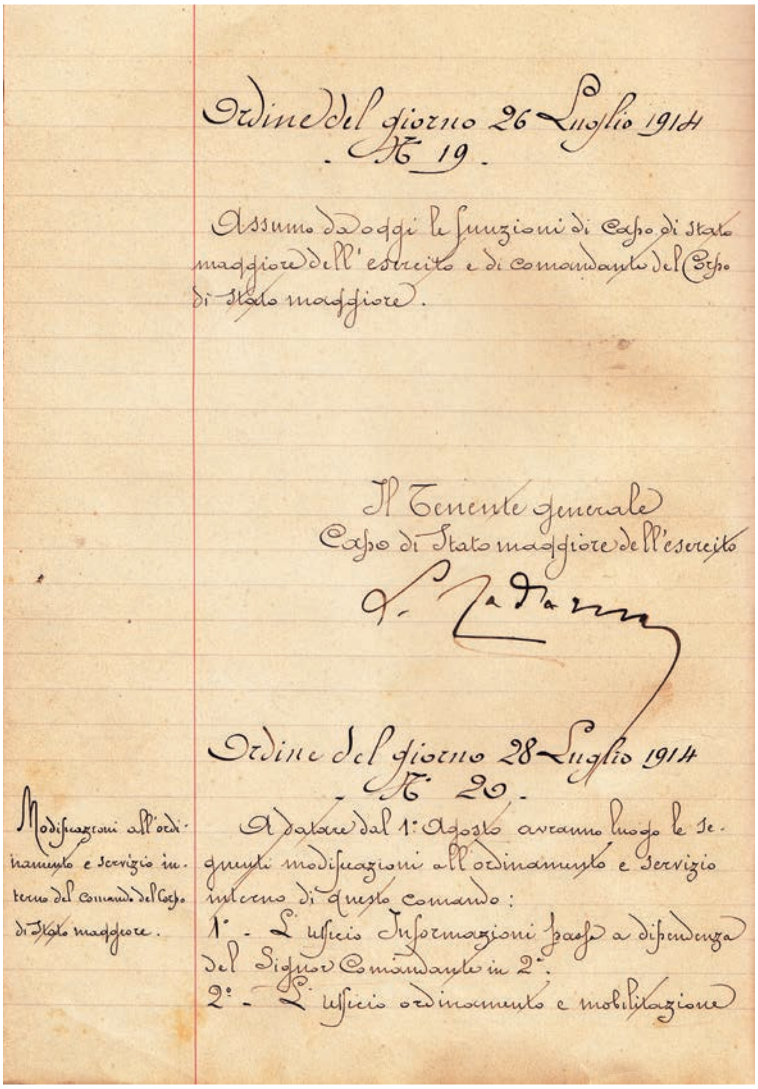
3.3 PREPARATION DURING NEUTRALITY

New Intelligence Tasks

The Intelligence structure in war times, defined during the neutrality period, included: a special Intelligence Office within the Supreme Command, which directed the whole service; an officer assigned to the Headquarters of the Armies; the chiefs of Staff at the Corps' and Divisional Headquarters; an officer assigned to every combat units, particularly skilled in enemy's languages for interviewing informers, prisoners, deserters, people inhabiting the zones the troops passed through, etc[29].

[25] Intelligence Office, letter no.1117, 24 June 1914, AUSSME, G-9 Series, env.6.
[26] Intelligence Office letter no.1024, 25 June 1914, *ibidem*.
[27] Letter no.1915, 19 August 1914*, ibidem*.
[28] Intelligence Office, letter no.2272, 1 September 1914, AUSSME*, ibidem.*
[29] Information Office, *Norme per la raccolta e la trasmissione delle notizie relative al servizio informazioni in guerra* (Rules for collection and transmission of information on the Intelligence Service in war time), 1914, AUSSME, F17 Series.

One of the very first decisions taken by Luigi Cadorna was to place the Intelligence Office under the authority of the Second-in-Headquarters of the General Staff Corps, who later became Deputy Chief of the Army Staff[30]. This decision cancelled the long-lasting direct relation between the Intelligence Office and the Chief of the General Staff, possibly revealing a certain preconceived scepticism about the efficacy of this Office' activities, as confirmed by the Cadorna declaration to the Commission of enquiry on the Battle of Caporetto[31].



Ordine del giorno 26 Luglio 1914
N. 19.

Assumo da oggi le funzioni di Capo di Stato maggiore dell'esercito e di comandante del Corpo di Stato maggiore.

Il Tenente generale
Capo di Stato maggiore dell'esercito
L. Cadorna

Ordine del giorno 28 Luglio 1914
N. 20.

Modificazioni all'ordinamento e servizio interno del Comando del Corpo di Stato maggiore.

A datare dal 1° Agosto avranno luogo le seguenti modificazioni all'ordinamento e servizio interno di questo comando:
1° - L'ufficio Informazioni passa a dipendenza del Signor Comandante in 2°.
2° - L'ufficio ordinamento e mobilitazione

3.6 Page from the collection of orders issued by the Headquarters of the General Staff Corps, including the organization changes ordered by Luigi Cadorna

[30] Chief of Army Staff, Agenda no.20 28, July 1914, AUSSME, L3 Series, env.297. The Decree no.337 of March 1915 established the office of Deputy Chief of Army Staff that replaced the office of Second-in-Command of the General Staff Corps

[31] Commissione d'inchiesta di Caporetto, *Trascrizione della deposizione del Generale Luigi Cadorna* (Transcript of General Cadorna deposition), AUSSME, H-4 Series, env.1: "Undoubtedly, the purpose of the intelligence service is to gather all the information about the enemy. However, it must be recognized that it is an objective very hardly achievable. The transmission lines are hundred km long and therefore the espionage activities in Switzerland do not produce results due to the delay in the arrival of information. The Intelligence Office can exclusively rely on prisoners and deserters".

However, Cadorna did not hesitate to entrust the Intelligence Office with significant tasks. With the purpose of enhancing the war plan against Austria-Hungary he asked the Office, in August/ September 1914, to gather and select information useful to identify the positioning and movements of the higher echelons and units of the Habsburg Army, namely to "extend its tentacles towards the enemy troops" for discovering "where they can be redeployed and sent against us". To this end, the movements of the troops had to be detected by informers located along the main railway lines and in the places of arrival and gathering of troops[32].
Following those instructions, the Intelligence Office started to rebuild with the greatest possible accuracy, the deployment of the Austro-Hungarian Army on the Eastern, Balkan, and Italian fronts. In the fear that German troops could join Austro-Hungarian forces on the Italian front, the monitoring was extended to the Germany territory, especially to its southern borders, with the purpose of discovering any movement of troops and materials towards the Alps front. The Eastern Theatre decided to control Western Galicia/Silesia/Moravia, the Tyrolese/Bavarian border, and the Austrian/Serbian/Montenegrin border as well as the most important railway junctions, such as Vienna and Budapest for arrivals from Galicia; Munich for arrivals from Bavaria; and Bosna Brod for arrivals from Serbia. Informers located in the stations of arrival and gathering of troops, began to create a vast intelligence network.
Moreover, in January 1915, Cadorna gave the Intelligence Service the mission of hatching a complex plot aimed at distracting the Austro-Hungarian attention from the organisation of the main Italian action on the Isonzo front[33].

Intelligence Networks in Austria-Hungary

In Trentino, Venezia Giulia and Istria operational intelligence networks made up of 'unredeemed' people have been already implemented. The agents from Trentino reported to centres located in Milan, Brescia, Verona, and Rome and those from Venezia Giulia and Istria to centres in Pontebba, Udine and Venice. The intelligence activities were rather fruitful until late 1914, thanks to the frequent desertion of Italians returning from other theatres of war, while afterword a better monitoring of the borders by the Austrian Gendarmery led to the reduction in their number. On the other hand, it turned out to be appropriate leaving good informers within the Empire where they continued to conduct intelligence activities from the beginning of war.
On the other hand, the creation of a network of informers in Tyrol and Puster Valley resulted extremely problematic, because of the inhabitants' proverbial loyalty to the Habsburg Monarchy. It was less difficult to find informers in the region of the middle course of the Sava, delimited by Klagenfurt/Ljubljana/ Agram and Graz, because of the Slovenians dislike against the Double Monarchy. In the centre of the Empire, particularly in Wien, recruiters tried to find potential informers among Italians who lived there, especially students, and among Jews and women who were easy to bribe.

[32] Information Office, *Norme per la raccolta, op. cit.*
[33] Office of the Chief of Army Staff, Memorandum of 18 January 1915, *Provvedimenti per ingannare l'avversario circa le nostre intenzioni nell'eventualità di una guerra a Nord Est* (Measures to deceive the enemy about our plans, in case of a war on the North East fronline), AUSSME, F4 Series.

3.7 The Kaisejäger parading in the streets of Innsbruck

In addition to informers found among the people resident in Austria-Hungary, it was also planned to send on the spot agents from Italy, in particular Army Officers skilled in German language. The officers, proposed for this task by the Intelligence Office, included Reserve General Vittorio Murari della Corte Bra and Captains Marietti, Gazzera, Cavallero, Caleffi and Perfetti[34].
Moreover, liaison officers were permanently seconded to the General Staffs of the Allies for obtaining information about the military organisation of Austria-Hungary and Germany. At the beginning of the war, some of those officers and military attachés sent to the front provided the Headquarters of the General Staff Corps with valuable information about the type of war fought on the European fronts[35]. Unfortunately, their reports containing the lessons learned on the battlefields and the new tactical criteria adopted by the belligerent armies did not arrive on time before entering the war and could only partially be included into the Italian Army rules, such as the *Procedimenti per l'Attacco Frontale nella Guerra di Trincea in uso nell'Esercito Francese* (Procedures for frontal attacks in trench war used by the French Army) of May 1915 which also explained the characteristics of the trenches used by the Armies of Entente and Central Empires.

The Transmission of Information

As expected, the transmission of achieved information from the agents abroad to their reference points in Italy, resulted to be the weakest link in the Intelligence chain. To solve communication

[34] Intelligence Office, Memorandum no.2 dated 4 January 1915, AUSSME, E2 Series, env.122. In 1908, Italian authorities were set up in the following Austro-Hungarian cities: Vienna (embassy), Budapest, Rijeka, Innsbruck, Lviv, Trieste, Zadar (consulates), Split, Dubrovnik (vice-consulates).
[35] Francesco Angelone and Andrea Ungari (a cura di), *Gli addetti militari italiani alla vigilia della Grande Guerra 1914-1915,* Rodorigo, Rome, 2015.

problems, the Intelligence Office established offices or agencies in neutral territories, which acted as intermediaries, handling correspondence to and from the enemy country and collecting news from the local press as well as information provided by emissaries. In particular, “two offices” were arranged in Switzerland, “to collect and send mail. They employed a captain from the reserve living in St. Gall as well as an Italian living in Lucerne, who already cooperated with the Intelligence Office”. Another Office in Zurich, “engaged a person who also analysed German and Swiss newspapers and monitored the possible actions taken by the Germans against us and the position of Switzerland in such cases”[36].

The creation of an Intelligence Centre in the Netherlands was also planned, under the direction of Alessio Chapperon, a General of the reserve who had “already shown his exceptional abilities in this field during the Turco-Italian war in Tunis and could communicate with us through an office located in London”.

An Intelligence Centre established in London at the beginning of the war, was suppressed after three months “due to scarce performance and excessive requests for money”. In the intention of the Intelligence Office, this centre could be re-established “when Italy will enter the war and British and French authorities probably stop obstructing the passage of Italian mail”, also to act as a liaison for the correspondence from the Dutch office.

The Crisis in Early 1915

Despite the efforts made by the Intelligence Office, the overall results of the activities carried out, in the months preceding the start of the war, for improving intelligence inside the Austro-Hungarian domain, were not fully satisfactory. In fact, the Office found difficulties in creating a well-organised and far-reaching intelligence network, in recruiting and instructing informers and, above all, in infiltrating agents in Austria and Germany, which were already involved in the war and therefore monitored their territories carefully. An Office memorandum reads:

> The closing of the frontiers, the monitoring in particular of Italians and Slavs, the strict measures against possible espionage activities, the rigorous censorship on postal and telegraphic communications, the recruitment in the Army of all Italians aged 20-42 years, even those barely fit for military service, and their deployment in Bosnia-Herzegovina and Galicia, the threatened expulsion from border areas and the internment in concentration camps of people who are more or less under suspicion are all factors that make it extremely difficult to find informers who, either for personal profit reasons or patriotism, are willing to take such serious risks[37].

The Trentino area was well ‘covered’[38], while problems in Southern Tyrol and in the areas surrounding the Isonzo River were encountered due to ethnic groups who demonstrated hostile and hindered every italian intelligence activity.

Cadorna understood the seriousness of the situation, highlighted the poor knowledge about the enemy defences located a few kilometres from the Italian border, and urged the Army Intelligence to improve its performance, stating that:

[36] For all news in this paragraph, see: Intelligence Office, Memorandum no.2, 4 January 1915, AUSSME, E-2 Series, env.122.
[37] Memorandum no.2, January 1915, Intelligence Office, *op. cit*.
[38] For information about tThe networks organized implemented in Trentino by the Verona and Brescia Centers are also described in: Tullio Marchetti, *Ventotto Anni nel Servizio Informazioni Militari (Esercito),* Trento, 1960, pp.59-64.

> the Eastern Theatre provided me with information about the current deployment of Austro-Hungarian troops in the regions of the 2nd and 14th Corps and about the defensive works between the rivers Isonzo and Sava. However, despite some sound deductions and the good intentions, it is impossible to know with certainty what is going on near our borders. […] Therefore, it is necessary to immediately strengthen the intelligence service for achieving sure results as soon as possible[39].

Under these circumstances, Colonel Poggi asked for additional officers since his Office was overloaded due to the ever-increasing expansion of the service. He complained, for instance, the lack of resources to manage "the continuous relations with the Public Security Direction, the Ministries of Finance, of Foreign Affairs and Interior Affairs […]"[40].

3.4 CADORNA'S REORGANISATION

Measures Taken in the Imminence of the War

For supporting the Intelligence Office, in March-April 1915, some 'detached' offices were established near the front in Lombardy-Venetia with the task of creating and managing information networks beyond the borders, assuring their unity of action and purpose.
The detached offices strengthened their networks of informers in the enemy countries and thanks to their activity, the information lack on the enemy Army was fixed, to some extent. As expected, the best results were achieved by exploiting the pro-Italian feelings of most people from Trentino, where the most famous intelligence structure, managed by Tullio Marchetti, was flanked by other active and effective organisations, such as the one headed by General Florenzio Aliprindi who wrote:

> Dealing with intelligence activities, I reached quite satisfactory results. I had the opportunity to contact refugees from Trentino who provided me with daily information about the enemy defences. […] Before the start of the war, I could make a confidential report aimed at facilitating the orientation of the troops, when deployed beyond the border. I remember I succeeded in obtaining some tables showing the trenches and the interruptions prepared by the enemy[41].

Even General Max Ronge said that before Italy entered the war, "our (Austrian A/N) counterespionage service achieved only few results, while the Italian Intelligence Service worked at full pace", also thanks to about 20,000 'unredeemed' people from Tyrol, who fled to Italy, and to deserters from the Gendarmerie[42].

[39] Office of the Chief of the Army Staff, Memorandum no. 38, 3 January 1915, AUSSME, E-2 Series, env.122.
[40] Intelligence Office, Memorandum of 23 March 1915, AUSSME, F-4 Series, env.49. In addition, Poggi asked for new funds after obtaining an additional check amounting to 4,000 liras per month until March 1915 included.
[41] Commissione d'Inchiesta su Caporetto, *Trascrizione della deposizione del Generale Aliprindi*, AUSSME, H-4 Series, env.25.
[42] Max Ronge, *Les Maitres de l'espionnage*, Payot, Paris, 1935, p. 161 -162.

3.8 Telephoto of Predil fort taken by specialist units of the Italian Corps of Engineers

Most of the detached Offices, immediately after the war declaration, converged in the Intelligence branches of the Armies, allowing "the service to switch from peace to war automatically and seamlessly"[43]. In addition, in the imminence of war and occupation of Austro-Hungarian areas, rules for civil administration and for ensuring security in the regions beyond the borders that the Italian army expected to conquer, were prepared, including the declaration of the state of war in the occupied countries and the creation of military courts for punishing crimes committed also by civilians. The Corps' Headquarters had to appoint selected senior officers as special commissioners, with the task to manage the municipalities. The Royal Carabinieri should replace the Austrian Gendarmerie[44]. Censorship offices had to control the distribution of newspapers, the sale of books, theatre shows, movies, telephone, telegraph, and postal communications. Squads were prepared to patrol the areas outside populated areas to intercept optical transmissions, clandestine radiotelegraphic stations and dovecotes for homing pigeons. They also had to monitor telegraph lines to avoid telegrams interceptions.

The Intelligence Office and the War Situation Office

Before the mobilisation starting, the Theatres suppression caused the transfer of their personnel to the War Situation Office, whose main tasks entailed the exploitation of the information about the Austro-Hungarian army mainly collected by the Intelligence Office, to update the situation of the enemy's forces and to assess their possible intentions.

[43] T. Marchetti, op. cit., pp. 65-67. Some officers were also preselected to cover the position of Chief of the Intelligence Office of the Armies.
[44] Supreme Headquarters - Secretariat-General for Civil Affairs. General Cadorna's Order of 25 June 1915, *Istruzioni sulla ordinanza del 25 giugno 1915 per la gestione provvisoria dei servizi civili nei territori occupati.*

In April 1915, the circular of the Headquarters of the General Staff Corps titled *Norme generali per la costituzione e funzionamento del Comando Supremo mobilitato* (General Rules for the implementation and functioning of the mobilised Supreme Command) divided the intelligence tasks between the Intelligence Office and the War Situation Office. The former had to:

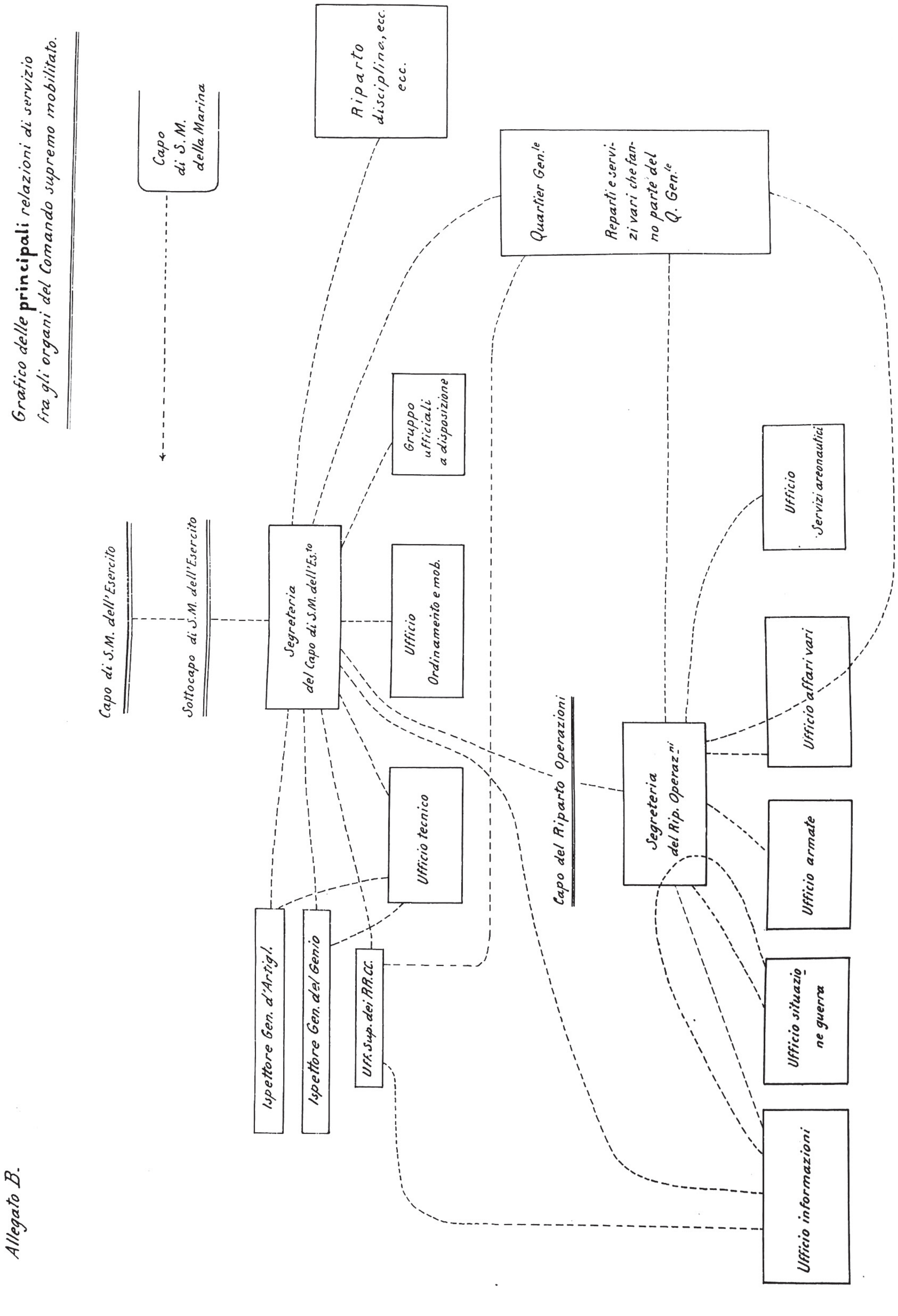
– organise the intelligence service and provide for its operation;
– coordinate and compare the information got from prisoners, deserters, inhabitants, etc. with the information achieved from agents, enemy press, or other means;
– deliver instructions to counterespionage;
– deal with the coded correspondence of the Supreme Command[45], of the Chief of the Army Staff;
– interpret the documents captured from the enemy, when possible.

The War Situation Office had to:

– gather all information about the deployment of national and adversary troops;
– coordinate, select and compare the information about the enemy's Army provided by the operating troops and the Intelligence Office with the information already known about the enemy's Army and the information about the operations terrain;
– report the war situation of the national and adversary armies in accordance with the instructions of the Chief of the Army Staff;
– conduct studies about the ground of the theatres of operations;
– draft war bulletins for the Government[46].

The Intelligence Office and the War Situation Office were under the authority of the Operations Division. Picture 3.9 shows the relations between the two offices and other offices under the authority of the Operations Division and of the Secretariat of the Army Staff Chief[47].

[45] Except for the correspondence managed directly by the Secretariat.
[46] Headquarters of the General Staff Corps, *Norme generali circa la costituzione e funzionamento del Comando Supremo mobilitato,* April 1915. At the mobilisation, the Headquarters of the General Staff Corps was transformed into the Supreme Headquarters and transferred to the zone of war.
[47] A table dated 23 May 1915 shows the organisational structure, the offices and the Divisions of the Supreme Headquarters mobilized in war. According to this table, the War Situation Office employed 12 officers, while the Intelligence Office, renamed Intelligence and Encoding Office, employed 37 officers and a public security officer. AUSSME, F-4 Series, env.49.



3.9 Relations among units of the Supreme Command mobilized according to April 1915 organization

CHAPTER FOUR

The first period of War: challenges and new tasks

4.1 INTELLIGENCE AND SITUATION OFFICES ENTER THE WAR

The Mobilisation

At the time of the mobilisation, the Intelligence Office, also known as I Office (I stands for *Informazioni*) of the Headquarters of the General Staff Corps directed by Colonel Rosolino Poggi, relied on seven staff officers[1] plus 18 officers from the combat arms, two officers from the Carabinieri, nine officers as interpreters and translators, and one public security officer.
A brief description of its organisation is found in the Office logs kept since 22 May 1915, date of the general mobilisation, issuing:

> The Office - located in the usual rooms on the mezzanine floor of the offices of the Headquarters of the General Staff Corps in Rome - consists of a Secretariat, the 1st and the 2nd Intelligence Sections, a Counterintelligence and Military Police Section and an Encoding Section. The 2nd Section was responsible for collecting, screening, and transmitting information concerning the border from the Stelvio to Peralba. The 1st Section had assigned similar functions for the border from Mount Peralba to the Adriatic Sea.

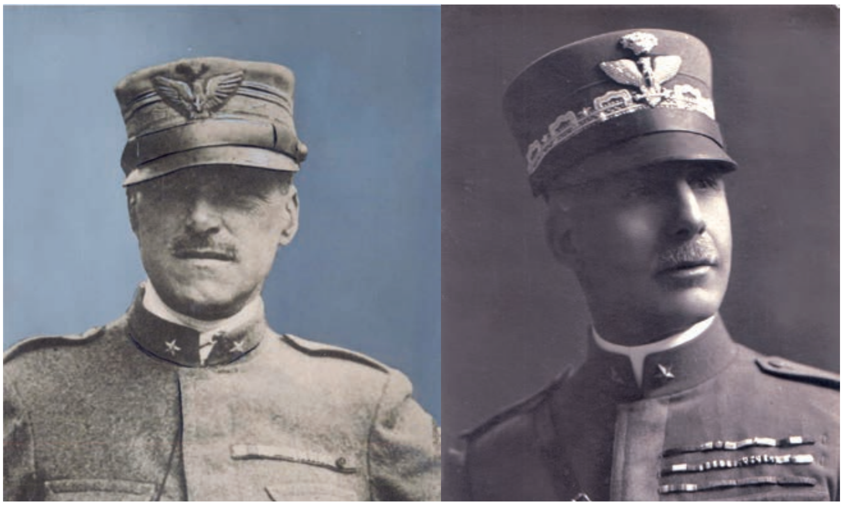
Following mobilisation, most of the Intelligence Office staff moved to the Office with the same name at the Supreme Command in Udine. A small team remained in Rome to create the 'Territorial Intelligence Office', in charge of maintaining the relations with the government bodies in the Capital[2].
On 23 May 1915, the logs of the Intelligence Office reported: "All preparations are being made for the departure for Treviso", where the bulk of the Office arrived on the morning of the 25th. The I Office soon changed its name after it was assigned the Encoding Section of the Supreme Command and became known as the "Intelligence and Encoding Office".
The logs also inform that the 'detached' offices formed in April 1915 and located in Milan, Verona, Brescia, Palmanova, Udine, Tolmezzo, and Belluno passed immediately under the jurisdiction of the Armies[3], merging with the Intelligence Offices of the Armies, except for the Milan Office, which became the 'Special Military Office'. It was tasked with the coordination of informer networks in Switzerland, Austria-Hungary, and Germany - having their collection centre in Bern - and with the counterespionage activities in the border area between Italy and Switzerland[4].

[1] Rosolino Poggi had replaced Colonel Silvio Negri in September 1912. The Staff Officers were: Lieutenant Colonel Giovanni Garruccio, Major Giuseppe Boriani, and Captains Carlo Bergera, Emilio Granelli, Odoardo Marchetti, Camillo Caleffi, and Carlo Vecchiarelli.
[2] It served also as a relay station for telegraphic communications from abroad, directed to the war zone.
[3] Logs of the Intelligence Office, AUSSME, Series B-1, 100/S, 1a. The 1st Army received the previous offices of Verona and Brescia; 4th Army that of Belluno; the Carnia Area Headquarters, that of Tolmezzo; and the 2nd and 3rd Armies received those of Udine and Palmanova, respectively.
[4] The Military Special Office (formerly Detached Office) merged with the Monographs and Guides Office. It settled in the premises of the latter in the Magenta Barracks in via Mascheroni. In 1916, other Special Counterespionage Offices were activated in Feltre, Vicenza, etc.

About the Intelligence Offices of the Armies, O. Marchetti wrote: "they initially consisted of a Captain as the head of the office and some other officer and continued to work as in the detached offices they came from. […] Soon the heads of those offices found themselves engaged with prisoners and deserters, who became the almost exclusive focus of their activities"[5].

General Order 1 of 26 May summarised the organisation and mission of the Intelligence Office. In addition to a Secretariat and two Intelligence Sections, it embraced the following sections: Military Police and Counterintelligence; Encoding; Translators and Interpreters; Available Officers and, where appropriate, the Press Section[6].

Each Intelligence Section, responsible for two distinct areas of the front, included a Military Intelligence Unit dealing with information on composition, strength, location, and movements of opposing troops; a Field and Politico-Military Intelligence Unit, and a Situation and Correspondence Team which updated the locations of both national and enemy troops of the opposing forces on detailed maps. It also dealt with correspondence with the depending agents.



4.1 Alberico Albricci (on the left) Chief of the War Situation Office until February 1916 and Enrico Tellini Chief of the same Branch until July 1917

On 25 May, the War Situation Office was also mobilised in Treviso and assigned to Lieutenant Colonel Alberico Albricci. It relied on three sections and nine officers[7].

First Structural Changes

On May 30, the transfer of the Intelligence Office to Udine began[8]. In the early days of operations, several modifications occurred to the structure and responsibilities of the Intelligence Office. The need of initial adjustments depended on many factors such as the importance of this essential and sensitive branch, the many kinds of Office tasks and the vastity of the covered front, without forgetting that the information needs regarded areas more extensive than the Italian front alone. Moreover, the overlapping responsibilities of Intelligence Office and the War Situation Office soon became evident, especially about the definition of the battle order and the location of enemy forces on the ground.

[5] Odoardo Marchetti, *op. cit.,* pp. 77-81. The Intelligence Offices of the Armies reported to two entities. The Chief of Staff of the Army Headquarters was the superior officer on the hierarchical side, while the Intelligence Office of the Supreme Headquarters was the superior entity on the technical side.

[6] Intelligence Office, *Diari prima guerra mondiale* (Logs of World War I), AUSSME, Series B-1 Series 100/S, 1a.

[7] Lt. Col. Enrico Tellini replaced Albricci in February 1916 and was replaced in July 1917 by Colonel Riccardo Calcagno.

[8] The new Headquarters, which also had an interrogation room, was hosted inside the Iacopo Stellini school and directly connected with all the remaining branches of the Operations Division. By 8 June, the French, British and Russian liaison missions joined the Supreme Command in Udine.

The original name of the Office changed to Intelligence Office again, when the encoding service was assigned to the General Affairs Division on 30 June[9].
In August, the War Situation Office merged with the Armies Office into the "War Situation and Operations Office". Unlike the previous organisation, this new important structure liaised with both the Secretariat Office of the Chief of the Army Staff and the Headquarters of the Armies concerning the Army operations[10].
In October 1915, Colonel Giuseppe Garruccio replaced Colonel Rosolino Poggi at the head of the Intelligence Office.

4.2 Giovanni Garruccio Chief of the Intelligence Office/Service from October 1915 to September 1917

4.2 HUMAN INTELLIGENCE MAIN SOURCES

A characteristic of Intelligence common to all the forces during WWI was the increasing type and quantity of information sources, including telephone eavesdropping and radiotelegraphic interceptions, which the second part of this book deals with. Another new source of information about the enemy came from air reconnaissance and photographic footage of the enemy's front and rear lines. On the other hand, the traditional sources based on classic espionage operating in enemy and neutral countries, the interrogation of prisoners and deserters and the capture of enemy documents, included in what is currently known as 'Human Intelligence', continued to play a relevant role. Consistent with its duties, the Intelligence Service managed to develop and coordinate the collection of information on the enemy, both through the aforesaid innovative means and Human Intelligence.

Intelligence Centres Abroad

On 10 June, Colonel Garruccio left for Bern to coordinate the information networks that existed there or were being formed. One of the objectives of the mission was to study "the possibility of setting up a press agency in Switzerland [...] which would essentially be responsible for disproving the false and biased publications of the press against us, and for publishing our war bulletins and articles depicting our situation".
The information network in Switzerland was also useful for the flow of information collected by the networks of agents established in Austria and Germany. In addition,

> through factual negotiations, Colonel Garruccio established a relationship with a person linked to Austrian and German diplomats, who could provide politico-military information. He established a new network for the collection and delivery of information using Italian publicists who have long been residents of Switzerland, where they have extensive relations[11].

[9] The Encoding Office was created in July 1915 under the Secretariat of the Operations Division.
[10] Supreme Headquarters, Service Order, 28 August 1915, AUSSME, Series B-1, 104/D, 1c. The Office of Situation and War Operations was organised on: 1st Section (National), 2nd Section (Foreign) e 3rd Section (Bulletin and Press) with 17 officers in total. In April 1916, the name of the Office of Situation and War Operations changed into Office of Situation, War Bulletins and Missions Abroad with its mission remaining unchanged.
[11] The Intelligence Office Log dated 2 September 1915 also reported that "Information coming in is sent by Alpini Lieutenant Dadda. He managed to move through the Rhenish countries undisturbed and provided the Intelligence Office with political and military information about movements of troops and materials, the status of troops, and the sentiment of population

Afterwards, the organisation of the information gathering service in Switzerland became stronger thanks to centres and sub-centres manned by agents generally supported by the local diplomatic and consular officers, such as "Lieutenant M.T. Moriondi, an engineer and commercial attaché at the Royal Legation in Bern, directly subordinate to Major General Alessio Chapperon, the Head of our Intelligence Service in Switzerland, […] who asked and obtained that a special counterintelligence service be set up in Switzerland"[12].

In June 1915, more than a dozen networks of whistle-blowers or isolated agents were already operating throughout Switzerland and kept contacts with the detached office in Milan and its branch in Brescia regularly[13]. A press office in Chiasso dealt with the German-language press review.

In this context, the detached office in Milan acquired a significant role, both as a coordination centre for military and politico-military information, and as a centre for counterespionage performed mainly through Switzerland. The reorganisation and expansion of that office headed by Colonel Achille Brotti were therefore required to face the growing needs[14].

Professor Antonio Cippico, an 'unredeemed' person having extensive relations with the publicists in the British capital, was sent to London to reinforce the local centre. One of his functions was to publicise the Italian nature of Dalmatia against the pro-Yugoslavian press campaign. One can easily infer that, since the first months of the war, the I Office dedicated its efforts to broadcast propaganda abroad and dealt with political matters beyond the military.

In this framework, given the multi-ethnic composition of the Dual Monarchy - its Achilles' heel -, the I Office planned of fuelling the latent frictions between the peoples under the Habsburgs' rule through propaganda that would foster internal conflicts in the Empire. However, those proposals were initially hindered by Italian civil authorities[15].

Collaboration With the Allied Intelligence Services

After Italy joined the conflict, liaison officers were exchanged with the staffs of France, Great Britain, Russia, Serbia, Belgium, and later Japan and the United States of America. The military missions of the Allied Powers accredited to the Supreme Command referred to the War Situation Office which guided their activities and provided them with information about the Italian and

towards us, etc." On 6 September, the Intelligence Office Log reported that "The new intelligence network created by the office through Mr. Serravallo is generating the first results. At present, the information collected are of political and economic nature". (Log of the Intelligence Office, AUSSME, Series B-1,100/S, 1a).

[12] *Ibidem.*

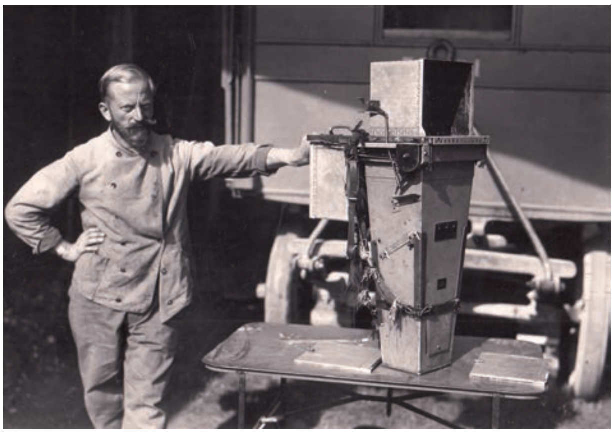
[13] Among the more efficient was the 'Carlo' network, a nickname for unredeemed Gino Tornari, a resident of Zurich who received information by several agents residing in Austria-Hungary and Germany. Individual agents operating in enemy countries relied on points of contact in Switzerland to send information to Italy. These were, among others, Matteo Brunetto, a native of Friuli who relied on the Consuls in Basel and Zurich from Austria; Ascanio Ceschini, sent to Germany and Austria on 5 June 1915, who relied on the military attaché and the Consuls in Zurich, Basel, and St. Gallen; Giovanni Permull, an Austrian naturalised as British who operated in Austria, etc.

[14] Intelligence Office, Circular letter no.3756, 24 August 1915, AUSSME, Series F-17.

[15] The Boselli Administration created a Ministry for Propaganda Abroad under the authority of Vittorio Scialoja and an agency for domestic propaganda managed by Ubaldo Comandini. In the Orlando Administration, the Undersecretary for Propaganda Abroad and Press, Romeo Adriano Gallenga Stuart, replaced Scialoja (Gian Luigi Gatti, *Dopo Caporetto. Gli ufficiali P nella grande guerra: propaganda, assistenza, vigilanza,* LEG, Gorizia, 2000, pp. 26-27). For instance, the launching of leaflets written in the various idioms of the Austro-Hungarian dominions along the enemy lines to induce personnel whose nationalities were most adverse to the Habsburgs - such as Czechoslovakia - to desert, was soon interrupted at the behest of the political leadership.

Austro-Hungarian armies, the progress of operations at the front, and the economic and financial situations.

The exchange of information with the Allied intelligence services was of utmost importance for the reconstruction of the war scenarios of the enemy powers and the deployment of their higher echelons on the European fronts. Cooperation with the Russian mission was crucial to control the frequent movements of the Austro-Hungarian units from the eastern front to the Italian one and vice versa. Given the intense trade and imports of arms and equipment from France (see picture 4.3), the relations with the French mission were particularly tight.



4.3 Equipment for aerial photographs, made in France and used by the Italian Air Force Corps

The Italian intelligence service in France took care of two activities: the first one was military, conducted mostly in a war zone under the control of the Paris Intelligence Centre; the other - entrusted to a special detached section - involved the liaison with the intelligence services of the Entente. The heads of the Allied intelligence services, meeting in Paris in mid-September 1915, decided to establish a *Bureau Interallìée de l'Etat Major de l'Armée* (Interallied Office at the General Staff of the French Army), to be integrated in the French *2eme Bureau*. To this purpose, in October 1915, all the armies of the Entente detached a *Mission près du Ministère de la Guerre* (Mission at the War Ministry), each becoming a section of the Interallied Office. The Italian section had minimal staff, with one officer and six other ranks; it was headed by Colonel Nicola Brancaccio, also responsible for the Paris Intelligent Centre[16].

In November 1916, disagreements between the Italian and French representatives led to the withdrawal of the Italian section from the French Ministry of War. On the other hand, the relationships of the Italian Intelligence Service Officers with their French colleagues as well as with the *Maison de la Presse* (Press House) and the French censorship bodies were never broken.

Prisoners and Deserters Questioning

Among the sources of information regarding the Austro-Hungarian army, the questioning of enemy prisoners and deserters covered a major role to reconstruct the battle order of the enemy army, to know its offensive intentions and to get an idea of the morale of its troops[17].

[16] The *Bureau Interallìès* attended to several tasks, namely the mail and telegraph checks, passport checks, control over press and propaganda, economic limitations, censorship over press, navigation police, inter-allied propaganda, exchange of deserters and people who failed to report for conscription, border surveillance, drafting and distribution of the list of suspects, unification of the intelligence services of neutral states.

[17] According to circular letter no.113, 28 June 1915 on *Trattamento ed interrogatorio dei prigionieri e disertori* (Handling and Interrogation of Prisoners and Deserters), the Corps' Headquarters were required to notify the Intelligence Office of the Supreme Command by telegraph, the number and rank of captured soldiers and accepted deserters, the unit to which they belonged, the location and day of capture or presentation (Filippo Cappellano, *Servizio Informazioni e posta militare nemica,* in Gilda Gallerati - Cosmo Colavito, *La comunicazione nella grande guerra,* Conference, Ministry of Economic Development, Rome, 2016).

From the deserters who reached the Italian lines just before starting of each relevant operation planned by the Austro-Hungarian Supreme Command, the Italian army obtained a clear and precise perception of the time and place of the enemy attack a few days in advance. The same occurred before the Austro-Hungarian punitive expedition of May 1916, before the devastating gas attack on San Michele in June 1916, before the twelfth offensive of the Isonzo in October 1917 - that led to the breakthrough of Caporetto - and before the Second Battle of the Piave river in June 1918.
The interrogation of officers, especially the deserters, uncovered information of utmost importance, such as the reasons behind operational choices of the Austro-Hungarian High Command, as for instance, the halting of the offensive in Trentino in May-June 1916 and the subsequent withdrawal to more defensible positions.
Questioning prisoners and deserters also unveiled many interesting evaluations concerning the Italian troops and war tactics. The following opinions expressed by enemy officers seem worth to mention:

> The (Austro-Hungarian A/N) officers are all surprised […] by the Italian first line deployment with many men standing one next to the other. The Austrians at the front lines deploy no more than one man every 10 meters, and often every 20 meters. This way, artillery fire causes much less damage. A lieutenant of Yugoslavian origin said: “when I saw the mass of Italian troops. I was horrified by the thought of the damage any grenade hitting the Italian trenches could do.” […]
> “In the Italian Army”, the lieutenant added, “something is not working. The Italians troops have numbers, age, and equipment we should envy. [...] They have a perfect organisation, brave and heroic officers, a *great intelligence service* supported by many deserters who say everything because of their love for their own country and of the hatred for Austria. They have an artillery corps that is now almost perfect, and yet they do not, however, achieve the advantages that they can and must obtain. […] What does not work is their tactics, which is too regular in the preparation of artillery, in their continuous frontal attacks, as well as in their system of always stopping at the first front line conquered, as their only goal”[18].

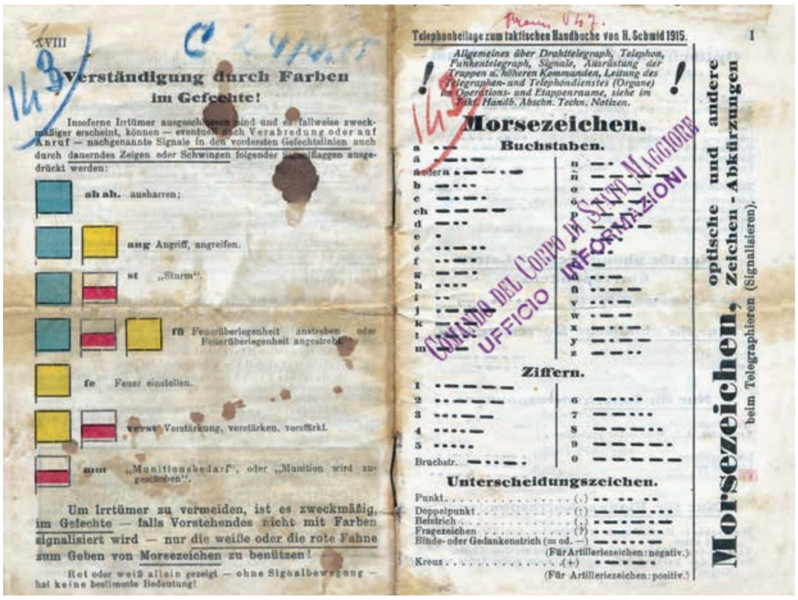
It can be easily understood why the Supreme Command promised cash prizes for the capture of prisoners by individual soldiers or groups of soldiers, while daring coups de main[19]. When operations stagnated, the Headquarters continuously required carrying out surprise attacks and other small actions for the specific purpose of capturing prisoners. In June 1916, a circular letter by General Cadorna ordered to “take prisoners, which is essential to obtain information on enemy intentions and movements [...]. I hereby authorise the Headquarters of the Armies to increase, to the extent they deem appropriate, the prizes for the capture of prisoners”[20].

[18] Office of Situation, War Bulletins and Missions Abroad, Circular letter, 25 November 1916 about a report of the Headquarters, 2nd Army, AUSSME, Series E-2. The letters dealt with the opinions of enemy officers held prisoner on the operational criteria of the Italian infantry and artillery, starting from the summer of 1915, as per Circular letter no.1654, 17 July 1915 and no.1973, 25 July.
[19] Discipline Section of the Operations Division, Circular letter no.6250, 14 May 1916. The following rewards were established: 10 liras for the capture of a soldier, 20 liras for an NCO and 50 liras for an officer.
[20] Supreme Headquarters - Secretariat, Letter no.153, 15 June 1916, AUSSME, Series F-2.

During 1917 and 1918, brochures were published containing statistical data on origin, unit, physical state, age, previous job, level of education, etc. of prisoners and deserters, as well as excerpts of depositions and opinions about the progress of the war, the political and economic conditions of the Dual Monarchy, and the morale of the population[21].
Ronge himself recognised "the ability of the Italian Intelligence Service in questioning prisoners with the use of suitably trained trustees"[22].

Captured Documents

The analysis of personal and military documents found on captured prisoners and deserters, or corps of enemy soldiers, often resulted useful for the intelligence service. A paragraph of the *Norme generali per il servizio informazioni sul nemico* (General Rules for the Intelligence Service against the enemy) highlighted "the importance of information that documents can reveal, even those of apparently no value, when they are examined by competent people by means of extensive investigative methods". Therefore, the Rules established that all documents found on the prisoners or deserters had to be seized by the Headquarters of the units and sent immediately in a closed envelope to the information-gathering centres, with the aim of delivering them to the Intelligence Service as soon as possible.



4.4 Manual for electrical and optical communications of the Austro-Hungarian army, with Italian Intelligence Office's stamp

In planning operations that envisioned occupations of enemy positions, small teams of 'special shock troops' were trained within the Headquarters of Infantry Brigades with the support of the Intelligence Offices of the Armies, to recover classified documents and files on the conquered trenches[23].
In particular, the analysis of private correspondence revealed the number of military field mail offices that served the large operational units, thus facilitating the rebuilding of the enemy forces'

[21] At the end of 1917, the Intelligence Office of the 3rd Army published the pamphlets: *Le condizioni interne della Monarchia austro-ungarica: Inchieste e statistiche sui prigionieri A.U. catturati nelle azioni di agosto-settembre 1917 e concentrati al campo di Bagnaria Arsa* (The internal conditions of the Ausrtro Ungarian Monarchy: Survey and Statistics on AU prisioners caught during August-September actions and collected at Bagnaia-Arsa field).
[22] M. Ronge, *Spionaggio, op. cit.*, p. 318-319.
[23] "Special teams sent to the battlefield have collected very precious enemy maps, documents, etc. through which we can reconstruct all the Austrian deployment across our front, a perfect knowledge of which is essential for the final victory" (Headquarters, 8th Army - Intelligence Office, Letter no. 1175/P, 26 June 1918, *Documenti nemici* (Ememy documents), AUSSME, Series F-3).

layout in the areas of operations[24]. The numbers of Austro-Hungarian field post teams were also circulated by the I Office to all armies by way of dedicated newsletters[25].

4.3 COUNTER-ESPIONAGE AND INTERNAL SURVEILLANCE

The collection of enemy information is not the only task entrusted to Intelligence Office. Since the beginning of the war, it dealt with a variety of functions, including the management of some codes and ciphers as well as the decrypting of enemy dispatches, analysed in another part of this book. Another task of primary importance was the coordination of the many forms of counter-espionage activities ranging from the fight against sabotage to the battle against defeatism, from the surveillance of the rear positions to the protection of military secrets.
But it was not enough, because the Intelligence Office also had an important role in other sectors, like the coordination of censorship, especially mail censorship, and was directly involved in propaganda operations until it became responsible for the P Service in 1918.

The Protection of Military Secrets

Following the previously mentioned General Cadorna requests, several laws and edicts were issued between spring and summer 1915 to protect the Nation and the Army, by restricting personal freedom and forbidding the dissemination of information on military operations[26]. In a decree issued in June, severe penalties were envisaged on "anyone who communicates to a group of people or to single persons, information on national defence or military operations, other than those made public by the Government or by High Commands of the Armies or of the Army"[27].
General Cadorna also took provisions to protect the secrecy of military operations, by prohibiting officers from carrying with them, at the front line, operation order or other documents, such as personal diaries containing information about for instance the troops deployment. He also decided to limit the distribution of orders of operation, or excerpts thereof, to maintain the secrecy of the concept of action at large, allowing only the high commands to be fully aware of this, as needed "for the regular conduct of operations, while the depending Headquarters will only be informed about whatever pertains to them in order to execute their mandate as best as possible"[28].
On 31 July 1915, the Supreme Command divided the 'war zone' i.e., the provinces of the Kingdom declared in a state of war in two parts: the 'territory of operations' where the units at the front fought, and the 'territory of the rear' where the units not engaged in combat stationed, together with supply and transportation means. Severe restrictions were applied to the territory of operations "to increasingly and effectively contribute to the prevention and repression of military indiscretions and espionage". Among other restraints, civilians in war zones were forbidden to keep telegraphic or radiotelegraphic materials, carrier pigeons, and visual or acoustic signalling devices.

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[24] Headquarters, 2nd Army, Intelligence Office, Bulletin no. 140, 9 October 1915, AUSSME, Series F-3.
[25] This system worked until as the Austro-Hungarians started to change the numbers of field mail, thus making more difficult this kind of activity.
[26] Law, 21 March 1915 no.273.
[27] Decree Law no. 885, 20 June 1915; Circular Letter no.609 of the "Official Military Journal", 20 June 1915.
[28] Supreme Headquarters - Office of the Armies, Circular letter no.5, n.d. (in Spring 1915), AUSSME, Series M-7.

However, with a view of not altering the ordinary life of the country, unless indispensable to protect military security, "the closer to the front lines within the area of war, the tighter the protection measures restricting personal freedom"[29].

The Fight Against Enemy Sabotage and Internal Defeatism

Counterespionage tried to curb enemy espionage, which in 1916 led to sabotage actions against industrial plants responsible for war production, ammunition depots and even warships. In the spring of that year, an organisation of Italian traitors was disbanded, which had damaged the steelwork factory in Terni and the dynamite factory in Cengio, as well as some railway lines and power plants. This operation started with the arrest in Terni on 17 May 1916 of a certain Giuseppe Larese, while he was trying to blow up the steelwork factory with special gelatine pipes smuggled from Austria[30].

The I Office was actively engaged in countering the intensification of subversive anti-war actions, also by infiltrating agents in extremists' organisations. In describing the work against the spread of defeatist propaganda within the Army, Garruccio acknowledged the Service activity was not wholly successful and added:

addì 3 agosto 1917.

R. ESERCITO ITALIANO
Comando Supremo
SERVIZIO INFORMAZIONI
Sezione U

N. 9646 di protocollo

OGGETTO

Uso di speciali ordigni incendiari da parte di agenti nemici.

CIRCOLARE RISERVATA URGENTISSIMA

ai comandi di armata e della zona Carnia;
all'intendenza generale;
al com. delle truppe O. A. N.;
al comando delle Legioni territoriali dei CC. RR. di Verona, Milano, Bologna, Ancona e della Legione provvisoria autonoma dei CC. RR. di Udine;
al comando del Dipartimento militare marittimo di Venezia;

e per conoscenza:

al Ministero della Guerra - Segr. gen. Div. S. M.

Vien riferito a questo Comando che da agenti tedeschi residenti nei paesi dell'Intesa, si fa uso di apparecchi incendiari aventi le parvenze di scatole di carne in conserva, sulle quali sono raffigurate la marca e le altre indicazioni delle qui allegate figure.

Tanto si comunica — presi gli ordini da S. E. il Capo di Stato Maggiore dell'Esercito — per le necessarie indagini e disposizioni di prevenzione.

Il Generale addetto
L. PICCIONE.

4.5 Circular letter of the Intelligence Service concerning sabotage incendiary devices used by German agents

> However, I had the opportunity to know and report the names of several agents of such propaganda, especially military agents. Appropriate measures of repression and further prevention or isolation were taken against them and the units where they acted. Likewise, I was able to intercept letters, seize newspapers, posters and printed materials that had the same purpose.

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[29] Intelligence Office, Circular letter no.2266, 22 July 1916, AUSSME, Series M-7.

[30] Intelligence Office, Memorandum of 19 July 1916, *Attentati dinamitardi in Italia* (Bomb attacks in Italy), Supreme Headquarters, AUSSME, Series F-1; Ministry of War - Secretariat General, Circular Letter no.6367, 24 April 1916, Ministry of War – Secretariat General, Circular Letter no.14016, 10 December 1917, AUSSME, Series F-3A. During the conflict, several plants for the production and storage of ammunition and powders exploded (Cengio, Acquasanta - Roma, forte Pietole - Mantova, Udine, ecc.), sometimes without any evidence of the causes. It was also assumed the terrorists wanted to damage railway lines, especially the Frejus and Ventimiglia lines.

Hence, in the opinion of Garruccio:

> With a view to perform a much more effective action than an organisation engaged with many other tasks (read I Office N/A) could carry out, we should have set a specific organisation, with adequate staff and means. The Government and particularly H.E. Orlando when he served as Minister of the Interior in the Boselli Cabinet, had a clear idea and a firm purpose about this matter. It was also the reason why I was recalled from the front at the beginning of October 1917[31].

Coversely, the Intelligence Service submitted several reports about the revolutionary initiatives in Turin, which led to the turmoil of August 1917 and O. Marchetti reported that agents of I Office had also infiltrated an organisation of deserters who fled to Switzerland and aimed to instigate a revolution in Italy.

Moreover, following the extension of the war zone to the provinces of Turin, Alessandria, and Genoa, decided in 1917, the Ministry of War granted substantial funds to the intelligence units of the local military territorial commands for compensating informers who had infiltrated the mass of local workers and the political organisations[32].

The military counterintelligence cooperated with the Directorate-General for Public Security of the Interior Ministry and with its Central Investigation Office created for the needs of war, not only to fight against subversives, but also to search for shirkers, deserters, and people who failed to report for conscription, founding refuge both in Italy and abroad, especially in Switzerland[33].

Controlling the Rear

In the summer of 1915, some concerns arose about the guerrilla activity carried out in some parts of the Austro-Hungarian territory conquered after the first Italian offensive which had become the rear portion of the Italian front, since "emissaries tasked with banditry had been left behind with the double purpose of harassing our operations and causing painful acts of repression against the people. Many of them are men from the *Landsturm*, gendarmes, forest rangers who are obviously disguised. They carry weapons and ammunition, and the Austrian Government paid some of them one thousand crowns and then, as a reward. They have fired and continue here and there to shoot our troops in the back, pointing against individuals, officers, freight trains, etc."[34].

Thus, "very frequent and sudden inspections to hotels, inns (even of the lowest order) [...] in the houses where rooms are rented, including authorised and unauthorised brothels, were carried out by Carabinieri teams in plain clothes"[35].

The mobilised and territorial units of the Carabinieri took care of surveillance in the whole war zone to prevent infiltration by the enemy, or the circulation of spies or dangerous elements. The civilians suspected of being enemy agents were often interned. Since the beginning of the occupation, the Italian military authorities had targeted the priests above everyone else, many of whom were accused of being sympathetic to the cause of the very observant catholic Austria-Hungary.

[31] Interrogation report of General Garruccio, *op. cit*.

[32] Ministry of War - Secretariat General, letter no.25294, 18 October 1917, AUSSME, Series F-17.

[33] For example, in November 1917, the records of I Service mentioned the discovery of an Italian anarchist residing in Bern who helped 219 deserters flee to Switzerland.

[34] Document of Intelligence Office signed by General Porro, sent to the Presidency of the Council of Ministers on 14 June 1915, AUSSME, Series F-17.

[35] Headquarters, 1st Army, Annex to letter no. 22039, 11 July 1916, AUSSME, Series E-1.

At the end of June 1915, Cadorna notified the Presidency of the Council of Ministers via telegraph that 37 Austrian priests had been arrested, two of whom had been released, 30 interned, 4 still under investigation, and one was held hostage. They were suspected of carrying out “propaganda and espionage activities to our damage, aiding and abetting the enemy, and spreading alarming news among soldiers”[36].

4.4 THE SEVERAL FUNCTIONS OF THE INTELLIGENCE OFFICE

The Censorship Service

One of the Intelligence Office’ missions since the outbreak of the conflict was the mail censorship applied, directly or in cooperation with other state structures, to both the Army and within the country at larges. Telephone, telegraphic and especially press censorships were entrusted to other Government bodies.

Two Law Decrees were approved one day before the declaration of war to enforce censorship on telegraphs, telephones, radiotelegraphs, and mail. In extraordinary circumstances, such as the impending conflict, the Government was authorised to suspend or limit at will the services mentioned above and to employ Army and Navy officers, or civilian officials, for opening private correspondence, to ascertain the presence of information concerning the armed forces, national military preparation and defence plans, and seize it, as needed[37].

Correspondence of military personnel serving in the war zone, directed to people residing in any other part of the State, was controlled at a special office in Treviso. The opportunity to strengthen such censorship, especially for the correspondence originating at the front, had already emerged in the first weeks of war, since the soldiers frequently took on pessimistic tones in describing their life condition to the families, which could adversely affect the public spirit[38].

However, the Auxiliary Concentration Office in Treviso, which started its operations on 10 June 1915, still found operation difficulties in the middle of 1916 due to the lack of suitable personnel and infrastructure[39]. To facilitate its work, I Office recommended the Headquarters of the armies to promote the diffusion of postcards instead of letters “because the former can be analysed with immediacy, while the latter requires more time, and their forwarding suffers significant delays”[40].

“A veiled censorship” on mail sent to the troops by ordinary citizens, “especially on mail coming from places where subversive parties prevail in number” was also recommended[41]. Thus, in October 1915, at the Bologna office - i.e., where this type of correspondence was collected - a limited censorship began to be applied[42].

Finally, in November 1915, the Intelligence Office delegated the regulating and administrative aspects of censorship on military mail to the General Superintendence and maintained the enforcing powers for itself[43].

[36] Supreme Headquarters - Secretariat of the Chief of Staff, telegram n.411-G, 28 June 1915, AUSSME, Series E-2.

[37] Decree no.688, 23 May 1915 concerned telegraph, telephone, and radiotelegraphic censorship. Decree no 689, 23 May 1915 concerned postal censorship.

[38] Higher Director of Military Post, Letter no.235-S, June 1915, AUSSME, Series M7.

[39] Letter no.15777, 27 July 1916, *op. cit.* Instead of checking all the mail sent from the front, the Treviso Office could only control 2% of it.

[40] Intelligence and Coding Office, Circular letter no.3767, 18 August 1915, AUSSME, Series F-17.

[41] Intelligence Office, Letter no.4179, 26 August 1915, AUSSME, Series F-1.

[42] Intelligence Office, Letter no.587, 29 September 1915, *ibidem.*

[43] Intelligence Office, Letter no.8496, 20 November 1915, AUSSME, *ibidem*.

One relevant publication produced by the I Office was the *Notiziario sullo spirito delle truppe* (Newsletter on the morale of troops), a confidential report taken mostly from mail censorship including also excerpts of letters from or to military personnel. These newsletters summarized the reasons for soldiers' discontent and contained several news about their disciplinary behaviour, reporting the frequent requests found in letters from first line soldiers for specific advice on how "to generate eye infections or cause other wounds that may exempt them from service"[44]. In the newsletter of April 1917, for example, the issue of self-inflicted wounds, was addressed and considered a sign of concerns for the next spring offensive.
For the censorship of foreign mail, offices were established in Bologna, Milan, and Genoa, including both civilian and military personnel[45]. Under agreements with the Allied powers, all correspondence between Italy and neutral states as well as between the neutral countries transiting through Italy, had to be censored. The heads of censorship departments were in direct contact with the Supreme Command's I Office, while the territorial Army Corps' Headquarters exercised their superior powers and surveillance over the service[46]. Since June 1916, the Military Censorship Office set up at the Secretariat-General of the Ministry of War started to exert its authority on the international mail censorship offices, taking on many of the previous duties of Intelligence Office[47].

Propaganda

At the beginning of the conflict, propaganda among troops existed mainly in verbal form and was delivered by military officers and sometime by lecturers foreign to the Army. Written propaganda through leaflets, pamphlets, trench newspapers and proclamations, while significant, was not as developed in its early stages of war as in the following years.
The Operations Division took care of propaganda and press control. The Situation Office drafted the war bulletins of the Supreme Command; the Intelligence Office released communications on operations to the press; the Secretariat maintained relations with the Government and with the political and military authorities of the allied countries. As such a separation of tasks prevented a unified propaganda, at the beginning of 1916, the Supreme Command decided to create a Press Office to document war events both within the country and between the units at the front. Moreover, to build public consensus around a just

4.6 Commemorative postcard of Enrico Toti, recipient of the Gold Medal for Military Valour and war propagandist

[44] Intelligence Office, *Notiziario sullo spirito delle truppe* (News about the spirit of the troops), 1 April 1917 AUSSME, Series G-9, env.32.
[45] Intelligence Office, Letter no.10411, 16 December 1915, AUSSME, Series F-17.
[46] Intelligence Office, Circular letter no.10563, 18 December 1915, AUSSME, Series F-1.
[47] Ministry of War – Secretariat General, Circular letter no. 6256-G dated 21 June 191. The military censorship offices had to report to the Intelligence Office only the communications about military operations and counterespionage.

war, in January 1916 a limited number of journalists representing approximately thirty newspapers were permanently allowed inside the war zone[48].

Propaganda in 1915 had the domestic public opinion as a main target, while since the beginning of 1916, the focus of persuasion turned onto deployed units, also to counter the pacifist propaganda fostered by the anarchists and by some socialists. In March 1916, the Office for Situation and War Operations proposed to deliver stronger propaganda efforts across the Army by means of official and unofficial publications aiming to stimulate the morale of troops and to show them the interest by the national military and political leaders[49]. Plenty of booklets or simple pamphlets were printed for soldiers with contributions from the Ministry of War or private bodies and distributed to the troops free of charge or for a few cents.

Between the end of 1915 and 1916, 'trench newspapers' - simple handcrafted sheets, usually printed by cyclostyle on four sides, in few copies - also began to spread on the initiative of individual units[50]. In 1917, as the trench publications number boosted, their structure became more complete thanks to financial contributions from the Headquarters.

The main editorial initiative in favour of soldiers in 1916-1917 was, however, the *Giornale del Soldato* (The Soldier's Newspaper) whose subscription was restricted to Army units and paid with the respective budget allotments[51].

4.5 THE WAR OPERATIONS IN 1915-1916

The Initial Assessment of Enemy Forces

By intensifying its intelligence efforts in April and May of 1915, the I Office could deny persistent French and Russian rumours concerning a substantial displacement of German forces on the Italian front[52]. It reconstructed an accurate picture of the field fortification works the Austro-Hungarians prepared along their main line of resistance, especially for protecting Gorizia and the Karst Plateau. Also, the number of Austro-Hungarian infantry battalions deployed on the Italian front, estimated at the beginning of June, proved to be remarkably close to the actual one[53].

The Intelligence Office noted a scarcity of enemy forces in the theatre of operation in Tyrol and Trentino, where "no presence of large, organised forces has been detected. The Austro-Hungarian troops deployed there were *Landsturm* battalions, march units, or *Ersatzreserve* (reserve units)"[54].

[48] Supreme Headquarters - Secretary Office, Circular letter no. 223, 15 January 1916, AUSSME, Series F-1. The first guided tours of Italian and foreign journalists to the front were organised in July-August 1915, (Intelligence Office, Circular Letter no.2092, 12 July 1915, AUSSME, Series F-1), this letter contained an attachment with the regulations applied to journalists visiting the war zone.

[49] Supreme Headquarters - Office of Situation and War Operations, Memorandum of 17 March 1916, *Organizzazione del servizio delle comunicazioni al pubblico* (Organization of the public communication service), AUSSME, Series F-1.

[50] Trench newspapers reached the peak of their distribution in 1918 thanks to the support of renown national intellectuals. Section U "ultimately approved the creation of satirical booklets for the widest possible distribution among troops" (Intelligence Service, Circular Letter no.1757/SI dated 27 February 1918).

[51] Ministry of War - Secretariat General, Circular letter no 23829 dated 23 December 1916, AUSSME, Series F-1. The Soldier's Newspaper was published in Milan, "with three copies distributed to every company, squadron, or battery of the permanent Army or mobile militia".

[52] Intelligence Office, Report no.38, 31 May 1915. "The enemy forces in Trentino seem adequate to conduct strong and active defence operations, but not significant offensive operations. If the Austrian (or German) Headquarters intend to carry out an offensive, we believe their main force is still being formed." (AUSSME, Series B-1, 100/s, 1a).

[53] Filippo Cappellano, *L'imperial regio esercito austro-ungarico sul fronte italiano, op. cit.,* pp. 83-87.

[54] Supreme Headquarters - War Situation Office, *Notizie sul nemico - 15 giugno 1915,* AUSSME, Series F-1.

The interrogations of prisoners and the information from agents revealed the arrival of German mountain troops to the Tyrolean front as early as the beginning of July. The I Office noticed that "this scattering and fragmentation of German and Austrian forces may be the sign of that no regular large units form the enemy force in Trentino and southern Tyrol, as occurred elsewhere. The enemy may be trying to hide its weakness and gain time by projecting almost all the troops along the front and trying to compensate their quantitative inferiority with its great power represented by the skilful exploitation and fortification of the terrain"[55].
General Cadorna, therefore, could redirect the bulk of his forces to the Isonzo front without fearing an Austro-German offensive from Trentino or Cadore.
The abundant information, sometimes even exaggerated, about the obstacles and trenches prepared by the Austro-Hungarians led the Italian infantrymen and cavalrymen to reduce their offensive momentum in some parts of the front to the detriment of the plans to break through the front[56].
However, Ronge's thesis that the lack of an overwhelming initial Italian offensive was caused by the overestimation made by the Intelligence Office of the Austro-Hungarian forces deployed to defend their borders, does not seem sharable[57].

The "Shoves" in the Autumn of 1915

During the Third and Fourth Battles of the Isonzo - the last two Italian '*spallate*' (shoves) of 1915 - the Intelligence Office fell into error mainly due to inexperience, since it did not evaluate with due caution the depositions of some prisoners who had highlighted the scarcity of active soldiers and reserve deployed against the Italian 2nd and 3rd Armies.
The content of those interrogations was confirmed by informers who reported on the fatigue and progressive exhaustion of the Austro-Hungarian troops positioned on Isonzo and Karst fronlines, following the relentless Italian assaults. Moreover, the statements of an unspecified high-ranking person living abroad and connected to the official Austro-German circles were considered particularly reliable, as he said:

> The brave and vigorous Italian offensive on the Karst plateau should prevail. It was proven that the Austrians are scraping the barrel of their units with operational value. They have also deployed the last piece of artillery available to withstand the Italian pressure. [...] In any case, thanks to information from both the Austrian circles and our faithful informers, we could anticipate the fall of the fortified positions between Plava and Tolmin if we maintain a resolute, offensive effort there[58].

As a result, the Army Headquarters insisted on the attacks, but the expectations raised by the Intelligence Office and endorsed by Cadorna turned out to be insubstantial, and the enemy positions were not broken. After this experience, Cadorna no longer trusted the information provided by the I Office as before, especially the news coming from abroad.
From the beginning of 1916, the observation service was perfected through the acquisition of several technical devices and the channelling of data to a single body in charge of fusing them,

[55] Intelligence Office, Report no. 357, 5 July 1915, AUSSME, Series B-1,100/s, 1a.
[56] A confirmation of defensive works extent along the Isonzo came, for example, from the early air recognitions that Captains Piccio and Moizo, carried out on 8 June in the 3rd Army Sector. The flight reports were summarised in Bulletin 61 of the Intelligence Office.
[57] M. Ronge, *Spionaggio, op. cit*. p. 170 -171.
[58] Supreme Headquarters -Secretary Office of the Chief of Staff, Letter no.911, 30 October 1915, AUSSME, Series E-2.

with the aim of knowing "with the best precision, not only the location, but also the features of the enemy defences such as their robustness, the artillery and machine guns positions, the observation posts, the shelters, etc. The surveillance was developed with all the available means, both on land and in the air […]. The accurate observation of artillery 'flashes' at night was instrumental in determining the positions of the enemy artillery with greater precision"[59]. The perfect knowledge of the enemy's defensive preparations, therefore, became indispensable premise for any offensive operation, from the big "shoves" to the even small coups de main.

4.7 Laboratory of photo team of the Army. On the table, panoramic photographs of positions held by the enemy

The 'Strafexpedition' (Punitive Raid)

Intelligence Service was more effective during the preparation of the Austro-Hungarian offensive in Trentino in the spring of 1916.

The first, sparse information on the arrival of enemy reinforcements to South Tyrol and on the offensive preparations began to emerge at the end of 1915. The I Office considered this information as reliable already in January 1916, based on news from several agents, from the intelligence organisations at the Ministry of the Interior and Ministry of Foreign Affairs, as well as from the allied intelligence services. After all, it seemed obvious that, after Serbia's defeat due to the joint Austro-Bulgarian-German action at the end of 1915, the Habsburg army could redeploy its forces on the Russian and Italian fronts.

The amount of information about the enemy preparation achieved by the Divisional Headquarters increased between February and March: "The several movements of troops and materials reported in the recent weeks on the Plateaus and in Valsugana continue to date. [...] The frequent presence of officers engaged in observation tasks, led us to believe that the enemy will soon abandon its passive attitude to try to land a blow against our front line"[60].

Between the end of March and the beginning of April, prisoners and deserters of the units opposing the 1st Army insisted on the arrival of reinforcements and large artillery pieces in preparation of an imminent, massive offensive. As reported by the 5th Army Corps: "the information achieved from prisoners can be summarised in a large offensive enemy would carry out in Trentino, along the Valsugana-Adige front, with intensity on the Plateaus, to open three main lines in Val d'Astico, Val

[59] Supreme Headquarters - Secretariat of the Chief of Staff, Circular letter no.1561, 21 February 1916, AUSSME, Series M-7.

[60] Letter no. 74, 22 March 1916, 34th Division sent to the al Headquarters, 5th Corps. As early as March, thanks to the revelations of a deserter officer, the positions of large calibre cannons were pinpointed. These were a 380cal. cannon, two 420cal. howitzers, and many 305 cal. mortars (Headquarters, 1st Army, letter no. 8150, March 31, 1916, AUSSME, Series E-1).

d'Assa, and Vallarsa. The advance of the infantry would take place after a violent preparation fire by the artillery, with a large amount of artillery pieces being allegedly amassed on the Plateaus. [...] Continuous movements of railroad, of infantry troops and artillery are taking place everywhere along the entire front of the Corps, from the Adige to the Brenta"[61]. The offensive preparation was confirmed by air reconnaissance and by reports on departures of units from the Isonzo front to Trentino.

4.8 Tullio Marchetti, in charge of the Intelligence Office of the 1st Army in Trentino

In April, the Intelligence Office of the Headquarters, 1st Army guessed the almost exact layout of the enemy deployment. The serious threat that was building against the 1st Army was also perceived by the Intelligence Office of the Supreme Command which, in its Bulletin no. 2307 on 23 April, considered "the offensive likely to be carried out shortly on the southern Trentino front, perhaps in a week or two at the most"[62]. In addition to correctly forecasting the attack zone, the period of the attack and the consistency of the enemy troops, it was also possible to exclude the participation of German forces in the offensive as well as possible contemporaneous actions on the Isonzo, Carnia or Cadore fronts.

Despite many repeated information on the enemy offensive, the Situation Office remained sceptical about the extent of the attack[63]. Perhaps it was influenced by Cadorna, who did not believe a large-scale operation was possible at a time when even the Austro-Hungarians knew rumours about imminent offensive of Russian General Alexei Brussilof on the eastern front[64]. In early May, however, the same Situation Office reported that "Trentino is now the centre of the Austro-Hungarian military activity. A significant number of forces was removed from the Isonzo river and the Gail, from the Balkan and Russian theatres, and gathered in Trentino where it seems they were organised into three armies. According to the informers, this significant, massive force, including between 12 and 18 divisions, is concentrated in the Valsugana - Val Lagarina sector, to conduct offensive or simply counteroffensive operations"[65].

[61] Headquarters, 5th Corps, Letter no. 2410 dated 3 April 1916, AUSSME, Series E-1.

[62] A deserting Bohemian Lieutenant, considered reliable, provided detailed information on the Austrian plans at the end of April: "The offensive against Italy led from Trentino has always been General Conrad's obsession. Everybody mentioned and continues to mention it. The deserter believes this will be a large-scale operation consistent with the result the Austrian Headquarters aims for" (Headquarters 1st Army, Intelligence Office, Memorandum, 28 April 1916, AUSSME, Series E-1).

[63] Lieutenant Colonel Tellini, Chief of the Situation Office, wrote on 3 April that "Generally speaking and supported by the telephone interception of enemy communications, we are convinced that the Austro-Hungarian Headquarters cannot carry out large-magnitude offensive operations and that his activity across our front aims at maintaining the current positions and perhaps to correct the most forward line" (Supreme Headquarters - Office of Situation and War Operations, Memorandum of 3 April, 1916, *Circa le voci di offensiva di grande stile da parte dell'Austria-Ungheria*- About the rumors concerning a large Austro -Hungarian offensive, AUSSME, Series E-2).

[64] On 18 April Cadorna notified the General Superintendence that "based on the information gathered so far, the verified massing of enemy forces near our 1st Army shows operations of any entity are not only possible but likely in the Val Lagarina, Plateaus and Valsugana".

[65] Supreme Headquarters - Office of Situation and War Operations, *Situazione generale ed avvenimenti politici militari delle varie potenze, 1°- 30 aprile 1916* (General situation and military-political events of the various Power 1-30 April 1916), AUSSME, Series E-2.

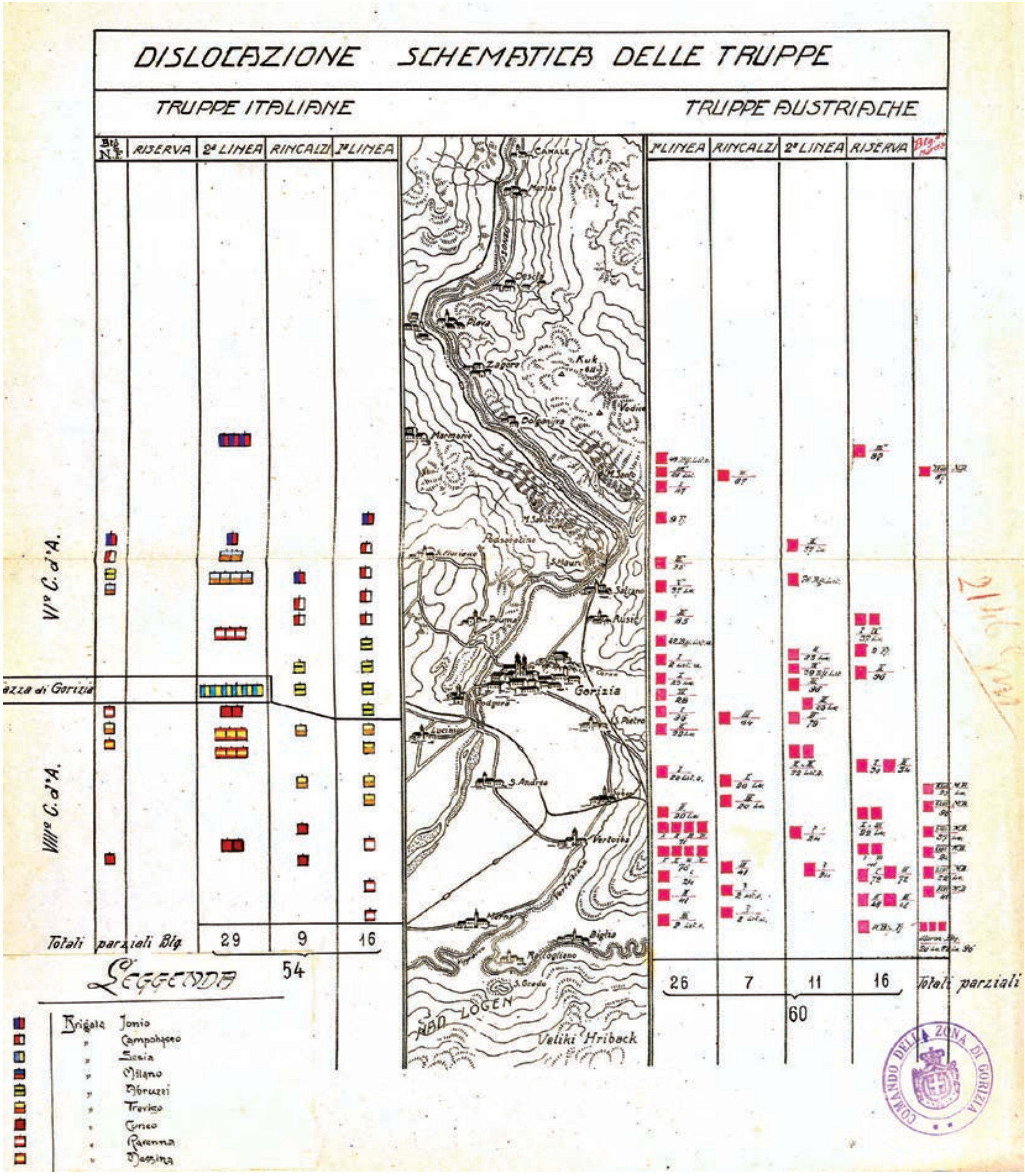
It is therefore unclear why Ronge could say that “our assault was a surprise for the Italians” provided he too acknowledges that, despite Cadorna’s disbelief, the “Italian troops were redeployed from Isonzo, and joined the 1st Army; [...] some brigades with newly formed regiments also arrived in Tyrol”[66].
Equally important information about the reasons that led the Austrian commands to stop the offensive came from the questioning of prisoners, who unveiled several other causes in addition to that exhibited by Ronge who ascribes the final Austro-Hungarian retreat only “to the new war events on the Russian front”[67], that is to the impossibility of deploying additional units on the Italian frontline due to the Russian offensive. The interrogations highlighted also: “the very heavy daily losses; the widespread unease among troops (services were very irregular); the reports of deserters on the very strong reserves in the Italian rear (an Army of six Corps); the displacement of 50 battalions in several stages by means of 1.500 trucks, from the left wing of our [Austro-Hungarian, A/N] deployment to its farthest right wing” and finally “the dilemma posed by Germany to abandon this offensive or accept not having its help”[68].

Seizing Gorizia

Even before the end of operations in Trentino, Cadorna turned his attention once again to the Isonzo front and ordered the 3rd Army to resume the preparation for an offensive effort against the entrenched camp of Gorizia and San Michele.
Circumstances seemed favorable to strike this blow since the parallel offensives in Galicia by the Russians and counteroffensive in Trentino by the Italians had forced the Austrian commands to remove some divisions from the Isonzo and Carso fronts. In fact, the Intelligence Offices of the Italian Armies and the Centre in Bern reported significant troop movements occurring from Trentino to the eastern front and the weakening of the Boroevic’s army along the Isonzo. Before the attack, the Supreme Command’s Intelligence Office was tasked with spreading rumours to distract the enemy’s attention from Gorizia. A deception plan was hence implemented by agents of the Bern Centre who disseminated fake news both across the units and by letters written in invisible ink, imitating the handwriting of known spies.
The railway plans for transporting troops and materials from Trentino were also modified to make the enemy believe that the destination was Cadore and not Isonzo: “A movement was prepared as if it should take place towards the area of the 4th Army. All personnel of the Transportation Directorate and the commanders were aware of the movement towards the 4th Army; instructions were given to limit the movement of passenger trains and goods in the direction of Cadore; preparations in the unloading stations of the 4th Army area made a mass concentration in this zone more credible”[69].
Urged by the Situation Office, Cadorna ordered the commander of the 3rd Army, the Duke of Aosta, to attack as soon as possible to seize the favourable opportunity and to prevent the enemy from strengthening its forces along the Isonzo frontline:

> I hereby forward to Your Excellency the attached study compiled by the Office of Situation and War Operations. It shows that the situation of the enemy forces on the front of the 3rd Army is still favourable. Above all, one can infer - as I have said to Your Excellency before - that any delay at the beginning of our offensive would reduce the possibility of success, since it would give the enemy time to bring other troops to the Isonzo; and that, for the same reason, our

[66] M.Ronge, *Spionaggio, op. cit.,* p.232 -233.
[67] *ibidem, op. cit.,* p. 234. Ronge says he had detected the presence of the Italian 5th Army near Padua.
[68] Supreme Headquarters - Office of Situation, War Bulletins and Missions Abroad, Memorandum of 28 June 1916, AUSSME, Series F-1.
[69] Intelligence Office, Memorandum of 11 July 1916, sent to the Chief, Operations Divisions, AUSSME, Series F-1.



4.9 Overview of opposing forces on the low Isonzo valley. Made by the Gorizia Area Headquarters in January 1916

> attack must take place very violently and rapidly, to win enemy resistance as soon as possible, before being supported by reinforcements[70].

Once again, Ronge did not attribute any merit for the seize of Gorizia to the Italian Intelligence Service, since, in his view, it would only have exploited several deserters. However, he recognised that "the Russian front was attracting everyone's attention at that time"[71], and later admitted the failure of the entire Austrian Intelligence Service.

[70] Secretariat of the Chief of Staff, Letter no.470, 2 August 1916, AUSSME, Series E-2.
[71] M.Ronge, *Spionaggio, op. cit.,* p. 237.

CHAPTER FIVE

Difficulties and recovery until Vittorio Veneto

5.1 THE REORGANIZATION OF OCTOBER 1916

Conflicts Between Intelligence Office and Situation Office

The already mentioned overlapping of some tasks of the Intelligence Office and of the Situation Office had generated frequent frictions between those two bodies, mainly concerning the management of information sources.
The War Situation and Operations Office collected information not only from the Intelligence Office but also from the military attachés and from the liaison missions to the Entente Powers. On the other hand, the sources of the Intelligence Office included agents operating abroad and the Intelligence Offices of the Armies Headquarters. However, the latter managed to interact with the other bodies of the Supreme Command, first and foremost the Situation Office and, at times, directly with the Chief and the Assistant Chief of the Army Staff, leading to a progressive detachment from the Intelligence Office of the Supreme Command[1]. As a consequence, serious problems arose along the chain of command, fuelled by antagonisms and misunderstandings, with the result of impairing the Offices performance[2].
In February 1916, the conflict between the two branches peaked to such an extent[3], as to compel Cadorna to reiterate that the War Situation Office was the only body in charge of reconstructing the enemy's battle order and deployment, writing:

> I would like to state clearly, once and for all, that the Intelligence Office, thanks to its different and often uncertain information means, investigates on all the traces it discovers and collects information from various sources. Then it conveys that information to the Headquarters concerned, to allow them to focus on it, and, when necessary, verify it. […] The daily bulletin on the enemy's forces and situation that is composed by the War Situation and Operations Office represents the view of this Command regarding the overall situation[4].

Nevertheless, the issue was not completely settled, as witnessed by General Giovanni Garuccio to the Commission of enquiry on the Battle of Caporetto:

[1] The War Situation and Operation Office asked for support from all Intelligence Office of the Armies to keep the enemy's situation constantly updated (Circular letter no. 1901, 13 February 1916, *Formazione di guerra dell'esercito austro-ungarico* (Wartime Deployment of the Austro-Hungarian Army), AUSSME, Series F-1.
[2] In September 1915, the Intelligence Office asked the Operations Division to have more extensive access to the reports written by military attachés, which primarily flew into the War Situation Office (Intelligence Office, *Relazioni degli addetti militari* - Report of military attaches, AUSSME, Series F-1).
[3] Allied military missions had noticed the difference between the enemy situations submitted by the two Offices of the Supreme Headquarters and had asked for clarification, thus highlighting the issue.
[4] Supreme Headquarters – War Situation and Operations Office, Circular letter no.2456, 23 February 1916, AUSSME, Series F-1, env.107.

> Regarding the relationships between the Intelligence Office and the Situation Office, the latter never really accepted to receive from the former all the information it needed to keep the Chief of Staff constantly abreast of the situation of enemy forces […]. Therefore, it had organized its own irregular intelligence service, which tended to overlap with the regular service performed by my branch. […] The competing Office always managed to impose its own views, especially because of the more frequent and direct contacts it could keep, due to the specific nature of its own functions, with the Secretariat of the Supreme Commander and with him personally. Thus, after about a year of troubles and frictions, I finally succeeded in implementing a more rational distribution of tasks between the two Offices[5].

The Reorganization of the Intelligence Sector

In October 1916, the Intelligence of the Army was completely reorganized and subdivided into two distinct areas. One of them, dealing with the war zone, was assigned to the War Situation and Operations Office of the Supreme Command, which incorporated the first two sections of the Intelligence Office[6]. The Intelligence Offices of the Armies were placed under its technical supervision. The other sector comprehensive of the remaining parts of the previous Intelligent Office and named 'Intelligence Service of the Supreme Command', dealt with the rear line and foreign countries. Its main branch was transferred from Udine to Rome.

5.1 General Carlo Porro, Assistant Chief of Army Staff, supervising the Intelligence Office from 1915 to November 1917

As a matter of fact, the Intelligence Office/Service lost part of its responsibilities regarding the reconstruction of the enemy military organization - which was assigned to the Situation Office - and focussed on the relationships with centres abroad and with the missions to Allied Countries, on economic matters, on information collected in the rear line and on counterintelligence[7].

The adopted settlement aimed not only to solve the disputes between the Intelligence Office and the Situation Office, which took over the entire responsibility of assessing enemy battle order and intentions, but also to make more effective the information transmission chain. In fact, all the information collected by the two Sections previously included in the Intelligence Office, as well as the information from the Armies, could now immediately reach the bureau charged with its processing and arranging to be as fruitful as possible.

[5] Commission of Enquiry on the Battle of Caporetto, Minutes of General Garruccio's questioning before the Commission, AUSSME, series H-4, env.30.

[6] The two Intelligence Sections of the Intelligence Service were incorporated and continued to receive all the military or political-military news collected by the service yet, they were now reporting to the Chief of the War Situation and Operations Office.

[7] Once the war was over, the Intelligence Office of the Supreme Headquarters wrote: "During the war […] the bodies of the Intelligence Service, both in the country and abroad, focused on the collection and analysis of all political economic, financial, commercial and industrial news that could in any case be related with the military situation on the front line, as well as on the effectiveness of the block that the Allies had created and surrounding enemy countries (Intelligence Office, letter no.480/S, 22 August 1919, AUSSME, Series F-3, env.28.

The tasks assigned to the entire reorganized intelligence sector of the Army were, in brief, the following:

– collection of information regarding the enemy's position and activity in the area adjacent to the combat line, carried out by Intelligence Offices of the armies in charge of coordinating and transmitting to the Situation Office the information inferred from units' reconnaissance, aerial observation, prisoners and deserters questioning;
– gathering military information on the rear line of opponent armies and the internal situation of enemy States;
– military police service including information on the morale of troops and population, mail and telegraph censorship, surveillance of enemy and subversive propaganda, etc.;
– counterintelligence, including all the measures to fight against the enemy information activities;
– collection of economic news relevant to the enemy's resilience and therefore concerning the war;
– secondarily, collection of political news, although not immediately relevant to military operations, but useful for the Government.

All the above-mentioned information categories, except the first one, were assigned to the Intelligence Service.

Instruments available to this Service comprised the decryption of enemy radiograms intercepted by radio eavesdropping and of wire telegrams originated especially by foreign diplomatic authorities.

The structure of Intelligence Service included the Sections named M (Milan), R (Roma) and U (Udine), and embraced also the pre-existing Special branch in Milan and the Detached branch of the Territorial HQ Staff Corps in Rome.

Section M managed the Intelligence activities carried out abroad, collecting all the provided information which, after brief analysis and arrangement, were forwarded: those of economic nature to the Section R responsible of this sector, and those including military news to the Section U acting as interface with the Supreme Command. Section U also leads military police and counter-intelligence service.

Decrypting activities were assigned to a specific Unit that belonged to Section R[8].

In May 1917, the Intelligence Service still directly reported to the Assistant Chief of Staff, apart from Section U remained a part of the Operations Divisions[9]. Then, starting from 1 August 1917 the Supreme Command was reorganized according to the chart shown in picture 5.2[10].

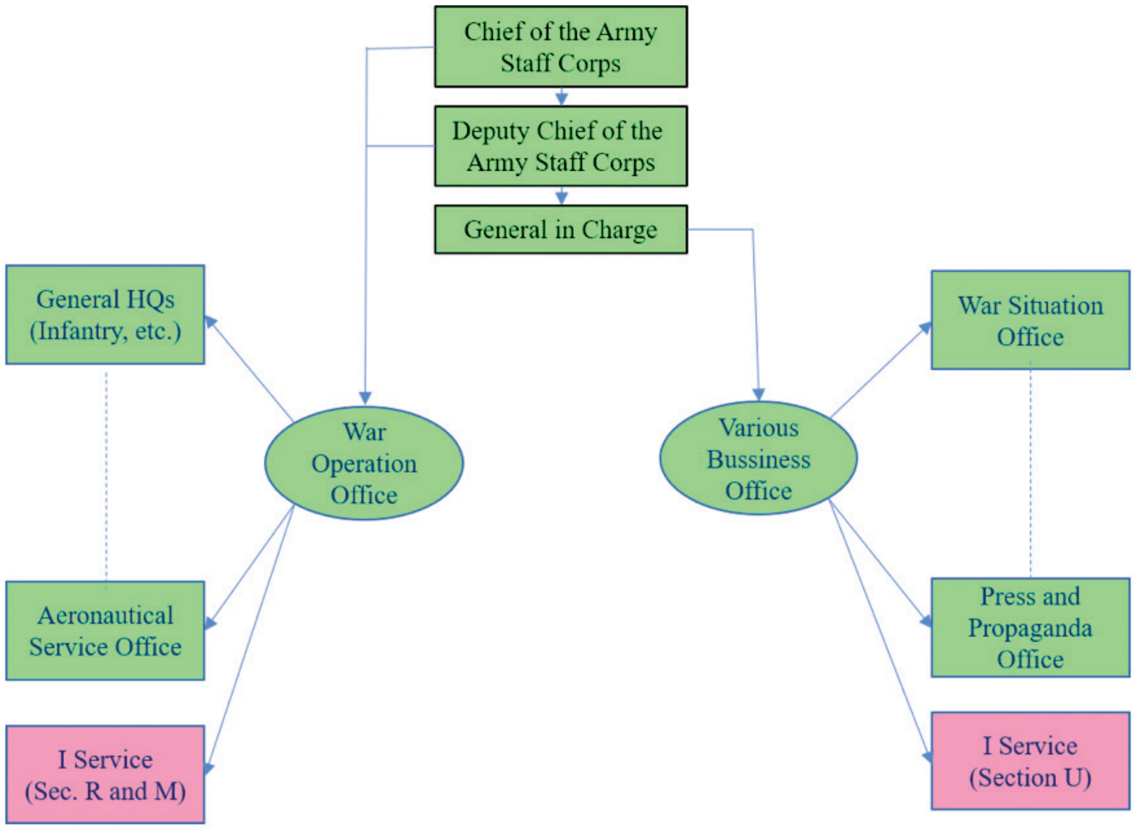
The reorganization of the top level of the intelligence sector in October 1916 later involved the Intelligence Office of the Armies as well. These branches, with purpose of better fulfilling their increasingly numerous tasks, created new bodies at the Divisions and lower levels (Sectors). Total freedom was given to Armies Headquarters in organizing and staffing their own Intelligence structures, with terminologies and procedures considerably different among them[11].

[8] *Cenni sommari sul funzionamento del servizio informazioni* (Brief overview on the functioning of the Intelligence Service), 1917, AUSSME, Series F-1.

[9] Supreme Headquarters - General Services Office and Secretariat, Service communications no.14068, May 1917, AUSSME, Series M-7.

[10] Supreme Headquarters - Office of the Chief of Staff, Service order, 28 July 1917, AUSSME, Series M-7. As shown in figure 5.2, Section U of the Intelligence Service reported to the General who has been tasked with the former responsibilities of the dissolved Operation Division. Section R and M reported to the Assistant Chief of Staff through the War Operations and General Affairs Office.

[11] For instance, within the 1st Army, the divisional and sectorial intelligence collection centres relied on questioning of prisoners and deserters, telephone interception centres, artillery observers, aerial reconnaissance, news communicated by front line regiment Headquarters and by the Headquarters of the engineer corps, artillery and infantry in the area. (1st Army



5.2 Organization chart of the Supreme Command as of August 1917

The Intelligence Office of the Army was headed by a junior officer who gathered the evidence provided by subordinate collection centres.
The Intelligence branches of the Armies often maintained informer networks in distant enemy rear lines with the evident endorsement of the Supreme Command, especially in the Cadorna period.

5.2 THE CRISIS OF THE INTELLIGENCE SERVICE

An Inexistent Enemy Offensive

The abundant documentation produced by the Intelligence Office/Service and coming from agents operating abroad, sometimes showed to be scarcely reliable since it reported fanciful news, such as the deployment of Turkish or Bulgarian troops on the Italian front. Because of the complexity of distinguishing the more credible and truthful pieces of information within the quantity of collected news, the Intelligence Service had to rely more on the dependability of the information sources than on the analysis of the contents of the information they provided.
One of the most famous pieces of information - later proved to be false - was the alleged preparation of a large Austro-German offensive in Trentino in early 1917. The rumours about this offensive,

Headquarters - Intelligence Office, Letter no. 516 of 4 January 1917, AUSSME, Series F-1. The document also comprises detailed provisions regarding the telephone interception service and the artillery group observers.

insistently coming also from the Allied intelligence services, in the period between November 1916 and April 1917, greatly alarmed the Supreme Command, which adopted significant defensive measures that turned out to be completely useless[12].

While the Intelligence Service gave great credit to those rumours, the Situation Office, on the contrary, remained sceptical and strengthened the Chief of the Army Staff's appreciation, declaring that:

> Several informers of the Intelligence Service, who are generally considered reliable, have been collecting and conveying for some time abundant news concerning the arrival of German troops and materials in Tyrol-Trentino […]. Over these last few months, many rumours have been reported regarding an imminent large offensive by a *Süd Deutsche Armeé* (South German Army) comprising Austrian and German troops, against Italy. Until now, all this information has not been confirmed neither by consistent declarations of prisoners and deserters nor by the Intelligence Offices of the armies […]. This consequently leads to be very cautious regarding the information provided by the Intelligence Service, as they come from scarcely reliable or untrustworthy informers. In the same way, it is not advisable to give credit to the recent news regarding the frequent movements that have been remarked, at the end of February, of trains bound for Innsbruck and for Trentino and carrying German troops[13].

Relationships with the Navy Intelligence Service

The relations of the Intelligence Service with the similar organization of the Navy were characterized by poor cooperation and some tensions, occurred for instance in connection with the famous 'stroke of Zurich' which helped neutralize the network of Austrian spies and saboteurs operating in Italy. That group of agents has accomplished several attacks against Italian objectves, apparently including the sinking of the battleships Benedetto Brin and Leonardo da Vinci. The Headquarters of the spy network were located inside the Austrian consulate in Zurich. During Carnival night of 1917, after long and painstaking preparation, some agents of the Italian Navy Intelligence Service broke into those premises, forced the safe and removed many documents, including the list of Austrian spies and the plans for future attacks[14].

With reference to this action, Ronge declared: "the most painful loss we could verify depended on the theft of the code, not to mention espionage documents"[15].

Lieutenant Ugo Cappelletti of the Intelligence Service of the Army took part in the stroke. However, a copy of the seized material was not transmitted to the Army Intelligence centre in Bern, annoying

[12] Supreme Headquarters - War Situation and Operations Office, Memorandum, 14 February1917, *Circa possibile grande offensiva contro l'Italia* (On a Possible Large Offensive against Italy), AUSSME, Series F-1. The Situation Office stated: "Communications from the Intelligence Service continue to mention future vigorous Austro-Hungarian operations against our front. Such rumours started last November and mentioned imminent offensives in full winter. This Office has always considered such rumours unreliable".

[13] Supreme Headquarters - Office of Situation, War Bulletins and Missions Abroad, Memorandum no.5, 5 March 1917, *Truppe e materiali germanici nel Tirolo-Trentino,* (German Troops and Materials in Tyrol-Trentino National), AUSSME, Series F-1. Also, in 1918 the reports from abroad proved to be scarcely reliable as, for instance, when in March 1918 a large-scale attack on the Italian front was expected, which took place two months later. (telegram no. 9359 of 26 March 1918 of the Supreme Headquarters signed by Diaz, AUSSME, Series E-2).

[14] For further details, see: G. Manzari, *Il Colpo di Zurigo*, in *La Comunicazione nella Grande Guerra,* Proceedings of Conference at Ministry of Economic Development, edited by G. Gallerati and C. Colavito, Rome, 2017.

[15] M. Ronge, *Spionaggio, op. cit.,* p.293.

the Officials in charge of the centre who reacted wrongly, as stressed in a letter of the Chief of Navy Staff, Admiral Paolo Thaon de Revel to Cadorna:

> During the recent break-in in the Austro-Hungarian consulate of Zurich, as far as I know, the conduct of some officers assigned to the Royal Army Intelligence Centre in Bern was not adequate to the specific requirements of that moment, nor was it consistent with an attitude of cooperation with the same Navy service. Since the latter came into possession of important documents taken from the safe which had been broken into, it would have been natural to convey them safely to Italy through Switzerland as secretly and as quickly as possible. As far as I know, Major Marchetti Bastianini and Captain Moriondi have, through inappropriate and patent inquiries, caused curiosity, suspicions and rumours that should have been avoided. By interrogating unknown persons and speaking loudly, they have considerably embarrassed the Navy Intelligence Service. On this occasion, too, they reiterated a disrespectful conduct, that was reported to me some time ago and that affects the perfect harmony of shared work to be carried out by two similar bodies for the same cause[16].

Relations between intelligence organizations of the Navy and of the Army in Switzerland continued to be characterized by poor cooperation, although in September 1917, Section R informed General Porro that: "the misunderstanding has been clarified and relations between the Navy Service and ours are excellent again"[17].

The Removal from Office of the Intelligence Service Chief

The reform of the intelligence service in October 1916 was consistent with Cadorna's need to improve the performance of the Situation Office, further staffed with new experienced and specialized personnel. But it also met the needs of both Garruccio and of the Assistant Chief of the Army Staff, General Carlo Porro, who had supervised the Intelligence Office since May 1915, as they showed particular interest in internal political affairs.

The Garruccio's removal from office in September 1917 was mainly due to his preference to deal with political affairs, as Cadorna attested in front of the Commission of enquiry on the Battle of Caporetto:

> It is true that Section R of the Intelligence Service included in its report to the Supreme Command information collected in political, social and journalistic circles also mentioning rumours regarding the Army Supreme Command. […] However, I never ordered to write those reports, and above all, I have never attached any importance to them. […] On the contrary, as I had once read some inappropriate comments in them, I ordered the Assistant to Chief of the Army Staff to second elsewhere General Garruccio, Chief of the Intelligence Service[18].

[16] Office of the Chief of the Navy Staff - 4th Division, Letter no.33, 12 March 1917, AUSSME, E-2. However, there were some further misunderstandings between Cadorna and Thaon de Revel.

[17] Intelligence Service - Section R, Memorandum 9428/S, 25 September 1917 of the AUSSME, Series F-17.

[18] Commission of enquiry on the Battle of Caporetto, Letter by Cadorna of 14 February 1919, AUSSME, Series H-4, envelope 1. After being assigned to commanding a brigade, General Garruccio was seconded to the Presidency of the Council of Ministers to create a central political-military Intelligence Office, which soon came into conflict with military Intelligence Service.

The circumstances of Garruccio's removal from office were reported by Garruccio himself to the Commission of enquiry: "Once the sessions of the parliamentary secret commission were over, I thought my duty to report my final impressions on the commission conclusions to General Porro in writing. I believed the most important among them regarded the suggestion that the Supreme Command, the Government and the Parliament needed to have more consistent views by establishing more frequent, direct and friendly relationships. It was the reading of that passage of my personal report in the presence of some officers of H.E. Cadorna's staff that caused his bitter disdain. He was certainly ill-disposed towards me and this led to my removal from office"[19].
In the same report to the Commission, Garruccio attributed to Cadorna the request for political investigations he had conducted and, moreover, criticized the whole organization of the Supreme Command and of the entire intelligence sector, allegedly too resembling the previous peace structure.
Colonel Odoardo Marchetti was appointed to replace Colonel Garruccio as Chief of the Intelligence Service.

5.3 THE 1917 OPERATIONS

The Carzano Surprise Attack

In September 1917, following the suggestion of the Intelligence Office of the 1st Army that had managed to contact Ljudevit Pivko, a Slovenian lieutenant who intended to desert, a surprise attack was attempted at Carzano (Valsugana), to break down the enemy lines and reach Trento. The plan was originated by Cesare Finzi, a Major of the Intelligence Office of the 1st Army, in cooperation with Pivko, during several secret meetings and obtained Cadorna's approval and encouragement[20].
The initial action "was such a complete success that the operation started at 22.30 on the 17th and the alert in the enemy lines was only given at 3 on the 18th". However, the attack failed because among the three units tasked to carry out the action "the only one that managed to cross the (creek, A/N) Maso and to surprise, seemingly, the garrison in Carzano, found itself alone for the entire day on the 18th and exposed to the counterattacks of the enemy, suffering considerable losses"[21].
The failure of the operation, however, did not cloud the Intelligence Service's excellent preparatory work[22]. In particular, Pivko allowed the Italian forces to easily seize the forward Austro-Hungarian lines, fulfilling all his engagements: he sent trusted people to lead the Italian vanguards, interrupted electricity in the barbed wires, gave the men in his battalion spirits with narcotics that Finzi had delivered to him, piled up timber to quickly widen the carriageway of a bridge near Carzano for expediting of the Italian forces advance[23].

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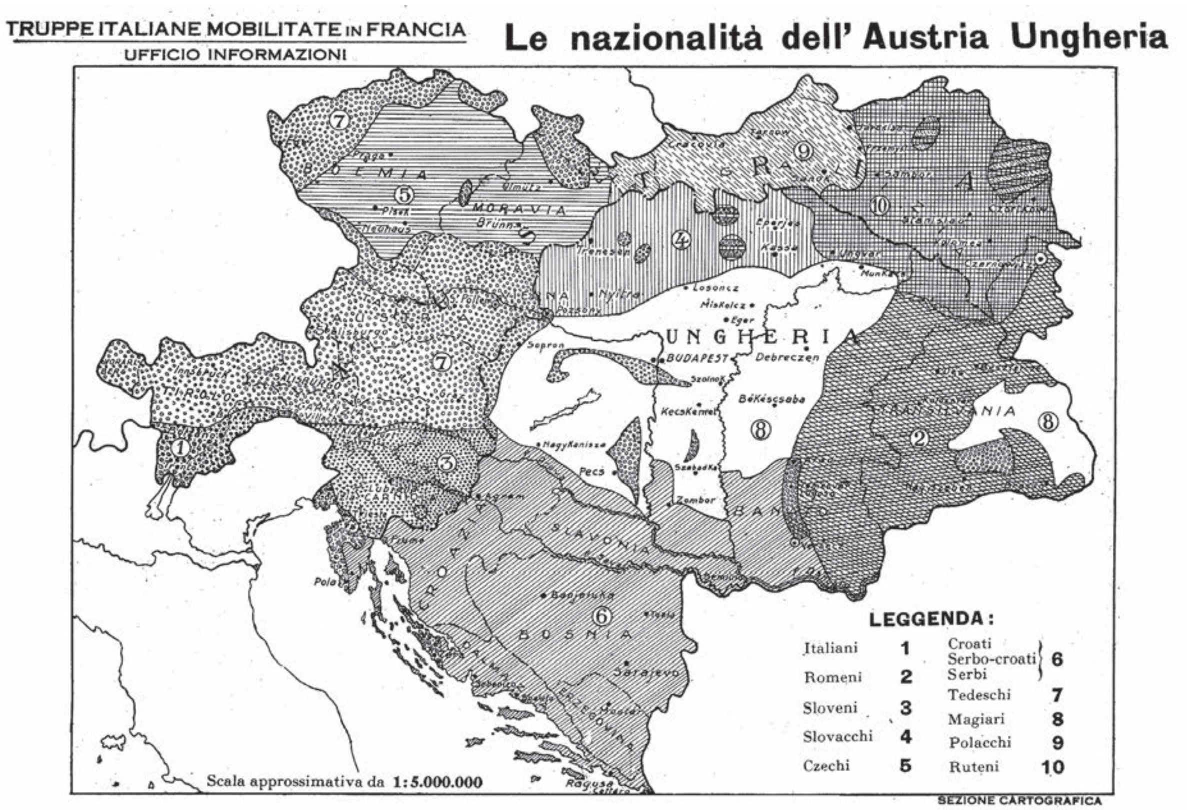
[19] Commission of enquiry on the Battle of Caportetto, *Minute dell'interrogatorio del Generale Garruccio davanti alla Commissione* (Minutes of the General Giovanni Garruccio's questioning before the Commission), AUSSME, Series H-4, env.30.
[20] Before the action, Cadorna telegraphed the Commander in charge of the operation: "I trust Your Excellency's energy to inspire everyone with the utmost drive in carrying out the operation, whose success depends above all on conducting it with bravery." (Supreme Headquarters - Secretariat of the Chief of the Army Staff, Telegram no.4441 of 16 September 1917, AUSSME, Series E-2).
[21] Supreme Headquarters - War Situation and Operation Office, letter no.4474, 19 September 1917, AUSSME, Series E-2.
[22] General De Robilant, Chief of the 4th Army, was tasked with an enquiry on these facts. He informed the Supreme Headquarters that "Major Finzi and all personnel, officers and enlisted personnel of the Intelligence Service that helped the conduct of the operation deserve to be praised" (4th Army Headquarters, letter no.10 of 26 September 1917, AUSSME, Series E-2).
[23] Cesare Pettorelli Lalatta, *L'occasione perduta: Carzano 1917,* Mursia, Milan, 1967.



5.3 Nationalities in the Austro-Hungarian Empire (from a document of the Intelligence Office of the 2nd Army Corps)

According to Ronge, one of the reasons for the failure of the attack depended on the fortuitous finding by an Austrian patrol of a telephone wire connecting the Italian troops in Carzano with the reserves under General Zincone's command ready to intervene, and because "any attempt to restore communications was defeated by our (Austrian N/A) fire"[24].

Caporetto

The Intelligence Service predicted the Caporetto offensive with accurate information arriving well before those coming from two Romanian deserting officers, who provided the plans of the enemy attack in the second half of October. Correct forecasts were helped by telephone and radiotelegraphic interceptions along with the radio-goniometric location of radio stations, above all German ones.

As of 7 October 1917, the Intelligence Service reported a "likely offensive on the middle Isonzo to re-conquer in its entirety or part thereof the Bainsizza plateau; local operations on the rest of the front; deceptive initiatives in Trentino; limited German support". On 13 October, according to a final information appraisal "an offensive action from Tolmin to Monte Santo should be considered as very probable and imminent"[25].

[24] M. Ronge, *Spionaggio, op. cit.,* p. 310.

[25] O. Marchetti, *op. cit.,* pp. 192-193. O. Marchetti reported that in early October he had a meeting with General Porro during which he judged the enemy offensive as imminent, to be expected during the third ten days of the month and located the Tolimin basin as the starting base for the main direction of the attack.

The actual size of the German forces' deployment was confirmed only shortly before the action. From mid-October both the Bern Centre and the Milan Section believed with certainty that German troops had been arriving in masses. On 19 October, Bern communicated that nearly all informers, sent in Austria to assess the rumours and news regarding a great enemy offensive, had consistently reported, when coming back, the imminence of the attack which would be supported by a strong contingent of German troops.

The Intelligence Offices of the armies were the bodies that promptly and to the best appraised the enemy's preparations. As soon as 9 October, the 2nd Army informed the Situation Office: "the vague yet consistent news collected over the last days regarding the enemy's preparations for a massive attack on the front of the Army has been confirmed by deserters and prisoners seized yesterday. The presence of German troops is now certain, and the enemy's offensive intentions are validated by many directives which imply movements of troops and artillery in Austrian stations and rear lines. This news is partly confirmed by the reports of our observers"[26].

The presence of German troops was also confirmed by documents found on the bodies of a fallen Prussian soldier recovered in the Isonzo and of two Prussian pilots who had been shot down in the sky over Auzza. On 20 October, it became evident that the large number of deserters coming from the Tolmin area was due to "the imminence of the attack, with the main clash - according to their report - on the Tolmin plateau, as seemingly proven by the large number or artilleries and bombards positioned there"[27].

On the same day, two already mentioned Austrian lieutenants of Romanian nationality serving as company commanders deserted the IV/37 and delivered official documents showing the details of the action that the Austro-Hungarian had been preparing. "Those documents clearly confirmed the sector the enemy had chosen for the attack, the objectives they wanted to achieve, the forces to be employed, and the approximate date of the start of action, as they were already known to this Office thanks to the questioning of prisoners and deserters and confirmed by the interpretation of enemy dispatches that have been intercepted especially by our telephone interception stations in the Rombon-Tolmin sector"[28].

As the attack was imminent, the Headquarters of the 4th Army Corps warned its own troops: "Based on the clues we have, it is almost certain that an enemy attack, already announced by the newssheets 2417 and 2420 of 21 October, will take place tomorrow. Enemy fire with asphyxiating bullets is likely to start at 2 am tonight and continue for about 4 hours. Afterwards, drumming fire expected to last about one hour and half and then infantry attacks tomorrow morning"[29]. On 22 October, the Intelligence Office of the 4th Army disseminated a bulleting opening as follows: "according to information from verified source, if the weather and the circumstances allow it, a series of small-scale actions would be imminent along the whole front of the Tyrolese-Tridentine scenario and of the Gail valley. Such activities would have a demonstrative and binding purpose

[26] 2nd Army Headquarters, Telegram no. 4785, 9 October 1917, AUSSME, Series B-1.

[27] 2nd Army Headquarters– Intelligence Office, News sheet no. 2413, 20 October 1917, *Stralcio delle informazioni più importanti delle ultime 24 ore* (Excerpt of the most important news of the last 24 hours), AUSSME, Series E-2. On the contrary, according to Cadorna: "While the situation of enemy forces always accounted for 9 German battalions, there only vague hints to the possible presence of a larger German contingent. Only the situation bulletin of 21 October mentions rumours about the presence of 9 Divisions, and it was only on 22 October that such a massive force is detected and counted. Similarly, the German *Alpenkops*, which had been assumed to be in Trentino, was suddenly detected and counted on the Giulia front in the 23 October bulletin only" (Commission of enquiry on the Battle of Caporetto, minutes of General Luigi Cadorna's questioning, AUSSME, Series H-4, env.1).

[28] 2nd Army Headquarters – Intelligence Section, *Notizie sull'offensiva austro-tedesca dall'Isonzo alla Piave* (News on the Austro-Hungarian Offensive from the Isonzo to the Piave River), AUSSME, Series E-2, env. 28.

[29] Headquarters of the 4th Army Corps, Telegram no. 4693, AUSSME, Series B-1.

5.4 Italians prisoners captured by the Austro-Hungarians during the 12th Battle of the Isonzo

and should integrate with a large offensive on the Isonzo front having a dual purpose: boost the self-confidence of Austrian populations and impact on the morale of Italian populations and parties, to push them toward a revolution that seems to be the fundamental objective of the enemy's strategy as regarding Italy"[30].

On this occasion, too, the Situation Office was not perfectly aligned with the Intelligence Service and, up to the last moment, underestimated the scope of enemy action[31], probably under the influence of the Chief of the Army Staff who, for a long time, was sceptical about a large-scale enemy offensive in that season and around the middle Isonzo.

Only on 23 October, facing the evidence provided by the information gathered, Cadorna wrote to the Ministry of War:

> My predictions are coming true. The enemy has now completed the concentration of its forces and artillery on the Giulia front, as I had been warning since last 18 September, and is about to attack. Verified news and information gradually collected from reliable sources and confirmed by the statement of two deserting officers of Romanian nationality permit the determination, with a fair degree of approximation, of the size of enemy forces and the general plan of the imminent attack. […]. The main action should be supported by diversionary attacks in Carnia,

[30] 4th Army Headquarters - Intelligence Office, Bulletin no.1225, 22 October 1917, AUSSME, Series B-1.

[31] "The documents of the Situation Office until 19 October explained enemy preparation with an exclusively counter-offensive intent or an offensive intention limited to the recapture of the Bainsizza plateau or, if anything, with an offensive having the Tolmin bridgehead as its outer northern limit. After 20 and 21 October, the option emerged of an offensive lunched mainly in the Bovec-Tolmin sector" (*Commissione d'inchiesta di Caporetto,* General Luigi Cadorna's questioning, AUSSME, Series H-4, env.1).

> in Cadore and in Trentino. A considerable contingent of German troops is supposed to take part in the offensive, according to the forecasts I made a long time ago[32].

International Consequences of an Incorrect Assessment

Immediately after Caporetto, when the Battle on Mount Grappa-Piave River to halt the enemy was about to begin, the Intelligence Service of the Supreme Command got involved in a harsh controversy that risked undermining its credibility at the international level. In fact, during the inter-allied conference of 6 November 1917 in Rapallo, the Assistant Chief of the Army Staff, General Porro, described the situation of opposing forces on the Italian front that seemed, to some extent, scarcely credible regarding the number of German units about to arrive on the Tridentine front.

According to Ambassador Aldovrandi's journal, Porro declared that the German units on the Isonzo in the moment of the attack of 24 October supposedly amounted to 9 - a figure not quite different from the actual 7 units plus some reinforcement units -⁻ and added: "after 24 October, other consistent information reports that 12 to 15 fresh German units have been directed against us. They come from Alsace, Romania, and the German heartland, amounting to 150 battalions. It would seem they will be sent to Trentino". To the next question from Lloyd George: "How many German Divisions are there?", the French Minister Franklin-Bouillon, without waiting the Porro replay, answered: "General Porro has already pointed out that the German Divisions, along with the reinforcement units, are from 21 to 24"[33].

Therefore, the Porro evaluation of enemy forces present on the Italian front slightly exceeded the right figure but was completely incorrect regarding the predicted deployment of new German units in Italy. The reason of the mistake could be probably found in the credit given by the Italian Intelligence Service to fake news disseminated by the Austro-Hungarian and received also by allied Intelligence Offices, regarding an imminent attack in Trentino with the support of German forces.

Aldovrandi's journal reports that after Porro's statements, General Robertson remarked: "the news I received this morning quote no more than 6 German Divisions along the whole Italian front" - a rounded down estimate - and then Lloyd George insisted on stressing the difference between Porro's estimate and the English one[34], while it would have been more appropriate to focus on the reliability of information regarding the assumed movement of German units from other fronts to the Trentino front.

The macroscopic discordance between the estimate of 21-24 units, attributed to Porro and evidently absurd, and that of 6 Divisions provided by Roberston - incorrectly presented also to the press - discredited Cadorna's Supreme Command as a whole and sped up the decision to change the Italian military top level, as wanted by the Allies[35].

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[32] Supreme Headquarters - Office of Situation, War Bulletins and Missions Abroad, Letter no. 4929 of 23 October 1917, *Imminente offensiva austro-germanica sulla nostra fonte* (Imminent Austro-Hungarian Offensive on our front), AUSSME, Series E-2.

[33] Luigi Aldrovandi Marescotti, *Guerra diplomatica, ricordi e frammenti di diario (1914 -1919)*, Mondadori, Milano, 1937, p.150. The Author attended to the entire meeting, as representative of the Minister of Foreign Affairs. David Lloyd George was the British Prime Minister and Henry Franklin-Bouillon was the French Prime Minister.

[34] *ibidem,* p.151 -152.

[35] Such discordance was negatively commented on by the British press, which caused the intervention of the Italian ambassador in London: "It is still important to reaffirm the truth concerning the size of enemy forces. It is necessary and urgent to prevent this large public from being under the false and absurd impression - which may be difficult to counter in the long run - that the only cause of our failure was not an overwhelming enemy but cowardice and treason. […]" (Headquarters, General

To make things worse over the following days, Italian military authorities were questioned about this issue by English and French Intelligence Services and reported, once again, information inconsistent with the real enemy forces deployed. The Intelligence Service had communicated to the English War Office, via Section R, data not concident with the official view originated by the Situation Office[36].
This led Minister of Foreign Affairs Sidney Sonnino to resentfully request the new Supreme Commander General Armando Diaz, to provide clarifications, "considering that inconsistent information was given on several occasions by this Supreme Command regarding the size of Austro-Hungarian forces deployed along our front and that prejudicial assessments from abroad should be rectified with accurate and certain data". Sonnino invites therefore Diaz to inform him "as thoroughly as possible about the exact number of German units and of old and new Austro-Hungarian units reported along our front and on enemy rear lines"[37].
General Diaz answered that there were 57 enemy Divisions on the first or rear line, including 9 German Divisions, while another 5 units were reportedly going to arrive.

5.4 THE 1918 REFORMS

The I.T.O. Service

At the beginning of 1918, according to the *Norme generali per il servizio informazioni sul nemico presso le truppe operanti* (General Regulations for the Intelligence Service on the enemy within Operating Troops), all intelligence activities were divided into two large sectors. The first one, entrusted to the "Intelligence Service", dealt with extensive rear lines, both the enemy's and its own, working abroad as well as in Italy. The second sector, named *Informazioni Truppe Operanti* shortly *I.T.O* (Operational Units Intelligence Office) and chaired by the Chief of Situation Office of the Supreme Command, dealt with the contact zone between belligerent armies and operated on the front line as well as on the closer areas[38].
The bodies of the I.T.O. were the Situation Office and, within each Army, the Intelligence Office that directly reported to the Chief of the Army Staff. Moreover, within each Army Corps Headquarters, and when necessary, also within Divisions or at lower level, information collection centres, shortly *CRITO - Centri di raccolta Informazioni Truppe Operanti* (Information Gathering Centres on Operating Troops) were implemented. They generally operated in definite territorial areas and therefore did not follow the displacements of the units which they temporary served.
The structure of the Intelligence Offices of the armies and of the information collection centres could vary in terms of number of sections and sub-sections, as well as in terms of personnel, depending on the specific conditions of each Army. Generally, an Intelligence Office of an Army would comprise: a Chief; an interpreters' section; fiduciaries and informers to question prisoners and to translate documents; a

Staff Corps - World War Correspondence, telegram no.508 of 12 November 1917 of the Royal Italian Embassy in London, AUSSME, Series E-2).
[36] Supreme Headquarters – Situation, War Bulletins and Missions Abroad Office, Memorandum of 15 November 1917, *Apprezzamenti inglesi sul nostro Servizio Informazioni* (Opinions about our Informetion Service), AUSSME, Series E-2.
[37] Ministry of Foreign Affairs, Telegram no. 1816/192, 15 November 1917, AUSSME, Series E-2.
[38] The Memorandum of 6 January 1918 of the Situation Office reported: "Enclosed Regulations were written by this Office to establish the main directive for the enemy-oriented Intelligence Office within operating troops. They do not aim to change the current functioning of the service but tend only to facilitate continuity of orientation." AUSSME, Series F-1, env.107.

telephone eavesdropping section; an aircraft, ground, and balloon observation section; a study and communication section.

A collection centre would generally only comprise an officer heading the centre supported by a certain number of non-commissioned officers and soldiers[39].

5.5 A recently captured German trooper being interrogated by an Officer of the Operational Units Intelligence Office on the French front

Under the new Regulations issued in June 1918, the Operational Units Intelligence Offices became an integral part of the Army corps staff, perhaps with the purpose to better control their activities, avoiding excessive freedom of action and eventual intrusion upon the responsibilities of the central Intelligence Service[40]. In fact, this kind of interferences was the main and most common reason for frictions occurred during the Cadorna period, when the Intelligent Offices of the Armies entailed the possibility of having their own intelligence networks abroad, which was at times formally forbidden but silently granted by the Supreme Command.

New responsibilities of the Intelligence Service

At the beginning of February 1918, a deep transformation of the Supreme Command organization led to the integration into the new Operations Office of three pre - existent Offices, namely: The War Operations and General Affairs; the War Situation, war bulletins and missions abroad; and the General Services Offices[41].

The new Operations Office was mainly interested in information regarding the enemy, such as the war situations; the processing of data concerning the opponent Army; the coordination of the Italian Armies Intelligence Offices.

[39] Supreme Headquarters – Situation, War Notices and Missions Abroad Office, *Norme generali per il Servizio Informazioni sul nemico presso le truppe operanti* (General Regulations for the Enemy-Oriented Intelligence Service within the Operating Troops) AUSSME, Series F-1, env.107.

[40] Circular letter n. 11797, 30 June1918, *Norme generali per il servizio informazioni presso le truppe operanti* (General Regulations for the Intelligence Service within the operating troops), with five attachments published separately as booklets, at different times. The first attachment dealt with the regulations on "questioning of prisoners and deserters for the analysis of enemy documents and correspondence and for the functioning of telephone eavesdropping sections". The second attachment reported the "regulations for the interpretation of photographs", the third attachment concerned the Regulations for I.T.O. observers. The last two attachments comprised forms and procedures to fill in the periodical reports on "Probable Status and positions of enemy forces opposite the army and of enemy artilleries along the front of the army".

[41] Supreme Headquarters, Service communication no. 5400, 9 February 1918, of the AUSSME, Series M-7, env.42.

On the other hand, the Intelligence Service tasks were broadened, including some new objectives such as: "to foster the patriotic and martial spirit of the civilian populations" and "to protect the morale of the troops and of the inhabitants around operations"[42].
The responsibilities of the Intelligence Service also concerned: the collection of militaries, economic and political news from foreign countries; military police and the spirit of troops; censorship on correspondence; counterpropaganda and support to propaganda; counterintelligence; border surveillance; relationships with the intelligence services of allied armies; management of the *Opera Mutilati di Guerra* (Foundation assisting personnel wounded during the war).
In February 1918, the Intelligence Service management moved to the Supreme Command premises in Abano, leaving in Rome the territorial Headquarters of the Staff Corps which interacted with the military attachés and the military missions abroad and maintained various offices including Section R[43].
In the course of 1918, two new auxiliary divisions of the Service were created, i.e., T (Turin) and G (Genoa), following the extension of the war zone to include some Piedmont and Lombardy provinces, for reasons of public order. Section M expanded its functions including an informer and saboteur school, a correspondence centre for Italian prisoners of war, and a surveillance body for the northern frontier.

5.5 PROPAGANDA ON BOTH SIDES

Austrian Attempts to Create a Second Russia in Italy

Starting from 1916, the Austrian-Hungarian Intelligence Service used Italian prisoners of war and deserters sent back to Italy with the mission of persuading former brothers in arms to desert. For instance, in 3rd Army trenches: "Italian deserters came again near our forward lines to convince others to desert. This, of course, could only happen with our enemy's support and advice. […] We believe that an organized system uses deserters and prisoners also to collect military data"[44].
The questioning of two Yugoslav deserting officers previously involved in the enemy intelligence service provided information regarding the secret preparations carried out in Austria and Germany to release in Russia and Italy prisoners of war indoctrinated with socialist and anarchist ideas, for inciting revolutions in their countries of origin. Their witness reads:

> Seeing that it could not win the war with weapons, Austria considered it appropriate to exploit the revolutionary spirit of the Russian and later Italian states. The first step was taken in early 1916 by detaining all prisoners with socialist and anarchist ideas in the same place. […] There are two defeatism schools, one in Vienna and the other in Budapest. After attending the school, some of these individuals, depending on their ability, came to the Isonzo front and in Tyrol on the Austrian lines, approaching the Italian outposts at night with Austrian patrols. They would start talking with their compatriots, which often led to desertion among the Italian

[42] Supreme Headquarters, Circular letter no.11797, 30 June 1918, *Norme generali per il Servizio Informazioni sul nemico presso le truppe operanti* (General Regulations for the Enemy-oriented Intelligence Service within I.T.O.) - AUSSME, Series F-1, env.296.
[43] Alessandro Gionfrida, *L'ordinamento del Comando Supremo del Regio Esercito nella Prima guerra mondiale,* Bollettino dell'archivio dell'Ufficio Storico, no. 25-26, gennaio - dicembre 2013.
[44] 3rd Army Headquarters - Second Intelligence Section, Circular letter no. 2357-RI of 19 March 1916, *Disertori italiani che rientrano* (Italian Deserters Returning to their Country of Origin), AUSSME, Series M-7.

ranks. Others who were unfit or unable for this service went back to their country of origin as sick persons and were tasked to disseminate defeatist ideas among soldiers and middle-class persons in Italy. In Austrian military circles, rumours went around that Caporetto costs 700,000,000 crowns to Austria, spent for espionage and defeatism[45].

The capture of a member of the Austro-Hungarian intelligence service, Johan Kreutz, permitted knowing the activities and organization of enemy forward patrols, designated to fraternize with Italian soldiers to cause them to desert or persuade them to mutiny. “Two days after the capture, he told a fiduciary that his regiment had played such an important part in the fraternization action along the Russian front, so that the Emperor, in addressing the regiment during his last review, had said: ‘You wise guys of the 9th Schutzen go on!’. The Kreutz regiment on our front had the same task. This group, including 5 people, used the pretext of exchanging objects and food with Italian soldiers as a first step to incite the birth of ‘a new Russia’ in Italy”[46].

5.6 Cover of German illustrated news magazine aiming to show the good treatment of prisoners and to encourage Italian soldiers to surrender and desert

Moreover, the Austrian repeatedly sent “against our posts squads wearing Italian uniforms and badges to deceive our troops”[47]. After Caporetto, surveillance over isolated military personnel in the rear lines and in the territorial zone was also strengthened, following the arrest of various enemy agents wearing Italian uniforms[48].

In addition to enemy actions, the Intelligence Service had to fight against the activism of the anti-war Italian parties and their

[45] Intelligence Service, Circular letter no.10197, 13 July 1918, AUSSME, Series F-3.

[46] Supreme Headquarters - Operations Office, Letter no.5586, 28 February 1918, AUSSME, F-2, env.179. For a documented episodes of fraternization see Basilio di Marino - Filippo Cappellano, *L’arma della fraternizzazione nella grande* in Studi storico-militari 2007, SME, Roma, 2009.

[47] Supreme Headquarters - Situation Office, War Bulletins and Missions Abroad, Letter no.19667, 13 September 1917, *Abuso di uniformi italiane da parte del nemico* (Misuse of Italian Uniforms by the Enemy), AUSSME, Series E-2.

[48] Is has been ascertained that during the retreat of Caporetto and in the 1st Battle of Piave River, the enemy intelligence service used agents disguised as Italian officers. Some of them were shot on the spot. See: Situation, War Bulletins and Missions Abroad Office, Circular letters no. 93 of 1 January 1918, *Infiltrazione di militari nemici nelle nostre file* (Infiltration of Enemy Servicemen in our Ranks) and no.542 of 7 January 1918, *Predisposizioni nemiche per mescolare, al momento opportuno, fra le nostre truppe, ufficiali austro-tedeschi travestiti* (Enemy provisions to infiltrate among our troops, at the right time, Austro-German Officers in Disguise) and telegram no.120665 of the Ministry of War of 20 December 1917, communicating “the new arrest in the territorial zone of enemy servicemen wearing the uniform of Italian officers”.

defeatist propaganda tended to depress the morale of the population and of combatants, as proven by an Intelligence report of December 1917:

> On last 18 and 19 November, two secret meetings took place in Florence of members of the leftist Leninist wing of the Socialist party […] During these meetings it was decided to charge Leninist comrades working at auxiliary plants with: intensifying anti-war and desertion propaganda; directing propaganda above all against the French and English influence, to be blamed for fostering the continuation of war; disseminating incitement by clandestine press to uprising against the bourgeoisie, showing Russia as an example where war actually stopped after the revolution[49].

The P Service

Therefore, it was necessary to promote among Italian troops a vigorous counter-propaganda action along with more careful surveillance, but also to assist the soldiers through moral and material support, as a reaction to the Caporetto defeat.

In January 1918, the Supreme Command ordered the Headquarters of large units to control the troops' morale by a dedicated intelligence system to be staffed with confident and serious officers, carabinieri and police officers, but also with enlisted civilians having ascertained and unquestionable political and moral fibre[50].

5.7 Postcard of the Intelligence Service showing the Austro-Hungarians' brutal treatment of Italian prisoners of war

Selected fiduciaries were tasked to "mix with soldiers, listen to speeches, assess feelings, ambitions, and shortcomings in order to be able, depending on the various opportunities, to assist them with comforting and reassuring words immediately". In addition to informing superiors about the needs of troops in terms of assistance and welfare, they disseminated propaganda material, prepared conferences, organized recreational activities and shows in periods of rest in the rear lines. The action of officers in charge of propaganda had to: address also the populations by organizing surveys on civilians' morale and opinions; influence local press, by directly providing articles; carry out verbal propaganda to prevent spreading of defeatist ideas[51]. The need to monitor populations had

[49] Intelligence Service, Letter n.628/P, 23 December 1917, *Movimento sovversivo* (Seditious Movement), AUSSME, Series F-3.

[50] Intelligence Service, Circular letter no. 916, 9 January 1918, AUSSME, Series E-5, env.194.

[51] Supreme Headquarters - Section U, Circular letter no. 1117/P, 1 February 1918, AUSSME, Series F-2, env.105.

emerged especially after the retreat to Piave, when the war zone stayed in an area near to the Lombardy, Emilia, and eastern Veneto whose populations had predominantly anti-war feelings[52].

In March 1918, the counter-propaganda activity was regulated and entrusted to the Intelligence Service of the Supreme Command to which the Intelligence Offices of the armies reported. In May of the same year, 'Service P' was officially established, comprehending a Sections P within each Intelligence Office of the Armies and sub-sections P at the level of Army Corps' Headquarters, Intendancies of the Army, HQs of the Army Engineer Corps, Artillery and Air force.

Volunteer Units

The Press and Propaganda Office of the Supreme Command[53] was charged with the preparation of all written and oral propaganda, including posters designed to destroy the unity of the Empire by stressing racial differences and war bulletins and notices formerly prepared by the Operations Office. This Office shold harmonise his work with that of the soon-to-be-created Inter-Allied Propaganda Central Committee, which will comprise officers from allied armies and representatives of oppressed nationalities of the Austro-Hungarian Empire[54]. The already mentioned *I.T.O General Regulations* assigned to the Press Office the task of coordinating "its own action with the Intelligence Office and the Under-Secretariat for Propaganda Abroad […]"[55].

From 15 May to 1 November 1918, the Italian Army poured almost 60 million leaflets on the enemy to weaken soldiers' morale and persuade them to surrender, in addition to more than 9 million copies of propaganda papers in the various languages spoken within the Empire (Picture 5.8). Austro-Hungarian newspapers, like the "Gazzetta del Veneto" were even forged and distributed inside the invaded provinces, for the benefit of the civilian populations.

5.8 Propaganda manifest on the intervention of the US Army addressed to the Italian domestic front and then translated into various languages, of the Austro-Hungarian Empire

[52] The most delicate matter was the reorganization of camps collecting dispersed troops of the 2nd Army, and located in rural zones of Emilia, where hostility towards the war continuation had been largely diffused.

[53] In April 1918, the Press Office was transformed into to increase the consistency and force of propaganda towards both the enemy and the troops.

[54] Supreme Headquarters, *Relazione sui lavori della Commissione Centrale di Propaganda sul Nemico* (Report on the Sessions of the Central Committee for propaganda against enemy), 15 May - 30 June 1918, AUSSME, Series F-1, env.262. Propaganda leaflets were also dropped on Hungarian troops. For saving the Magyar nation, it should be pursued "its total separation from the alliance with Germany and from the union with Austria, which would later allow its economic and social rebirth on sincerely democratic foundations against the feudal oligarchy of aristocratic - or who had recently become so - landowners" (Second Report of the Sessions of the Central Committee for enemy - oriented propaganda, 1 November 1918).

[55] Supreme Headquarters, *Norme Generali per il Servizio di Indagine, di Propaganda e di Controspionaggio fra le truppe operanti e le popolazioni e di propaganda sul nemico* (General Regulations for investigation, propaganda and counter intelligence in the operating troops and population and for the propaganda towards the enemy), August 1918, AUSSME, Series F-1.

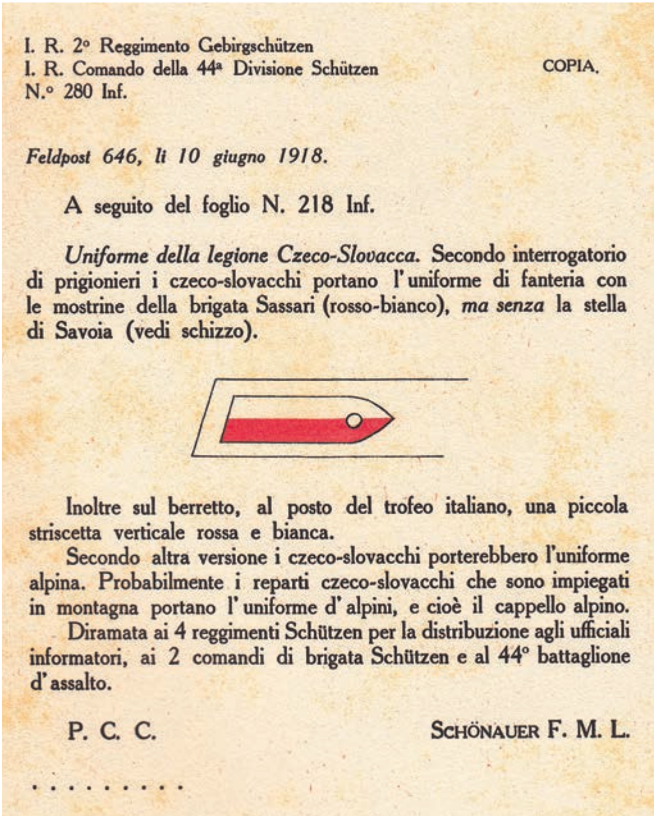
Propaganda towards the enemy, aimed mainly at stirring internal conflict and encouraging ambitions of independence of the nationalities comprised within the Hapsburg Empire, gained strength by employing deserters and 'unredeemed' prisoners. One of the first and most active collaborators of the Italian Intelligence Service had been the Bohemian deserter Francesco Hlavacek who had reached the Italian lines on 10 August 1916, carrying many documents, maps, and sketches of enemy positions. After the initial questioning, he remained for about a month at the artillery Headquarters of the 2nd Army corps and provided, moving from one lookout to the other, a lot of useful information on enemy positions. He then summed up the information and data collected over several months in a lucid report - a copy of which was sent to the Supreme Command - also containing a plan to attack the Bainsizza plateau[56].

Before the Italian strike of May 1917, he was recalled to the war zone and employed by the 47th Division Headquarters, tasked with the military demonstration in Loga and Bodrez. On that occasion, he become an actual collaborator of the Headquarters and his suggestions proved to be extremely useful for the operation. He then personally questioned a large part of Bohemian prisoners to identify the new defence lines that the enemy had established on the plateau after his desertion.

He later joined the Czechoslovakian Patriotic Committee located in Rome. Before the Bainsizza attack, Hlavacek was once again recalled and assigned to the 24th Army Corps, in charge with the breakthrough[57].

Starting from early 1918, Czechoslovakian, Romanian, Polish and Jugoslav prisoners were detained in concentration camps separated from the rest of the Austro-Hungarian troopers, to facilitate their recruitment as volunteers[58].

In February 1918, the Supreme Command asked the Ministry of War permission for the official employment, within Intelligence Offices of the Armies, of volunteer enemy prisoners of various nationalities who had been



I. R. 2° Reggimento Gebirgschützen
I. R. Comando della 44ª Divisione Schützen COPIA.
N.° 280 Inf.

Feldpost 646, li 10 giugno 1918.

A seguito del foglio N. 218 Inf.

Uniforme della legione Czeco-Slovacca. Secondo interrogatorio di prigionieri i czeco-slovacchi portano l'uniforme di fanteria con le mostrine della brigata Sassari (rosso-bianco), *ma senza* la stella di Savoia (vedi schizzo).

Inoltre sul berretto, al posto del trofeo italiano, una piccola striscetta verticale rossa e bianca.

Secondo altra versione i czeco-slovacchi porterebbero l'uniforme alpina. Probabilmente i reparti czeco-slovacchi che sono impiegati in montagna portano l'uniforme d'alpini, e cioè il cappello alpino.

Diramata ai 4 reggimenti Schützen per la distribuzione agli ufficiali informatori, ai 2 comandi di brigata Schützen e al 44° battaglione d'assalto.

P. C. C. SCHÖNAUER F. M. L.

. . . .

5.9 Document of the Austro-Hungarian Intelligence Service regarding the Czechoslovakian Legion, translated by the Headquarters of the 3rd Army

[56] Supreme Headquarters - Office of Situation, War Bulletins and Missions Abroad, Memorandum no. 15109 of 2 October 1916, *Memorie di un ufficiale disertore dell'Esercito austriaco circa una nostra eventuale operazione tra Aussa and Descia* (Memoirs of a deserting officer of the Austrian Army regarding our possible operation between Aussa and Descia), AUSSME, Series E2, env.67.

[57] 2nd Army Headquarters - Intelligence Office, Letter no.2835, 31 August 1917, *Rimunerazione dell'informatore boemo Francesco Hlavacek* (Remuneration of Bohemian Informer Francesco Hlavacek), AUSSME, Series F-3. The 24th Army Corps broke through the Isonzo enemy lines and got through the Bainsizza plateau.

[58] Circular letter no. 11054/A, 18 August 1918.

already serving as interpreters, translators, and fiduciaries. Czech, but also Romanian, Polish, and Yugoslav recruited patriots was largely engaged for questioning prisoners and as undercover agents in concentration camps to extort military information from prisoners. Later, contact patrols reporting to the Intelligence Service, went into action by approaching enemy lines at night to convince the sentinels to surrender and join the Italian ranks, by means of patriotic songs and throwing leaflets and food.

As a further step, actual combat homogeneous units were created, with prisoners of war enlisted on a voluntary basis, carrying Italian weapons and equipment. They supported the units of the Royal army along the front line and carried out dangerous sabotage actions behind Austro-Hungarian lines. In April 1918, it was decided to establish a Czech special corps comprising an infantry Division, a depot, and a concentration camp. The Romanian legion was created on 15 October 1918[59].

The Intelligence Service worked also to stay in contact with the political representatives of the committees that had appeared in Italy and in other countries of the Entente, formed by members belonging to the various nationalities of the Dual Monarchy. Another activity performed by the

5.10 Battalion of the Czechoslovakian Legion comprising former prisoners of war enlisted as volunteers in the Italian ranks

Intelligence Service aimed to facilitate the escape of Italian officers detained in internment camps and their movement across Austria-Hungary by: “forging false travel papers proven to be, on this as on other occasions, the safest way for our prisoners to escape”[60].

[59] Cesare Gotti Porcinari, *Coi legionari cecoslovacchi al fronte italiano ed in Slovacchi,* SME-Ufficio Storico, Roma, 1933; Wojtech Hanzal, *Il 39° reggimento esploratori cecoslovacco sul fronte italiano,* SME-Ufficio Storico, Roma, 2009; Filippo Cappellano, *La legione romena,* in *Studi storico-militari 1996*, SME-Ufficio Storico, Roma, 1998.

[60] Intelligence Service - Section R, letter no.1245/S, 27 January 1918, *Evasione di ufficiali dalla prigionia austriaca* (Escape of Officers from Austrian Concentration Camps), AUSSME, Series E-2.

5.6 THE BATTLES OF SOLSTICE AND VITTORIO VENETO

Operational Appraisals Before the Last Austro-Hungarian Attack

With regards to operations in January 1918, the Intelligence Office confirmed the rumours about the withdrawal of the German forces from Italy, which induced the Supreme Command to resume the initiative with the Battle of the Three Mountains, with the purpose of showing the enemy that the Italian army had recovered its offensive capabilities.
In March and April, preparations for a large-scale Austro-Hungarian offensive were detected, with no German support and with no certainties as to the direction and the date of the attack. On 28 May 1918 general Diaz wrote to the French General Foch, Commander in Chief of the Allied Forces:

> The news collected over the last days and coming from both diplomatic sources and the questioning of prisoners and deserters, leaves no room for doubt about the enemy's intention to develop, as soon as weather conditions allow it, a large-scale attack on the front of the Piave River. This should be supported by another forceful attack in the mountains, which should involve the Mount Grappa region and the Asiago Plateau. This information is frequent, consistent and confirmed by other provided by our officers who have recently returned from imprisonment[61].

According to a telegram the Operations Office sent to the Ministry of War on 9 June: "prisoners and deserters agree on affirming that a large-scale enemy offensive is in an advanced state of preparation. The deployment of artillery seems to be complete and the reserve units appear to be advancing to reach the proximity of the front lines"[62].
The enemy preparation was followed in any detail:

> In early June, (Austro-Hungarian, A/N) companies on the front line received food supplies and reserve ammunition to be distributed to troops before the offensive. At the same time, soldiers had to return their second blanket and set of underwear; all superfluous material was removed from the front line. Approximately on 7 June, troops in the front line started to get better and richer meals, and non-essential goods were largely distributed. At nights, between 7 and 11 June, assault battalions were sent to their positions. It was only on 4 June that news spread about the enemy command's decision to begin the offensive around mid-June. Later, it was possible to specify that the enemy would attack on 15 June, in the morning. On 14 June it was certain that the enemy would start preparatory artillery fire at 3 of the following day. […] The enemy had tried to hide its intentions by starting preparations quite in advance to have them completed, more than one month before the action, by keeping its plans secret and by changing them. Yet, it was possible to have timely knowledge of its assets and predict the day and time of the offensive. […] At 3 on 15 June enemy preparation fire began. At 3.05 counter-preparation fire began[63].

[61] Supreme Headquarters - Operation Office, letter no.11030, 28 May 1918, *Situazione militare sulla fronte italiana* (Military situation on the Italian front), AUSSME, Series E-2. Important information had come from the questioning of a pilot shot down during a reconnaissance flight to film the fortification around Treviso and some sectors of the Piave River near Ponte della Priula (Supreme Headquarters - Operations Office, Memorandum of 18 May 1918, AUSSME, Series E-2).
[62] Telegram no.15907, 9 June 1918 of the Supreme Headquarters - Operations Office, AUSSME, Series E-2.
[63] 4th Army Headquarters - Operational Unit Intelligence Office, Memorandum no. 4363, 26 July 1918, *Relazione riassuntiva sull'offensiva svolta dal nemico sulla fronte dell'Armata, 14 giugno - 5 luglio 1918,* (Summary report of the offensive

The Intelligence Office, on the base of telephone eavesdropping and statements of last-minute deserters, specified the exact time for the attack, thus allowing Italian artillery, in some sectors of the front, to forestall enemy preparation and block enemy infantries at their starting bases.
Following the seizure of a considerable number of documents during the Battle of the Solstice, the Intelligence Office of the 3rd Army translated and comprised them into a collection called *Servizio informazioni presso l'esercito A.U* (Intelligence Service within the Austro-Hungarian Army)[64].

The Preparation of the Final Battle

After the Battle of the Solstice, the Intelligence Office grasped the deep political and economic crisis affecting the Austro-Hungarian Empire and in late summer of 1918 suggested a general offensive on the Italian front that might become decisive.
It also predicted the collapse of Bulgaria following the offensive carried out by the Allies on the Macedonian front on 15 September. During the first half of October, movement of enemy units towards the Balkan front were detected. From 17 October, the progressive internal collapse of Austria become evident because of increasing number of deserters in the Army, even not coming from the front line.
Immediately before the decisive Italian attack, it was disclosed that:

> the pressure of political events in Austria has shown an impact also on the Army. Higher commands consistently report that among units, and especially in the rear lines, a negative feeling is broadening that could have serious consequences on the combativeness and the fighting efficiency of the Army. Especially among troops far from the front lines a belief has spread that the war is now over, and that going back home is a matter of just a few weeks. An alarming lack of discipline prevails everywhere and is apparently gaining more and more ground […]. It is possible to say with absolute certainty that, as regards troops in the rear lines, the soldiers' morale is seriously affected. In our opinion, with difficulty and not anytime soon can these soldiers be brought to combat. Cases of indiscipline among soldiers of oppressed nationalities are countless[65].

When the Battle of Vittorio Veneto was imminent, thanks to the radio communications interceptions which will be discussed in more detail in the next chapters, the Intelligence Office of the 4th Army warned its own Headquarters that the Austro-Hungarians were waiting for an Italian attack at any time.

Air and Special Forces on the Enemy Rear Lines

Since 1915, the Intelligence Offices of the Armies had also been dealing with the planning of reconnaissance aircraft mission and observations from balloons. Along the war, the aircraft surveillance flights to pinpoint the enemy's defensive posts and watch over its rear lines and vital centres, became more paying than ground observation and photographs.

launched by the enemy along the front of the Army, 14 June - 5 July 1918), AUSSME, Series F-2.

[64] For security reasons the documents were printed and disseminated only in 1920 as folder no.8 of the collection *La battaglia del Piave dal 15 al 24 giugno 1918.*

[65] 3rd Army Headquarters – Intelligence Office, Memorandum, 30 October 1918, *Movimenti di truppe e notizie dal Trentino e dal Tirolo - notizie avute dall'ufficio informazioni della 1ª Armata* (Movements of Troops and News from Trentino and Tyrol - news from the Intelligence Office of the 1st Army), AUSSME, Series, E-1.

5.11 Volunteers from Veneto who carried out guerrilla operations behind the Austro-Hungarian lines in the autumn of 1918

In view of the enemy offensive of the Solstice, an air force squadron was made completely available to the Intelligence Office with the main task "of carrying out complete and accurate photographic reconnaissance of enemy deployment on the left of the Piave River, from Montello to the sea, in particular to locate the positions of bombards and artilleries"[66].

As of May 1918, cooperation between the Air Force and the Intelligence Service developed to support special missions of informers and saboteurs by means of airdrops, air supplying and landings in enemy territory.

Starting from the summer of 1918, aircraft first and seaplanes later transported, and in some cases parachuted, informer officers to occupied territories of Friuli and Veneto for performing espionage activities with the help of the local population. Information thus gathered would be transmitted beyond the lines by means of carrier pigeons or signalling cloths spread over fields and photographed by reconnaissance aircrafts[67]. For coordinating and directing the air force participation to those missions, the 1st Special Air Force Group was created in September 1918[68].

Infiltration operations were also carried out by boats on Lake Garda and on the Adriatic Sea in cooperation with the Royal Navy.

Intelligence missions were followed, towards the end of the war, by sabotage and guerrilla in the enemy rear lines, organized by the Intelligence Offices of the Armies[69]. In these operations,

[66] Supreme Headquarters - Air Force High Command, Circular letter no. 675, 24 May 1918, AUSSME, Series M-7.

[67] 3rd Army Headquarters - Intelligence Office, Memorandum, 18 July 1918, AUSSME, Series F-3.

[68] Supreme Headquarters - Air Force High Command, Circular letter no.1309, 28 August 1918, AUSSME, Series M-7.

[69] The first sabotage operation behind enemy lines had been carried out by the Intelligence Office of the 1st Army by using members of the 23rd Assault Unit since May 1917 (Vincenzo Zazzaro, *La "Giovane Italia",* "Storia Militare" n. 25 October 1995).

Czechoslovakian servicemen wearing their old Austro-Hungarian uniforms were sometime employed[70]. The 3rd Army created a saboteur training school in Mogliano Veneto[71].

It is worth to notice the debate that took place within the Intelligence Branch about those non-conventional forms of warfare. On the one hand, the Chief of the Service was in favour of employing small units of special agents who, in close cooperation with regular forces, would create disorder behind the enemy lines[72]. On the other, Colonel Ercole Smaniotto and Colonel Amelio Dupont, Chiefs of the Intelligence Offices of the 3rd and 8th Army respectively, were willing to organize partisan squads, to conduct large-scale guerrilla operations under the command of agents who had been infiltrated specifically for this purpose. To form these squads, prisoners of war who received help in escaping from Austrian concentration camps in Veneto, as well as supporters belonging to the civilian population should be recruited[73].

The latter view was deeply influenced by the idea of people's war of Renaissance and Garibaldian inspiration and forcefully in contrast with the former approach, which perhaps more realistically limited the activity to that developed by trained special units[74].

For the necessary communications between the guerrilla teams operating beyond enemy lines and the Headquarters on other side of the Piave River, in addition to the carrier pigeons, the use of radio equipment was envisaged, thanks to their limited size and weight achieved by means of the most advanced technologies. Moreover, innovative ciphers had become available for a more secure radio transmission during the final phase of the war, because of the extraordinary evolution in both radio and cryptographic capabilities achieved in the Italian army from 1915 to 1918, as discussed in the following chapters.

[70] Cesare Pettorelli Lalatta, *ITO, op. cit.,* p. 277.

[71] Nino Sales, *Missioni speciali della Terza Armata,* Istituto edizioni accademiche, Udine, 1940; Alessandro Tandura, *Tre mesi di spionaggio oltre Piave. Agosto - ottobre 1918,* Longo & Zoppelli, Treviso, 1934; Camillo De Carlo, *La spia volante. Ricordi delle gesta d'oltrepiave,* Brentano's, New York, 1919.

[72] Intelligence Office, letter no.11089/A, 20 August 1918, AUSSME, Series L-3, env.166.

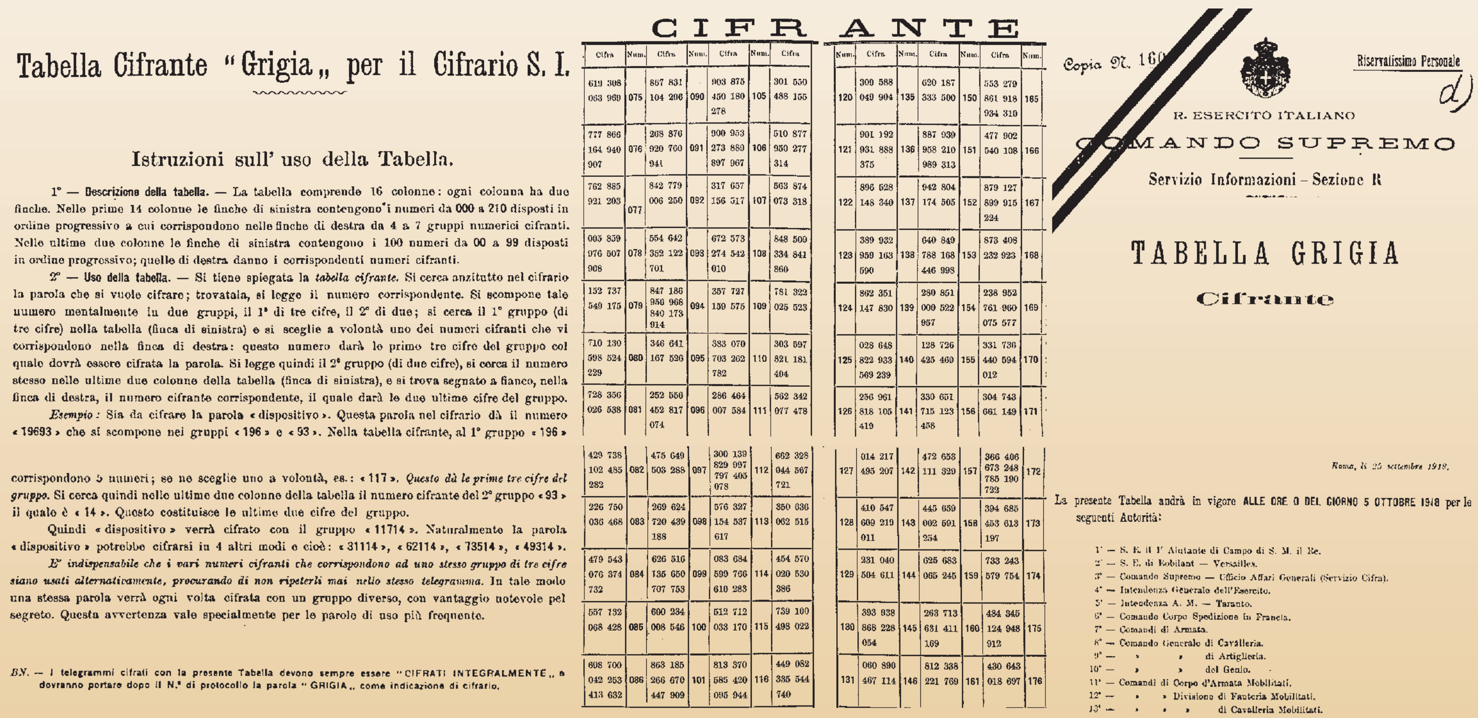
[73] 8th Army Headquarters - Intelligence Office, Memorandum no. 1607, 16 August 1918, *Circa una possibile organizzazione di moti insurrezionali nei territori invasi,* (On the potential organization of uprisings in invaded territories); Memorandum of 6 September 1918, *Disegno per l'organizzazione della guerriglia nei territori invasi,* (Plan for the organization of guerrilla in invaded territories); 3rd Army Headquarters - Intelligence Office, Report of 4 October 1918, *Piano per l'attuazione della guerriglia nei terreni invasi* (Plan for the application of guerrilla in invaded territories), AUSSME, Series L-3, env.116.

[74] Alessandro Gionfrida, *Comando Supremo italiano e strategie di guerriglia,* "Storia Militare" n.113 February 2003.

The Grey enciphering table for the SI code, 1918

SECOND PART

Communication Intelligence and Security



CHAPTER SIX

Telecommunications and Intelligence

6.1 MILITARY COMMUNICATION MEDIA

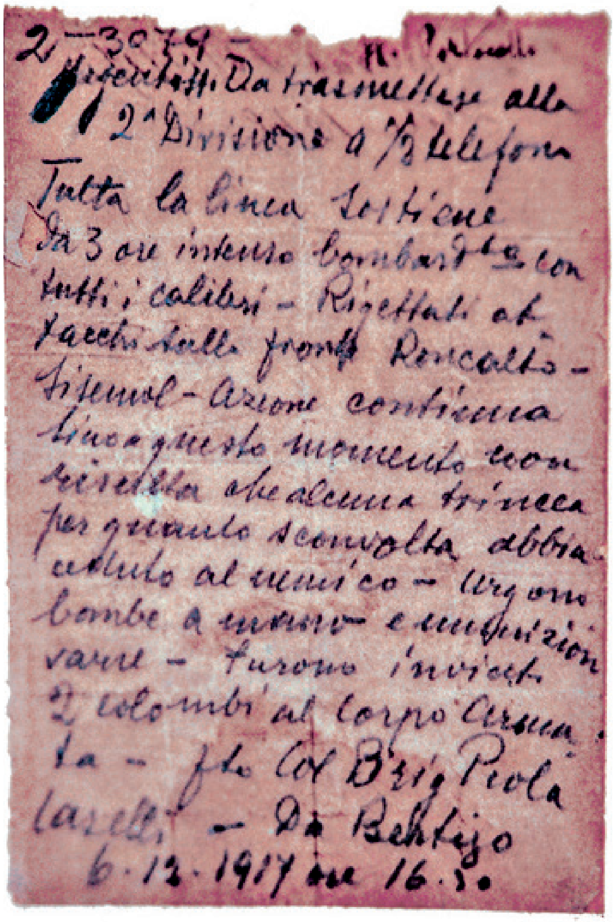
From the early phases of war, Italian army exploited various communication tools which allowed orders transmission along the chains of command, requests and information from first line to the Headquarters, actions coordination between infantry and artillery on the battlefields, etc. The application fields of those media rested on their different characteristics, briefly illustrated in what follows and including the maximum reachable distances, the transmission speeds, and the capacity of preserving the secrecy. However, their joint employment was also envisaged for increasing the survivability of connections among the combat units, even in the most difficult circumstances.

"Classic" Methods for Dispatch Transmission

The oldest way to transmit orders and communications on battlefields is the use of dispatch couriers who, also during the WWI, carried a large amount of written and, at times, oral messages. The messengers, when travelling by horse, bicycle, motorcycle, etc. certainly achieved a faster transfer of dispatches, but enemy fire and the risk of being captured remained an obstacle, especially along unprotected routes. Therefore, relay couriers were often employed as the ultimate resource in default of other faster and safer communication means.

Trained animals, sometimes dogs, but more often carrier pigeons, were also exploited to transport messages. The capacity of pigeons to carry dispatches, covering hundreds of kilometres at considerable speed - up to 60-80 km per hour - had been known for centuries. The moderate number of occurrences in which pigeons could not go back to their dovecote once they had been freed, encouraged the Armies to create specialised pigeon services.

During WWI, the Italian army started to use war pigeons in the spring of 1917. The initial number of five dovecotes assigned to


2-3079 - [illegible]
[illegible] Da trasmettere alla
2ª Divisione a ½ telefono
Tutta la linea [illegible]
da 3 ore intenso bombardamento con
tutti i calibri - Rigettati attacchi sulle fronti Roncatto -
[illegible] - Azione continua
fino a questo momento non
risulta che alcuna trincea
per quanto sconvolta abbia
ceduto al nemico - Urgono
bombe a mano e munizioni
varie - Furono inviati
2 colombi al Corpo Armata
- f.to Col Brig Piola
Caselli - Da [illegible]
6.12.1917 ore 16.50

6.1 One of the pigeongrams preserved at the ISCAG Museum

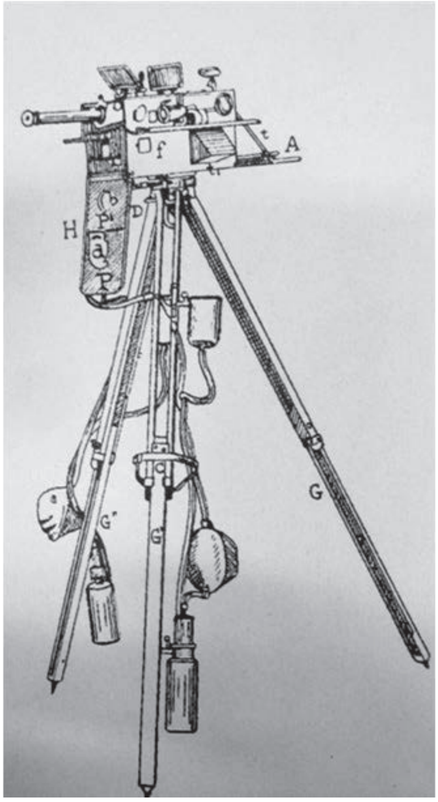
6.2 Pigeon basket being parachuted (ISCAG Museum)

the 2nd and 3rd Armies quickly increased, until they were positioned along all the frontline, to connect forward units with rear commands. The large number of pigeongrams held at the Engineer Corps Museum in Rome proves the extensive use of this kind of message transmission, for instance by frontline units engaged in harsh battles to ask for various forms of relief, artillery support, or ammunition supply (picture 6.1).
Reconstructing the feats of the pigeon service during the conflict would require an entire volume at least. We only mention the expeditions by Italian aircrafts performed in 1918 to create links with units 'resisting' behind the frontline, in territories occupied by the Austro-Hungarian army. For this purpose, pigeons were released toward the ground by small parachutes (picture 6.2).
Hunting horns, sirens, and similar tools, along with other acoustic instruments such as trumpets and drums, had been employed for military purposes since an unmemorable time, in addition to the human voice. Even when amplified by megaphones, the human voice can reach limited distances, which also partially happened to many acoustic instruments, particularly during battles when noise is strong and persistent. However, whistles, sirens and klaxons proved particularly useful for broadcasting orders such as an infantry attack or alarms concerning for instance a gas bombing inception.

Optical Communications

Forward units largely adopted the so-called 'signal telegraphy' relaying on flags, coloured discs, lanterns, and other devices, which allow very slow transmission and only fit for short dispatches. Such telegraphic means could only be used during the day and in good weather conditions, being also at risk of enemy detection and observation.
Coloured rockets fired for instance by Very pistols found large application, day and night, in all Armies turning out to be, together with the telephone, the most popular communication media adopted in WWI, especially during battles, despite deception attempted by enemies which often fired similar flares[1]. Smoke signals, visible in daytime from a few kilometres and Donath lamps, portable battery-fed spotlights, were also adopted for light air-to-ground signals.
Heliographs and dioptres as that shown in picture 6.3[2], offered several advantages including larger range and speed of transmission in comparison with signal telegraphy, as well as easy transportability of equipment, absence of conducting wires and difficulty of interruption by the enemy, so that this telegraphy systems found large application during the conflict.
However, along with the above-mentioned advantages, heliographs and dioptres also presented several drawbacks, since they required stable weather conditions and favourable environments

[1] Very pistols fired three-coloured flares (red, green and white) reaching a 100-m height approximately. By combining colours, one could also convey a considerable number of messages, while in battle it was more convenient to simplify the use of such ciphers as much as possible.
[2] Heliographs use sunlight intercepted by a mirror to transmit flashes of light obtained by covering the mirror with a shutter or by rotating it, according to a code, often the Morse code. Dioptres performed the same function thanks to artificial sources such as a lamp.



6.3 A 100 mm Faini equipment

to begin and maintain a connection and moreover, they generateted high error occourrence at reception with a not perfectly transparent atmosphere or when distance exceeded a few kilometres. In fact, it was often necessary to verify the transmission accuracy at the end of each word or of each group of word, further reducing the transmission speed in comparison with that achievable by electrical telegraphy transmission. Furthermore, they did not guarantee secrecy as generally emit a quite wide beam of light.

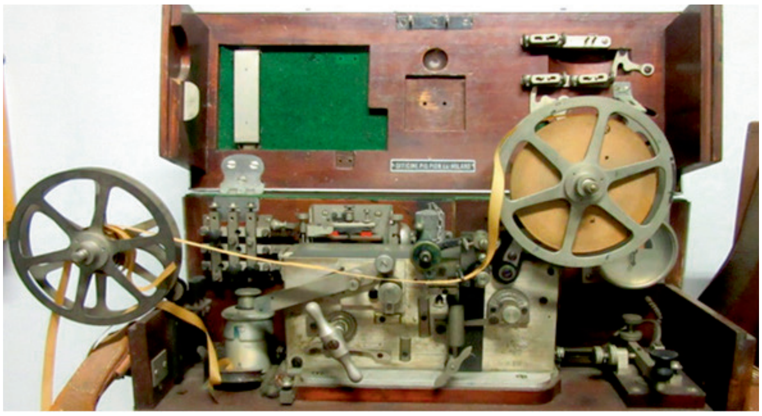
All the media mentioned above had some advantages but also serious drawbacks which triggered the success of wire telephony and telegraphy, on the Austro-Italian as well as on other fronts. On the contrary, the diffusion of wireless telegraphy occurred slowly because of technical and operating difficulties partially overcome along the conflict thanks to a relevant technological advance.

Electric Telegraphy and Telephony

Telecommunications on physical conductors - namely electrical telegraphy and telephony - had been extensively applied by all Armies even before the World War I, as they were considered as the fastest connection tool also across long distances, especially on communication channels exclusively available to the Armed Forces. The Italian army introduced electrical telegraphy during the second Independence War[3] and when WWI began, it was equipped with approximately 250 robust and portable Morse field devices (picture 6.4).

The more recent field telephones relied on simple technology and had demonstrated satisfactory performances also on battlefields (picture 6.5)[4]. Yet, at the beginning of the war, in the Italian Army there were less than 250 field telephones in operation, provided only to high commands.

Both those techniques obviously required connection lines[5] and shared the same shortcomings, namely vulnerability under enemy artillery fire as well as potential exposure to disturbances and interferences due, for instance, to induction generated by energy conductors



6.4 A field telegraph equipment (Museum of Communication, Rome)

[3] C. Colavito, *Telegrafi e Telegrafisti del Risorgimento, op. cit.*

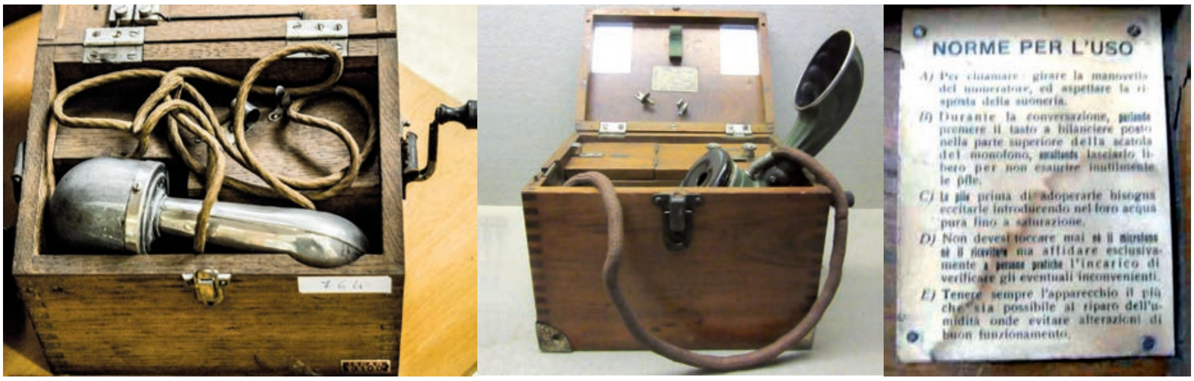
[4] Captain Anzalone, Engineer Corps, had patented an appliance particularly fit for field use (see picture 6.5).

[5] The overall length of lines in the Italian Army network did not exceed, in May 1915, about 1.500 kilometres.

or other telecommunications circuits, without forgetting the potential exposure to enemy eavesdropping.

Telegraph communications, unlike telephone communications, needed specialized personnel and relatively longer time for transmitting messages, especially encrypted ones, but telegrams recorded on paper tape were a written documentation, more difficult to contest than phonograms. Due to the time needed for transmission and the potential complications just described, electrical telegraphy had a larger diffusion across long distances and between high commands down to division-level than on the front first line.

Telephone communications also had some downsides, as the voice transmission impairment due to the battle noise and the talking difficulty when wearing anti-gas masks. However, despite those disadvantages, the field telephones became the favourite mean of communication among



6.5 "Anzalone" telephone (Museum of Communication, Rome)

combatants of World War I, since they allowed practical, fast, and immediate communication, so that at the end of the conflict approximately 25,000 devices were operating in the Italian army, as shown in picture 6.6. A considerable increase also in the number of telegraphic systems, despite not being comparable to that of telephones, can be remarked in this picture.

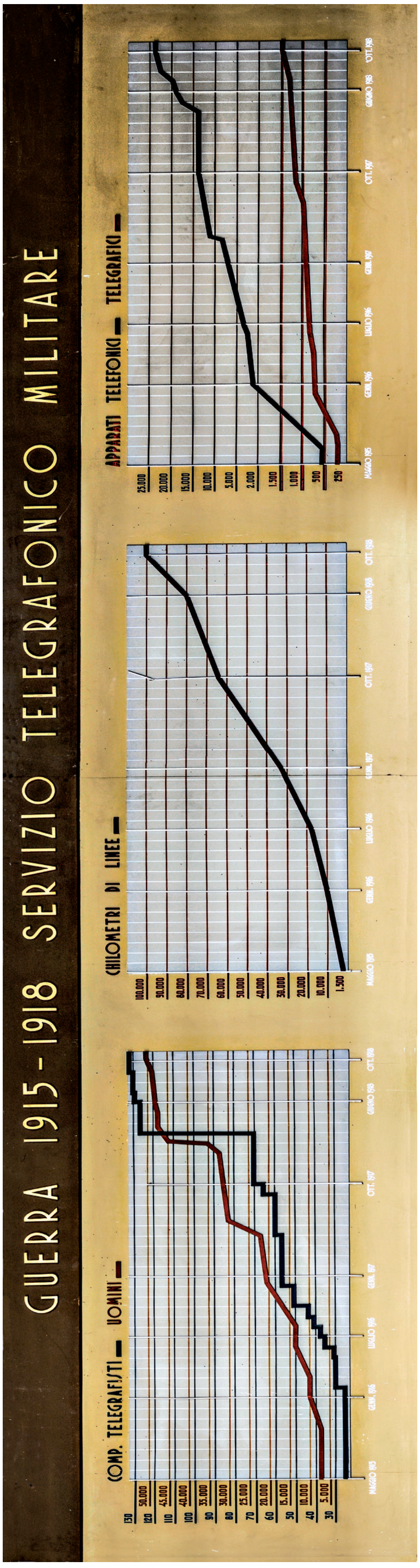
The demand for telephone equipment was much higher than the figure mentioned above, but not entirely met due to the problems encountered in their procurement, because of the limited industrial output in all the Countries of the Entente.

Since 1917, TPS (Télégraphie Par le Sol), a special type of telegraphy, has been successfully employed by subordinate units of Italian army, for short distance communications.

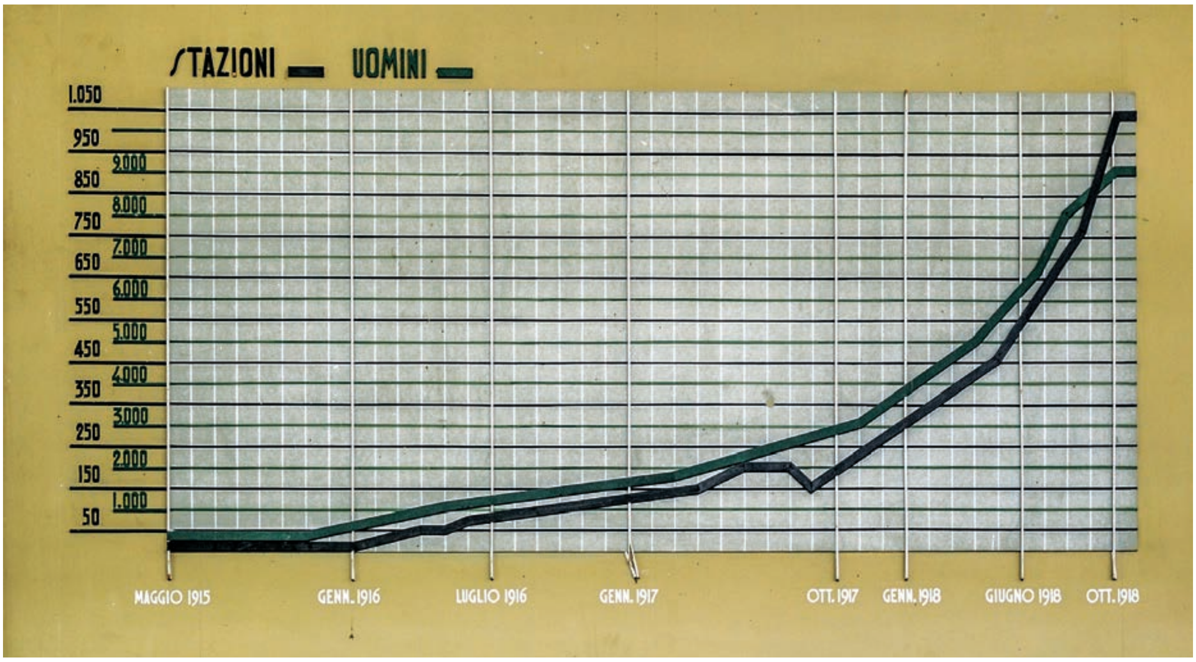
Radio Communication

In the early stages of war, radio communications systems were provisioned only to highest Headquarters, which used them for 'Command and Control' at the strategic level. During the war in the Italian, as in all belligerent armies, radio systems were adopted for an increasing number of applications ranging from communications between flying aircraft and ground stations to dissemination of weather forecasts, from anti-aircraft alert networks to trench radiotelegraphic systems, and turned out to be indispensable whenever the static trench warfare turned into a war of movement.

Especially during the last year of the conflict, many forward Italian units required and achieved transportable radio devices, to cope with the vulnerability under artillery fire as well as with the scarce reliability of physical lines in extreme weather conditions. Therefore, despite the limits and drawbacks in radio communications - first and foremost their potential risk of interception by the



6.6 Development of Italian field telephone and telegraph services from May 1915 to October 1918 (ISCAG Archive)



6.7 Increase of Italian field radio communications during WWI (ISCAG Archive)

enemy - a relevant increase in the number of telegraph field radio stations within the Italian army occurred in the period from May 1915 to October 1918, as shown in picture 6.7.

Several other radio applications in addition to field ones deserve to be mentioned, as long-distance communications, performed by more and more powerful stations with aerials hundreds of metres high[6]. When the war began, after the British navy destroyed German submarine telegraph cables, radio waves emitted by powerful stations, such as that located in Nauen near Berlin, avoided a total isolation of Germany by connecting it with the eastern coast of the United States, with the German colonies in Africa and with many German agents across the world.

6.8 Coltano radiotelegraph station (Pisa), established in 1911 by Guglielmo Marconi for long-distance communications (ISCAG Archive)

The station in Coltano near Pisa (picture 6.8), connecting Italy with its colonies since 1911[7], transmitted throughout the war

[6] According to the British Admiralty, in June 1914 there were 37 radio stations in the entire world for international communications, including 4 Italian ones, in addition to many stations for local and maritime communications. (D.R. Headrick, *op. cit*., p.132).

[7] The station of Coltano (Pisa) had a 250kW transmitter designed and implemented by Guglielmo Marconi. Since November 1911, the station had allowed Italy to communicate with the colonial stations of Mogadishu and Massawa. When the war

period, a daily war bulletin in Italian, English, and French, received by several countries: from Russia to Egypt, from Spain to the Netherlands.
In 1917, the Italian navy built the San Paolo Station in Rome, which allowed stable communications with the United States of America, where newspapers could inform the Italian immigrants about the more recent war events[8].
The spread of telecommunications, in particular telephony and radio communications, urged belligerent Armies to refine techniques capable to gather as much information as possible from enemy transmissions and, on the other hand, to defend one's own communications from any intrusion by the opponents.

6.2 THE ATTACK ON TELECOMMUNICATIONS

The Start of Telecommunication Interceptions

The spreading of electric telegraphy, during the second half of the 19th century, had led to flourish 'commercial codes' designed to guarantee a minimum standard of security and, above all, to cope with the high tariffs for dispatch transmission, particularly at international level. Such codebooks, sold without any restrictions, replaced words or even entire sentences with groups of letters and/or figures of a limited length, achieving considerable cost savings[9].
However, the increasing utilization of telegraphy also in diplomatic relations soon created stronger demands in terms of secrecy in comparison with trade and commerce, since host Countries frequently intercepted diplomatic correspondence of ambassadors and military attachés with their respective governments, in secret agreement with public or private boards managing the telegraphic service.
The interest in knowing - in peacetime and especially when war was drawing near - the contents of diplomatic correspondence led to the creation, in some European countries, of new 'black chambers', like those in vogue during the previous centuries to examine mail[10]. The need for greater security led to creating very bulky codes, usually difficult to rebuild by interceptors.
Since the early years of application of electric telegraphy in the military domain, attempts to intercepting enemy dispatches by tapping telegraph lines were frequently undertaken. Yet, difficult access to transmission infrastructure and connected risks impacted on the feasibility of that kind of operations. In order to protect the secrecy of military dispatches transmitted over public, dedicated or field networks, various kinds on codes and ciphers were adopted, including in some circumstances, versions of the commercial codebooks mentioned above.
The situation changed radically with the introduction of radiotelegraphy or TSF (*Télégraphie sans Fil*) generating large volumes of correspondence that could be easily intercepted due to the inherent features of the new transmission medium. The impact of radio communications on the war Intelligence has occurred well before WWI. For instance, in May 1905, during the Russian - Japanese War, the Russian Admiral commanding the fleet coming from the Baltic Sea and heading towards Vladivostok, ordered to maintain radio silence with the purpose of remaining hidden to the Japanese. For this purpose, once discovered by an enemy patrol boat, he decided to avoid

with Turkey broke out in 1911, the management of the station was transferred from the Ministry of Post and Telegraph to the Ministry of the Navy.

[8] The San Paolo Station was equipped with a Poulsen 100 kW arc transmitter working at a wavelength of approximately 10.000 m.

[9] C. Colavito, *Telegrafi e Telegrafisti del Risorgimento,* Aracne, Roma 2014, p.352 e s.

[10] D. P. Nickles, *Under the wire, How the Telegraph changed Diplomacy*, Harvard University Press, Cambridge, 2003.

using the interference produced by its powerful transmitter to prevent the alert diffusion from the enemy boat to the bulk of Japanese forces which attacked and defeated the Russian fleet in front of the Tsushima Island[11].

Since the early months of the World War I, radio interception had shown its effect, both on the eastern and the western front. The Russian army's unencrypted radio communications had provided the Germans with the opportunity to know the enemy's plans and movements, which helped them win the Tannenberg Battle in August 1914.

On the western front, the German armies that invaded Belgium and France were compelled to use the radio, as telegraph and telephone lines were inoperable because had been destroyed during the battles or by the French army before the retreat[12]. However, the German encoding system resulted to be too complex, making the work of cipher offices difficult and lengthy so that, due to the frequent mistakes, many telegrams needed to be transmitted repeatedly. At the end, delays and inefficiency in communication sometimes forced to transmit messages even as plaintext, which made French interceptors incredibly happy[13].

What had happened in the early stages of war proves the importance of radio communications but also their intrinsic exposure to interception, leading all armies to protect radio dispatches by more effective codes and ciphers, frequently changing systems, and keys, as well as to develop organizations and techniques for intercepting and interpreting enemy dispatches.

Moreover, the activity of telephone eavesdropping developed by all the belligerents, after the beginning of the war, without any physical tapping of the enemy lines, induced to adopt specific measures for protecting the secrecy also of those communication means.

Communication Intelligence: What is it About?

Intelligence gathering through enemy telecommunication became extensive and elaborate during the conflict, to such an extent as to allow the allocation in the years of the war of the origin and first development of what is named, in modern terms, Communication Intelligence or COMINT[14].

Actually, terms analogous to Communication Intelligence were introduced in common usage in the last months of WWI, for instance by the American Expedition Force deployed to France which identified its cryptologic branch as "Radio Intelligence Section"[15].

At present, specialist publications and relevant Committees define Communication Intelligence in various ways. In very general terms, COMINT means the collection of information by subjects other than the recipients to whom the communication is originally addressed, thanks to interception and analysis of signals emitted by persons in different ways (voice, text, etc.). Telephone and telegraph communications belong to this category[16].

[11] Mario de Arcangelis, *Electronic Warfare, From the Battle of Tsushima to the Falklands and Lebanon conflicts*, Blandford Press, 1985, pp. 11-18. The name of the Russian Admiral was Zinovij Petrovič Rožestvenskij.

[12] The number of German transceivers at the beginning of the war amounted to 30 average-power transceivers and 33 low-power trans receivers.

[13] The German cipher called ÜBCHI by French analysts, used column-based double transposition, as explained in the following pages.

[14] This added to the traditional source of information that is nowadays termed HUMINT (Human Intelligence) and which relies on espionage, questioning of prisoners and deserters, etc.

[15] D. Kahn, *op. cit*., p.333. The term Radio Intelligence refers to that part of Communication Intelligence obtained with radio instruments.

[16] In current use, the term Signal Intelligence or SIGINT is sometimes preferred to COMINT. According to current definitions. SIGINT includes, in addition to COMINT, also ELINT (Electronic Intelligence), that is the collection of information through interception and analysis of signals emitted by devices such as Radar, which developed after World War I. In this context, it seems more appropriate to use the term 'Communication Intelligence'.

COMINT relies on several means corresponding to specific phases in the process of information collection from enemy transmissions. The most important ones are:
- interception, namely find out, copying and recording enemy dispatches;
- traffic analysis, namely studying intercepted traffic to get information, even without interpreting the meaning of messages;
- interpretation of intercepted dispatches, which includes the cryptology analysis.

A full efficacy of Communication Intelligence can be achieved by mean of a close synergy between the three sectors just mentioned: interception, traffic analysis, and cryptologic operations.

A further form of attack on enemy communications, which is somehow alternative to interception, consists of interference to the point of complete communication interdiction, a technique that is now called *jamming*. Radio interference was systematically used also on the Italian-Austrian front, for instance to prevent enemy reconnaissance aircrafts from transmitting to ground stations information that could be useful in aiming enemy artillery against one's lines or in disclosing the positions and movements of troops.

During the war, French military experts submitted to the Allied Radiotelegraphic Committee a radio interference plan to be implemented against the international radio connections of the Central Powers. The plan was rejected due to opposition by the British, who thought that interception would be more fruitful than interdiction of enemy communications[17].

Telecommunications, both radio and telephone, were frequently employed for various forms of *deception*. The Austrian Army attempted radio deception during some phases of the war by increasing the intensity of radio traffic in areas other than the ones where attacks were being prepared. Moreover, on several occasions the Italian and the Austrian tried to deceive one another by false phonograms or mere telephone conversations that seemed real and could be easily interpreted by the enemy. For avoiding the dangers of deception, the data gathered through interception, decryption and/or interpretation, must be validated by comparison with other information.

To defend their telecommunications from attacks, all armies adopted defensive measures that can now be globally considered as pertaining to Communication Security or COMSEC which includes the physical defence of equipment and material integrity, as well as the protection of transmission channels and carried messages.

The following paragraph briefly describes the offensive and defensive methods used during the WWI in the domain of telephone and radiotelegraph communications.

Telephone Eavesdropping

The mass telephone interception carried out during the WWI along the land front lines, resulted as an important source of information for Intelligence. As soon as the war broke out, all armies realised that they could listen to enemy conversations through their own ordinary telephones. They immediately profited from this opportunity creating more adequate high-sensitivity devices and organizing specialized services to carry out systematic eavesdropping operations.

Most interception did not happen by tapping or direct insertion into enemy connections but mainly by telephone lines installed in favourable positions with respect to the enemy lines, exploiting the combined effect of ground conductivity and electromagnetic induction.

Since field telephones were largely used, Intelligence could rely on information more relevant in terms of quantity, but of different nature than that collected through Radio Intelligence. In fact, the

[17] F. Cartier, *Souvenirs, op.cit.*, No. 85, p.35.

range of telephone interception systems amounted to very few kilometres, so that the intercepted communications directly came from front line units and usually had a short-term operational relevance. Yet, this kind of activity could in many cases provide interesting results also from a strategic point of view. Ronge himself acknowledges that "listening (to telephone conversations) was actually more important for local news. However, it provided valuable data also for higher-level directives and could be useful to monitor deserters' statements." The last part of the sentence regards the false deserters sent by the Italians to provide the enemy with fake news[18].

Radio Interception and Traffic Analysis

The immaturity of radio techniques available at the beginning of the war led to many drawbacks, including high sensitivity to atmospheric disturbances, to interference generated by the enemy or friendly transmissions and, above all, exposure to *interception*.

To exploit this last weakness, opposed armies produced large and continuous efforts to improve their own organizations committed to listening activities, in terms of quantity and quality of resources. They developed, for instance, more and more advanced systems to intercept, select, and classify enemy radio stations according to their main characteristics[19].

However, one should not underestimate the difficulty inherent in interception operations due to the simultaneous presence of many transmitters belonging to friendly, enemy, or neutral parties and using the same radio wavelengths. Difficulty was also generated by the previously mentioned disturbances that sometime made reception uncertain, not only for stations to which dispatches were directed but also for intercepting stations.

Finally, to intrude effectively on enemy communication flows, intercepting stations must be positioned on the front line - although in locations not as forward as telephone listening stations - and advanced as the transmitted power of enemy stations decreased. Therefore, their physical integrity must be secured reducing, as far as possible, the vulnerability of intercepting posts and of their connections with data primary processing centres: usually telephone or telegraph lines prone to be interrupted by enemy artillery fire, adverse weather conditions, etc.

The expression *traffic analysis* dates to many years after WWI though the activities belonging to that category were already being extensively carried out during the war. The analysis of traffic generated by enemy stations entailed studying intercepted signals to mainly identify:

– their power and wavelength;
– frequency and periodicity of communications;
– nature and length of dispatches;
– time of transmission;
– positions of transmitters by means of radio location devices.

To understand the usefulness of traffic analysis, it is enough to think that simply counting radiograms daily emitted by the enemy is a significant indication of its activity, which usually increases before the beginning of large operations. In addition, the frequency and addressees of dispatches help outline the structure of communications networks and therefore the hierarchy of enemy organization.

[18] M. Ronge, *Spionaggio, op. cit.,* p.228.
[19] At the beginning of every dispatch, the transmitting station generally specifies its own names and the name of the receiving station(s), consisting of a limited number of letters and figures.

6.9 *Direction finding equipment used by the Italian army in 1907 (ISCAG Museum)*

Data that seems scarcely significant - such as the 'touch' of the operator using the telegraph - can help identify a land or maritime unit and follow its movements.
An important component of the traffic analysis is *the Radiogoniometry*, also called *Radio Direction Finding* (RDF)[20] is especially useful to identify the deployment of enemy forces, also because transmitters are usually located in the proximity of their Headquarters[21].
The RFD equipment was a creation of Italian scientists and technicians, who invented it during the first decade of the 20th century. While studying directional antennas as far back as 1903, Professor Alessandro Artom of the Engineering School of Turin developed an experimental device called *direction meter* that was tested by the Italian army. The Engineering Corps Museum in Rome holds a 1907 radio goniometer, which is shown in picture 6.9, along with a rudimentary direction indicator, shown at the bottom of the picture. As stated by Luigi Sacco, Artom's equipment were the first ones employed - right after the beginning of the war - to locate Austrian stations on the Isonzo line. Even if more advanced than the relic exhibited at the Engineering Corps Museum, they were soon replaced by Marconi-Bellini-Tosi's devices, named after the patents registered in 1908 and 1910 by Ettore Bellini, an engineer, and Alessandro Tosi, a Navy Lieutenant. In 1912, the Marconi Company purchased the patent and adopted for its equipment the trade name Marconi - Bellini - Tosi, which became well-known as many Armies and Navies were using them during and after the war.
As already mentioned, the effectiveness of Communication Intelligence mostly depends on synergy among its components, as shown for instance by David Khan who remarked that, during the WWI "as the number of codes multiplied, their successful solution depended increasingly on accurate traffic analysis which allows to distinguish the messages of one army from those of another"[22].
The third component of COMINT - the *cryptologic analysis* - will be dealt with after discussing some security implementation methods and tools.

[20] Direction finding devices identify the direction the electromagnetic wave comes from; connecting two or three of them allowed the position of a transmitting station to be pinpointed.
[21] For instance, the distance from the front lines could indicate the Command level, therefore a station positioned in the rear lines probably coincided with a High Command.
[22] D. Khan*, op. cit.* p.315. Of course, cryptologic analysis also provides useful information to improve the results of traffic analysis, such as, for instance, the identification of channels and circuits to be intercepted because relevant for Intelligence.

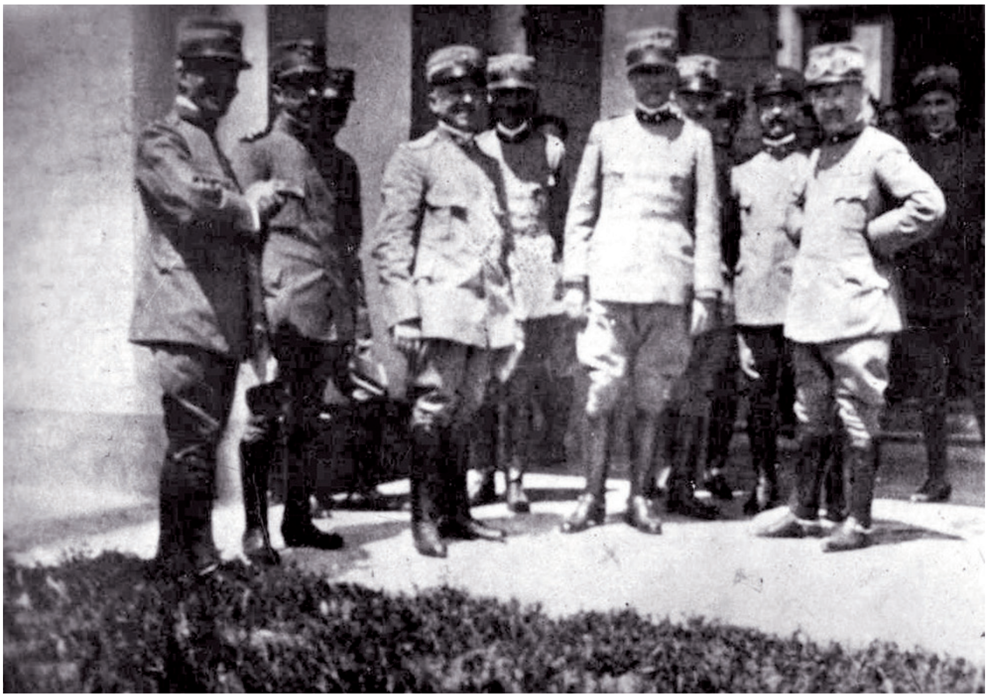
6.3 TELECOMMUNICATIONS SECURITY

Security Objectives

It is obvious that the best defence against enemy Communication Intelligence is achieved by limiting as much as possible the use of telecommunications media, for instance by avoiding the use of the telephone indiscriminately and adopting radio silence every time that alternative communication channels are available. Therefore, the success of communication intelligence operations depends significantly on the enemy's communication strategies regarding the size and type of traffic, transmission norms, etc. The Italian and the Austro-Hungarian armies adopted, during a large part of the war, significantly different criteria in their radio communication management.
Since it was impossible to completely exclude telecommunications, which resulted to be indispensable in many circumstances, all armies tried to adopt procedures presently encompassed under the Communication Security discipline, trying to ensure a) the communication systems physical integrity; b) the protection of transmission channels and c) the protection of contents.
Physical security measures, systematically implemented during WWI, include surveillance of telegraph and telephone lines and of radio stations as well as adoption of methods suitable to prevent the capture of equipment, instruction manuals, ciphers, and other classified documents regarding telecommunications.
Transmission security consists in defending transmission channels from interception and interference, while *protection of contents* requires the application of cryptologic or of steganographic techniques.
In telephony, afrer the first fortuitous listenings of enemy communications, it became evident that the same thing could have happened also on the opposite side. Therefore, all armies tried to increase the telephone transmission security modifying the telephone lines structure to prevent eavesdropping, with not always successful results.
Different methods and tools to increase the transmission security of radiotelegraphic transmissions were also tried during the war. Yet, in practical terms and with the available technologies, the means utilezed for this purpose often proved to be not easily operable and/or scarcely effective.

Attempts to improve radio transmission security

Radio vulnerability to interceptions mainly originated from the difficulty to implement field directional antennas which could avaoid the transmitted waves to be broadcasted in every direction, including enemy posts. The increased safety of communications through greater directionality of antennas was a goal pursued with all the available technical tools, but impaired by the difficulty of increasing the size of field antennas beyond certain limits and by the low radio frequencies generally employed at that time.
During the early months of 1916, while serving on the front line as a lieutenant of the Engineering Corps, Guglielmo Marconi identified as a means for achieving high directionality with relatively small-sized antennas, the transition from the long and medium waves used until than for field communications, to metric waves (VHF or Very High Frequencies). Marconi carried out the first experiments in the hallway of the hotel in Genoa where he had been staying to recover from an illness. He later repeated the measurement on a larger scale in Leghorn and then in England, but radio technology was not developed enough for radical innovations of that kind. In fact, the higher frequencies tested by Marconi where systematically employed several years after the end of war. picture 6.10.
In addition to the difficult increase of antennas directionality, it was hard to reduce the transmitted powers, also because the field stations connecting Army's high commands were often deployed at



6.10 Guglielmo Marconi visiting Treviso radio station in 1916 (ISCAG Archive)

hundreds of kilometres of distance, so that the necessary high-power radiations would reach also the enemy's rear. The regulation of transmitted power at levels suitable for different applications, became gradually widespread during the war, but, at the same time, receiver sensitivity became stronger thanks to the introduction of vacuum tubes that made it possible to detect weaker and weaker signals, requiring larger efforts to elude interception.

A frequent change of the transmission wavelength could limit the enemy eavesdropping opportunities. Some Italian radio stations had used this method in the period before the war, by changing the wavelength with no fixed rule[23]. In the same period, fixed stations of the Austro-Hungarian navy implemented the wavelength changing method shown in picture 6.11, with transmission wavelengths between 300 and 3,000 metres[24]. The changes had to be frequent to prevent interceptors from identifying the programmed sequences.

However, as discussed further on, technologies then available allowed only few radio channels to be allocated on the limited frequency band available for field communications. Moreover, frequency changes were not easy to perform, especially on the land front, where many friendly and enemy transmissions crowded the same radio channel[25].

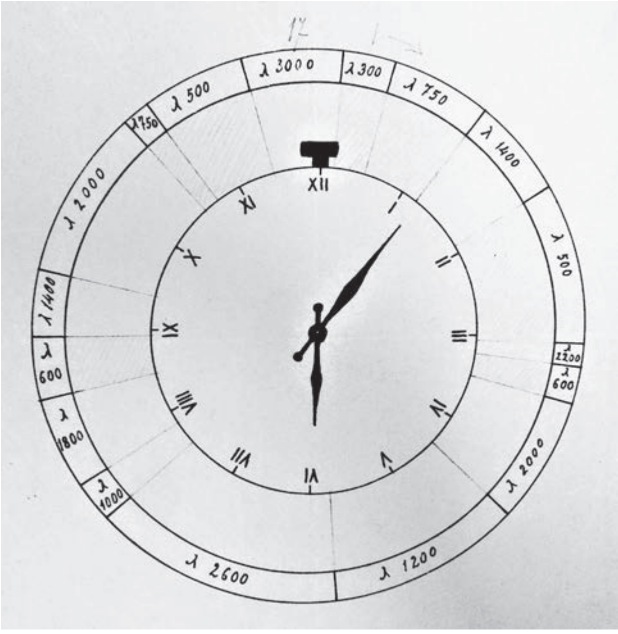
Conversely, reducing the duration of communications proved to be quite effective, especially when the enemy was not prepared to intercept because, for instance, it could not predict the frequency that would be used. In order to neutralize this kind of contermeasure, the eavesdropping organizations

[23] Specialist Battalion of the Engineer Corps, Radio Office, *Intralcio dell'intercettazione dei radiotelegrammi*, (Disturbance of radio telegram interception) 6 April 1913. There had been tests with frequency changes one or several times during the message transmission, a technique currently called *frequency hopping*,

[24] Office of the Chief of Navy Staff, Intelligence Office, Memorandum no. 27*: AUSTRIA, Sistema di segnalazioni Radiotelegrafiche* (AUSTRIA, radio telegraphic signals warning system), 1 March 1913, AUSSME, Series F4 Services office, env.7.

[25] On the other hand, the transmitters could be tuned to very few channels or only to one channel.

started to deploy several listening stations, each tuned to one of the frequencies most often employed by enemy stations.
An efficient method for improving transmission security became, during the war, the accurate monitoring of friendly communications aiming to avoid use of radio and telephone communications for purposes other than regular service and to grant rule compliance on communications protection.
Having explored the limited effectiveness of the methods applicable for transmission security improvement, let us now analyse the characteristics of the last component of Communication Security, namely protection of the transmitted dispatches by means of codes and ciphers (*cryptography*) or secret languages and writing systems (*steganography*).



6.11 Clock used by the Austro-Hungarian navy for the periodical change of radio frequencies (ISCAG Archive)

6.4 BASICS CRYPTOLOGY[26]

Cryptography is the set of encryption methods for hiding the contents of a message. It is part of *cryptology* which also includes the *cryptographic analysis* or *cryptanalysis*, aiming to disclose the meaning of a message without knowing the encryption methods used[27].

CRYPTOGRAPHY

Cryptography aims to make a *plaintext* unintelligible to unauthorised people, transforming the clear text into a *cryptogram* or *encoded text* through an *encoding or ciphering procedure*, which requires both a complex set of rules and tools (code books, tables, apparatus, etc.) representing the *cipher*, and the *key*, namely an agreed word, a set of figures or an acronym.
A cryptogram is transmitted to one or more addressees who *decode or decipher* it, transforming the encoded into the original plaintext, by the same cipher and the same key used for its encoding.
A message is *decrypted* when someone who is not the addressee and who is not supposed to know the cipher and the key, manages to interpret it correctly.
A traditional classification of cryptographic systems distinguishes between *ciphers* also named *literal systems* and *codes*.
In ciphers, the elements in the plain text - letters, numbers, punctuations marks, groups of letters - are altered by *substitution* or *transposition* methods.

[26] For readers already familiar with the basics of cryptography it may be recommendable to skip this paragraph and go directly to paragraph 6.5.
[27] The term “cryptography” is often applied to both aspects.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
B	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A
C	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B
D	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
E	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D
F	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
G	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F
H	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G
I	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H
J	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I
K	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J
L	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K
M	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L
N	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M
O	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N
P	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Q	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
R	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
S	S	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
T	T	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
U	U	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
V	V	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
W	W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
X	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Y	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Z	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y

6.12 Specimen of a Vigenère table

In substitution methods, the plaintext elements are replaced by another conventional sign. The most famous and ancient among them is the *Caesar cipher*, where alphabet letters are replaced by letters of the same alphabet shifted by a fixed interval (A is replaced by C and B by D, etc.). Those simple *mono-alphabetic ciphers* were mostly substituted, as far back as the 15th century, by *poly-alphabetic systems* where replacing alphabets are numerous and chosen, for each letter or group of letters of the original message, according to a numerical or alphabetic key. The first application of a poly-alphabetical code is Leon Battista Alberti's ciphering disc and perhaps the most famous one is the Vigenère square, including 26 alphabets written out in different rows, each alphabet shifted cyclically by one letter compared to the previous one (picture 6.12)[28].

With the *transposition method*, the plaintext elements are scrambled by different means. For instance, the letters of a plaintext dispatch are written line by line on a rectangle of an agreed size and then read by columns for transcribing them in the cryptogram. In case one wishes to apply a key made of an unordered digits sequence, the latter are written on the first line of the table, which includes a columns number equal to the digits of the key. Then, columns are not read in a sequence, but according to the numbers of the key. If the key is a word or a sentence, letters are converted into numbers in accordance with the alphabetic progression, as shown in picture 6.13. The transposition can also be multiple, namely repeated more than one time.

Mnemonic Key	V	E	N	I	C	E
Digital Key	6	2	5	4	1	3
Plaintext	F	U	E	L	A	R
	R	I	V	E	D	T
	O	D	A	Y	A	T
	E	I	G	H	T	M
	O	R	N	I	N	G

Cryptogram: ADATN UIDIR RTTMG LEYHI EVAGN FROEO

6.13 Example of transposition cipher with a short mnemonic key

[28] To encode by means of this table, a letter of the plaintext is read in the first line, and the corresponding letter of the key is read in the first column on the left. The letter of the coded text is where the line and the column intersect. To decode, the reverse proceeding is applied.

In *code systems*, code groups made of letter or numbers replace words, syllables, or entire sentences. For this purpose, vocabularies or *code books* are generated with varying dimensions, ranging from a few dozen to ten thousand terms or more, depending on the code application.
Codes can be *one-part codes* or *two-part codes* which are also called *inverted codes*. One-part codes have not only plaintext elements listed alphabetically, but also code groups in ascending order when made of numbers or in alphabetic order when made of letters. Therefore, a single codebook is enough for both coding and decoding. In two-part codes, code groups are chosen randomly, requiring two codebooks: one for coding and another for decoding where the code groups are shown in ascending or alphabetic order.
A *double ciphering* or *overencoding* can be implemented by further ciphering the code groups obtained with the first coding process, by means of a substitution or transposition method.
The different cryptographic methods will be discussed in more detail further on, along with the variety of versions used by the Italian and the Austrian armies during the World War I.

Cryptanalysis Methods

The methods, tricks, and intuitions that help understand the enemy's encoded messages are so numerous and diverse as to make it impossible to classify them, let alone describe them in a short paragraph. According to the American cryptologist William Friedman, the method to decrypting a message would consist, in brief, of identifying in succession: language, cipher and key, though in practice this logical sequence is not systematically followed.
With the aim of identifying the language, the analysis of some statistical parameters characteristics for each language is required, such as the occurrence of alphabet letters, bigrams (couple of letters) or trigrams, representing specific features that are lost only with some coding methods. This *frequency analysis* proves particularly useful also to solve cryptograms based on mono-alphabetic substitution. In fact, in that case, a diagram of single letters occurrence maintains - even after the encoding process - the same structure and it only shifts with respect to that of the original language[29].
The solution of cryptograms achieved by poly-alphabetic substitution systems relies on their reduction to several mono-alphabetic systems which in turn are solvable by the frequency analysis. According to this principle, since the 19th century, some decrypting procedures known as Babbage-Kasinski and Kerckhoffs methods have been designed for poly-alphabetic systems of the Vigenére type.
To break some transposition ciphers, it may be convenient to analyse the sequence of some letters, called *pilot letters*: for instance, in Italian the letter Q is always followed by letter U, while in German the letter C is followed by H in 90% of cases or by K. In some circumstances, it can be helpful to analyse the sequences of bigrams and trigrams. Another approach known since 19th century to solve transposition systems is the *multiple anagrams* method which however needs the availability of several cryptograms not only employing the same cipher and key, but also with the same length.
All the methodologies mentioned above will be more thoroughly discussed further on.
Of course, the easiest and most effective method to break ciphers and, above all, codes rely on having plaintexts corresponding to encoded messages or even the whole code book, achieved by stealing it from the enemy or taking advantage of the various opportunities provided by Human Intelligence.

[29] The use of homophones - that is different symbols corresponding to the most frequent letters and used alternatively - allows reducing the occurrence frequency of the latter, which changes the spectrum characteristics.

When these circumstances do not occur, the code breaking can be implemented by methods that considerably differ from those just described for the literal systems. The level of difficulty usually increases as the codes get bigger and results to be considerably higher for two-part compared to one-part systems. In fact, regarding the one-part codes, once the correspondence between a term in the code and a code group has been discovered, the equivalence with other terms of the following or the previous groups can be quite easy found, by using a dictionary of the language.

There are also circumstances that help the solution of any code or cipher, for instance taking advantage of partial coding of massages. Therefore, as a basic rule, ciphering must be integral and comprise all words in the telegram including the address and signature.

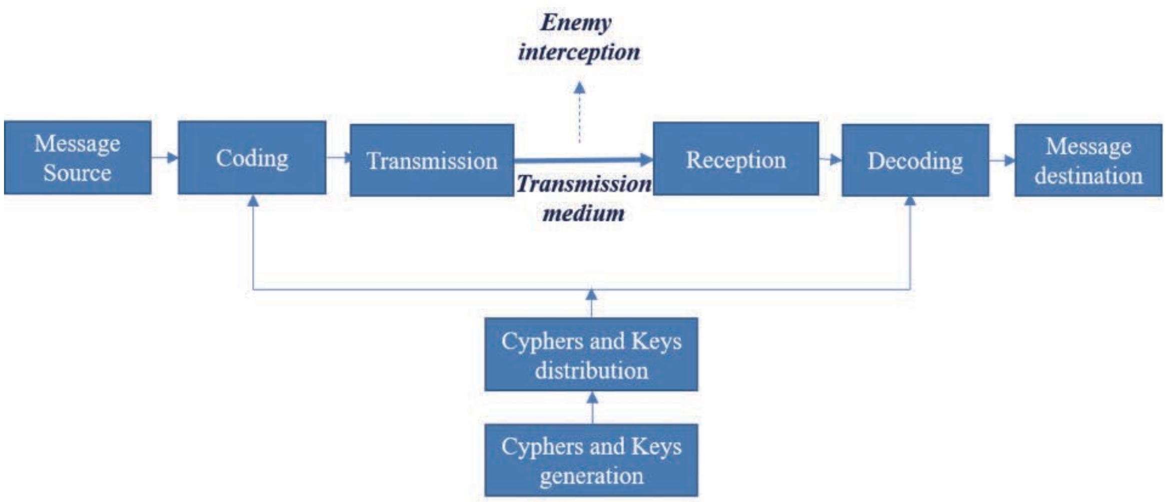
In addition, the analysts can exploit the operators' inaccuracy in the coding process. If a codegroup occurs in the same cryptogram several times, its correspondence with frequently used letters or syllables or words may be assumed. In many cases, the use of stereotypical expressions, such as "with reference to your dispatch" or "I am honoured to", or the knowledge of the topic, the possible structure or even the content of cryptograms help start breaking the code. In fact, once the meaning of some code groups is identified, it can be applied to other enemy cryptograms, which helps to discover more.

A further weakness that is often exploited by analysts is the sender's signature, often encoded letter by letter or syllable by syllable, which makes it easier to decrypt. If the same signature appears in two cryptograms transmitted respectively before and after a change of code or cipher, it helps to start breaking he last if the previous one is known.

6.5 MILITARY CRYPTOLOGY

Encoded Communications

In military telegraphic communication - both wire and radio - as well as, in more simple forms, in the transmission of confidential phonograms, coding and decoding are relevant parts of the operations required to transmit and receive a message as shown in picture 6.14 where, for the sake of clarity, only one unidirectional pattern of a communication channel has been represented. The



6.14 Outline of a communication channel with encoding

encoding and the corresponding decoding process of dispatches can take place near their origin - generally speaking, at the code offices of emitting Headquarters - or at the premises in charge of transmitting and receiving the dispatches, namely telegraphic or radiotelegraphic stations or telephone operators. In fact, very often during the war, radio stations not only encoded and decoded service messages, but performed the same task also for telegrams originated by and sent to various units and Headquarters. For both those purposes, they employed the so called *Service Ciphers*.
The transmission medium indicated in the picture may be physical (overhead wire or cable) or radio, with consequent changes of the transmitter and receiver structure.
Interception operations do not generally interfere with the transmitted signal, facilitating the detection immunity, although, in some cases, certain signals could indicate enemy activities that may have already occurred, be underway or possible. For instance, listening to enemy conversations during a telephone communication is a clear sign that the talkers can be intercepted in turn.
The picture also shows a single distribution channel for both ciphers and keys. The relevance of those channels and the reasons for eventually choosing different communication ways for ciphers and keys will discussed further ahead.

Required Characteristics of Codes and Ciphers

The two fundamental requirements in designing a cipher or a code are their security and quickness. For some applications, security achieved by a robust encryption, result to be a must, while in others, the need to ensure quickness and simplicity of encoding and decoding becomes prevalent, without neglecting the warranty of the secrecy along a time interval consistent with the dispatches contents.
Therefore, at the beginning of the war, most of the armies was equipped with at least two different types of ciphers and codes alternatively used according to the degree of security and to the encoding and decoding operation conditions. One category aimed to protect communications of a strategic nature between high commands, while the other was suitable for tactical communications with and between subordinate units. In the first case, complex codes and relatively bulky manuals were exploited, with the purpose of increasing difficulty and time needed for dispatches' interpretation, while forgoing quickness operations to a reasonable extent. On the other hand, lower-level units were equipped with simple and handy ciphers which involve a limited time for encoding and decoding operations and may be quickly replaceable when lost, but structured for delaying interpretation of cryptograms by the enemy the time necessary to render obsolete the information contained therein.
In addition to being secure, quick, and simple in decrypting dispatches, military codes and ciphers also need to be extremely reliable in terms of precision and accuracy. Those characteristics are essential to minimize, the probability of error in the encoding and decoding operations, thus avoiding repetition of messages or, even worse, their misinterpretation.
It is also obvious that coding operations should not imply an increase in length of the cryptogram compared to the plaintext.
During the war, the number of codes with specific purposes (air force communication, weather forecasts, etc.) multiplied for all armies and moreover many units developed systems for their internal use. Therefore, in order to grant suitable levels of security, meeting the above-mentioned criteria and others specifically related to each application, centres with high-level cryptologic capabilities were set up in many armies, in charge of controlling the characteristics of codes and ciphers produced by people often without the necessary cryptologic knowledge.

Operational Security

In addition to a constant accuracy in encoding operations, frequent changes of keys and ciphers would be assured, because the collection of a considerable number of uniformly encoded cryptograms in the hands of enemy analysts facilitates the solving process enormously. Indeed, the abundant homogeneous cryptographic material makes statistical analysis more reliable and increases, for instance, the likelihood of repeated code groups being detected. As already mentioned, this can mark the start of a code or chipher breaking.

The enemy's skill in cryptolology must be never underestimated[30]!

It is intuitively clear that a short dispatch protected by a cipher and a key that are rarely used is much safer than a long telegram or more telegrams encoded in the same manner. Claude Shannon theoretically validated this concept in 1949, identifying a 'minimum distance', that is the maximum length of a cryptogram or set of uniformly ciphered cryptograms below which multiple solutions are allowed or, in other words, the text is not decryptable[31].

Therefore, the more intense is the generated traffic, the shorter the operating lifetime of ciphers, and especially of keys, must be. This avoids providing the enemy with enough cryptographic material to break the system. Another method to achieve the same goal consists of using many ciphers at the same time to reduce, for each of them, the number of intercepted cryptograms while increasing the workload of enemy analysts who had to cope with many different encoding systems.

During the war, the undereducated or short-sighted operators who did not comply with coding rules, jeopardized the security of even excellent cryptographic systems. French Colonel Marcel Giviérge - one of the leading figures in the cryptologic war on the western front - stated that "One should code well or not code at all". In fact, when not coding, one risks disclosing some information to the enemy, yet when coding inefficiently, one provides the enemy with the opportunity to break a cipher and therefore to disclose a greater amount of information concerning oneself and his brothers in arms[32].

A peculiarity of military cryptography therefore was the need to instruct in basic cryptography methods hundreds and at times thousands of code operators and telegraphists who had to often work in all but favourable conditions. The lack of a basic knowledge of cryptology for many Italian operators, at the beginning of the WWI, was not a marginal cause of some of the successes obtained by Austro-Hungarian analysts.

Another extremely crucial problem arising during the harsh radio cryptographic battle taking place between the two opposed parties regarded the keys which, in addition to their programmed changes, had to be immediately replaced whenever their loss was certain or even just suspected. The frequent and sometimes unpredictable keys changes required very safe transmission channels. In fact, according to a general principle that is still valid, the decrypting of encoded dispatches by the enemy should be avoided, even when ciphers or codes fall into the enemy's hands and security relies exclusively on keys[33]. On the other hand, keys had to be delivered - often in a short time - to numerous units deployed to extensive front lines, including faraway and remote locations, at times connected via radio only. Solving the problem of the keys' security transmission, which do

[30] First principle of cryptography 1 (F.L. Bauer, *Decrypted secrets, Methods and Maxims of Cryptology, Springer* - Velag, Berlin, 1997. p.205 – 207).

[31] Claude Shannon, *Communication Theory of Secrecy Systems*, Bell System Technical Journal, 1949, Vol. 28(4), p. 656 - 715.

[32] M. Givierge, *Questions de Chiffre*, *op. cit,* the statement is attributed to an important and unspecified French personality, at the conclusion of the the article.

[33] This principle was enunciated by Kerckhoffs, (Auguste Kerckhoffs**,** *La Cryptographie Militaire*. Journal Des Sciences Militaires**,** Janvier 1883, 2° Desiderata) as one of the basic features of a cipher. Many of the ciphers used during the WWI did not meet such criteria.

not exist exclusively in the military domain, has been an issue for cryptologists for decades, until the implementation of public-key systems.

6.6 STEGANOGRAPHY: A SPY'S INSTRUMENT

Technical Steganography

During the WWI, agents operating beyond enemy lines, in order to convey the information gathered to their contact persons, were often forced to use classic communication means such as mail, public telegraphs, carrier pigeons, advertisements on newspapers, etc., and hence tried to conceal their dispatches by steganography.

The term *steganography* comes from Greek and means hidden writing. It comprises systems hiding the very existence of the message by *technical or linguistic* methods[34].

Invisible inks are among the most notorious technical steganography methods. In order to hinder the detection of these apparently invisible writings, chemical laboratories - in particular German ones - designed more and more sophisticated inks, constantly challenging the Entente's specialists who, in the meanwhile, were trying to identify the chemical substances that could reveal the writings hidden by the new inks[35]. The Italian Intelligence Service also achieved a valuable level of specialization in the field, progressing from "the first basic means to finding out secret correspondence […] to well-equipped chemical laboratories where it was almost impossible for any sophisticated substance used to hide suspect correspondence to go undetected"[36].

Several other technical steganography methods, also used after the WWI, allowed for instance photographically reducing an image to the size of a full stop in a typewritten document. More recently, messages were hidden inside images transmitted via Internet.

Unlike technical steganography, *linguistic* or *textual* steganography aim to hide a secret text inside an apparently harmless text that eventually can get through the most accurate checks, even by censorship[37]. The linguistic methods comprise the *concealed ciphers* and *the concealed languages (Jargon codes or language convenu).*

Concealed Ciphers

During the conflict, in addition to many classic versions of veiled secrete writing, such as acrostics, grilles[38], etc., some numerical techniques strictly connected to cryptography were sometime applied.

For instance, the number of vowels or consonants in each word of the plaintext can form code groups: an even number can represent a 1 and an odd number represents a 0. Therefore, with five consecutive words one can obtain five binary figures (1 to 0), generating 32 (2^5) possible combinations, each corresponding to a letter of the alphabet or to a number, or to a symbol of the

[34] The term was introduced by Abbot Trithemius (Johann von Heidenberg from Trittenheim), who entitled his book "Steganographia", first published in 1506.
[35] The evolution of the technique and use of invisible inks during WWI is described in H.O. Yardley, *op. cit.,* p. 55-89.
[36] O. Marchetti: *op. cit.,* p. 92.
[37] Textual steganography introduced by Abbot Trithemius is still applied today to digital texts.
[38] The initial letters of the words of an acrostic are used to make up the hidden message. Cardano's grilles are made by holes in a metal plate or on a sheet of paper. The message is written into the holes; a support text completes the message.

Baudot code[39]. With fewer consecutive words a lower number of combinations can be achieved: four words give rose to 16 letters or symbols and so on.
Accepting a higher level of complexity, the letters obtained with the above-mentioned method could be, for instance, assembled in couple, developing a small code where the combinations of two letters correspond to syllables, words, or entire sentences.
Concealed ciphers are not suitable to convey long and complex messages. In order to increase, although to a limited extent, the amount of information contained within a concise telegram, the first letter of each word of the transmitted text may be associated with a number, according to an easily memorized table (d, t = 1; y, n, z = 2; m, w = 3; etc.). In this case, with five words one can transmit the same number of group of figures from 0 to 9, obtaining a number of combinations much greater than that of the previous examples. Since each code group of many secret and commercial codes in use between 1914 and 1918 usually comprised five figures, the just mentioned dissimulation allows to transmit a secret word or an entire sentence with only five words in the dispatch[40].
To make concealed ciphers ineffective, censorship tried to change, in suspect telegrams, the order of words, or alter them while maintaining - a as far as possible - the original meaning of the message.

Concealed Languages

Dispatches using these kinds of language can hide military information concerning movements of troops, ships, etc. into text that apparently regards innocuous topics. During WWI, in order to increase the security of telephone communications, all Armies systematically used concealed vocabularies where words commonly occurring in military communications were replaced by names related to different domains, such as historical, geographical, foods, beverages, etc.
Intelligence operators would also use even simpler concealed languages appropriate for short telegraph communications. As the Head of Intelligence Service of the Italian 1st Army Tullio Marchetti describes in his book[41], fiduciaries operating in the Austrian territories transmitted to him information on Austro-Hungarian troops activities by telegrams written in a concealed language and conveyed through other agents at designated addresses in Switzerland[42].
Italian officers, prisoners of war in the Austro-Hungarian Empire, frequently offered an unexpected Intelligence contribution by means of telegrams sent to their families containing some relevant information in concealed languages, probably product of customary practice in telephone communications on the front line. At times, this information proved to be effective, despite the understandable difficulty and danger in collecting and telegraphing it from a prison camp.

[39] In 1874 Emil Baudot patented the first numerical code made up of a sequence of five bits, namely 1 or 0. The 32 possible combinations allows encoding alphabet letters but not 1-to-10 numbers. This problem was solved by means of a symbol marking the transition from letters to numbers.
[40] . During WWI, some German spies applied this method to telegraph dispatches, using ABC, a commercial code widespread at international level. One of them was the famous Maria de Victorica or Baroness Maria von Kretschamn, probably the daughter of a German general. She was arrested in New York in April 1918 and died two years later in prison. She became famous after the leading character in spy stories transposed in some films. (H.O. Yardley, *op. cit.,*183 -187).
[41] Tullio Marchetti, *Ventotto anni nel Servizio. op. cit.,* p.153 -155.
[42] According to Tullio Marchetti, “fiduciaries” were often “Unredeemed” (in Italian “Irredenti” i.e., people living in Italian territories making part of the Austrian Empire), who provided information for patriotism, while “informers” did that for money.

CHAPTER SEVEN

Radio and Cryptographic Deployment

7.1 FOR A SHORT HISTORY OF ITALIAN FIELD RADIO COMMUNICATIONS BEFORE 1914

Origin and Evolution

When all the Armies firstly tried to adopt field radio communications, they found significant and often unexpected difficulties to achieve from manufacturers, compact and robust equipment, transportable even on difficult terrain, and antennas with acceptable dimensions, easy to be quickly assembled and disassembled. Moreover, energy sources with adequate autonomy had to be provided since the field radio stations were often required to operate in areas without any other power sources.

In the last years of the 19th century, the most important radio manufacturers had been working to find satisfactory solutions to the problem of adapting the new radio systems to the above-mentioned communication needs of a moving army. The first military applications of the radio dated back to the Anglo-Boer War of 1899-1902 and did not result altogether satisfactory.

At the beginning of 1903, after some tests performed by means of equipment designed for fixed stations, the Italian army decided to check the performance of a field radiotelegraphic system, during its manoeuvres. For this purpose, after an accurate analysis of the proposals submitted by Marconi's Wireless Telegraph Company and by Siemens & Halske, an appointed technical team decided to choose the Marconi equipment instead of the system proposed by the German company and designed by the famous scientist Carl Ferdinand Braun's, mainly because of the different antenna characteristics[1].

However, during the army manoeuvres of 1903 in Veneto, even the Marconi system didn't deliver convincing results, mainly because of the difficulty to find in hilly areas a flat surface having a diameter of approximately 80 metres and free from obstacles, as needed to install the Marconi antennas. Furthermore, the time between the equipment provision and the beginning of the army manoeuvres resulted too scarce for a suitable training of the personnel.

Despite the initial troubles, the relationship between the Italian army and the Marconi Wireless Company became stronger, especially after the agreement signed in 1904 between the Italian Government and Guglielmo Marconi who granted "the Government the use for military purposes of his patents concerning radiotelegraphic equipment, for no fee and with the authorization to reproduce the equipment in question at governmental arsenals and plants"[2].

Consequently, the Radiotelegraphic Section of the Specialist Brigade - which at that time, managed the Army's radio communications - could adapt Marconi Wireless's new field systems to its own

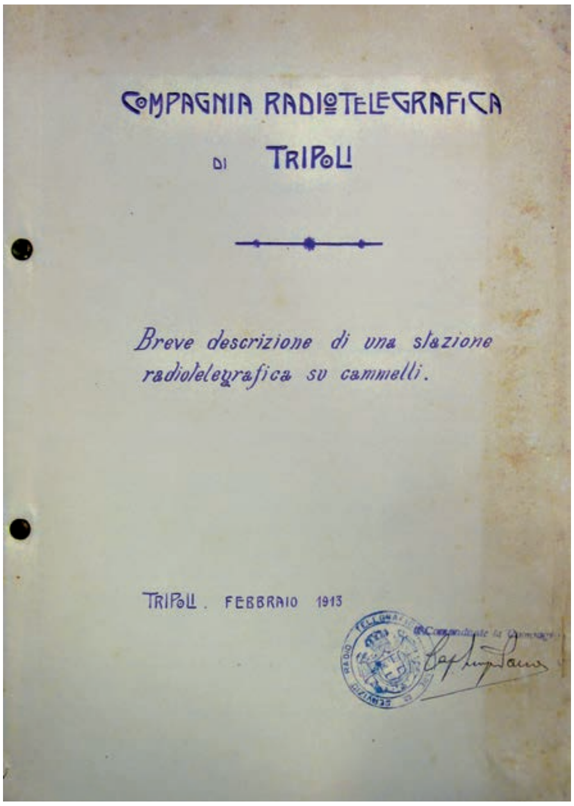
[1] Inspectorate General of the Engineer Corps, *Studi ed esperienze di Telegrafia da Campo* (Field Telegraphy Studies and Experiences), 15 April 1903, AUSSME, Series F4, env.11. During the 1902 manoeuvre, the German Army had tested the Siemens - Braun system, which employed balloons or kites to lift the electrical wires of antennas. This was an effective solution in favourable weather conditions only. Marconi Wireless, instead, provided antennas made up of eight metal wires 40 metres long, placed eight metres above the ground at a radial pattern connected to the equipment by a central vertical wire.

[2] *Agreement between the Italian Government and Guglielmo Marconi,* London, 5 May 1904, Article 1, AUSSME, Series F4, env.11. The agreement formalizes what Marconi had already granted to the Royal Navy in 1901.

requirements and employ them during the army manoeuvres from 1905 to 1907. The objective was to "cover" increasingly longer distances - up to more than 100 km - on hilly or even mountainous terrains[3]. However, the relations between the Army and Marconi Wireless's representative in Rome, Marquis Luigi Solari, were not always idyllic, also because the latter claimed exclusive rights for his own company regarding the equipment supplies. A whole volume would be necessary to recount the numerous misunderstandings between Solari and the technicians of the Army concerning, for instance, the 1908 tests on equipment to be used by the Cavalry[4]. Other disagreements arose at the end of 1909, when the Army stations to be included in the 'National fixed network' were set up by using equipment provided by the company Jacoviello, since the Marconi Wireless had not provided the required devices within the very tight deadlines imposed by the urgent necessity to prepare radiotelegraphic connections between major Italian cities, in light of the strike of the Ministry of Post and Telegraphs' employees.

The Libyan War

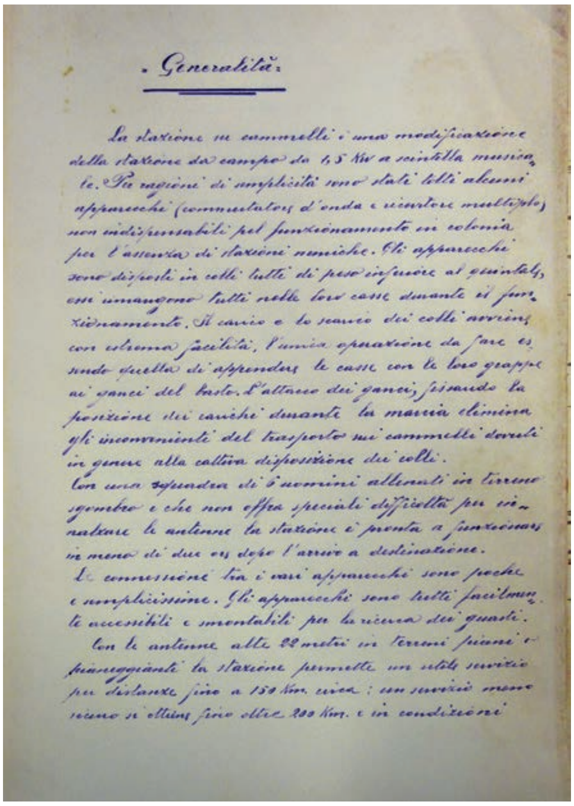
Tension between Marquis Solari and the Army Headquarters peaked two years later when, to deal with an emergency during the war in Libya, 300 W radio telegraphic systems made by the French company SFR were installed in Cyrenaica and in the Aegean islands, instead of the 500 W Marconi stations which did not perform satisfactorily, above all due to engine overheating caused by the Libyan climate[5].



COMPAGNIA RADIOTELEGRAFICA DI TRIPOLI

Breve descrizione di una stazione radiotelegrafica su cammelli.

TRIPOLI . FEBBRAIO 1913



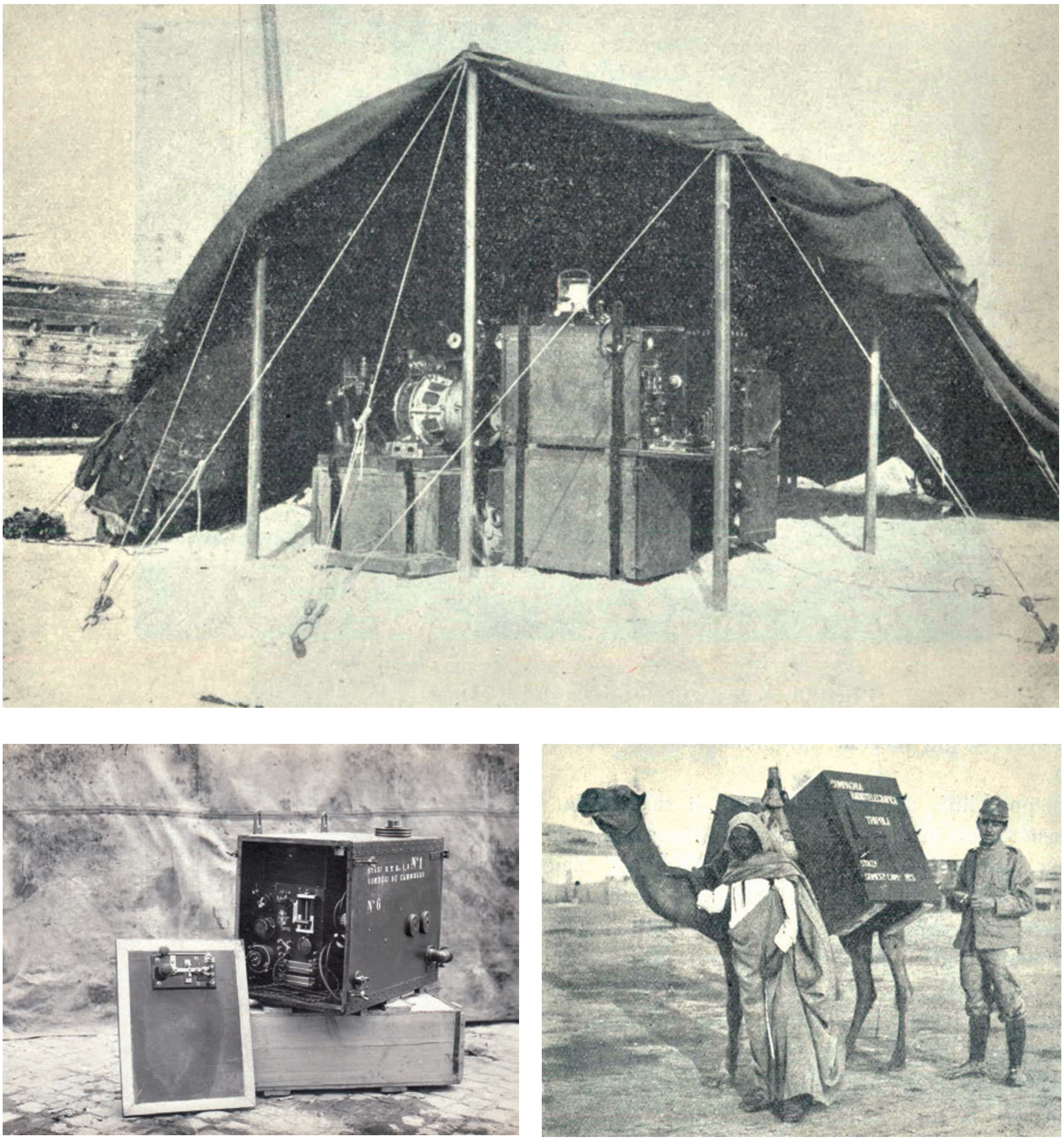
Generalità.

La stazione su cammelli è una modificazione della stazione da campo da 1,5 Kw a scintilla musicale. Per ragioni di semplicità sono stati tolti alcuni apparecchi (commutatore d'onda e ricevitore multiplo) non indispensabili pel funzionamento in colonia per l'assenza di stazioni nemiche. Gli apparecchi sono disposti in colli tutti di peso inferiore al quintale, essi rimangono tutti nelle loro casse durante il funzionamento. Il carico e lo scarico dei colli avviene con estrema facilità, l'unica operazione da fare essendo quella di appendere le casse con le loro grappe ai ganci del basto. L'attacco dei ganci, fissando la posizione dei carichi durante la marcia elimina gli inconvenienti del trasporto sui cammelli dovuti in genere alla cattiva disposizione dei colli.
Con una squadra di 6 uomini allenati in terreno sgombro e che non offra speciali difficoltà per innalzare le antenne la stazione è pronta a funzionare in meno di due ore dopo l'arrivo a destinazione.
Le connessioni tra i vari apparecchi sono poche e semplicissime. Gli apparecchi sono tutti facilmente accessibili e smontabili per la ricerca dei guasti.
Con le antenne alte 22 metri in terreni piani o pianeggianti la stazione permette un utile servizio per distanze fino a 150 Km. circa; un servizio meno sicuro si ottiene fino oltre 200 Km. e in condizioni

7.1 Cover and first page of the description of Luigi Sacco's camel-born station (ISCAG Archive)

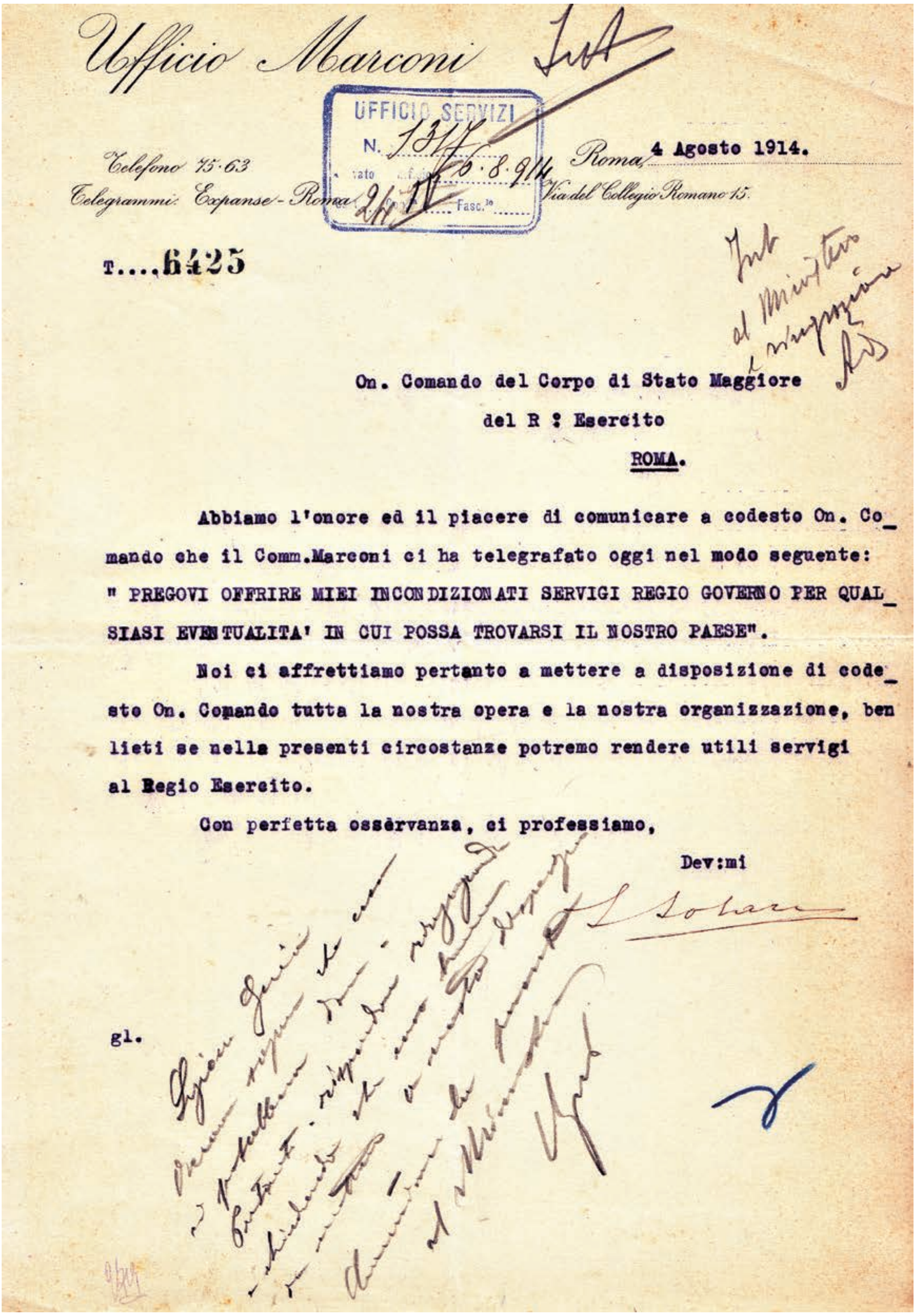
[3] General Inspectorate of the Engineer Corps, *Studi ed esperienze, op. cit.*
[4] *ibidem*, Cavalry's use of wireless telegraphy allowed to connect quickly scouting units with their own or higher commands.
[5] Marconi's office in Rome, Letter to the Headquarters of General Staff Corps, *Dotazioni RT mobili per il R. Esercito* (Radiotelegraphic Equipment for the Royal Army), 14 November 1912 and answer of 3 December, AUSSME, Series F4, env.8.

Conversely, the network in Tripolitania - implemented by the then Lieutenant Luigi Sacco - used Marconi equipment only. Some of them were assembled to form a camel borne station, modifying the 1.5 kW sound spark gap equipment (picture 7.1). A convoy of at least 13 camels transported all devices necessary to ensure the stations operation in remote areas, for a period of at least twenty days. Pictures 7.2 shows some images of a camel borne station[6].



7.2 Pictures of a camel-borne station. On top, the installed station; in the bottom left corner, an open box; on the right, a camel carrying two boxes (ISCAG Archive)

[6] Tripoli Radio Telegraph Company, *Breve descrizione di una stazione radiotelegrafica su cammelli a firma del Comandante la Compagnia Cap. Luigi Sacco* (Brief Description of a camel-born radiotelegraphic station signed by Company Commander Cap. Luigi Sacco), Tripoli, febbraio1913, ISCAG, Coll. 235.



Ufficio Marconi

UFFICIO SERVIZI
N. 1317
6.8.914

Telefono 75·63
Telegrammi: Expanse - Roma

Roma, 4 Agosto 1914.
Via del Collegio Romano 15.

T....6425

On. Comando del Corpo di Stato Maggiore
del R: Esercito
ROMA.

Abbiamo l'onore ed il piacere di comunicare a codesto On. Comando che il Comm. Marconi ci ha telegrafato oggi nel modo seguente: " PREGOVI OFFRIRE MIEI INCONDIZIONATI SERVIGI REGIO GOVERNO PER QUALSIASI EVENTUALITA' IN CUI POSSA TROVARSI IL NOSTRO PAESE".

Noi ci affrettiamo pertanto a mettere a disposizione di codesto On. Comando tutta la nostra opera e la nostra organizzazione, ben lieti se nella presenti circostanze potremo rendere utili servigi al Regio Esercito.

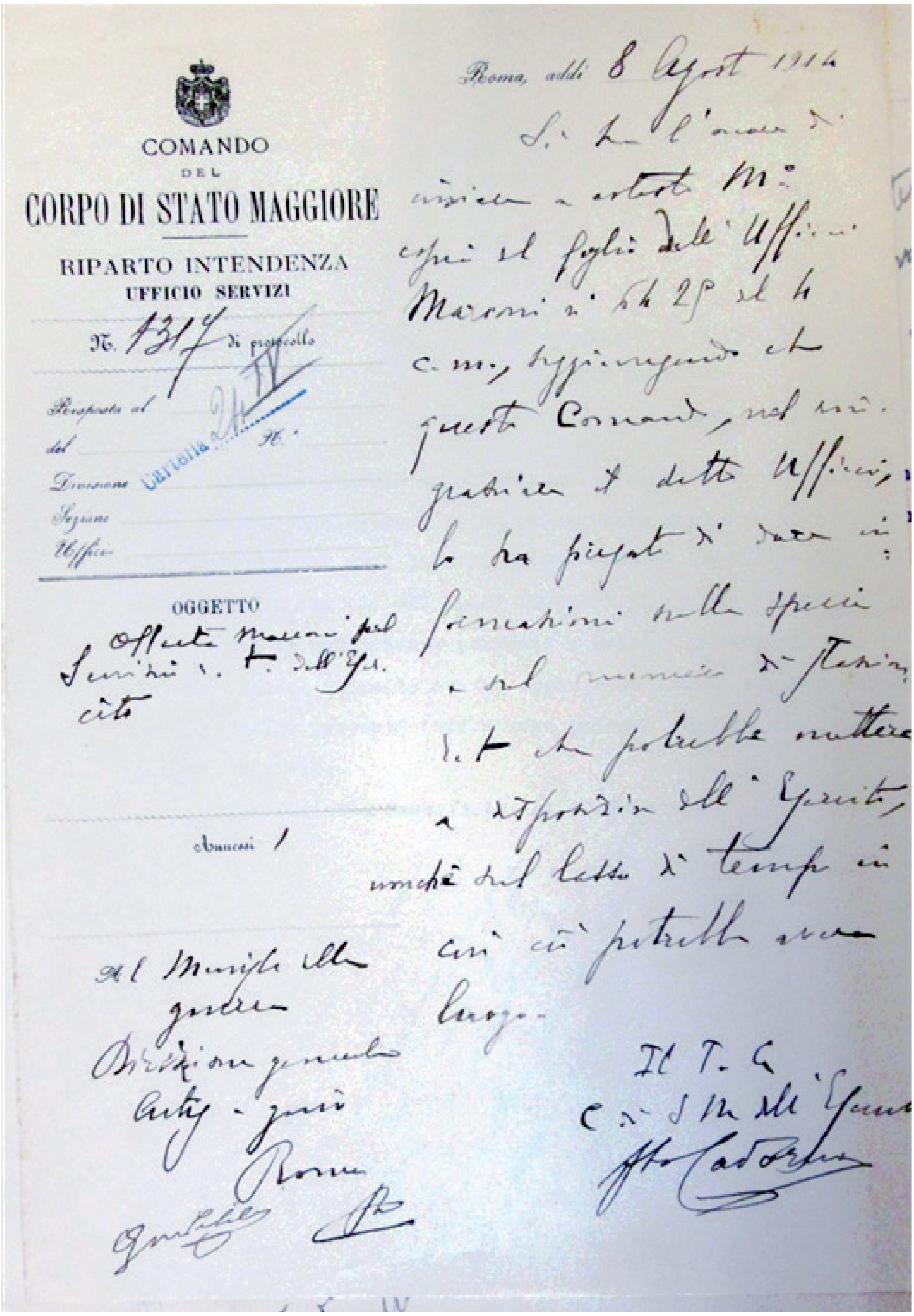
Con perfetta osservanza, ci professiamo,

Dev:mi

L. Solari

gl.

7.3 Letter from Solari reporting the text of the telegram by G. Marconi (on the left) and letter by General Cadorna to the Minister of War (on the right) guaranteeing that orders had been transmitted to check on equipment available at the Italian Marconi factory (ISCAG Archive)



COMANDO
DEL
CORPO DI STATO MAGGIORE
RIPARTO INTENDENZA
UFFICIO SERVIZI

N. 1317 di protocollo

Risposta al ...
del ... N. ...
Divisione
Sezione
Ufficio

Cartella 24 IV

OGGETTO
Offerta Marconi pel servizio R. T. dell'Esercito

Annessi 1

Al Ministero della Guerra
Direzione generale Artiglieria e genio
Roma

Roma, addì 8 Agost 1914

Si ha l'onore di inviare a codesto Ministero copia del foglio dell'Ufficio Marconi n° ... del 4 c.m., soggiungendo che questo Comando, nel ringraziare detto Ufficio, lo ha pregato di dare informazioni sulla specie e sul numero di stazioni R. T. che potrebbe mettere a disposizione dell'Esercito, nonché del lasso di tempo in cui ciò potrebbe aver luogo.

Il T. G.
C. di S. M. dell'Esercito
f.to Cadorna

During that war, a large effort was required to gather all radio assets immediately available in Italy or on the international market, not only to quickly develop the Libyan networks but also to guarantee communications for the troops deployed to the Aegean Sea, Eritrea, and Albania[7].
An extreme lack of resources became evident when the time came to prepare materials, means of transportation and troops for the mobilization before the beginning of the WWI. Due to the pressing request for radiotelegraphic stations, the 3rd Regiment of the Engineering Corps - which had been tasked with the Radiotelegraphic Service since 27 August 1912 - did not manage to recover even the equipment to instruct radiotelegraphic operators[8].
Therefore, right after the war broke out in August 1914, a telegram from Guglielmo Marconi reassuring the Italian government that he would be completely and "unconditionally" available in supporting his homeland, was warmly received. General Cadorna, who had been recently appointed Chief of the Army Staff, decided to immediately ask the Italian office of Marconi Company to provide a list of equipment available or in preparation at the Marconi plants in Genoa (picture 7.3). Marquis Solari immediately complied with the request[9].

7.2 THE ARMY RADIO AT ITALY'S ENTRING THE WAR

Technological Limitations

At the beginning of the war, the number of fixed and mobile stations in the Italian army, as well as in other belligerents' armies, was relatively small when compared to the vastness of fronts and the large number of fighting units. A larger radio diffusion was prevented by several factors such as, in the Italian army, the paucity of resources in terms of material and men due to the long-standing financial problems. However, some general technical constraints related to the technologies available at that time were perceived by all the Armies.
In an article published in 1914, Luigi Sacco himself, a pioneer in this field, admitted:

> Despite the great progress made, it is still not possible to say that, a priori, unlimited trust in the service that radiotelegraphy could render in a European war is justifiable.
> Radiotelegraphy still suffers from considerable drawbacks, which become particularly significant in war applications. [...][10]
> Therefore, its undeniable flaws justify limited and careful use[11].

The bulkiness and weight of equipment represented still an issue that was opposed to an easy field usage of the radio, above all in a war of movement, although great efforts had been made to improve the robustness and the handling of equipment and to reduce the amount of time required to set up and dismantle stations.

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[7] The Libyan network required 25 radiotelegraph stations and other 7 stations were necessary in other locations.
[8] 3rd Regiment, Telegraphists of the Engineer Corps, *Relazione sulle condizioni in cui si è trovato il Reggimento nei riguardi della preparazione del personale dal 30 settembre 1912 al 31 marzo 1914* (Report on Regiment personnel's preparation between 30 September 1912 and 31 March 1914), Florence, 8 April 1914, AUSSME, Series F4, env.8.
[9] Marconi's office, Rome, Letters to the Headquarters of the General Staff Corps, Ufficio Intendenza, Services 0ffice, Object: *Materiali Radiotelegrafici,* (Radiotelegraphic materials) signed by Solari, 10,11,12 August 1914, AUSSME, Series F4, env.8.
[10] L. Sacco, *Note sulle applicazioni campali della Radiotelegrafia* (Notes on field applications of radiotelegraphy), Rivista di Artiglieria e Genio, October, 1914, Vol. IV, p. 82. The text highlights the progress of radiotelegraphy over more recent years, including the ability to transmit up to twenty words per minute, in undisturbed conditions.
[11] *ibidem,* p. 111.

The strongest inconvenience, however, was due to the ease of interception by the enemy, to the considerable impact of atmospheric disturbance and to the limited number of possible simultaneous telegraph communications which could be transmitted within a given geographical area, in the frequency band available at that time. Because of this last weakness, the risk that a radio communication could suffer strong interferences produced by friendly and enemy stations tuned on the same as its frequency resulted extremely high. This situation was only partly solved by the adoption of 'sound spark gap' transmitters that allowed distinguishing stations thanks to their different audible tones as perceived at the reception.
To cope with those issues, all armies decided to limit the number of transmitters and entered war with a few dozen field radio stations mostly working for High Commands and the Cavalry.

Organization and Regulations

Even when working with a limited number of stations, strict rules and practices would be established to regulate the radio traffic, mainly in the presence of enemy contemporary emission. To this end, in September 1914 a special Committee including Army and Navy officers had started working in Italy for implementing general rules to be applied to all radio communications in case of war[12].
One of the main goals was the definition of the frequency bands assigned to the various categories of stations as well as the measures to adopt for avoiding mutual interference. Moreover, the control stations in charge of supervising radio communications and settling any 'collision' between radio stations were designated[13].
The regulations issued in 1914 divide radiotelegraphic stations into four categories: on-board, coastal, terrestrial fixed and mobile. The Royal navy, in addition to coastal and on-board military stations managed most of the National fixed radiotelegraphic network.
One of the approved directives reads as follows: "radiotelegraphy must not be used when communications can take place with different means; […] it is mandatory to always use the minimum amount of energy required to guarantee communications"[14]. The Engineering Corps Inspectorate reiterated this instruction for the Army, ordering to employ wireless communication only when ordinary wire telegraphy was unavailable.
The General Regulations provided for the appointment of the Chief Inspector of the STM (Servizio Telegrafico Militare, Military Telegraphic Service) reporting to the Chief of the Army Staff and in charge of coordinating the entire telecommunication system within the Army. A Captain would report to the Inspector for the direction of the Radiotelegraphic Service operating on the theatre of war, with both field and fixed radiotelegraphic stations[15].
This organization met the need to have a unified coordination of all fixed and mobile stations in the warzone, regarding for instance the personnel assigned to stations and the distribution of service codes and ciphers together with the rules for their application, with the exclusion of codes managed by different bodies, such as the Ministry of War.

[12] Ministry of War and Ministry of the Navy, *Norme generali comuni per il Servizio RT nel R. Esercito e nella R. Marina* (General Rules for the radiotelegraphic service in the Royal Army and in the Royal Navy), 21 December 1914, AUSSME, Series F3, env.50.
[13] *ibidem,* p.4- 6.
[14] *ibidem*, p.2 -3.
[15] Supreme Headquarters, *Promemoria circa l'ordinamento del Servizio telegrafico, telefonico e radiotelegrafico presso l'Esercito mobilitato* (Memorandum regarding the telegraph, telephone and radio telegraphic service in the mobilised army), 10 May 1915, p.1, AUSSME, Series F3, env.50.

Finally, the Chief Inspector had to "know the position of radiotelegraphic stations [...] that are not exclusively relevant to one Radiotelegraphic Section but require cooperation among various Sections"[16]. This right, when exercised without due precautions in asking for the position of field stations via radio, might provide the enemy with valuable information concerning the deployment of Italian forces.

The Deployment of Italian Stations

When the European war began, the radio resources envisaged for the war zone included the Army field stations and the fixed stations located inside fortresses and other key places across the territory. Despite Marconi's personal availability, over the last months of 1914 considerable delays occurred in the Marconi Wireless supply of the material required for instance to prepare mobile stations for Cavalry Units. More powerful equipment needed to complete the fixed-station network in the areas designated as the Army's gathering places were not available either. Only during the spring of 1915, when the participation of Italy in the war as an ally of the Entente Powers became more likely, those problems started to be gradually solved[17].

To set up field stations, the workshops of the 3rd Regiment of the Engineering Corps provided to place into containers the equipment that could be transported by animals, carts, or military lorries. Picture 7.4 shows some possible uses of a 1.5 kW cart station.

Outside the war zone, the Army's fixed stations contributed, along with the Italian navy's, to forming the National fixed network. Its structure is shown in Picture 7.5 where connections and stations managed by the Army are indicated in red[18].

The preparation of field radiocommunications in the war prospective had begun with the manoeuvres conducted in Veneto in the summer of 1914. One of the major goals of that operation was to analyse the propagation conditions and the intelligibility of the received telegraphic signals between field stations installed at adequately selected locations on the north-east border as well as between them and the fixed stations, forming a star-shaped network with the centre in Treviso. These connections are marked by the white lines in the picture 7.6, while the field station connections are indicated by red lines[19].

In the same occasion, the network capability in terms of number of simultaneous communications that could be carried out within the available waveband were tested, demonstrating that only four telegraph communications could work simultaneously with no reciprocal disturbance in the wavelength interval ranging between 700 and 1,200 m, inside the area shown in the picture 7.6. In fact, the spark gap transmitting equipment commonly employed at that time required considerable bandwidth, compared to continuous wave (CW) equipment, then unavailable for field applications. Moreover, personnel skills were tested, mainly to investigate their capability of intercepting enemy communications[20].

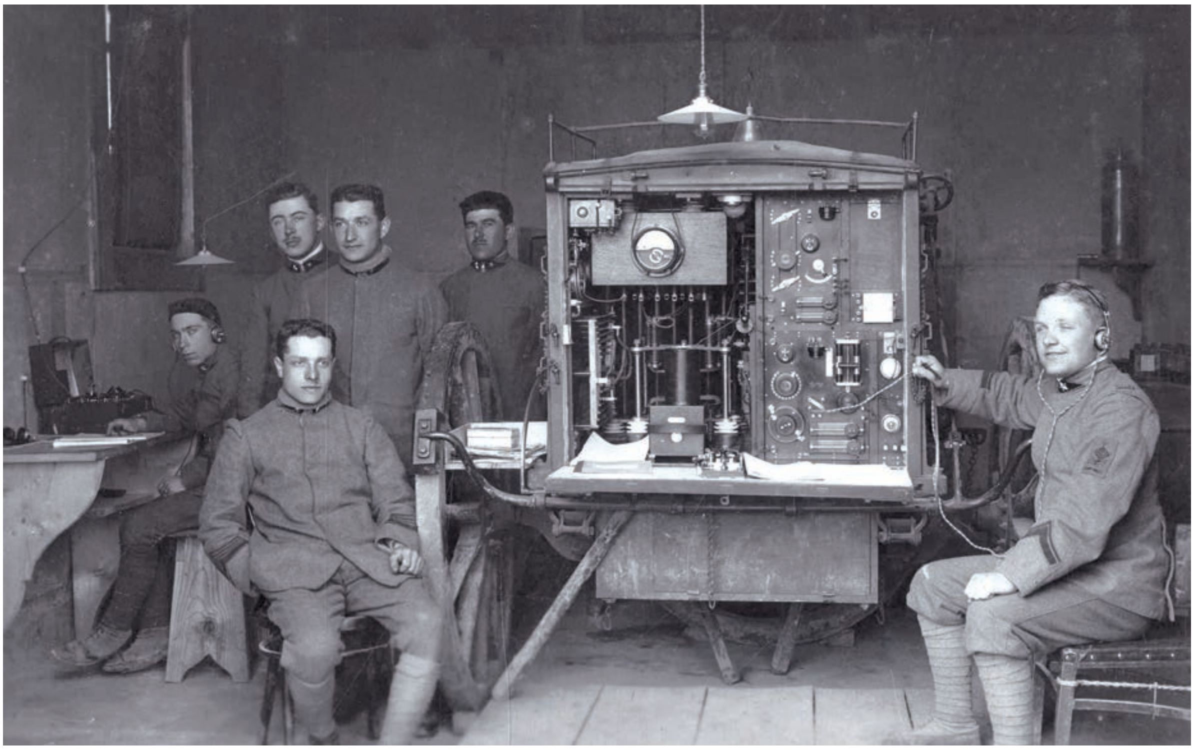
[16] *ibidem*, p.4.

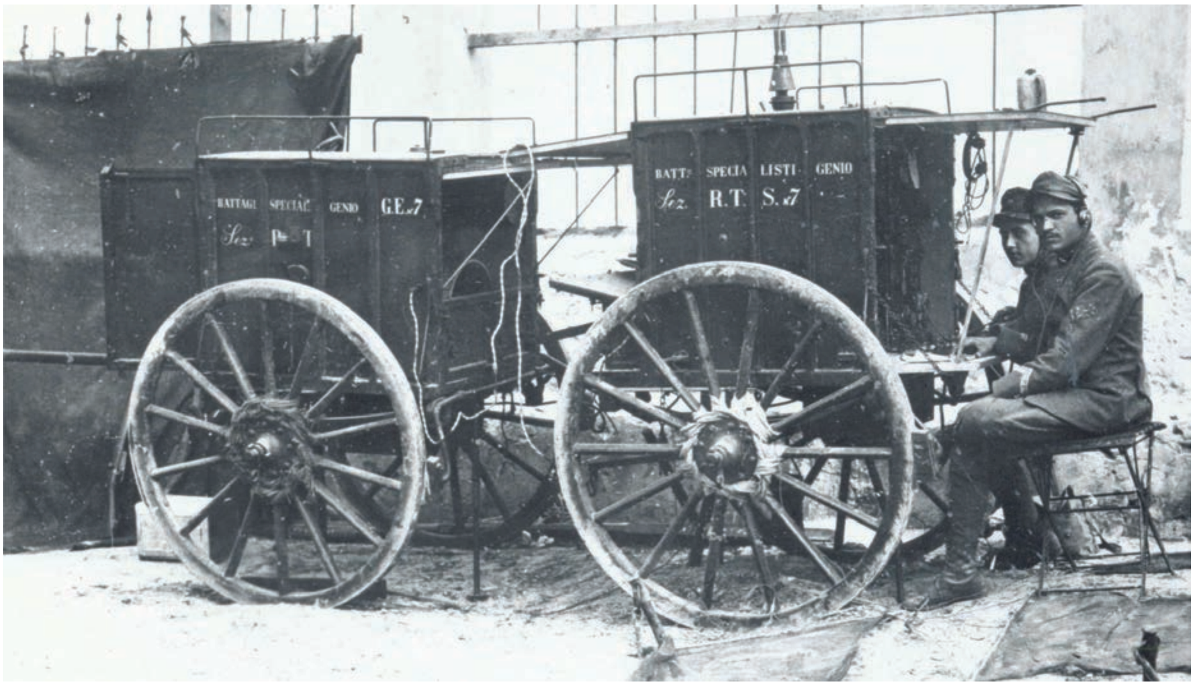
[17] The frequent correspondence between the Services Office of the Supreme Headquarters, the Inspectorate of the Engineer Corps (AUSSME, Series F4, env.7) and the Deployment Office (AUSSME, Series F4, env.8) proves this difficult situation and shows its evolution.

[18] Ministry of the Navy, *Consegne di massima per il servizio radiotelegrafico in caso di mobilitazione radiotelegrafica militare,* (General instructions for the radiotelegraphic service in case of military radiotelegraphic mobilisation), extremely confidential circular letter, 9 April 1914, AUSSME, Series F4, env.7. Stations of the Royal Navy's national network had 5 to15 kW power.

[19] Captain Ugo Levi, Engineer Corps, *Relazione sulle esercitazioni radiotelegrafiche alla frontiera NE* (Report on the radiotelegraphic exercises on the north-east border), Florence, 31 August 1914, AUSSME, series F4, env.7.

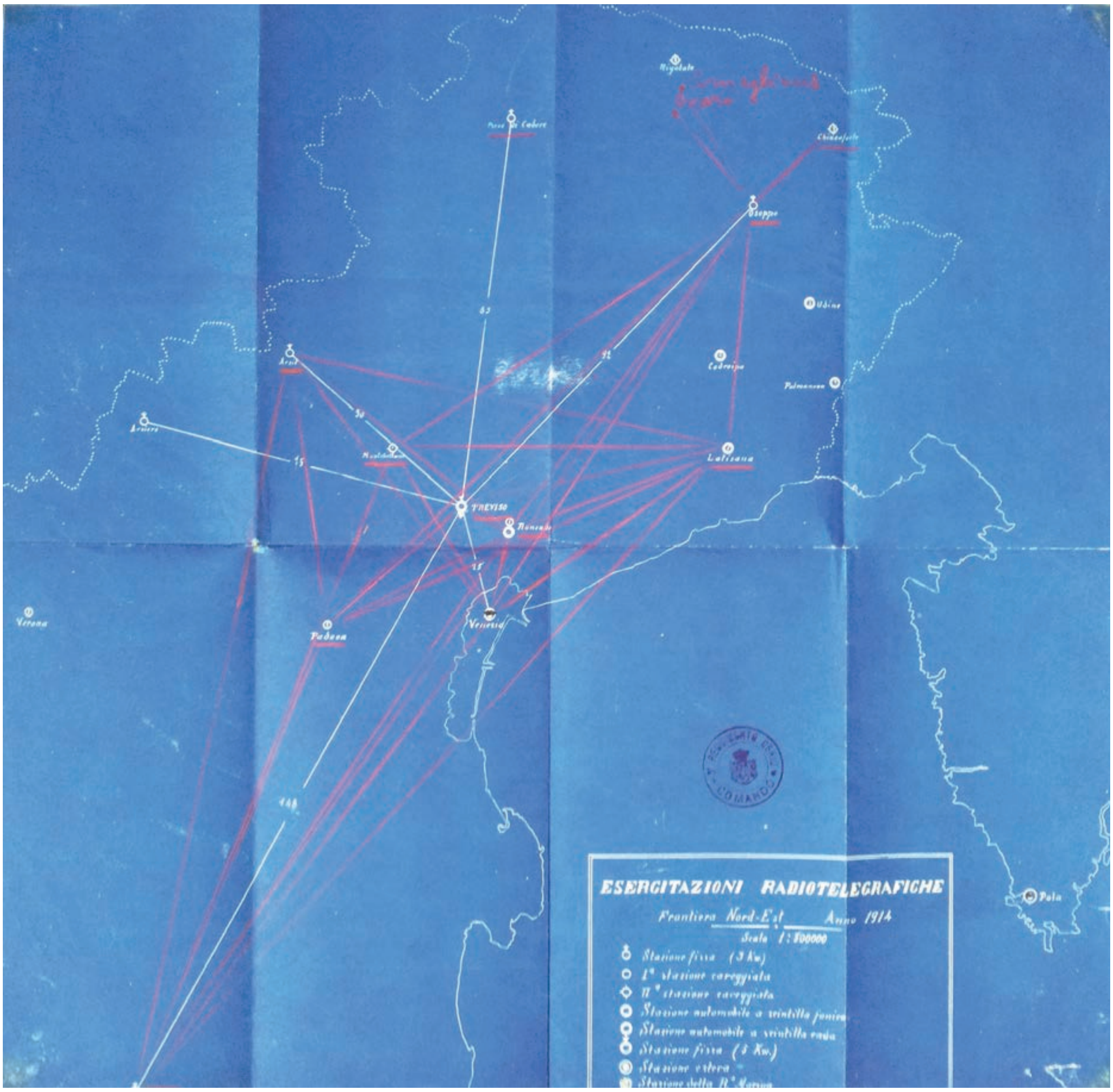
[20] *ibidem*.





7.4 Photographs of the 1.5 kW on cart station (ISCAG Archive)

7.5 The national network comprising radiotelegraph stations of the Navy and Army, May 1914 (ISCAG Archive)



7.6 Outline of radio connections during the 1914 summer training operations (ISCAG Archive)

At the beginning of operations on the Italian front, 18 field stations were assigned: 2 to the Supreme Command, 2 to each of the four Armies and 2 to the each of four Cavalry units. Their power ranged from 5 to 1,5 KW[21]. Nine Radiotelegraphic Sections managed the entire field stations systems. Indeed, during the spring of 1915, in the stores of the Italian army some equipment with lower power compared to the ones just mentioned, were available and soon requested by some operating units.

[21] The 1.5 kW power equipment of the Supreme Command and the Armies were loaded on carts; the cavalry had 3 or1,5 kW stations loaded on lorries. Two 5 kW fixed stations were n Bologna and Mantua; the 3 kW stations were in Treviso, Arsiero, Primolano (Arsiè), Pieve di Cadore, Osoppo and the 1.5 kW stations were in Belluno, Verona and Ravenna.

7.3 SPY HUNT

A Not-Only-Italian Issue

During the war preparation, activities were carried out in most Countries with the purpose of achieving a complete availability of the radio spectrum for military and state communications, "freeing" it from private transmissions.
Moreover, in expectation of the imminent war and even more when the war began, the Intelligence Services of prospective belligerent Nations meticulously sought clandestine radio stations, with methods which sometimes risked becoming a witch hunt. especially in England[22].
A well-known official of British Intelligence reported that the counter-espionage Headquarters in London sent a telegraphist team travelling on a lorry equipped with equipment and aerials of various kinds to an area in eastern England, with the mission of detecting clandestine equipment. The members of the team were immediately arrested by the local police as suspected of espionage and released only after clarification between the local police and the London counter-espionage Headquarters. Afterword, the team had to travel to another region but demanded to be escorted by a State Police officer in uniform. A few days later, London received a telegram sent by the police of the region visited by the team: "We have arrested three German spies travelling on a lorry fully equipped with radio systems. One of them was disguised as an English policeman"[23].
In Italy, the search for clandestine stations was not that paroxysmal, but demanded nevertheless careful and constant activity, especially starting from March 1914, when the "Permanent Advisory Committee for the Telegraphic Service of the Kingdom" chaired by the famous scientist Augusto Righi, dealt with the issue upon request of the Ministry of the Navy. The opportunity arose because of a concession request for two private receiver stations located in the strongholds of Taranto and Messina[24].

Results of the Search in Italy and on the Swiss Border

In September 1914, the Chief of the Intelligence Service, Colonel Rosolino Poggi, asked the Service Office to add some *Istruzioni per la ricerca di stazioni radio telegrafiche clandestine* (Instructions for Searching Clandestine Radiotelegraphic Stations) to the *Regolamenti per il Controspionaggio Militare nel periodo di pace* (Rules for Military Counter Espionage during peacetime) that had been issued in July 1913, with purpose of providing the Royal Carabinieri, the Guardia di Finanza and servicemen in general with the information required to detect clandestine stations[25].
The instructions issued by the Service Office comprised criteria to identify transmitter stations based upon size of the antennas, required power, noise generated by the spark gap, etc.[26], but highlighted difficulties to localize intercepting receivers that, when located near military transmitters, need

[22] During the war, in addition to other concerns, the English suspected the existence of transmitter used by German spies to direct toward London the raids of German airships, which were equipped with diorection finders exactly for that purpose. When a clandestine station was identified and seized, the English did not interrupt the transmissions but moved the station to open countryside.
[23] Sir Basil Thompson, *Queer people*, Hodder & Stoughton, London 1922, p.39.
[24] Permanent Advisory Committee, Letter to the Ministry of the Navy of 20 March 1914, AUSSME, Series F4, env.7, f.107. The Committee was created by Law 395 of 30 June 1910 within the Ministry of the Navy.
[25] Headquarters of the General Staff Corps, Intelligence Office, *Promemoria per l'Ufficio Servizi*, (Memorandum for the Services Office), 5 September 1914, *ibidem.*
[26] Headquarters of the General Staff Corps, Intelligence Office, *Promemoria per l' Ufficio Informazioni* (Memorandum for the Intelligence Office), 26 September 1914, *ibidem*.

small-sized antennas, quite easy to conceal. Consulted by the Ministry of War, the Minister of Post and Telegraphs stated that:

> considering the techniques available, it will not be simple to protect the State from the evil intentions of private subjects who may intercept radiotelegraphic and radiotelephone transmissions from military or public stations in a malicious or clandestine manner […]. Therefore, radiotelegraphic stations need to adopt adequate precautions in writing important messages since, presently, there is no other way to guarantee the secrecy of radiotelegraphic and radiotelephone stations[27].

More explicitly, Righi recommended encoding confidential radio dispatches even during peacetime as the only effective measure against clandestine interception. The Army Headquarters shared this view.

With the purpose of reserving the radio spectrum for State communications, the Ministry of Post and Telegraphs issued, in August 1914, a ban on new concessions and immediately thereafter abolished the concessions that had already been granted to private subjects.

Following the instructions mentioned above, the Directorates of Telegraph and Telephone that operated on the territory reporting to the Ministry of Post and Telegraphs, intensified the search for unauthorized stations and found dozens of them across Italy, from Ferrara to Rome, from Florence to Forlì, mostly receiving stations designed for study and research, without any connection to clandestine activities. However, in some cases it turned out impossible to find the owner of the facility, which led to suspicion of espionage or activities associated with the uprisings of June 1914, for the coordination of the organizing committees in several Italian cities[28].

In few cases, the referral to justice led to acquittals for not having committed a crime or due to a lack of evidence. According to collected information, it seems no stations for espionage purposes were detected on the Italian territory, except for some stations close to but beyond the border.

The Italian Intelligence Office - later Intelligence Service - worked during the entire war period to counter the use of the radio for espionage operations, especially along the Swiss border where the frequently occurring espionage activity, in addition to smuggling and desertion, required continuous and strong suppression action. Moreover, this area was particularly relevant to the war because of the dreaded attack that the Central Empires could have launched against Italy through the Swiss territory[29].

Since 1915, the counter-espionage section of the Intelligence Office strived to hinder the radio transmission across the Swiss border by enemy agents operating in Italy. To achieve this goal, radio surveillance was employed to intercept any communication by relatively little powerful transmitters installed in border areas[30].

[27] Ministry of Post and Telegraphs, Telegraphic General Directorate, *Impianti telegrafici abusivi sorretti da cervi volanti* (Illegal telegraphic stations with antennas supported by kites), letter to the Ministry of War of 7 October 1914, AUSSME, Series G9, env.2. This folder comprises many documents concerning the topic.

[28] Large documentation in this regard is also provided in AUSSME, Series F4, env.7, f.107.

[29] Situation and Operations Office. *La neutralità svizzera nei suoi pericoli* (Swiss neutrality and its dangers), November 1915, AUSSME, Series F1, env.369. To defend the Po Valley from such risks, Cadorna went back to an old 1882 project, and built a fortified line that comprised trenches extending for more than 70 Km, artillery posts and other fortifications controlled by the troops of the *OAFN - Comando Occupazione Avanzata Frontiera Nord* (Northern Front Forward Occupation Command) that was created in 1917.

[30] Monitoring had started in 1914 and allowed identifying radio stations also in other border areas. In fact, some stations were discovered in Hotel Fonzari in Grado and in the bell tower of Aquileia, both communicating with Pula. Other radiotelegraphic

At the beginning of 1915, a major concern came from a radiotelegraphic station installed at the Albergo Ticino - formerly known as Felix - a hotel near Chiasso. The station was neutralized by Captain Eugenio Raimondi of the Engineering Corps Directorate of Milan, who entered the hotel disguised as a workman and gathered the information necessary to demand - in the name of Swiss neutrality - the Country authorities to order the station dismantling, based upon irrefutable evidence of its espionage activities[31].

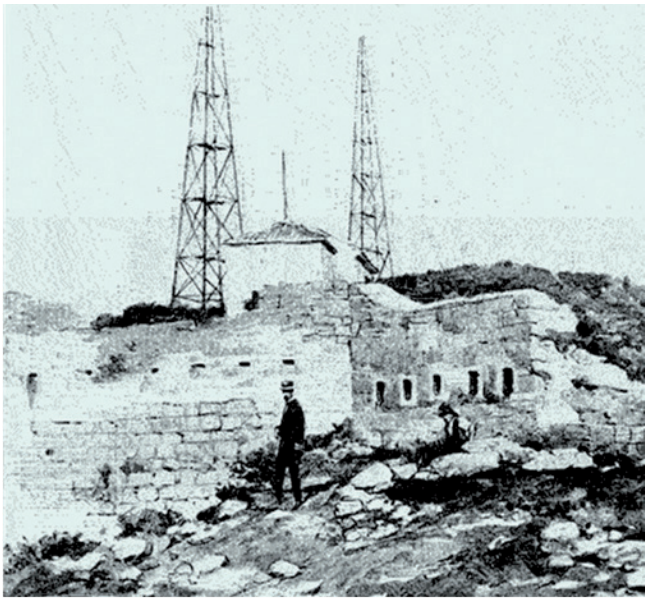
7.4 "RADIO INTELLIGENCE" IN THE ITALIAN AND AUSTRIAN ARMIES

The Austro-Hungarian Army's Experience

For a long time, even before WWI, the Austro-Hungarians had shown a large interest in listening to radio dispatches of potential enemies with particular focus on the Italian radio political and military communications.

The first interception operations carried out by the Imperial Royal navy aimed at detecting the preparation of new radio stations on the Adriatic coastline, and the movements of the first Italian warships equipped with radio systems. This activity intensified after completion of the radiotelegraphic station in the port of Pula and between 1908 and 1909, during the critical times of Bosnia-Herzegovina annexation to the Austro-Hungarian Empire, when the relations with Italy, already critical due to the well-known issue of "unredeemed" territories, became progressively worse.

After that period, surveillance on Italian radio correspondence was continuous and tireless. Maximilian Ronge - a Major then Head of the Investigative Group of the Evidenzbureau (Kundschaft gruppe) - tried to interpret with considerable personal efforts a "large amounts of foreign dispatches received and sent by the Antivari radio station, in Montenegro, (picture 7.7) that had been intercepted by our (Austrian, A/N) navy"[32].



7.7 Antivari station implemented by G. Marconi in 1904 to connect Italy (Bari) and Montenegro (ISCAG Archive)

Austrian eavesdropping peaked with the Italian expedition in Libya and started "on the military side, since 24 September 1911"[33]. The same year, in order to speed

stations were detected near Trento and Riva del Garda (Intelligence Office, *Memorandum 599* of 22 April 1914 and 767 of 2 October 1914, AUSSME, Series F4, env.12).

[31] Directorate of the Milan Engineer Corps, *Stazione radiotelegrafica nell'Albergo Ticino in Chiasso* (Radiotelegraphic station in the Ticino Hotel, Chiasso), 13 February 1915, AUSSME, Series F4, env.7.

[32] M. Ronge, *Spionaggio*, *op. cit*., p. 61.

[33] M. Ronge, *Spionaggio*, *op. cit*. p. 62. The Investigative Team of the *Evidenzbureau* developed considerably in the period before WWI, also thanks to the overall intelligence activities carried out against Italy but also in the Russian and Serbian scenarios. In fact, the Russian and Balkan intelligence sub-groups were created soon after the Italian.

up the interpretation of a large quantity of intercepted telegrams, Ronge set up a decryption service (Dechiffrierdienst) initially comprising just one person, the above-mentioned Captain Andrea Figl, who mastered the Italian language and "until the end of the war, with the exception of brief periods, worked within the decrypting service against Italy, developing undeniable expertise in this field"[34]. Moreover, Ronge tried to get as many Italian codes as possible, to facilitate decrypting of the intercepted radio dispatches piling up in the archives.

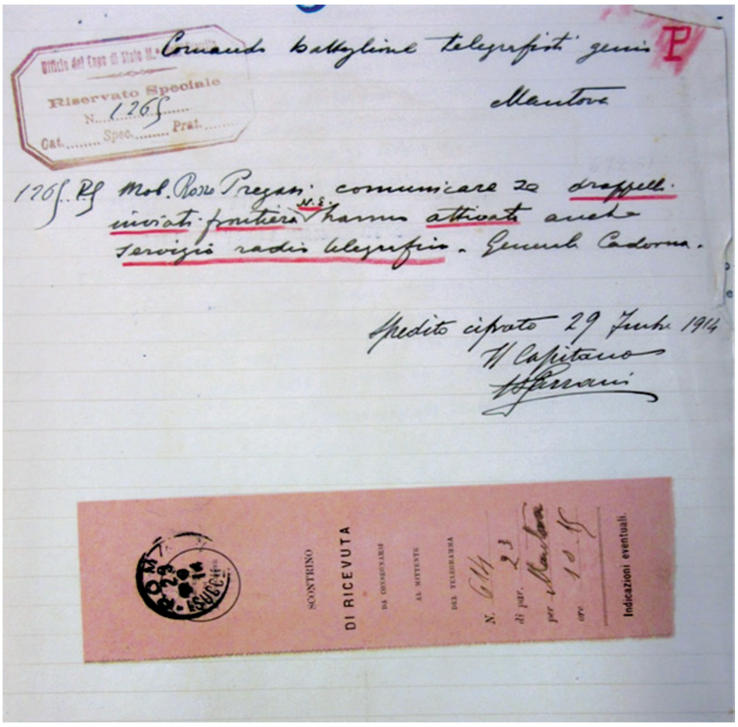
Finally, after August 1914 Austro-Hungarian analysts had joined Russian and Balkan fronts, developing a considerable experience in breaking enemy field ciphers, which proved useful in order to decrypt Italian dispatches.

In August 1914, the Austro-Hungarians army was equipped with 13 fixed transmitting and receiving stations and 13 field stations, assigned to the Supreme Command (AOK) and to the Armies' Headquarters. Later they acquired low power equipment easily transportable on difficult terrains, such as mountain areas, utilizing 11 of them on the Italian front for interception purposes since November 1915[35]. Being convinced that listening to enemy radio communications would lead to considerable competitive advantage, the Austro-Hungarian used their radio resources more to intercept enemy communications than for communicating between units of their own army.

Italian Troubles

Right before the war, the Italian Supreme Command was aware of the importance to intercept Austro-Hungarian radio communications, as shown by the correspondence that the Headquarters of the General Staff Corps sent to the Mobilization Office in August 1914, to request that "the fixed radio stations of Treviso, Arsiero, Primolano, Pieve di Cadore and Osoppo" be mainly dedicated to a "convenient listening service by intercepting radiotelegraphic communications". The interest of General Cadorna in immediately launching this activity is demonstrated by a telegram (picture 7.8) which urged to deploy the required personnel to manage those stations[36].

However, contrary to what happened in the Austrian army, the Italian General Staff Corps



Comando battaglione telegrafisti genio
Mantova

Riservato Speciale
N. 1265

1265 R.S. Mob. Rosso Pregasi comunicare 20 drappell. inviati frontiera N.E. hanno attivato anche servizio radio telegrafico. Generale Cadorna.

Spedito cifrato 29 Luglio 1914
Il Capitano

SCONTRINO DI RICEVUTA
N. 614 di par. 23 per Mantova ore 10.15
Indicazioni eventuali

7.8 Request by General Cadorna to initiate the radio interception service at the Eastern border

[34] M. Ronge, *Spionaggio, op. cit*. p. 178.
[35] M. Ronge, *Die Radiohorch*, *op. cit*. p.1 - 2.
[36] AUSSME, Series F3, env.52.

did not create a specific organization to decrypt dispatches even though the tasks assigned to the Intelligence Office in April 1915 included the the decryption - when possible - of documents taken from the enemy[37]. Poor cryptographic knowledge of the entire intelligence sector clearly emerged during the first months of war, when no officer of this sector managed to decrypt any enemy's encoded dispatches.
As a partial justification of the Italian Army's lack of cryptologic knowledge, the insufficient culture of the whole Country in this domain could be mentioned. According to David Kahn, "Italy was about as interested in cryptology as it was in say, social reforms"[38]. Nevertheless he acknowledges that at that time most other European Armies took part in the same "parade of cryptologic ignorance", even though some of them, namely the French, the Austrian and partly the Russian army were more prepared than others in this field. In fact, before the war, "there was no organized military cryptanalytic bureau in any country, except France and Austria-Hungary"[39].
The same inadequacy concerns the preparation of the codes and ciphers of the Italian army. Under the regulations in force, their creation was not a responsibility of the Intelligence Office which had only to select the keys, as the existing ciphers were perhaps considered sufficient or because the creation of new ciphers could presumably be assigned to another organization, which did not actually exist.

7.5 MOBILIZATION CODES AND CIPHERS

As for most other Armies, two kinds of large diffusion cryptographic systems were in service at the mobilization of the Italian Army, respectively for communications among high level Headquarters and for communications with and between minor units.
Within the first category, after the war in Libya three codes had been used meeting different levels of secrecy, depending on their dissemination: the fewer copies printed and distributed the higher the level of secrecy achieved. The *Red Code* - also called the Red cover book - considerably widespread had the lowest level of confidentiality, while the *Blue Code* used for reserved communications was considered more secret. An even higher level of secrecy belonged to the *Green Code* reserved for strictly secret telegrams.
The mobilization ciphers list included the *Pocket Military Cipher* for communications between subordinate units.
Moreover, the radiotelegraphic sections of the Supreme Command of the Armies and of Cavalry Units had a *Service Cipher* applied not only for coding service communications between radio stations, but also to encode and decode dispatches originated by Headquarters.
The following paragraphs describe the structure of the two most common mobilization systems, namely the *Red Code* and the *Pocket Military Cipher*. Other codes available during the mobilization phase as well as the *Service Ciphers* will be discussed in the following chapter.

[37] *Norme generali per la costituzione e il funzionamento del Comando Supremo Unificato* (General Rules for creation and functioning of the Unified Supreme Headquarters*),* AUSSME, Series L3, env.48; M. G. Pasqualini*, Carte segrete dell'Intelligence italiana,* Parte quinta, dal 1914 al 1918, p. 258.
[38] D. Kahn, *op. cit*., p. 263.
[39] *ibidem.*

The Red Code

The second edition of the *Red Code*, published on 30 June 1915, derived directly from the first edition of 1898, when the Intelligence Office included only one Official, the Colonel Felice De Chaurand de Saint Eustache. The new edition of the *Red Code* - which the Austrians called '*Red 15*' - differs slightly from the 1898 one, because of some amendments and additions.

It could be preliminary remarked that this Code, like the *Pocket Military Cipher* had been in service for many years already, providing the Intelligence of potential enemy Countries with the opportunity to steal them, in addition with offering a considerable quantity of homogeneous cryptographic material. Regardless of their cryptographic validity, it would have been imperative to completely replace all codes and ciphers at the beginning of the war, to avoid serious risks on the communication security.

The cover and the first page of the 1915 edition (picture 7.9) show that the *Red Code* was a publication of the Ministry of War[40]. The book was distributed to many bodies, including the Presidency of the Council of Ministers, the major Ministries, the Office of King's aid-de-camp, the Headquarters of the armies, of army corps and divisions, down to several lower-level units, such as military healthcare directorates and some hospitals. The number of circulating copies amounted to a few thousand, not always used in a rigorous manner, with serious consequences for the protection of the secrecy, which had been in any case compromised long before the war because of the acquisition by the Evdenzbureau.

7.9 Cover and first page of the Red Code

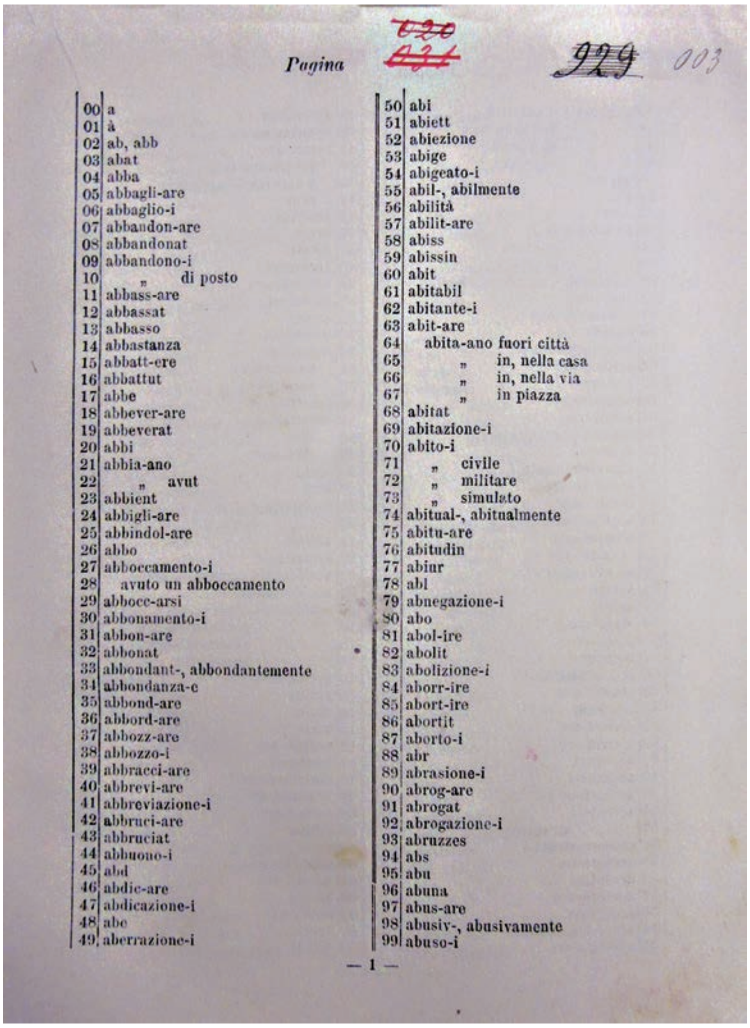
From a cryptographic point of view, the *Red Code* belongs to the category of 'one-part paged code'[41]. It was regular because to each plaintext items (words, numbers, short sentences, etc.) following an alphabetical order, corresponds an orderly progressive group of five digits (code group). Three digits represent the progressive number of pages, reason of the 'paged' name given to the code. The other two digits identify 100 items on each page, corresponding to numbers from 00 to 99 in ascending order on odd pages and to numbers from 99 to 00 in descending order on even pages[42].

The 1915 edition comprises a 235 pages dictionary and an appendix listing the names of the General Officers of the Army and Admirals still serving as of the date of reprint, the ships of the Royal navy, the radio stations and semaphores, geographical names (country towns, regional

[40] Some specimens of the Red Code are preserved in AUSSME, Series F3, env.28.
[41] In the following the short term 'paged code' is often used.
[42] Several "Commercial codes" available on the free market and private and business telegraphy, were paged codes.

capitals, etc.), for a total number of pages amounting to 252. Many positions are empty and allow new items or 'nulls', as groups with no meaning, to be included into dispatches[43].

According to a procedure commonly adopted for increasing the secrecy of paged codes, the page numbering used in coding and decoding could differ from the strictly progressive numbering shown at the bottom of each page. In the first page of the dictionary (picture 7.10) the page numbers written manually and erased at the top of the page lead to infer that, during the service period of this copy, the numbering changed four times[44]. However, page numbering could not be modified in a disorderly manner because this would generate considerable difficulty for decoding operators. Therefore, one had to adopt a partially random order - for instance ascending or descending - and skip some numbers, as allowed by the fewer pages than the thousand combinations between 000 and 999[45].



Pagina ~~020~~ ~~021~~ ~~929~~ 003

00	a	50	abi
01	à	51	abiett
02	ab, abb	52	abiezione
03	abat	53	abige
04	abba	54	abigeato-i
05	abbagli-are	55	abil-, abilmente
06	abbaglio-i	56	abilità
07	abbandon-are	57	abilit-are
08	abbandonat	58	abiss
09	abbandono-i	59	abissin
10	" di posto	60	abit
11	abbass-are	61	abitabil
12	abbassat	62	abitante-i
13	abbasso	63	abit-are
14	abbastanza	64	abita-ano fuori città
15	abbatt-ere	65	" in, nella casa
16	abbattut	66	" in, nella via
17	abbe	67	" in piazza
18	abbever-are	68	abitat
19	abbeverat	69	abitazione-i
20	abbi	70	abito-i
21	abbia-ano	71	" civile
22	" avut	72	" militare
23	abbient	73	" simulato
24	abbigli-are	74	abitual-, abitualmente
25	abbindol-are	75	abitu-are
26	abbo	76	abitudin
27	abboccamento-i	77	abiur
28	avuto un abboccamento	78	abl
29	abbocc-arsi	79	abnegazione-i
30	abbonamento-i	80	abo
31	abbon-are	81	abol-ire
32	abbonat	82	abolit
33	abbondant-, abbondantemente	83	abolizione-i
34	abbondanza-e	84	aborr-ire
35	abbond-are	85	abort-ire
36	abbord-are	86	abortit
37	abbozz-are	87	aborto-i
38	abbozzo-i	88	abr
39	abbracci-are	89	abrasione-i
40	abbrevi-are	90	abrog-are
41	abbreviazione-i	91	abrogat
42	abbruci-are	92	abrogazione-i
43	abbruciat	93	abruzzes
44	abbuono-i	94	abs
45	abd	95	abu
46	abdic-are	96	abuna
47	abdicazione-i	97	abus-are
48	abe	98	abusiv-, abusivamente
49	aberrazione-i	99	abuso-i

— 1 —

7.10 First page of the Red Code dictionary

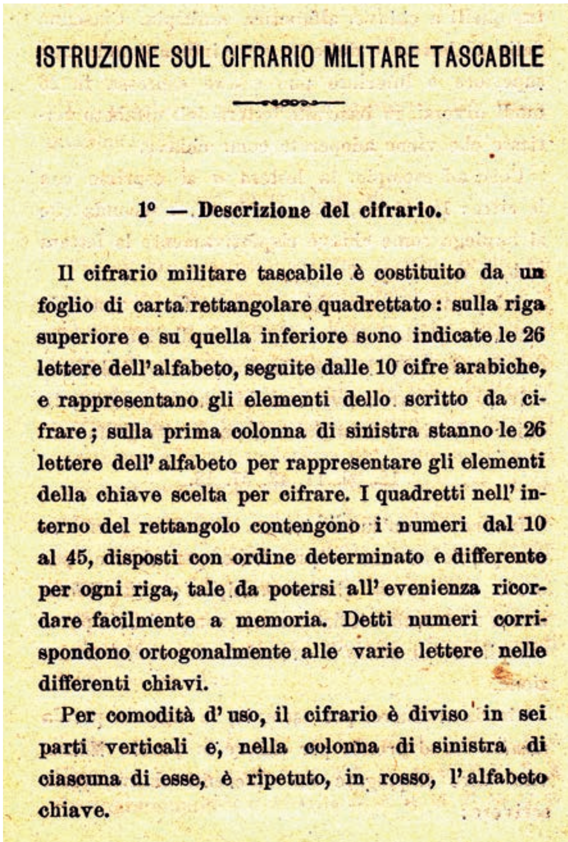
Of course, experienced analysts, especially with the code in their hands, could identify an ordered numbering of this kind.

In all codes, including paged ones, protection against decryption could be greatly increased by adopting a 'double-encoding' or 'overencoding', achieved by transposing figures within each group or by adding or subtracting numbers that could vary according to established keys. The following chapters will illustrate the various methods adopted for trying to increase the *Red Code* security after 1915, until the introduction, in the summer of 1917, of encoding-decoding tables that resulted much more effective than mere overencoding to counter enemy decryption.

[43] Such a trick, along with the skilful use of homophones - namely several groups corresponding to one letter, syllable or word selected amongst the most frequent ones - would have made breaking the code much more difficult.

[44] AUSSME, Series F2, env.28. In one specimen therein "Supreme Headquarters" is written.

[45] This rule applies to any numbering in the examined codebooks. Some examples of numbering as follows: first example: 003, 008, 011, etc. up to 891, 893; second example: 929, 925, 919, etc. up to 091, 099.


ISTRUZIONE SUL CIFRARIO MILITARE TASCABILE

1° — Descrizione del cifrario.

Il cifrario militare tascabile è costituito da un foglio di carta rettangolare quadrettato: sulla riga superiore e su quella inferiore sono indicate le 26 lettere dell'alfabeto, seguite dalle 10 cifre arabiche, e rappresentano gli elementi dello scritto da cifrare; sulla prima colonna di sinistra stanno le 26 lettere dell'alfabeto per rappresentare gli elementi della chiave scelta per cifrare. I quadretti nell'interno del rettangolo contengono i numeri dal 10 al 45, disposti con ordine determinato e differente per ogni riga, tale da potersi all'evenienza ricordare facilmente a memoria. Detti numeri corrispondono ortogonalmente alle varie lettere nelle differenti chiavi.

Per comodità d'uso, il cifrario è diviso in sei parti verticali e, nella colonna di sinistra di ciascuna di esse, è ripetuto, in rosso, l'alfabeto chiave.

7.11 Cover and first instructions page of the Pocket Military Cipher

The Pocket Military Cipher

In 1901, when the Headquarters of General Staff decided to also provide subordinate units of the Italian army with a cipher, Felice De Chaurand de Saint Eustache presumably created the *Pocket Military Cipher*. The 1915 edition directly stemmed from the 1901 (picture 7.11) edition with some minor changes in the instruction manual. The Instructions of 1915 edition openly state that "the two mobilization coding systems of the Army - the *Pocket Military Cipher* and the *Red Cover* dictionary - were in use since peacetime by various Arms, Corps and Services"[46], further specifying that "Commands at the lower level than Division were equipped with the *Pocket Military Cipher* only, while higher-level commands had both"[47].

The *Pocket Military Cipher* required for its practical appliance just one table (picture 7.12) contained in single page which could be folded and held in one's pocket. In addition, it was easy to reconstruct, as necessary for communications of units operating in forwards areas of the front line. This cipher adopts a poly-alphabetic literal substitution method where each plaintext letter or number is replaced by a letter or symbol of another alphabet that varies according to a set key, as in the 'square table' improperly called Vigenére table. The *Pocket Military Cipher* differs from the original Vigenére because, instead of the letter of the alphabet comprised in the square table,

[46] Ministry of War, Headquarters of the General Staff Corps, *Istruzione sul Cifrario Militare Tascabile* (Instructions for the Pocket Military Cipher) Rome, January 1901 (reprint June 1915), p 11, 12, AUSSME, Series H 5, env.11.

[47] Lower-level Headquarters are: Brigade HQ of the Royal Carabineri, of Infantry and of Cavalry; Regiment HQ of the Royal Carabinieri, of Infantry, of the Bersaglieri and of the Alpini battalion; HQ of the Artillery, of the Engineer Corps, of the Medical Commissariat of Army Corps; Bycicle Company HQ; Regional HQ and Costline Company HQ; Fort HQ.

	A	B	C	D	E	F	G	H	I	J	K	L
A	10	11	12	13	14	15	16	17	18	19	20	21
B	45	10	11	12	13	14	15	16	17	18	19	20
C	44	45	10	11	12	13	14	15	16	17	18	19
D	43	44	45	10	11	12	13	14	15	16	17	18
E	42	43	44	45	10	11	12	13	14	15	16	17
F	41	42	43	44	45	10	11	12	13	14	15	16
G	40	41	42	43	44	45	10	11	12	13	14	15
H	39	40	41	42	43	44	45	10	11	12	13	14
I	38	39	40	41	42	43	44	45	10	11	12	13
J	37	38	39	40	41	42	43	44	45	10	11	12
K	36	37	38	39	40	41	42	43	44	45	10	11
L	35	36	37	38	39	40	41	42	43	44	45	10
M	34	35	36	37	38	39	40	41	42	43	44	45
N	33	34	35	36	37	38	39	40	41	42	43	44
O	32	33	34	35	36	37	38	39	40	41	42	43
P	31	32	33	34	35	36	37	38	39	40	41	42
Q	30	31	32	33	34	35	36	37	38	39	40	41
R	29	30	31	32	33	34	35	36	37	38	39	40
S	28	29	30	31	32	33	34	35	36	37	38	39
T	27	28	29	30	31	32	33	34	35	36	37	38
U	26	27	28	29	30	31	32	33	34	35	36	37
V	25	26	27	28	29	30	31	32	33	34	35	36
W	24	25	26	27	28	29	30	31	32	33	34	35
X	23	24	25	26	27	28	29	30	31	32	33	34
Y	22	23	24	25	26	27	28	29	30	31	32	33
Z	21	22	23	24	25	26	27	28	29	30	31	32
	A	B	C	D	E	F	G	H	I	J	K	L

	M	N	O	P	Q	R	S	T	U	V	W	X
A	22	23	24	25	26	27	28	29	30	31	32	33
B	21	22	23	24	25	26	27	28	29	30	31	32
C	20	21	22	23	24	25	26	27	28	29	30	31
D	19	20	21	22	23	24	25	26	27	28	29	30
E	18	19	20	21	22	23	24	25	26	27	28	29
F	17	18	19	20	21	22	23	24	25	26	27	28
G	16	17	18	19	20	21	22	23	24	25	26	27
H	15	16	17	18	19	20	21	22	23	24	25	26
I	14	15	16	17	18	19	20	21	22	23	24	25
J	13	14	15	16	17	18	19	20	21	22	23	24
K	12	13	14	15	16	17	18	19	20	21	22	23
L	11	12	13	14	15	16	17	18	19	20	21	22
M	10	11	12	13	14	15	16	17	18	19	20	21
N	45	10	11	12	13	14	15	16	17	18	19	20
O	44	45	10	11	12	13	14	15	16	17	18	19
P	43	44	45	10	11	12	13	14	15	16	17	18
Q	42	43	44	45	10	11	12	13	14	15	16	17
R	41	42	43	44	45	10	11	12	13	14	15	16
S	40	41	42	43	44	45	10	11	12	13	14	15
T	39	40	41	42	43	44	45	10	11	12	13	14
U	38	39	40	41	42	43	44	45	10	11	12	13
V	37	38	39	40	41	42	43	44	45	10	11	12
W	36	37	38	39	40	41	42	43	44	45	10	11
X	35	36	37	38	39	40	41	42	43	44	45	10
Y	34	35	36	37	38	39	40	41	42	43	44	45
Z	33	34	35	36	37	38	39	40	41	42	43	44
	M	N	O	P	Q	R	S	T	U	V	W	X

	Y	Z	1	2	3	4	5	6	7	8	9	0
A	34	35	36	37	38	39	40	41	42	43	44	45
B	33	34	35	36	37	38	39	40	41	42	43	44
C	32	33	34	35	36	37	38	39	40	41	42	43
D	31	32	33	34	35	36	37	38	39	40	41	42
E	30	31	32	33	34	35	36	37	38	39	40	41
F	29	30	31	32	33	34	35	36	37	38	39	40
G	28	29	30	31	32	33	34	35	36	37	38	39
H	27	28	29	30	31	32	33	34	35	36	37	38
I	26	27	28	29	30	31	32	33	34	35	36	37
J	25	26	27	28	29	30	31	32	33	34	35	36
K	24	25	26	27	28	29	30	31	32	33	34	35
L	23	24	25	26	27	28	29	30	31	32	33	34
M	22	23	24	25	26	27	28	29	30	31	32	33
N	21	22	23	24	25	26	27	28	29	30	31	32
O	20	21	22	23	24	25	26	27	28	29	30	31
P	19	20	21	22	23	24	25	26	27	28	29	30
Q	18	19	20	21	22	23	24	25	26	27	28	29
R	17	18	19	20	21	22	23	24	25	26	27	28
S	16	17	18	19	20	21	22	23	24	25	26	27
T	15	16	17	18	19	20	21	22	23	24	25	26
U	14	15	16	17	18	19	20	21	22	23	24	25
V	13	14	15	16	17	18	19	20	21	22	23	24
W	12	13	14	15	16	17	18	19	20	21	22	23
X	11	12	13	14	15	16	17	18	19	20	21	22
Y	10	11	12	13	14	15	16	17	18	19	20	21
Z	45	10	11	12	13	14	15	16	17	18	19	20
	Y	Z	1	2	3	4	5	6	7	8	9	0

7.12 The table of Pocket Military Cipher

it employs an alphabet of numbers from 10 to 45. Moreover, to the 26 alphabet letters in the first line it adds the numbers from 0 to 9; this accounts for the rectangular rather than square shape of the table.

To encode and decode a dispatch, as with the Vigenére cipher, both the sender and the addressee had to share a key word made of letters only. For coding operation, the sender writes on a separate sheet, over each letter or number of the plaintext dispatch, the letters obtained by repeating the key word until all words to be transmitted are covered. Then he reads the first plaintext letter or number on the first line at the top of the table or the last line at the bottom of the table in picture 7.12. Then, in the vertical lines in red, the coder looks for the letter in the key sequence that was over the plaintext letter in the separate sheet. At the crossover between the column and line thus selected he could find the first code number. For instance, if P is the plain text letter and M the corresponding letter in the key sequence, in the table of picture 7.12, one obtains the number 13. After repeating this procedure for the entire dispatch, the coder collects the numbers obtained to form groups of five figures, included in the cryptogram.

For decoding the opposite process is used. The letters of the key sequence and the couple of received numbers are written on a separate sheet then the two values are searched on the table and combined to trace back each plaintext letter or number.

The Vigènére table[48], like the ciphers deriving from it, was considered indecipherable from the 16th century until, as already mentioned, Charles Babbage in 1846 and then Friedrich Kasinski in 1863

[48] The square table called Vigénère table derives from ciphers defined in the 15th and 16th century by eminent humanists like Leon Battista Alberti, Giovan Battista Bellaso and Giovan Battista Della Porta.

identified a decryption method. In 1883, Auguste Kerckoffs created another method that could be useful only when one had many dispatches of equal lenght coded by the same key[49].
Yet, by adopting keys with appropriate length and characteristics, for instance long as the dispatch and variable from one dispatch to the next, the work of enemy analysts becomes much more difficult, even when they had the basic table.
The instruction manual for the *Pocket Military Cipher* deals with the keys and suggests - appropriately - that they would change frequently[50]. However, no instruction is provided about the length of the keys, so that the short keys distributed every five days by the STM Inspectorate, facilitated quick decryption of Italian dispatches.
Moreover, the same manual contains a serious cryptographic error as it recommends ciphering just “very few words in a message”[51], in order to make encoding and decoding operations faster and easier. As a matter of fact, this procedure was applied during the early months of the war - and not only to dispatches coded with the *Pocket Cipher* - greatly helping their decryption process.
In his memoirs, General Ronge expressed some criticism about the use of that cipher also because, as he writes, “Italians had been aware of its weaknesses since 1901”. Therefore, he wonders why they had not changed it[52]. The validity of Ronge’s statement is out of question, but it could be fully accepted if the Austrians had not employed ciphers analogous to the Italian one, as will be discussed further ahead.
Andreas Figl, noticed the small number of the intercepted radio dispatches coded by the *Pocket Military Cipher*, limited to “communications on the front line and, in any case, rare”, consistent with the initial limited diffusion of radio communication in the subordinate units[53]. When between late 1917 and early 1918, radio communications started being widespread inside Italian Divisions, ciphers much harder to break than the Pocket one had already replaced it.

7.6 THE CODE SUK

The Italian Codes and Ciphers Purchasing

Intelligence’s most obvious method to overcome, at least in part, the difficulty of breaking codes, consisted of acquiring them via one of the many available channels.
During WWI, the most common way was the seizure, usually during or immediately after battles, of the mostly diffused ciphers or coding-decoding tools, such as table, grilles, ciphering discs, rulers, trench codes, etc. In case of major turmoil, the gaining also included bulkier and more complex codes.

[49] As already mentioned, the Babbage - Kasinski and the Kerckoffs methods are based upon the reduction of poly-alphabetic systems to mono-alphabetic systems which can be solved by means of frequency analysis. The Babbage - Kasinski method consists in determining the length of a key exploiting repetitions of coding groups and then in dividing cryptograms into blocks whose length equals the length of the key. Since the first letters of each block are all coded with the same key letter and the same applies to the following, it is possible to apply mono-alphabetic system decryption methods to each set made up of the first letters, the second letters, etc. In the Kerckoffs method the same procedure applies when one has several cryptograms with the same length that can be juxtaposed. Thus, all letters in the first column are supposed to be coded with the same key letter, the letters in the second column are coded with the second key letter, and so on.
[50] For instance, the circular letter of the Supreme Headquarters in 1916 reports the following keys for the next month of May: Isonzo, Plezzo, Sile, Padua and Brenta (Very confidential circular letter of the Supreme Headquarters no. 8544 of 23 April 1916).
[51] *Istruzione sul Cifrario Militare Tascabile, op. cit.,* p.15.
[52] M. Ronge, *Der Radiohorch*, op cit., p. 51.
[53] Andreas Figl*, op. cit.,* p. 85.

In the previous peace period, codes would be seized in the most diverse ways, from commissioned theft to casual acquisition due to lack of care of the owner. However, the most frequent method was the purchasing at a picturesquely defined 'code suk', where sellers might be one or more disloyal officials, or free-lance agents who had somehow got hold of such valuable merchandise.
Potential advantages were of course proportional to the size and complexity of the codes. Therefore, the underground contention between intelligence services, dating back to a period well before the war, mainly aimed at diplomatic or high commands big codes.
In terms of cryptography, the years between 1900 and 1914 can be defined as "the era of stolen codes". Vienna seemingly was the centre of this activity[54] and, in fact, David Kahn could ironically point out: "in the […] world of pre - war eastern Europe, codes and ciphers were bid up and up like speculative shares in a stock market boom. Heading the list were those of Austria-Hungary which, at the crossroad of Europe, was a virtual ants' nest of espionage"[55].
However, the Italian Intelligence Service was not able to profit from any opportunity to seize Austrian codes, even in such an outrageous instance as the one involving the Austrian Colonel Alfred Redl - mentioned in one of the previous chapters.
Conversely, the Evidenzbureau showed a particular skill in getting, during the years preceding the war, the diplomatic and military codes of other important European countries, including Italy: in 1912 Ronge purchased the *Pocket Military Cipher* and immediately later the *Red Code*. In 1914, the Austrian Officer scored another success when he got hold of the *Carabinieri's Special Code*, a one-part vocabulary with code groups made of three figures, therefore containing a maximum of a thousand words.
When the war began, the Italian codes available to the Austro-Hungarian decryption service included the *Telegraphic Dictionary* of the Royal navy and the *Mengarini* commercial code, not only the version in free commerce but eventually that modified by the Italian army[56].
The procedure was seemingly different for the Italian diplomatic code knowledge. In this regard, O. Marchetti reports an episode than would have facilitated its breaking:

> On a certain day of 1913, the Italian Ambassador in Vienna visited the Austrian Ministry for Foreign Affairs and forgot a briefcase containing the text of a plaintext telegram with the related coded translation. It seems that the cipher used for that telegram was exactly one of the K-type codes that were for the most part interpreted later[57].

Possession of all this material provided the Austrian, in the early phase of war, with a considerable cryptologic advantage that would also inevitably impact on the following events.

Comint Vs Humint

In Figl's memoirs and in many other Austrian papers cited in the first chapter, the pre-war acquisition of Italian codes is not clearly mentioned, contrary to what Ronge reported in his 1930

[54] F. Pratt, *Secret and Urgent, The Story of Codes and Ciphers*, Blue Ribbon Books, Garden City, N.Y.,1939, p. 231.
[55] D. Kahn, *op. cit*. p.263. One Ronge's book is completely devoted to the description of several espionage operations performed by Italy, Russia, Serbia and Romania against the Austro-Hungarian Empire in the pre-war period and during the war (Max Ronge, *Les maitres de l'Espionnage,* Payot, Paris, 1935).
[56] M. Ronge, *Spionaggio*, *op. cit*. p.177; M. Ronge, *Die Radiohorch*, *op.cit*. p.49. It is not clear which of the many editions of the Mengarini code, both commercial and military, Ronge had purchased.
[57] Intelligence Service, *Attività dei Reparti crittografici dell'esercito austro ungarico durante la guerra* (Actvities of the cryptographic units of the Austro-Hungarian army during the war), Ref. N. 951/A of 14 March 1919, signed by O. Marchetti, AUSSME, Series H4, env.65.

book and in the 1943 memoirs. As regards the *Red Code*, Figl takes familiarity with the 1898 edition for granted, underlining its differences with the 1915 editions. Moreover, in both his book and memoirs, he only recalls the seizure of several copies of the *Pocket Military Cipher* during the Austrian attack in the spring of 1916 (Strafexpedition), while he never mentions what Ronge openly writes about the attainment of this cipher and other ones during peacetime[58]. One could wonder whether Ronge had told his colleagues about the codes holding or had kept them in the dark to test their ability or, in sports terms, to train them in the view of more arduous challenges[59]. This assumption is implausible for the Pocket Military because its instruction manual had been translated into German and printed by the Evidenzbüreau in 1912[60]. Concerning this cipher, it is worth recalling David Kahn's ironic remark pointing out that Ronge had no reason to be glad (about the acquisition, A/N) "since it has been a complete waste of money". In fact, he adds that Ronge's excellent fellow analysts would have had no difficulty interpreting dispatches coded by a system for which well-known decryption methods had existed for decades[61].
On the other hand, the bribing of other Italian ciphers and codes made decryption of intercepted dispatches considerably easier and faster. Ronge himself acknowledged this in recalling the "precious contribution" that the acquisition of "three ciphers of the Italian Army (presumably the *Red Code*, the *Pocket Military Cipher* and the *Mengarini* code, A/N note) represented for the Austrian cryptographic Service. Without those, our work would have been delayed"[62].
Therefore, he implicitly admits sharing the three ciphers with his colleagues, which extinguishes any doubt regarding the matter. However, he also adds that the delay mentioned above "would have been even greater without the expert contribution of Captain Figl to the codes and ciphers breaking activities, dating back to peacetime"[63].
In more general terms, skilfulness in the attainment of enemy codes has sometimes been stressed to hide the cryptologic proficiency of analysts, which had to be protected in view of prospective conflicts. For instance, British Intelligence services strategically attributed the successes achieved inside the legendary "Room 40" of the Admiralty to HUMINT operations. This occurred during the war, in occasion of the Zimmermann dispatch decryption, as well as in the post-war period, when the merits of radiogoniometry rather than cryptography were extolled, particularly with regard to the sea battles against the German navy[64]. Some authors even explained the partial initial breaking the famous 0075 German code - used for the Zimmermann dispatch - with the availability of some parts of the code that the young Austrian telegraphist Alexander Szek serving in the big German station of Brussels, had transmitted to the British Intelligence Office[65].
Conversely at times, crypto analysts would rather not talk about the support obtained through traditional intelligence methods, thus exalting their own skills, as was seemingly the case with Andreas Figl.

[58] *ibidem.*
[59] This kind of behaviour of persons in charge of Intelligence Services towards their own cryptologists was not unusual. For instance, right before World War II, Biuro Szyfrów, Chief of the Polish Biuro Szyfrów, knew the daily keys of the Enigma cipher thanks to the information provided by the German spy Hans-Thilo Schimdt. However, he carefully avoided to make this source known to the cryptologist Marian Rejewsk in order to spur him to the research finally leading to the famous "bombs".
[60] J. Pricowitsch, *Drahtlose Telegaphie, op. cit.* p.345. The publication is from the "Evidenzbüreau des k.u.k. Generalstabes K. Nr. 6500 aus 1912".
[61] D. Kahn, op. cit. p. 317.
[62] M. Ronge, *Die Radiohorch*, *op. cit.*, p. 15.
[63] *ibidem*
[64] A. Santoni, *op. cit*. p. 47 - 61.
[65] F. Pratt, *op. cit.,* p. 240 - 243.

CHAPTER EIGHT

The beginning of the COMINT battle

8.1 THE ITALIAN CRYPTOGRAPHY IN MID-1915

Codes With Different Levels of Secrecy

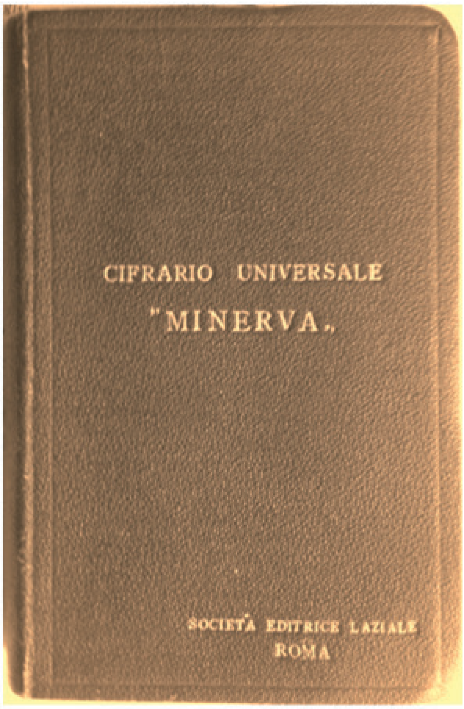
During the early months of the war, radio communications and related ciphers gradually began to be used by the Italian army.
The new *Red Code*, the most common and therefore less secure cipher, entered into force on midnight between 30 June and 1 July. To increase security, over-encoding was applied to some correspondence. A number at the beginning of the telegram, immediately after the reference number, informed the decoding operators that over-encoding had been applied[1].
On the same date, only a few authorities received the new *Blue Code*, made by only changing the numbering at the bottom of each page of the *Red Code*. Despite the ineffectiveness of this change to protect secrecy, it seems that Austro-Hungarian analysts reached the knowledge about the existence of the *Blue Code* only between August and September of 1917. This was probably due to its lower diffusion than the *Red Code* and its missing among the codes purchased by the Austrians before the war[2].
Furthermore, similarly to what had happened in other armies, the Italian army protected confidential communications between High Commands by means of systems with a higher level of secrecy, such as the *Green Code*, directly managed by the Intelligence Office and exclusively designed for communications between the Supreme Command and the Headquarters of the Armies. Upon mobilisation, only ten copies of the *Green Code* had been printed, stemming from a previous 1908 edition that had been revised significantly[3]. The Chief of the Encoding Service of the Supreme Command held one of the copies and few Officers had access to it.
The *Green Code* - a paged code, too - gradually spread to a limited extent over the following years for both wire and radio transmissions, yet Austrian sources mention the *Green Code* only once, but it does not coincide, in any case, with the code having the same cover colour and used by Italian High Commands[4].
General Cadorna, Chief of Staff, and his deputy General Carlo Porro were the only holders of a code with a still higher level of secrecy, and identified with the letters *FT*. This was used for

[1] Intelligence Service, Operations Division, Cipher Section, Service Order 69, *Varianti alla corrispondenza in cifra con l'Addetto Militare a Krakujevato (Serbia)* (Changes to the encoded correspondence with the military attaché in Krakujevato), 14 October 1915, AUSSME, Series F1, env.108. A coding group such as 28731 would be transmitted as 13782 and for increasing secrecy the order of coding groups would be inverted. Simple transpositions such as ROMA - AMOR, were not a cause of concern for Austrian analysts.
[2] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.186; M. Ronge, *Der Radiohorch, op cit.,* p.52a. The *Blue Code* had been used since the war of Libya and updated for mobilisation.
[3] Documentation of the Intelligence Office regarding the distribution of this code in February and March 1915 is in AUSSME, Series F3, env.52.
[4] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.165, 305. Figl mentions just once the *Green Code*, which is not that mentioned here because he associates it to Divisions communications with Brigades and Regiments. In fact, it coincides with the *Green Code* used since January 1918 within the 5th Army Corps.

confidential correspondence between them and the President of the Council of Ministers. When General Porro had asked to use a special system for that kind of correspondence, the President of the Council of Minister Antonio Salandra sent him the *FT Code*, which "has never been used before and is not available to any other authority"[5].

Several other codes with a different degree of dissemination, in use by the Italian army during the early months of the war, can be precisely listed being held by Encoding Service of the Supreme Command. They include the *Mengarini* code, the *Minerva Code*, the *CU* edited by the Ministry of the Interior and the *K15* of the Ministry of Foreign Affairs[6].

The already mentioned *Mengarini* code - a one-part paged code - had been modified by the Army long before the war and its frequently used 1913 edition was often mentioned as *M13*[7]. The Austro-Hungarian acquisition of this commercial code helped them in decrypting messages, although in some cases skilful over-encoding made analysts' work long and complex.



8.1 Cover of the Minerva code (8x12 cm)

Even if the use of commercial codes to protect military radio dispatches must be severely censured, yet it exists at least an example of such codes, adapted to military purposes, which eventually remained unbroken during the war. The *Minerva Code*, on the free market since 1904, was mentioned by Ronge only once amongst the codes used by the Italians in 1916, with a question mark in brackets[8].

The *Minerva Code* is a paged code of 571 pages containing more than 50,000 words, including the names of several plants, banks, and companies. The Encoding Services of the Supreme Command received a version of this code integrated with "several military and geographical terms" (Minerva T), in September 1915[9]. In December of the same year, the Commander of the Special Corps deployed to Albania, General Emilio Bertotti, received the code, now called *M.A.B.*, together with instructions to employ it only for direct correspondence with the Supreme Command Chief of Staff[10]. The Guardia di Finanza began using the Minerva Code in August 1918, as evident from the correspondence between different units[11]. Despite the code

[5] Secretariat of the Chief of Staff, Cipher Section, (Telegram to H.E. Salandra), 28 October 1915, signed General Porro; President of the Council of Ministers, Subject: *Shipping of codes, extremely confidential registered mail*, Re.no. 549, 28 October 1915, AUSSME, Series E2, env.26. Due to their limited spread, this kind of codes were not found in AUSSME and in other Archives.

[6] News regarding the Encoding Service reported in this paragraph were for the most part taken from the documents of the Section in AUSSME, Series F1, env.108. The list of ciphers as of 30 June is in the *Comunicazione di Servizio per gli Ufficiali addetti al Servizio Cifra* (Service communications for officers assigned to the encoding service) issued on the same day.

[7] The Encoding Office was also in possession of the 1898 and 1904 editions of the *Mengarini* codebooks.

[8] M. Ronge, *Die Radiohorch*, *op. cit.*, p. 52a.

[9] Supreme Headquarters, Secretariat, Encoding Service, *Comunicazione di Sevizio 62, Cifrario Minerva T*, 26 September 1915, AUSSME, Series F4, env.198. A copy of the entire *Minerva Code* was donated to the Author by Filippo Sinagra.

[10] Secretariat of the Chief of Staff, *Trasmissione di cifrario* (Transmission of a code), 1 November 1915, AUSSME, Series E2, env.16.

[11] Territorial legion of the Royal Guardia di Finanza of Milan, *Cifrari militari in uso presso la R. Guardia di Finanza* (Military Ciphers used by the Guardia di Finanza), 24 February 1917, AUSSME, Series F2, env.17; *Diari Sezione U*, 7 August 1918, AUSSME, Series B1,101D, Vol.362d.

length, which is almost double compared to other Italian commercial codes, its little pocketsize, due to the very small fonts, is shown in picture 8.1.
Among the reasons why the *Minerva* code remained apparently unbroken, its limited dissemination with consequent shortage of cryptographic material available to Austrian analysts, can be included. Moreover, this code does not appear amongst those acquired by the Evidenzbureau before the war, which once again proves the impact of those purchases on the cryptographic war.
The *CU* (Universal Code, not to be confused with the *Minerva* Code also called universal), was a paged code published in 1913 by the Ministry of the Interior, and largely widespread in Italy and abroad at Embassies and Consulates. The Army used it only for communications with the Ministry of the Interior.
A specific discussion - which is beyond the purpose of this book - could concern the history of Italian diplomatic codes of the K series, which progressed from *k15* to *k20* in the years between 1915 and 1918.
In summary, despite that, from the early phases of the conflict and throughout the war, some highly confidential codes had 'escaped' Austrian analysts, most of the codes available in 1915 to the Army and other bodies of the State, had two characteristics in common which made them scarcely secure, namely:
longevity, as they had been used for years, with a large probability that they were known to the enemy,
regularity, as they mostly belonged to the category of 'one-part paged codes'.
Moreover, the coding practices generally adopted during the first months after Italy's entering the war were harmful, to say the least, representing a further serious drawback.

Partial Coding

When the war began, radio traffic between field and fixed stations of the Army was not very intense, despite the Supreme Command encouraging the Armies not to "neglect this communication instrument" because it could be useful to "train the station personnel and to relieve to some extent the telegraphic service workload of ordinary telegraphic communications"[12]. This statement demonstrates the unawareness of some members of the Supreme Command of the most basic rules about Communication Security.
The same directive specified: "the dispatch coding is a responsibility of the sender unit; only when the sender does not have a code and asks the help of the radiotelegraph station, the last can encode the message by means of the Service Cipher". Since this circumstance happened quite frequently, many dispatches were coded by that method, even before starting to use *Red Code* and *Pocket Military cipher*. The STM Chief Inspector - who directed all radiotelegraphic sections in the war zone - was responsible for the *Service Cipher* and related keys[13].
The rules for *Service Cipher* employment provided to all radiotelegraphic stations, instructed for coding exclusively "the words necessary to avoid understanding the address and text of the dispatch"[14]. To this purpose the transmitting Headquarters had to underline the words to be coded, trying to limit the number of selected words.

[12] Supreme Headquarters, Operations Divisions, Communication to Army Corps of the Carnia region, Prot. No.611, del 18 June 1915, *Radiotelegraph communications service,* signed by the Assistant to the Chief of Staff Porro. AUSSME, Series F12, env.108.
[13] Colonel Natalino Mazzone was the Chief Inspector of the STM and was supported by Captain Ugo Levi, who were in charge until March 1917.
[14] Chief Inspector of STM, *Military History Journal - Service Order no 3*, 30 May 1915, AUSSME, Series,105 S, Vol. 87.

As a matter of fact, partial coding was a general custom dating back to the pre-war period and was applied to all dispatches transmitted via radio and wire, to cope with the scant availability of coding and decoding personnel within Headquarters and to reduce telegraphists' workload[15].
This helped enormously dispatch decryption so that Figl admits: "four years after the end of WWI, I sometimes think that our decryption operations would not have been so quick if complete ciphering had been applied from the very beginning (by the Italian, A/N)"[16].
The adoption of partial coding by other armies including, sporadically, the Austro-Hungarian one, is not a justification[17].

The First 'Service Ciphers'

Austrian sources do not mention the fact that, in 1915, two types of service ciphers were introduced relying on code groups made respectively of figures or letters. The first type - commonly employed by all radio stations - remained in use from 30 May 1915 until April 1916, while the letters-based cipher, introduced in early August 1915 - initially reserved for short confidential communications between the Supreme Command and the Armies on the Isonzo frontline - was modified in April 1916 and from then on, extensively applied to replace the figures one. Until that date, the cipher based on groups of letters had remained unknown and unsolved by Austrian analysts, also due to its limited usage.
It does not seem that for these two ciphers the Italian radio telegraphists systematically employed any acronym usually included in dispatch preambles for helping the decoding process. Only in cases of possible confusion, the acronyms *CFN* and *CFL* were introduced for ciphers consisting of figures and letters, respectively[18].
Figl and his colleagues focused on the *CFN* during the early months of the war. Helped by partial ciphering and, according to what Ronge says, by the seizure of the instruction manual[19], they managed to decrypt Italian dispatches. The following description of the table structure was possible partially thanks to data from Austrian sources.
In *CFN*, alphabet letters, groups of two or three letters, numbers or entire words were replaced by code groups comprising two or three digits, which could be coupled in cryptograms to form numbers with 2 to 6 digits. This made the cipher immediately recognizable.
CFN comprises a main table and an auxiliary table. The main table contains one hundred items, displayed in very regular order, consisting of alphabet letters, two-letter groups with one consonant followed by a vowel and three-letter groups "qui, quo, qua, que", as shown in picture 8.2. Each of these items is coded by two digits corresponding respectively to the column and the line to which the item belongs[20].
By adding an initial digit varying from 2 to 9, the auxiliary table allows the items in the main table to be modified, performing the function specified in the column to the right of the auxiliary table. Adding "0", or "1" at the beginning of the code group indicates respectively the use of other two

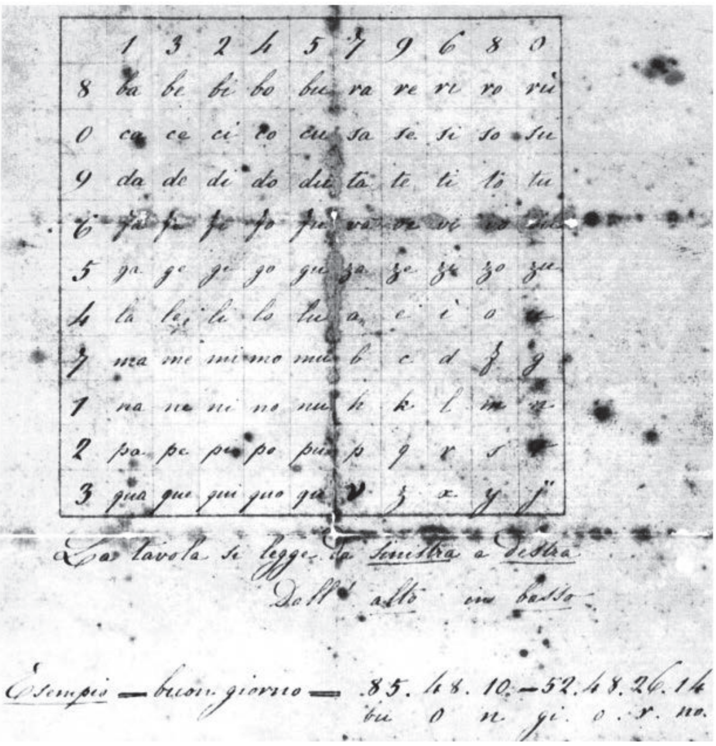
[15] Ministry of War, Secretary General, Staff Division, Circular regarding *Transmission confidentiality for telegrams and general correspondence,* 27 April 1918, AUSSME, Series E2, env.22.
[16] O. Horak, *Oberst a.D. Andreas Figl, op. cit*., p.96 - 97.
[17] M. Ronge, *Spionaggio*, *op. cit.* p. 49. The Author explains he had to deal with this kind of stupid behaviour of some Headquarters.
[18] Chief Inspector of STM, Military History Journal, Service Order *No.22 of* 26 August *1915,* AUSSME, Series B1,105 S, Vol.87.
[19] M. Ronge, Spionaggio op. cit. p. 177.
[20] For example, the "bi" is ciphered as either 43 or 34 depending on adopted conventional usage.

MAIN TABLE										
	0	1	2	3	4	5	6	7	8	9
0	a	b	c	d	e	f	g	h	i	j
1	ch	l	m	n	o	p	q	r	s	t
2	u	v	w	x	y	z	qua	que	qui	quo
3	ba	na	be	ne	bi	ni	bo	no	bu	nu
4	ca	pa	ce	pe	ci	p	co	po	cu	pu
5	da	ra	de	re	di	ri	do	ro	du	ru
6	fa	s	fe	se	fi	si	fo	so	fu	su
7	ga	ta	ge	te	gi	ti	go	to	gu	tu
8	la	va	le	ve	li	vi	lo	vo	lu	vu
9	ma	za	me	ze	mi	zi	mo	zo	mu	zu

AUXILIARY TABLE	
0	Common terms used in the Army
1	Telegraphic terms, figures, syllables
2	Inverted syllables
3	Insertion of 'i' in the middle
4	Insertion of 'm' at the beginning
5	Insertion of 'n' at the beginning
6	Insertion of 'n' at the end
7	Insertion of 'r' at the beginning
8	Insertion of 'r' in the middle
9	Insertion of 's' at the beginning

8.2 Simplified main table and auxiliary table of the Service Cipher based on groups of figures

tables including respectively one hundred military terms or one hundred mainly telegraphic terms. More simply, those terms may be inserted in two sub-rows of the main table. The functions of the auxiliary table are better illustrated in Annex A along with a table containing the military terms which, for the sake of clarity, are not shown in picture 8.2.



8.3 Cipher of the Mantua Plotters

The weakness of the cipher basically depends on the evident order of its structure.

For trying to increase *CFN* security, keys were applied, by frequently changing the sequence of figures in the first line at the top and in the first column on the left of the main table as well as in the first column of the auxiliary one[21]. Annex A shows that the keys used during the entire cipher life cycle were always well-ordered i.e., the numbers are in ascending or descending order, which further contributes maintaining regularity. The main table is evidently and surprisingly alike to the so-called *Mantua Plotters' Cipher*, dating back to the 19th century, held at the State Archive in Mantua, and shown in picture 8.3. It is also

[21] The keys were changed five times in 1915 and once in February 1916. (Chief Inspector of STM, Military History Journal, *Service order No.16 of 4 July 1915; Service order No.24 of 13 August; Service order No.28 of 22 September; Service order No.29 of 20 October; Service order No.35, of 11 December; Service order No.38, of 9 February 1916.* AUSSME, Series B1,105 S, Vol. 87 e 88). The days of the keys' changes were respectively: 10/7, 20/8, 30/9, 31/10, 20/12 of 1915 and 20/2 of 1916. When the cipher was first adopted on 30 May 1915 no key was apparently used.

evident that the keys used by the Plotters were not ordered and therefore the system results more resilient to decryption compared to the *Service Cipher*. No one knows whether Austrian analysts retained some memories about the Plotters' Cipher, which perhaps had been broken by their ancestors.
On the contrary, there is no evidence that the letter cipher delivered on 6 August 1915 to "the mobile stations of the 2nd and 3rd Armies and to the Supreme Command" could be broken until April of 1916, since no reference was reported by the Austrian sources and the instructios clearly ordered to apply this chipher only to "short or confidential messages. In all other instances, the figures cipher shall be used"[22].
More generally, trying to reduce opportunities for violation by the enemy, *Service Ciphers* underwent most of changes and had the highest number of versions compared to other codes adopted by the Italian army during the war, as facilitated by their small-size and relatively small number of copies.

8.2 AUSTRO-HUNGARIAN EARLY SUCCESSES

The First Decryptions

Immediately after entering the war, Andreas Figl, fresh from the success achieved on the Russian front and proficient in Italian, was deployed to the Italian front, where he started organizing interpretation of radiotelegraphic dispatches. The original Headquarters for this activity was in Maribor, currently in Slovenia[23]. In August 1915, a service reorganization took place, with three decryption centres set up at the Headquarters of Bolzano, Villaco and Adelsberg, called *Penkala*, a name afterword extended to the whole cryptographic service. The dispatches that could not be decrypted by Penkalas were sent to the *Nachrichtenabt* (Intelligence Service) in Vienna[24].
From 5 to 21 June, Figl seized four radiograms addressed to Massawa from the Coltano station, near Pisa, coded by the *VT Telegraphic Dictionary* of the Italian Royal navy. The Austro-Hungarians had already the code ironically called VerTrauen (trust)[25].
On 21 June, the first Italian dispatch coded through the *Service Cipher* appeared: an absolute novelty, as it was unknown to Figl and his colleagues. Breaking the first version of the cipher required a hard work and was initially just partial[26].
Regarding the first two changes to the cipher keys, Ronge points out that:

> on 10 July there was already a modification to the cipher (addition of the first key to the service cipher, A/N): after being distressed with the old version, we had to find the key to the new one […]. By 12 August we could decode 12 telegrams and the new key, completely explained, was transmitted to the Headquarters of the armies[27].

[22] Chief Inspector of STM, Historical and Military Journal, *Service order No.20, of 6 August 1915,* AUSSME, Series B1,105 S, vol.87.
[23] M. Ronge, *Spionaggio*, *op. cit*., p. 177 - 178.
[24] M. Ronge, *Der Radiohorch*, op cit., p. 4. *Penkala* is the name of a pencil factory whose advertisement showed the head of man with a pencil behind his big ear.
[25] O. H. Horak, *Oberst a.D. Andreas Figl, op. cit*., p. 74, 94. M. Ronge, *Der Radiohorch*, op cit., p.12, 49.
[26] The report concerning the solution to the cipher was written by Lieutenant Victor Reko and enclosed in M. Ronge, *Der Radiohorch, op. cit.*, Annex 6.
[27] M. Ronge, *Spionaggio*, *op. cit*., p. 177. Numbers reported by Ronge are the same as the ones in Figl's Memoirs which, as a matter of fact, do no mention decrypted dispatches but, dispatches that had been "delivered to the Intelligence Service" for

Ronge specifies that the seizure of an Italian manual regarding the wartime use of radio "comprising all necessary data, both technical and practical, about its structure and functioning" occurred right after the 12 August and points out that, following this event, "the number of decoded telegrams peaked to 50 and not infrequently to 70 a day". Possessing the manual substantially determines a breakthrough in terms of quantity and probably quality of decryption[28].
On the contrary, Figl does not mention any circumstance that could have facilitated the decryption process, perhaps fearing to diminish his own merits, which were in any case undeniable. This doesn't, in any way, attenuate the serious mistake of partial ciphering, nor does it lessen the evident weakness of the first service ciphers.
As regards mobilization code, the *Pocket Military* began to be employed in mid-June, along with the distribution of the first keys[29]. However, Ronge's memoirs point out that only in October 1915 the Austrians started intercepting a few dispatches encoded with the *Pocket Military,* which proves its rare use for radio communications. Of course, the Austrian could easily decrypt them just by finding out the short and simple keys, by one of the already mentioned methods[30].
Furthermore, according to Austrian sources, the first dispatch coded with the *Red Book* was intercepted and decrypted during the First Battle of the Isonzo, precisely on 5 July[31]. This version does not tally with the actual development of the facts, because the radiogram in question was not transmitted on 5 but on 25 July 1915, and presumably was not ciphered with the *Red Code*.

A Flaw in the Austrian Memoirs

Figl quotes the following radio dispatch intercepted by the Austrian stations on the 5th of July:

> 2nd Army Headquarters. By standing on the Medea Hill, His Excellency the Chief of the Army Staff, observes that 2nd Army demonstration is not carried out as vigorously as needed to facilitate the difficult action of the 3rd Army. General Porro[32].

A copy of the original radiogram shown in picture 8.4 shows the differences compared to radiogram reported by Figl probably due to translation issues or some difficulty in reception. However, the most remarkable discrepancy between the two version of telegram is the date: the 29th of July of the telegram in the picture is significantly later than the 5th of July when, according to the Austrians, the telegram was intercepted, so that it could be investigated the reason why the Medea radiotelegraphic station produced a copy of a telegram transmitted so many days before.
Let's to proceed in order. The Medea hill - approximately 20 kilometres west of Gorizia - despite being only 140 metres above sea level, provided a suitable post to control part of the Isonzo front. In fact, King Vittorio Emanuele III, General Cadorna, and the 3rd Army Headquarters used it as a lookout. Not far from there, the 3rd Army had installed one of the 3KW truck-mounted

an amount of 70 of them in just one day. Moreover, 12 August is the date in which, according to Figl, the second key to the service cipher was applied (O. H. Horak, *Oberst a.D. Andreas Figl, op. cit*., p. 98 - 99). Actually, this happened on 20 August, by a service order dated 13 August.

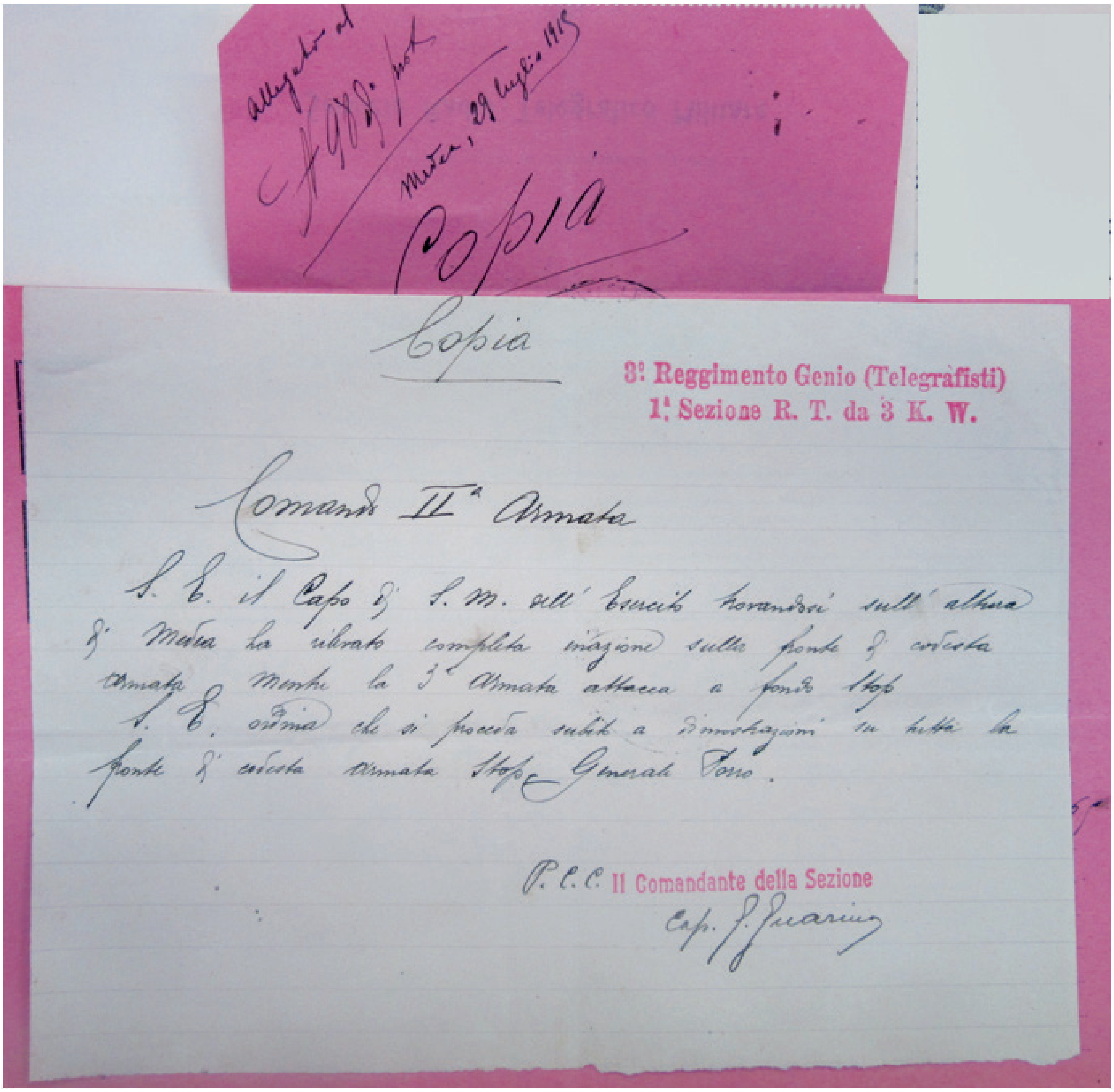
28 M. Ronge, *Spionaggio*, *op. cit*., p. 177. In the previous period, from 21 June to 12 August, telegrams interpreted every day would amount to less than one.

29 Royal Italian Army, Supreme Headquarters, Extremely confidential circular No. 960 of 17 June 1915, *Key to the Pocket Military Cipher*.

30 M. Ronge, *Der Radiohorch*, *op cit*., p.5.

31 O. Horak, *Oberst a.D. Andreas, op cit*., p. 97. The news was reported in M. Ronge, *Spionaggio*, *op. cit*., p. 177 and in M. Ronge, *Der Radiohorch*, *op cit*., p.3.

32 O. Horak, *Oberst a.D. Andreas, op cit*., p. 97.


Copia

Copia

3° Reggimento Genio (Telegrafisti)
1ª Sezione R. T. da 3 K. W.

Comando IIª Armata

S. E. il Capo di S. M. dell'Esercito trovandosi sull'altura di Medea ha rilevato completa inazione sulla fronte di codesta Armata mentre la 3ª Armata attacca a fondo Stop S. E. ordina che si proceda subito a dimostrazioni su tutta la fronte di codesta Armata Stop Generale Porro.

P. C. C. Il Comandante della Sezione
Cap. G. Guarino

8.4 The telegram transmitted from the Radiotelegraph station of Medea on 25 July 1915

radiotelegraphic stations that had been taken from a cavalry unit, which no longer needed it as the war had become static and trench-based.

As proved by the correspondence enclosing the radiogram of picture 8.4, General Cadorna had reached the lookout on 25 July, in the morning, when the Second battle of the Isonzo was raging, not on 5 July during the First Battle, as reported by Austrian sources.

In accordance with the order given before the battle, the 2nd Army had to support the 3rd Army's attack by creating diversions. Therefore Cadorna, with the purpose of communicating his concerns about the battle development, decided to transmit the dispatch in question from the radio station located near the lookout to the Medea hill. Of course, if the enemy had interpreted the intercepted telegram in a short time, valuable information would have been disclosed. However, the opportunity to give an operational order by radio is not the point here.

The point is rather focussing on the radio and cryptologic aspects of the matter, which results to be complex due to discrepant records. While Ronge reports the wrong date and writes that the dispatch was in *Red Code*, according to Figl's memoirs two dispatches seem to have been intercepted on 5 July having the same content and partially encoded with the *Red Code* and with the *Service Cipher*, respectively[33].

On the contrary, Italian documents include the statement of the Officer who oversaw the fixed radio station in Verona informing the Chief Inspector of the STM about the intercepted radiogram transmitted by Medea with "no ciphering". Urged to respond, on 29 July the Medea radio station explained it had "sent the radiogram on 25 [July] at 10.45, as per enclosed copy (picture 8.4), which had been encoded with the *Service Cipher* used by radiotelegraphic station". It also pointed out that supervising radio communications was not - according to the regulations in force - a responsibility pertaining to the Verona station, but to the stations of Udine and Treviso[34].

The truth about this matter has never been ascertained. According to what the Officer in charge of the Verona station declared, the dispatch might have been transmitted as plaintext, also because the copy displayed in picture 8.4 shows no underlining nor does it contain expressions such as 'to be encoded entirely'[35].

In conclusion, according to Italian documents, the dispatch might have been encoded with the *Service Cipher* or transmitted as plaintext. After all, radiotelegraphic stations, including the Medea station, did not have the *Red Code* and there would be no reasonable motive for General Cadorna and Porro, or their staff, to carry this code with them when leaving Udine.

The discrepancy between the Italian sources and Figl's and Ronge's versions obviously increases due caution when evaluating the various episodes regarding the decryption of Italian dispatches for the rest of the war period.

Italian Attempts at Improving Security

Coding confidential messages by means of scarcely widespread codes such as the *Green Code* and, until April 1916, by the *Letter Service Cipher* - which had not been broken by the Austrians - can be considered as an effective defensive measure.

Moreover, after the "careless conduct" at Medea, the Supreme Command repeatedly recalled the prohibition to transmit operational orders via radio, ordering to utilize radiotelegraphy only in the lack of any other communication means and, in any case, never to convey important military information. This rule was more strictly applied for communications from High Commands to the front, as they contained operational and tactical information, and less severely for the dispatches transmitted in the opposite direction.

In fact, Ronge admits that the Italians, differently from the Russians, "did not disseminate the decisions that they were adopting via radio"[36]. On the other hand, he stresses the Austrians' ability to infer interesting information about the deployed Italian forces, their movements, etc. also from intercepted radiograms not containing confidential news. For instance, "the movements of cavalry

[33] O. Horak, *Oberst a.D. Andreas Figl*., *op. cit*., p. 97.

[34] Letter of the 1st 3 KW station to the Telegraphic Inspector of the 3rd Army in Cervignano with the following object: *Servizio della stazione RT di Medea, 29 luglio 1915* (Service of radiotelegraphic station Medea, 29 July 1915) and other relevant correspondence, AUSSME, Series E2, env.19.

[35] Chiefs of radiotelegraphic stations were ordered to encode underlined words only (Operations Division, Communication to Army Headquarters and Headquarters of the Carnia region. Object: *radiotelegraphic communications service, op. cit.*). In this case, Porro himself or Cadorna dictated the telegram and the person writing it might have omitted to underline the words to be ciphered, thus leading the telegraphists to think that no underlining implied the order to not coding anything.

[36] M. Ronge, *Spionaggio, op. cit*., p. 178.

units would certainly indicate the beginning and the end of wide-ranging actions and also the main direction of the attack"[37].

As an additional defensive method, the Italians frequently changed the station names - which were made up of two letters for mobile stations and three letters for fixed ones - with the aim of increasing the difficulties to identify the origin and destination of dispatches and their attribution to Headquarters associated with the radio stations. The effectiveness of this provision obviously decreased or ceased when telegrams provided sufficient clues to identity the *station or*, even worse, the Headquarters to which the station reported, as it occurred above all during the early months of war.

8.3 A LEADING FIGURE ARISES: LUIGI SACCO

Concerns of the Supreme Command

As already mentioned, after the beginning of the war, the Italian radiotelegraphic stations had intercepted many ciphered radiograms, but great difficulties were encountered for their interpretation. Being aware of the serious difficulties in this domain, the Secretariat of the Chief of the Army Staff charged the Intelligence Office the issue and required it to interpret, according to the mandate of April 1915, not only the field dispatches of the Austro-Hungarian army but also diplomatic dispatches[38].

The Chief of the Intelligence Office, Colonel Garuccio firstly verified that neither the Ministry of Foreign Affairs nor the Ministry of the Navy had the capability to break the cipher used for instance in radio communications between Austria and Spain: a clear sign of Italy's extensive cryptographic incompetence at that time. He then answered to Cadorna's secretariat ensuring that he "would try to find the way to decrypt the intercepted dispatches also by relying on any relevant studies conducted by the Allied armies, which might become known through military missions"[39].

When the Intelligence Office sent this memorandum, Captain Luigi Sacco had been in France for about 15 days with the mission of asking the French Allies, who were considered masters in that field, also for cryptologic support[40]. At the end of June, he had left for Chantilly, where the General Headquarters of the French Army was located for a mission lasting about one month[41].

During his stay in France, Captain Sacco could observe, among other things, the organization and operational methods of radiotelegraphic stations in the French and English armies, visiting radio stations on the frontline and interviewing some Officers of both nationalities[42].

[37] *ibidem.*

[38] See the mentioned document by the Headquarters of General Staff Corps *Norme generali per la costituzione e funzionamento del Comando Supremo mobilitato* (General regulations for the creation and functioning of the mobilised Supreme Headquarters).

[39] Intelligence Office, Memorandum for the Secretariat of the Chief of the Army Staff, ref. no. 2292 of 16 July 1915, AUSSME, Series E2, env.26.

[40] In June 1915 Captain Sacco had been seconded to the Supreme Headquarters, where he immediately started to intercept and pinpoint enemy radiotelegraphic stations (General Sacco's Biography, AUSSME, biographies, 54/109).

[41] From 24 to 26 June, Sacco had been discussing the goals of the mission with colonel Natalino Mazzone, Chief Inspector of the STM, and with Ugo Levi, the Captain in charge of Telecommunications. He then left for Rome, continued his trip to Paris, and finally reached Chantilly, General Headquarters, on 1 July.

[42] These were Lieutenant Colonel Simon, Chief of the Telegraphic Office of the General HQ, Major Fraques, Chief of the radiotelegraphic section within that office, and Major Blandy who was in charge of radio communications of the British Army on the Western front.

8.5 Photo of Guglielmo Marconi and Luigi Sacco in Libya in 1911, with Marconi dedication (ISCAG Archive)

The Information gathering was possible thanks to the military agreement between Italy and the Entente's Allies that envisaged "close cooperation between staff of allied armed forces through special missions of liaison officers"[43]. Sacco could rely on the Military Mission established in France on 25 May 1915 and led by Colonel Giovanni Breganze.

On coming back to Italy in early August, Sacco delivered a report summing up the collected information not limited to the cryptographic issue, but regarding the existing situation on the western front line concerning the entire telecommunications sector, specifically on:

- overall organization of the radiotelegraphic service;
- radiotelegraphic stations for artillery and aircraft;
- direction finding and listening stations;
- field radio network;
- cooperation with the French army in radiotelegraphic communications, which meant in cryptographic field[44].

A summary of Sacco's wide-ranging overview and proposals is provided below.

The Radiotelegraphic Service Within the French and English Armies

Sacco affirmed that the very nature of radio communications required a centralised management of all radiotelegraphic services. This aspect was also stressed by Colonel Simon and Major Blandy, "considering how easy it is for stations operating in the same area to disturb each other, and also how much one can save in terms of personnel and efforts through centralization". The Author eventually criticizes the 'separatist trends' then existing within the Italian Army that aimed at the independence of artillery and air force radio services.

In the report, interesting remarks are included concerning the coding procedures within the French Army where, contrary to what happened in Italy, radiotelegraphic stations received dispatches that had been previously ciphered by the Encoding Service in each Army. The only plaintext item was the name of the recipient station. The service in question also encoded wire-telegrams and employed "always the same officers who, consequently, became surprisingly quick and confident". The received telegrams were sent to the Encoding Service, which decoded and forwarded them to their final addressees. Taking in mind the procedures used in Italy, Sacco remarks: "The French

[43] Filippo Cappellano, *Relazioni militari con la Francia nella Grande Guerra e le valutazioni del Comando Supremo*, in Studi storici militari, Roma, 2009, p.429.

[44] Italian Military Mission at the French General HQ*: Relazione sui Servizi RT francese e inglese,* G.Q.G (Report on French and English radiotelegraphic services, General Headquarters), 3 August 1915, AUSSME Series F6, env.7. The report is held at WWI's Archive of ISCAG, Coll. 234. It comprises eleven pages without any cover and annexes. The technical annexes - which were not found - contained news also regarding electrical telegraphy, photography and electrification of wire fences.

organization, based on the division of tasks, considerably simplifies the work of radiotelegraphic personnel, with remarkable benefits in terms of secrecy of communications".

Interception and Decryption

Listening stations of Allied armies, located in several areas along the front, immediately transmitted to their Headquarters the intercepted dispatches via wire telegraph in the French army and via telephone in the English one.

The French General Headquarters identified enemy transmitters and decrypted dispatches using already known ciphers. The most 'difficult' cryptograms were sent to the Ministry of War in Paris where "Colonel Le Cartier leads the office that has already managed to identify the keys of German radio communications"[45]. Sacco reports that the results obtained had effectively supported the French army operations during the early phases of the war, but in July 1915 the number of German radio transmission had decreased considerably due to the stabilized position of armies on the western front.

8.6 A French van mounted radio station photographed by Luigi Sacco (Luigi Sacco's photographic archive)

As regards the Italian situation, after noticing that some radiotelegraphic stations, including those of Rome and Florence, mostly dealt with listening to enemy radio communications and that interception stations were being set up "closer to the fighting line" as in Udine, Latisana, etc.", Sacco suggests implementing a systematic listening plan and to "urge all radiotelegraphic personnel to intensify listening activities"[46].

He also recommends that at the Italian Supreme Command "at least one Officer adequately selected be assigned exclusively to the decryption service." The Officer could possibly rely on French cooperation and research in the field.

Considering the possibility that the Austrians might have organised a similar service, Sacco asserts the absolute necessity of "using radiotelegraphic communications as little as possible, and always encoding the dispatches integrally with frequently changing keys and typologies of codes and ciphers"[47].

[45] In 1910, the French Ministry of War had created the 'Section de Chiffre', whose Chief was Captain Françoise Cartier, to create, distribute and manage the ciphers of the whole Army. In January 1914, the Section de Chiffre incorporated other Army offices dealing with cryptography (Military Cryptographic Committee and Bureau militaire de déchiffrement).

[46] Italian Military Mission at the French General Headquarters, *Relazione sui Servizi, op. cit.*

[47] *ibidem*

Radiogoniometry

8.7 Allied Officials photographed by Sacco in front of the French Headquarters in Chantilly during a meeting break (Luigi Sacco's photographic archive)

After visiting a French station in Joncheriy and a British one in Quiestede, Sacco declared to be ready to apply radiogoniometry on the Italian front, as "two direction finding equipment were already available, and it is relatively easy to build some others (in case there are no off-the-shelf ones)". Therefore, it was possible to immediately start a radio direction finding service with 4 stations, two - Mantua and Ancona - designed to identify enemy remote transmitters and two - Osoppo and Latisana - for close transmitters, being the latter already chosen as a potential intercepting post"[48]. The ability to build such equipment at the laboratories of the Italian Army was demonstrated, since Sacco himself, in the same period, had implemented a radio direction finding equipment with frequencies higher than 1 MHz (300 metres) which "performed excellently and, with regard to that specific wave band, provided more accurate data compared to similar devices made in Italy and abroad"[49].
The accuracy of goniometric surveys depended on the ability to apply adequate correction methods that the French had not evidently developed yet, particularly in the mountains. The Italian specialists gradually solved this drawback, allowing the radio direction finding technique to be widely applied, as proven by the monthly reports signed first by Sacco and later by his successor commanding the radio goniometric service, as illustrated in the following pages[50].

New Applications of Radio Communications

Regarding the stations with 1 to 5 KW transmitting power used to connect high commands, Sacco realized that English and French devices were not different from the Italian army ones. He rather focussed on air-to-ground radio communications and on low power equipment already tested by the Allies to connect both air observers to artillery units and trenches to rear Headquarters.
He was especially interested in the radio transmission by observers on aircrafts to direct artillery fire by means of on-board devices connected to ground receiver stations, for transmitting information to the batteries via telephone in the French Army and via radio in the English Army. Captain Sacco inspected several air and ground stations, observed artillery fire control and verified the efficiency

[48] *ibidem.*
[49] Lieutenant General Luigi Sacco's biography, AUSSME, Biographies *op. cit*.
[50] Regarding Sacco's radio-goniometric activities in this period, see: C. Picone, C. Micheletta, *Il Ten. Generale Luigi Sacco*, Bulletin of the ISCAG, October - December 1970, p.424 and following.

of radio equipment on aircrafts by personally conducting some transmission tests, eventually in flight[51].

The on-board transmitters examined by Sacco probably were built by the S.F.R (Société Française de Radiocommunication), that would be installed over the next months on Italian aircrafts too, having modest weight and size, with a 20-25 Km range when the aircraft was at an altitude of approximately 2500 metres.

The mission report includeded further information about reduced power equipment suitable for front line communications, mainly when violent enemy artillery fire destroyed all aerial lines and even underground cables. This was the case with an artillery lookout Sacco visited in the Neucheppelle area, about 200 metres from the first trenches, where the four cable connections with the artillery Headquarters were often out of order, compelling personnel to use radio communications.

8.4 EFFECTS OF SACCO'S MISSION IN FRANCE

The Disappointing Cooperation With the Allies

Captain Sacco, during his stay in France, could not get any useful input concerning methods to break enemy ciphers[52]. However he laid the groundwork for an agreement which could allow the interpretation of the Austrian encoded dispatches.

Regarding this topic, the following conclusive lines in Sacco's report deal with the cooperation between Italy and France:

> I have discussed this issue with Lieutenant Colonel Simon, with Colonel Cartier and with Major Fraques; it would basically be a matter of:
> 1) Connecting the two General Headquarters (or at least the Italian one with Paris) by means of a direct telegraph wire to make communications as fast and secure as possible.
> 2) Organizing a systematic listening and radio-goniometric service in Italy, which would result in telegraphic exchange of the most significant intercepted messages and goniometric measurements.
> 3) Exchanging with the French General Headquarters, via mail or telegraph, all available information regarding the enemy's organization, names, ciphers, etc.
>
> It is not necessary to explain the advantages of such an agreement and the benefit it could bring to the interpretation of enemy communications[53].
>
> Military attaché Colonel Cav. BREGANZE will specifically report on this issue to His Excellency the Assistant Chief of the Army Staff.

Sacco did not provide further details because the agreement under which radiograms intercepted on the Italian front were to be transmitted to France, then decrypted and sent back to Italy as plaintext,

[51] The report also includes a vivid account of air observation activities during the French attack in the Arras Souchez region where six aircraft remained in constant flight and sent 269 communications in just one day. The mainly tasks of air oservers concerned the movements of enemy infantries, which could be hit by French artillery long before reaching the battlefield.

[52] L. Sacco, *Manuale, op. cit*., p.308.

[53] This sentence clearly shows the final objective of the desired collaboration.

was signed at a higher level, namely between French General Ferdinand Auguste Pont and Colonel Breganze, who had previously sent a draft of the document to the Supreme Command[54].
After Sacco's return to Italy, Italian stations intensified interception activities, as evidenced by the records of the Armies' radiotelegraphic sections. Intercepted Austrian dispatches that were apparently the most interesting ones were generally sent from Udine to Paris through a dedicated telegraphic circuit. Unfortunately, the much-expected decrypted versions did never get to Italy. In this regard, O. Marchetti clearly affirmed: "no one ever knew anything about this matter and therefore our transmission did not occur anymore"[55].
The reasons why the agreement failed remain unknown. Considering the characteristics of some Austrian ciphers that will be illustrated further along, French analysts supposedly had no difficulty decrypting at least part of the dispatches. On the other hand, one can presume that they were busy for solving constantly evolving ciphers, especially of the German army, for decrypting diplomatic messages, dispatches of enemy navies, etc., and therefore assigned low priority to telegrams from Italy.
In addition, many cryptograms intercepted in Italy were from the German army and navy and since Italy had not declared war on Germany yet, it would have been imprudent to let the Italian know about French capabilities to break specific German ciphers. This case was not the only one of 'extreme reserve' regarding cryptography, concerning the Allies of both parties.
The waiting of French response caused a waste of precious time and led to further delays in the development of the Italian military cryptology, also because the impossibility of comparing the encoded versions of dispatches with the plaintext versions eventually received from the French reduced the opportunity to improve the analysis skills of the Italians.

Consensus on Sacco's Proposals

Despite the disappointing outcomes of the expected French-Italian cooperation in the cryptologic domain, Sacco's mission in France caused useful implications. In fact, some suggestions comprised in his report helped the Italian army's radio capabilities to evolve in the following months.
On 6 August, upon his return from France, Sacco had a meeting with the STM Chief Inspector, Colonel Mazzone, reporting information and views he had got from his interviews with the Allies. Significantly, on the same day, the Chief Inspector sent a service order to all radiotelegraphic stations making total encoding of telegrams mandatory[56].
A few days lter, when he received Sacco's report, STM Chief Inspector sent it to the Supreme Command, along with his own remarks. The Mazzone opening comments have no tangible evidence since he asserts that: "the organization of our telegraphic service is more complete than in the French and the English Armies" because - in his words - it met fully "all requirements for transmission of dispatches between large units"[57]. Moreover, Mazzone ensured that radiotelegraphic communications were completely encrypted - we know that this 'innovation' was introduced only after his meeting with Sacco - and in answering indirectly to potential comments, he incautiously

[54] Correspondence between Paris and the Supreme Headquarters, comprised in the Series of AUSSME, proves that the Italian Command had the draft of the agreement since 18 August. See also: O. Marchetti, *op. cit.,* p.158.
[55] O. Marchetti, *op. cit.,* p. 158.
[56] Chief Inspector of the STM Capo STM, *Military History Journal, 6 August 1915*, AUSSME, Series B1,105 S, vol. 87. Sacco had come back to Italy on 3 August.
[57] Supreme Headquarters, General HQ of the Engineer Corps, *Missione del Capitano Sacco cav. Luigi presso il G. Q. G. francese* (Captain Sacco mission at French General Headquarters), ref. n° 1222RG, 29 August 1915, AUSSME, Series B1,105 S, vol. 87.

affirmed: "service ciphers in use are safe and they will be adequately changed from time to time to be as confident as possible"[58].

Notwithstanding the success achieved by the Austrian analysts in broking the *Figure Service Cipher* was not known by Colonel Mazzone, his guarantee concerning security given to the Supreme Command without any concrete support, shows a poor cryptologic knowledge. Such persisting ignorance caused the Telegraphic Inspectorate to make many mistakes in managing service ciphers during a large part of the war period.

The Chief Inspector of the STM tried to blame others for any potential leak through enemy interception and decryption, explaining that:

> it would be recommendable for radiotelegraphic stations to receive from Headquarters fully encoded telegrams with safe ciphers, as is apparently the case with the French army and not with us. In fact, our telegrams are usually partially encrypted with the *Red Code*, which is such a common code that its compromise is at times possible[59].

On the other hand, Mazzone endorsed and submitted to the Supreme Command all suggestions of Sacco's report. In particular, he encouraged "exploiting the interception and direction - finding service" and proposed to "speed up the use of radiotelegraphy aboard aircraft" as well as to "purchase 50 low-power stations to be assigned to the various Armies"[60].

In September 1915, Lieutenant Guglielmo Marconi and Captain Cesare Bardeloni, on a mission on the western front, had the opportunity to read a copy of Captain Sacco's report in the possession of Colonel Braganze. They confirmed the events he had witnessed during his mission and agreed on the ensuing proposals he had submitted"[61].

Codroipo Radiotelegraphic Office

On 1 October 1915, the Radiotelegraphic Office, commanded by Captain Sacco, was officially established within the Radiotelegraphic Section of the Supreme Command. The tasks of the Office include "the interception of enemy and neutral radio stations also in order to ascertain their position and to decrypt their messages"[62]. The Office was located about 20 kilometres from Udine, in the small town of Codroipo, already hosting a long-wave receiver station intercepting long-distance communications.

On 5 October, Sacco settled in the new premises "to coordinate and manage all listening and direction - finding stations that were already operating or about to be completed"[63].

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[58] *ibidem*. This confirms that the Chief Inspector of the STM held himself responsible towards the Supreme Headquarters for the security of service ciphers and keys, evidently because they were created under his supervision.

[59] *ibidem.*

[60] *ibidem.*

[61] Letter of Captain Bardeloni to the Air Force General Directorate, written at Marconi Office, House Strand, London, 24 September 1915, AUSSMA, World War 1 Collection, env.44, folder 422. Marconi and Bardeloni were on mission in England and had interrupted their work in London for a visit of about a week to the Western front.

[62] The date is specified in 1st Direction Finding Section, *Relazione sull'operato della Sezione nella presente guerra* (Report on the activities of the Section during the current war) signed by Section Chief Lieutenant Dotto, November 1918, ISCAG, Coll. 242. The quotation is from Sacco's CV.

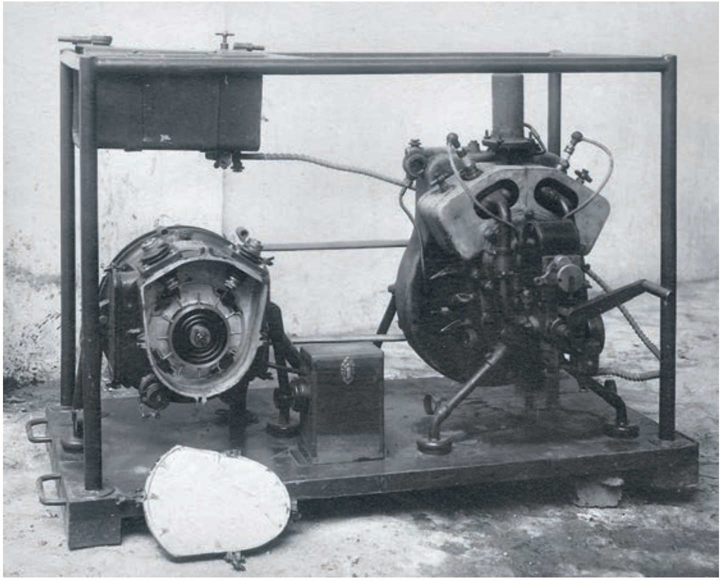
[63] Chief Inspector of the STM, Military History Journal, 5 October 1915, AUSSME, Series B1, 105 S, vol. 87. On 26 September Sacco had arrived in Udine, "before the material to be used to build listening and direction - finding stations". Some of this material had probably been prepared at the Airship Battalion where he had been seconded in early September.

Following the disappointing outcome of the agreement with the Allies, and in compliance with assigned tasks, Sacco tried to interpret intercepted enemy dispatches on his own. O. Marchetti explains: "we had no enemy code or chipher, it had not been possible to get them during peacetime and nobody considered it useful to request their research to our agents. [...] However, an Engineer Corps Lieutenant, despite he had no knowledge of the German language, proved to be so brilliant in his reasoning and deductions that, with the help of other officers, he managed to get some plaintext fragments of intercepted encoded messages"[64].
Sacco's efforts in cryptanalysis remained solitary throughout 1915. He did not get any help he relieved of the burden to manage the development and operation of the radio network implemented for carrying out interception and goniometric measurements.

8.5 ITALIAN RADIO OVER THE FIRST SIX MONTHS OF WAR

Evolution of Radiotelegraphy Applications

Since the early months of war, the Italian Army realized the need of a more extensive radio usage, including new applications, such as "air-to-ground communications and fast warnings about enemy aircrafts approaching"[65].
Radio communications between ground locations were specially wanted in emergencies, when bad weather interrupted physical connections, or during artillery fire systematically destroying wire connections that could not be quickly restored. Moreover, locations in the mountains, difficult to be reached via physical lines, could be connected only by radio.
The demand of new radio links conflicted with "limited availability of equipment along with the difficulty obtaining them from Italian industry". Therefore, "while the national request of radiotelegraphic equipment for the Army increases"[66], some measures were adopted to to fill the gap, at least partially, between demand and offer, such as:



8.8 A 500 W truck mounted transmitter. The rotating spark gap is visible on the right (ISCAG Archive)

– the transfer to some army Corps and observers of stations previously assigned to Cavalry Divisions;

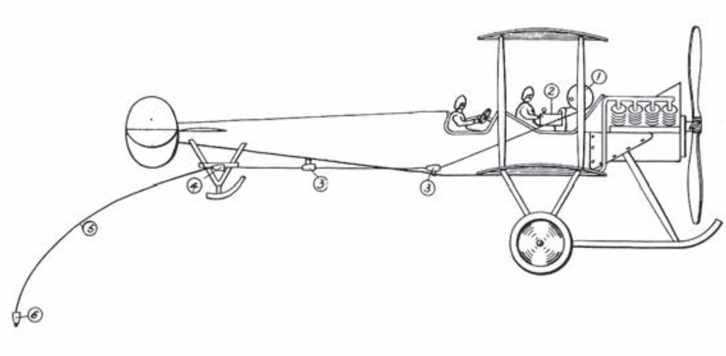
[64] O. Marchetti, *op. cit.,* p. 87. Marchetti erroneously recalled Sacco was a Lieutenant.
[65] Office of Chief of Staff, Technical Branch, Confidential circular letter, Subject: *Ordinamento e dipendenza del Servizio Radiotelegrafico* (Organization and employment of radiotelegraphic service), 20 September 1015, ISCAG, Coll. 220.
[66] Chief Inspector of the Military Radiotelegraphic Service, *Relazione Tecnica sul Servizio Radiotelegrafico nell'Esercito Operante durante la Guerra Italo - Austriaca (1915 -1918)* (Technical report on the radiotelegraphic service of the army during the Italo-Austrian war, 1915-1918), ISCAG, Coll. 242.

– the supply from France of 300Watt stations;
– the transfer to the 1st Army by mid-October of some 500Watt stations (picture 8.8) available at the Airship Battalion[67].

By the end of the year, there were slightly more than thirty stations[68], operating in the war zone, excluding the units used for interception, direction finding and air force service. 50Watt stations appeared immediately thereafter.

The First Air-to-Ground Communications

The purchase from S.F.R. and few weeks later also from Marconi Wireless of the first on-board transmitters and ground receiving stations made it possible to test, as of August 1915, an assistance service for artillery fire control by means of unidirectional telegraphic air-to-ground connections[69]. Picture 8.9 schematically shows the components of an on-board system, including the positions of the antenna during flight and of the observer, who set before the pilot and operated the transmitter[70]. Since the equipment initially provided by Marconi Wireless did not fully meet the Army's requirements, Guglielmo Marconi personally undertook to design and test a new on-board transmitter with a range exceeding 20-25 km, corresponding that of large-calibre weapons.



8.9 Outline of an on-board radiotelegraph appliance (from a manual of Marconi Wireless - AUSSME)

Between the end of September and early October 1915, Marconi's transmitters were tested and compared with the S.F.R. ones during flights, on aircrafts taking off from Mirafiori airport, near Turin[71]. "In addition to Captain Celloni and Second Lieutenant Borghese participating as observers aboard the two aircrafts, Captain Bardeloni and Lieutenant Marconi himself operated the receiving ground stations". […] Those tests allowed to identify the most efficient radiotelegraphic system as well as the modifications applicable to the new Marconi model to meet all operational requirements"[72].

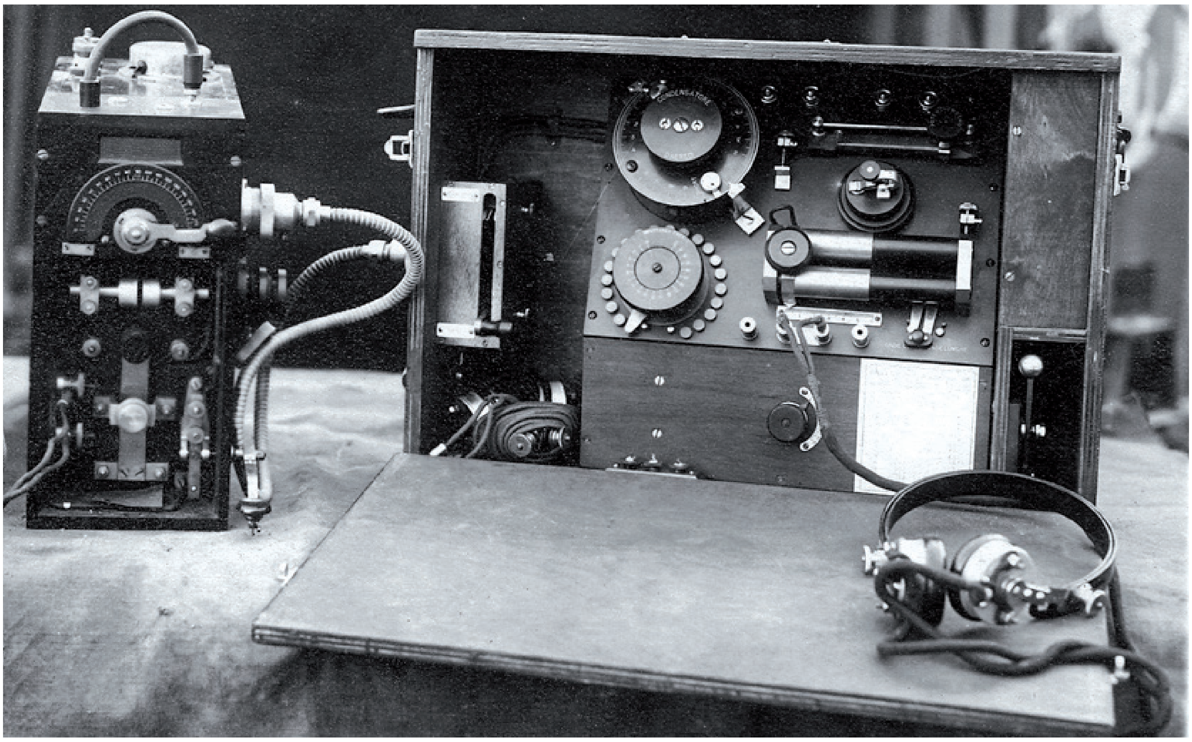
[67] General Headquarters of the Engineer Corps, Letter no. 2164 of 23 October 1915 to the Headquarters of the 1st Army, ISCAG. Coll. 220. The last two types of equipment had weight, size, installation, and dismantling timelines considerably lower than more powerful field stations while having, of course, lower range.
[68] Chief Inspector of the STM, Military History Journal, *Service orders 25,26,33 and 36,* 7 August - 11 December 1915, AUSSME, Series B1,105 S, vol.87.
[69] The 30 aboard stations purchased from S.F.R. had 40Watt power achieving a 20-25 km range. The 20 stations from Marconi Wireless, with 20Watt power and ranging 10-15 km were called *Marconi Vecchio modello-MVM* (Old Model Marconi).
[70] The picture is taken from the Instruction Manual of the Marconi equipment.
[71] Technical Directorate of Italian Air Force, *Relazione circa la RT per l'Aviazione* (Report on Air Force radiotelegraphy) signed by A. Celloni, 26 December 1915, ISCAG, Coll. 234. Two Caudron aircraft were employed: one of them was equipped with a new version of the Marconi equipment (Marconi Nuovo Modello-MNM) and an S.F.R. device with comparable power, that could be quickly switched. The other aircraft was equipped with the old version of the Marconi equipment (Marconi Vecchio Modello-MVM) that had been modified to increase power.
[72] *ibidem.*

In early November other tests were performed, with Marconi's participation, at the Trombetta (Verona) and Centocelle (Rome) military airports (picture 8.10).
The M.N.M. (Marconi New Model) was the prototype of the famous "Marconcina" (see picture 8.11) which would become the most common transmitter on Italian aircrafts because of its easily fitting into any type of airplane[73].

8.10 Lieutenant G. Marconi inspecting an on-board equipment at the Centocelle airport, November 1915 (ISCAG Archive)

At the end of 1915, twenty Caudron aircrafts operating on the frontline, four for each of the five reconnaissance squadrons, were equipped with radio transmitters, in addition to fifteen ground receiver stations. The on-board transmitters could be easily disassembled and moved from one aircraft to another.
The numerous organization and preparation activities carried out by Captain Celloni included the preparation of a cipher for air-to-ground telegraphic transmissions. Those kinds of ciphers were extremely simple and compact in such a way as to be easily memorised by observers aboard[74].
The Austrians implemented a similar radio communication service to support reconnaissance and artillery fire control and installed on board equipment like the one built by Siemens & Halske which had been found on an aircraft shot down in Arsiero, as accurately described in the Celloni report[75].

[73] The "Marconcina" was built at the Genoa plants. It worked on wave lengths included between 500 and 200 metres and was 20 Volt battery powered.
[74] Technical Directorate of the Italian Air Force, *Relazione circa la RT, op. cit.*
[75] *Ibidem.*



8.11 The "Marconcina" without front door (on left) and a Marconi receiver in the foreground (ISCAG Archive)

8.6 RADIO INTELLIGENCE AND SECURITY OF ITALIAN COMMUNICATIONS IN 1915

Interception and Radiogoniometry

The Radiotelegraphic Office in Codroipo coordinated the work of long-wave stations of "Codroipo and Rivolto for intercepting bulletins, correspondence and international communications" transmitted by high-power stations like those in Vienna, Pola, Budapest, Berlin, Nauen, Madrid and Costantinople, as well as of field stations located in Osoppo, Latisana, Padua and Bertiolo fully dedicated to eavesdropping the Austrian radio transmission on the Italian front[76]. Radio-goniometric stations operated in Padua, Latisana and Osoppo[77].
The instructions delivered to each station to the Office of Codroipo encompassed interception plans, names of enemy stations to keep under control and even the hours for performing listening activities. All those stations could communicate also among themselves by means of a special telegraphic wire network.
By combining the direction-finding data with the depositions of prisoners and deserters it was possible to identify the position and characteristics of many Austrian stations and, in some cases, also of the Headquarters they reported to. For instance, it was found that the so called 'mountain stations', fitted into six transportable boxes, were not powered by an engine, but by two men who

[76] 1st Radio Goniometric Section, *Relazione sull'operato della Sezione nella presente guerra*, *op.cit.* These stations were supported by several Armies' field stations. Osoppo was later transferred to San Daniele.
[77] See for instance: 3rd Radiotelegraphic Section of the Army, Military History Journal, 1915 - 16 - 17, ISCAG, Coll. 234.

rotate the pedals of a bike plugged into a dynamo, similarly to the 200Watt Italian station that became operational the following year[78].
Since 1915, radio-goniometric surveys and listening operations provide important information also on German and Turkish transmitters within the wider European and Middle Eastern context[79].
However, while the Central Powers extensively used long-distance radio communications for lack of alternative means, on the Italian front, the Austrian commands soon prohibited radio correspondence, as they had already done on the Russian front, with the only exception of emergency cases[80]. Consequently, the number of intercepted dispatches in this field dropped significantly.

The Cryptologic Situation at the End of 1915

The radiotelegraphic interception services as well as the direction-finding and the technical control in the theatre of operations, including the activities carried out by the radiotelegraphic Office of Codroipo, directly reported to the Chief Inspector of the Military Telegraphic Service, in compliance with the directives issued by the Chief of the Army Staff[81].
Conversely, the fragmented organization assigning to different bodies the responsibility concerning the management of each code and cipher, resulted to be one main drawback affecting the Italian Cryptography.
In fact, the *Red Code* was on charge of the Ministry of War and related deliveries issued by the Minister's Cabinet Office. The key words and other provisions concerning the *Pocket Military Cipher* - also published by the Ministry of War - were managed by the Supreme Command. Finally, the responsibility of the *Service Ciphers* pertained to the Chief Inspector of the Military Telegraphic Service[82]. The lack of adequate skills within all these organizations contributed to the first Austro Hungarian cryptologic successes.
However, the main cause of the Italian dispatches decryption in 1915 may be ascribed, as already mentioned, to the partial encoding, in addition to the weakness and longevity of codes and ciphers. The decision of abolishing the partial coding on 6 August[83], arrived too late because that procedure - along with the seizure of instructions - had in fact already helped break *Service Cipher* based on groups of figures. Therefore, the five key changes applied during 1915 proved to be ineffective for increasing its resistance to decryption. On the contrary, the service order introducing the use

[78] HQ of the 1st Army, *Disposizione Stazioni austriache*, (Position of Austrian stations), ISCAG, Coll. 235. The stations identified by the Austrian with progressive numbers from 1 to more than 20, were supposedly deployed opposite the Italian 1st Army at: the Stelvio Pass, the Tonale Pass, in Lardaro, Mount Brione, Rovereto, Folgaria, Caldonazzo and Lavarone; opposite the 4th Army at: Costalunga Pass, Maone, Col di Lana, Forte Dossaccio, Col Rondella, Cima Bocche, in addition to two stations in Puster Valley. Fewer stations were located on the Isonzo front.
[79] The report of the Codroipo Radiotelegraphic Office of January 1916 that will be discussed in the following chapter refers to the results achieved in the final months of the previous year.
[80] M. Ronge, *Der Radiohorch*, *op cit.,* p.4.
[81] Italian Army, Office of Chief of Staff, Technical Office, Confidential circular letter, ref. no. 4020 of 20 September 1915, Subject*: Organization and employment of radiotelegraphic service*, ISCAG, Coll. 220.
[82] The Chief Inspector's staff included an Officer expert in the technical aspects of the service, particularly in radio communications, with the task also of generating Service ciphers and related keys. During the entire war period, the two Engineer Corps Officers responsible of this task - Ugo Levi first and Cesare Bardeloni later - were excellent radio technicians but evidently had no special aptitude for cryptography. Bardeloni replaced Levi when colonel Gaetano Cadorna replaced colonel Natalino Mazzone as Chief Inspector of STM, in March 1917.
[83] Chief Inspector of the STM, Military History Journal, Service Order N°19, 6 August 1915, AUSSME, Series B1, 105 S, Vol. 87. The previous provisions issued on 30 May were discontinued. It became mandatory to encode completely the text, the address and the signature of any radio dispatch, excepting the abbreviation identifying transmitting and receiving stations.

of three-letter *Service Ciphers* was issued at the same time of the that abolishing partial encoding, which could have saved this cipher until the following April[84].
Unluckily, despite the official partial encoding withdrawal, the Supreme Command itself allowed to code only parts of telegrams, sometimes even just a few words[85].
Hybrid encoding implemented by a partial first encoding with *Red Code* at the Headquarters and for the remaining words of a message, by *Service Ciphers* at the telegraphic stations, facilitated the work of Austro-Hungarian analysts. In fact, this led to a serious cryptographic mistake, because if the enemy already knew one of the two systems, for example the Red Code, the adopted procedure practically resulted to be a partial encryption.
However, we cannot agree with Ronge's assessment that, due to partial coding, "the Italians had lost the cryptographic war, as had the Russians, ever since the war began"[86]. As a matter of facts, the gradual evolution of cryptographic skills - as shown by the events described further on - allowed the Italians to achieve unquestionable success in this field, above all during the last year of war.
Moreover, despite the overall negative situation, even in 1915 some Italian codes of limited use and therefore less familiar to the enemy were saved from enemy breaking[87] and, regarding the messages encrypted with the *Red Code*, the Italians enjoyed a 'temporary' success starting from October of that year.
Even before that date, those dispatches were protected by changing the page numbering and/or by elementary overencoding, not particularly difficult to identify. In October, a measure consisting of the mere inversion of the numbering of page lines led to a remarkable result since, according to what Figl himself admitted, it took Austro-Hungarian analysts several weeks of work to understand this change. This caused a decryption black-out lasting until 12 February 1916, for 112 days[88].

8.7 A NEW BRANCH OF INTELLIGENCE: TELEPHONE EAVESDROPPING

The First Detections

The most common system of telephone eavesdropping during WWI was based upon the combined effect of electromagnetic induction and interception of electrical current streams in the ground, generated by the telephone circuits.
If the conversation to be intercepted relies on a 'mixed circuit' made of one metallic conductor with two earth electrodes at the extremities, the return current circulates in the ground, following variable paths and intensifying in the areas with higher conductivity. A part of such current can be diverted into a wire terminating with two ground conductors installed in a favourable position, within the area surrounding the connection to be intercepted. A receiver headset inserted in

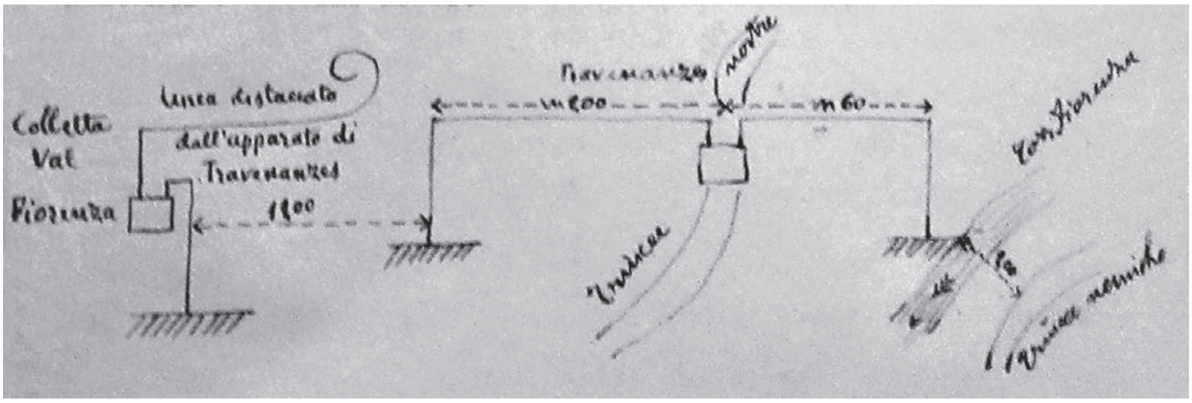
[84] Chief Inspector of the STM, Military History Journal, Service Order No.20, 6 August 1915, AUSSME, Series B1, 105 S, Vol. 87.
[85] According to a confidential circular letter of the Operations Division of 7 August 1915 signed by L. Cadorna, partial encoding was still allowed when telegrams did not concern confidential issues but comprised names of persons or army units to be encoded. This opened a gap in the new regulations.
[86] M. Ronge, *Der Radiohorch, op. cit.,* p.3.
[87] This happened with the very confidential ciphers for communications between high commands and between higher commands and the top level of governmental bodies, such as the *Green Code*, the *Blue Code* (until its disclosure in 1917) and with the *Service Cipher* based on code groups made up of letters, until April 1916.
[88] O. J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.120 - 123; p. 296.

above mentioned wire may allow to listen to a telephone communication that takes place on the intercepted mixed circuit.
The electromagnetic induction adds to this phenomenon, whereby the telephone current in the circuit to be intercepted generates a current with similar variations in the wire designed for listening[89]. The effect of induction between metal conductors had been well-known and used for decades also to try to transmit wireless telegraphic signals[90].
The Austrian Army began to use this kind of eavesdropping in 1915 on the Italian front where, in Ronge's words "starting from August the Intelligence Service added a new branch: telephone interception of enemy conversations"[91].
Almost at the same time, starting from September 1915, the Italians began to detect in various areas of the front line, the possibility of listening enemy telephone communications. Systematic interception and tests to investigate the phenomenon took place the following month, with little delay compared to the same activities carried out by the Austrian.

Almost Simultaneous Discoveries in the Italian Armies

The first Italian interception took place, in September 1915, in Cadore, near Cortina d'Ampezzo, between Tofana and Col Rosà, in Carnia, on top of Zellon-Rofel and in Val Dogna, in areas manned by the 4th Army[92]. By early October, some eavesdropping happened also at Batognica, in the Julian Alps, occupied by the 33rd Division of the 2nd Army. Other tests were conducted within the 3rd Army.
All those interceptions occurred by chance, during conversations between ordinary field telephones connected by single-wire connections and return in the ground (mixed circuits). Systematic eavesdropping tests started within the 4th Army, in the Cortina d'Ampezzo area, in early October "on the right bank of the Fiorenza creek"[93] where, following the casual listening occurred the previous month, Lieutenant Ludovico Fabbri was able to perfectly listen to enemy communications by modifying the telephone appliance, as shown in picture 8.12. Lieutenant Fabbri performed other tests also at different locations[94].
After first systematic investigations, the 2nd Army made some defensive tests to select the types of entirely 'metallic circuits' without return to ground, capable to reduce the intensity of the ground

[89] Documents of this period allow one to infer that personnel involved in the first Italian interception activities considered the effect of currents in the ground more relevant than induction. This general assumption at the time of mixed circuits, changed with the transition to entirely metal circuits.
[90] In 1892, William Preece had performed communications between two independent wires intelligible from approximately 5 kilometres. Yet he was not able to find practical applications for his system due to the length of conductors, which was almost equal to the length of the connection. Moreover, the effects of mutual induction were known, as in the case of telegraph and telephone circuits installed on the same poles.
[91] M. Ronge, *Spionaggio*, *op. cit.,* p.178. Ronge never mentions telephone interceptions on other fronts before the date in question.
[92] Chief Inspector of STM, *Comunicazioni telefoniche tra stazioni italiane e austriache* (Telephone communications between Italian and Autrian stations), ref. no. 874, 20 October, AUSSME, Series B1, 105S, Vol. 87.
[93] L. Fabbri, *Memoria delle Intercettazioni telefoniche svolte dal Tenente Lodovico Fabbri dall'ottobre 1915 al dicembre 1916* (Report of telephone interceptions carried out by Lieutenant Lodovico Fabbri since October 1915 until December 1916), Florence, 20 January 1917, ISCAG, Coll.222.
[94] As the right side of the picture, the interception circuit includes a simple telephone receiver positioned between two wires of adequate length, each one connected to the ground.



8.12 One of the first telephone eavesdropping circuits implemented by lieutenant Fabbri

currents. Pending an increase in national production of adequately isolated two-wires cords, two currently available telephone cords were utilized[95].

Moreover, Colonel Carmelo Squillace, Commander of the 131st Infantry Regiment, 3rd Army, described the discovery occurred on the front line controlled by this Army[96]. By using ordinary telephone systems taken from the enemy in October of 1915, Italian telegraphists laid out a wire from the Italian towards the enemy trench and put a piece of metal (i.e., the bottom of a metallic tin) at the extremity of the wire, then hidding everything with rags, dirt, and stones. Moreover, they implemented a listening booth built with sacks of dirt, wood used as an acoustic isolator and organized watches for translators, thus achieving an increased number of intercepted conversations and greater accuracy in translations. The prototype of a telephone interception station was born.

Immediately after, the 3rd Army Headquarters sent the Engineer Corps Lieutenant Bianchini to the 131st Infantry Regiment, to extend local listening operations by preparing new eavesdropping lines and to gather useful data to develop similar systems in other areas of front line. In December 1915, Army Commander Emanuele Filiberto di Savoia praised the Commander and personnel of the Regiment for their telephone interception activity.

Systematic Telephone Eavesdropping and Deceptions Attempts

Information achieved by the first systematic activities of the Italian Armies in this sector are well known also because, due to the novelty of the issue, the related reports were immediately transmitted to the Intelligence Office of the Supreme Command. For instance, the 2nd Army sent a list of interceptions made by the 33rd Division Unit at Batognica, 2163 m. above sea level, between 3 and 5 October 1915, including the names of some enemy officers, news about bread shortages in some units, requests of medical support (including surgeons) etc. The same letter assumes that the

[95] Tests were carried out in Plava, m. 383, in proximity of Zagora barracks and Globna blockade not far from enemy trenches. See: G. Guasco, *Relazione circa il funzionamento di un rivelatore telefonico e sui mezzi per evitare l'inconveniente dell'intercettazione dei fonogrammi,* (Report on the performance of a telephone detector and on methods to avoid phonogram interception), 11 February 1916, ISCAG, Racc. 220; G. Guasco, *Le intercettazioni telefoniche durante la guerra*, Rivista di Artiglieria e Genio, 1922, Vol.2, p. 236 - 249; A. Carletti, *Il servizio di intercettazioni telefoniche durante la guerra, Conferenza tenuta alla Riunione annuale dell'AEI in Roma nel novembre 1920,* Telegrafi e Telefoni, Anno II, n° 1, pp.16 - 26.

[96] Part of the memoirs, which is otherwise unpublished, is reported in V. Angelotti, *I Telegrafisti nella guerra 1915 - 1918* (War telegraphists, 1915-1918), Bulletin of the ISCAG, 1961, No. 77, pp. 629 - 632.

Austro-Hungarians protect their communications by "conventional number and letter or specific ciphers", as confirmed by questioning some prisoners[97].
On such a basis, the Technical Office of the Supreme Command suggested that the telephone interception station in Batognica remain operational with the only purpose to intercept the enemy's telephone messages. This principle rapidly extended to all Armies.
On 15 October 1915, a circular letter signed by General Porro requested that all circuits in the area where interception occurred be replaced by metallic circuits, while leaving unmodified the previous ones used to transmit "fake news" only. Taking for granted that the Austro-Hungarians were listening Italian telephone conversations, the circular letter reads:

> please do not use mixed circuit to transmit correspondence in the areas where the phenomenon in question occurred or might occur (listening to Austrian telephone conversations, A/N). […] Completely metallic circuit should be used […] and moreover, telephone interception stations that have intercepted enemy phonograms must continue to operate exclusively as intelligence tools and to perform active correspondence as in ordinary circumstances, though they must exclusively transmit and receive from the other friendly stations fake military news that seems true[98].

In the following months, apparently truthful news found large diffusion on the Isonzo front, as witnessed by the correspondence between Italian Headquarters. It can be mentioned as an example the 3rd Army Intelligence Office transmission "by the station in Selz of seven phonograms that were all intercepted by an enemy station where they made a considerable impression", so much so that they were immediately transmitted to the Headquarters.
The same communication by the 3rd Army mentions other phonograms with spurious news transmitted by the stations of Polazzo and San Michele, in the night between 5 and 6 March, which were not intercepted "probably because personnel in charge at the enemy station was asleep". They were submitted again the morning after. After a few days, the movements of enemy troops proved the complete success of 'our game'[99].
The text of a conference delivered presumably in February 1918 at a "Course on combat conduct" by an Austrian Staff Officer - who was an Informer of the 58th Division Headquarters - provides a vivid description of some episodes regarding the first telephone interception operations. As to the Austrian-Hungarian telephone eavesdropping service, according to the same officer, "perhaps nothing else has been more praised and at the same time more blamed than this invention. Often, the station would only intercept our communications, or the enemy would transmit false communications knowing these were being intercepted". After mentioning some successful results achieved in the Carso region in the winter of 1915-1916, he adds: "The Italians also made fun of our conventional names at times, which led us to infer that they were intercepting our communications too. Finally, complete attack plans could be intercepted; yet the attacks would take place in other locations, clearly showing that those orders were just imaginary"[100].

[97] Headquarters of the 2nd Army, Communication to the Intelligence Office of the Supreme Headquarters, *Fonogrammi di fonte austriaca intercettati* (Intercept Austrian phonograms), ref. no. 725 of 9 October 1915.
[98] Supreme Headquarters, Office of Chief of Staff, *Circular letter,* Ref. no. 4985, 15 October 1915.
[99] Intelligence Office of 3rd Army, Phonograms to the Supreme Command, 6 and 10 March 1916, Historical Archives, Army General Staff AUSSME, Series E8, env. 8.
[100] Supreme Headquarters, Daily News, *Un giudizio nemico sul vario rendimento del servizio d'intercettazione telefonica* (Enemy assessment about random performance of the telephone interception service), no. 231 of 3 October 1918, part 4, miscellaneous news. The Italian had seized this document during the Second Battle of the Piave River.

CHAPTER NINE

The hard transition

9.1 FIRST SIGNS OF ELECTRONIC WARFARE

Radio Direction Finding and Interceptions

Captain Sacco signed monthly or bi-monthly reports summing up the results of radio goniometric findings and of interceptions carried out by the Office in Codroipo[1].

In early 1916, the radiotelegraphic network designed for this purpose included some Armies' field stations that would intercept messages in the free time from other tasks[2], as well as posts designed to exclusively listen to enemy stations operating on the front, on a 24h basis, located in Bertiolo (Codroipo), Udine, Rivolto, San Valentino (Monte Altissimo), Medea and Mantua. In addition, the fixed stations in Bologna, Ravenna, Vlora and Rhodes were listening to enemy stations operating in the Adriatic-Balkan region.

Direction finding systems remained in Padua, Latisana, San Daniele. Later, a new station was implemented in Lecce to cover the Adriatic-Balkan region more effectively, in cooperation with the French direction-finding stations of Thessaloniki and Florina in Greece.

The Radiotelegraphic Office periodically distributed tables analogous to the one shown in picture 9.1[3] reporting, amongst other things, the names of the stations to be intercepted, the frequencies used and the types of emissions (continuous wave, damped wave, etc.)[4]. It also assigned to each group of Italian stations the control of a cluster of enemy stations, set up according to their geographic location and to similarity of transmission criteria[5].

The vastness of the operations theatre controlled by the RT Office is impressive. The analysis of radio traffic was extended quite beyond the Italian-Austrian front, including the Adriatic and Danubian areas, the Bulgarian and Turkish networks, and some distant Middle Eastern stations. The interception and radio location activities concerned Austrian and German army and navy communications as well as long and medium distance enemy international traffic especially between Germany, Austria - Hungary and some neutral countries such as Spain.

Results thus obtained were represented in maps, included in monthly reports, like the one shown in picture 9.2. Other maps of the same reports exposed the number of intercepted dispatches

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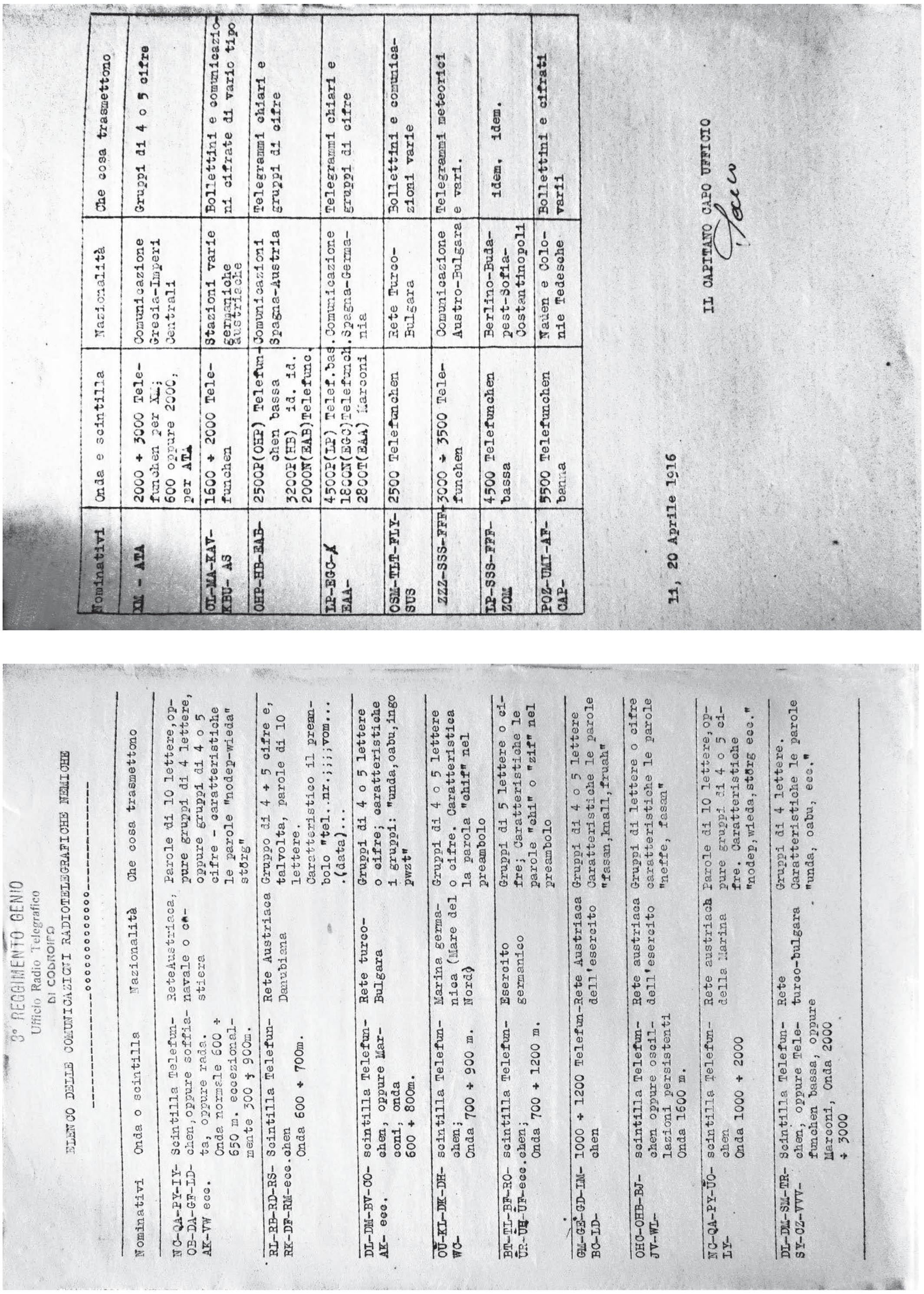
[1] 3rd Regiment of the Engineer Corps, Radiotelegraphic Office of Codroipo, *Relazioni sul servizio radiogoniometrico e di ascolto* (Report on Radio goniometric and listening service), January, Februarv - March, April - May, June, July - Aug., etc. 1916, ISCAG, Coll. 220. Similar reports written in 1915 that are mentioned in the January 1916's report have not been recovered.

[2] These include very active stations for field interception in Tolmezzo, Arsiero, Primolano (Cismon del Grappa), Villa D'Allegno and Treviso.

[3] Chief Inspector of the STM, Military History Journal, Letter no.1093, 24 April 1916, *Radiotelegraphic Listening Service*, AUSSME, Series B1,105 S, Vol. 88. The letter mentions other tables that had been communicated earlier.

[4] The letters identifying the type of spark-gap emission correspond to a pre-ordered ranking: B stands for Marconi spark-gap kind like the one in the Bologna station; M stands for Marconi and Telefunken of the 'sharp tone'; P stands for 'low tone' Telefunken like the one in Pola; R stands for 'low frequency spark', etc.

[5] Bertiolo, Ravenna, Valona and some field stations were tasked to listen to communications of Austrian naval and Danubian networks. Udine and Bologna were dealing with some transmitters of the Austrian army, etc.



3° REGGIMENTO GENIO
Ufficio Radio Telegrafico
DI CODROIPO

ELENCO DELLE COMUNICAZIONI RADIOTELEGRAFICHE NEMICHE

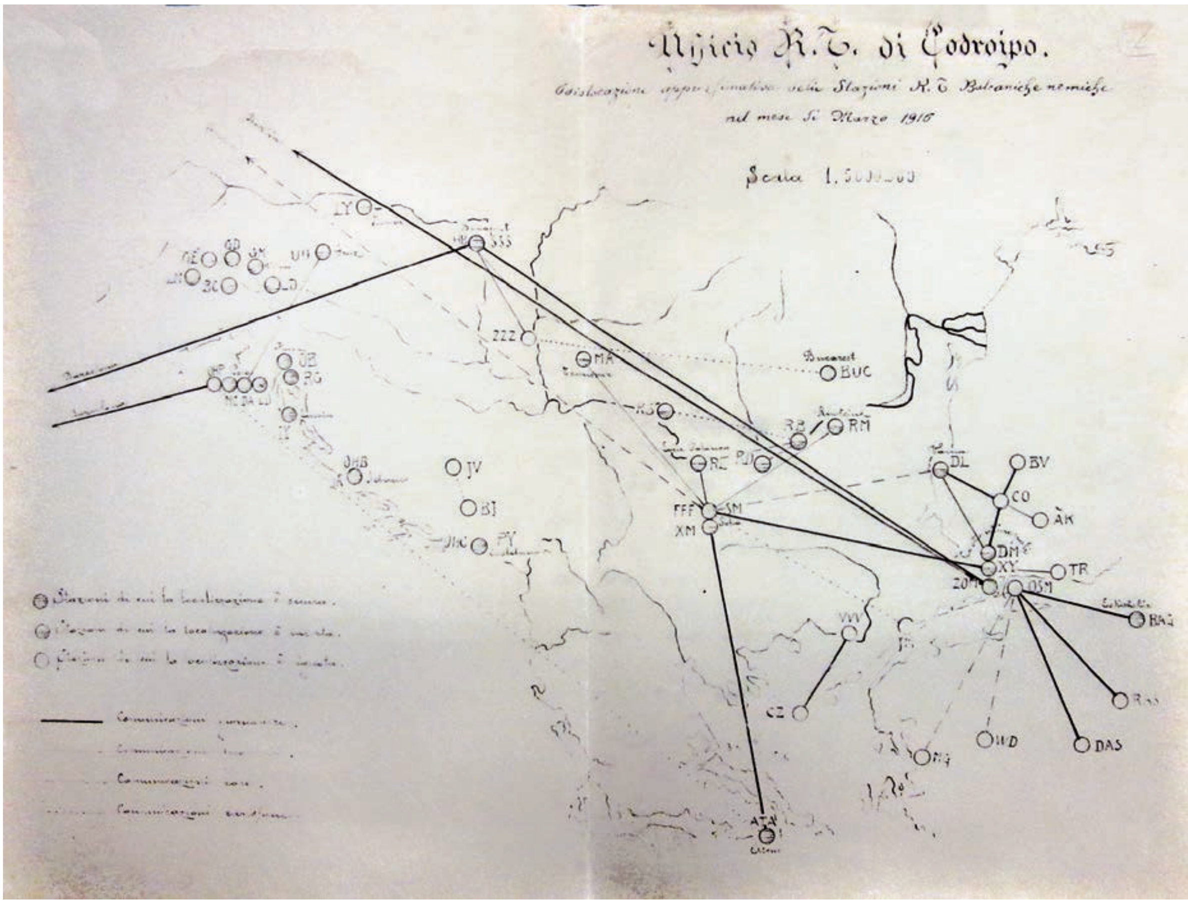
Nominativi	Onda o scintilla	Nazionalità	Che cosa trasmettono
NC-QA-PY-IY-OB-DA-GF-LD-AK-VW ecc.	Scintilla Telefunchen, oppure soffiata, oppure rada. Onda normale 600 ÷ 650 m. eccezionalmente 300 ÷ 900m.	ReteAustriaca, navale o costiera	Parole di 10 lettere, oppure gruppi di 4 lettere, oppure gruppi di 4 o 5 cifre - caratteristiche le parole "nodep-wieda" störg"
RL-RB-RD-RS-RK-DF-RM-ecc.	Scintilla Telefunchen Onda 600 ÷ 700m.	Rete Austriaca Danubiana	Gruppo di 4 ÷ 5 cifre e, talvolta, parole di 10 lettere. Caratteristico il preambolo "tel..nr.;;;;vom... .(data)...
DL-DM-BV-CO-AK- ecc.	scintilla Telefunchen, oppure Marconi, onda 600 ÷ 800m.	Rete turco-Bulgara	Gruppi di 4 o 5 lettere o cifre; caratteristiche i gruppi: "unda,oabu,ingo pwzt"
OÙ-KL-DK-DH-WC-	scintilla Telefunchen; Onda 700 ÷ 900 m.	Marina germanica (Mare del Nord)	Gruppi di 4 o 5 lettere o cifre. Caratteristica la parola "chif" nel preambolo
BT-TL-BF-RO-ÙR-UH-UF-ecc.	scintilla Telefunchen; Onda 700 ÷ 1200 m.	Esercito germanico	Gruppi di 5 lettere o cifre; Caratteristiche le parole "chi" o "zif" nel preambolo
GM-GE-GD-IM-BC-LD-	1000 ÷ 1200 Telefunchen	Rete Austriaca dell'esercito	Gruppi di 4 o 5 lettere Caratteristiche le parole "fasan,knall,fruah"
OHC-OHB-BJ-JV-WL-	scintilla Telefunchen oppure oscillazioni persistenti Onda 1600 m.	Rete austriaca dell'esercito	Gruppi di lettere o cifre caratteristiche le parole "neffe, fasan"
NC-QA-PY-ÙO-LY-	scintilla Telefunchen Onda 1000 ÷ 2000	Rete austriaca della Marina	Parole di 10 lettere, oppure gruppi di 4 o 5 cifre. Caratteristiche "nodep,wieda,störg ecc."
DL-DM-SM-TR-SY-CZ-VVV-	Scintilla Telefunchen, oppure Telefunchen bassa, oppure Marconi, Onda 2000 ÷ 3000	Rete turco-bulgara	Gruppi di 4 lettere. Caratteristiche le parole "unda, oabu, ecc."

Nominativi	Onda e scintilla	Nazionalità	Che cosa trasmettono
XM - ATA	2000 ÷ 3000 Telefunchen per XM; 600 oppure 2000, per ATA	Comunicazione Grecia-Imperi Centrali	Gruppi di 4 o 5 cifre
OL-MA-KAV-KBU- AS	1600 ÷ 2000 Telefunchen	Stazioni varie germaniche austriache	Bollettini e comunicazioni cifrate di vario tipo
OHP-HB-EAB-	2500P(OHP) Telefunchen bassa 3200P(HB) id. id. 2000N(EAB)Telefunc.	Comunicazioni Spagna-Austria	Telegrammi chiari e gruppi di cifre
LP-EGO-X EAA-	4500P(LP) Telef.bas. 1800N(EGO)Telefunch. 2800T(EAA) Marconi	Comunicazione Spagna-Germania	Telegrammi chiari e gruppi di cifre
OSM-TLT-FLY-SUS	2500 Telefunchen	Rete Turco-Bulgara	Bollettini e comunicazioni varie
ZZZ-SSS-FFF-	3000 ÷ 3500 Telefunchen	Comunicazione Austro-Bulgara	Telegrammi meteorici e vari.
LP-SSS-FFF-ZOM	4500 Telefunchen bassa	Berlino-Budapest-Sofia-Costantinopoli	idem. idem.
POZ-UMI-AF-CAP-	5500 Telefunchen banna	Nauen e Colonie Tedesche	Bollettini e cifrati varii

11, 20 Aprile 1916

IL CAPITANO CAPO UFFICIO
Sacco

9.1 List of intercepted enemy radio stations with their features, April 1916 (ISCAG Archive)



9.2 Map of positions and connections between the Austro-Hungarian stations localised along the Adriatic coast and in the Balkan area, March 1916 (ISCAG Archive)

in a month or two months between the stations. Data was sometimes compared with similar information collected by the British navy, also to release additional details to the latter.
Radio traffic analysis provided extensive knowledge about the correspondence between the stations, their locations and short identification codes, which had been partly found the year before[6]. Moreover, those findings, along with information from other sources, made it possible to associate the station short codes with military units deployed in the area, for instance:

SSS = Donau Flottillen Kommando in Budapest
RM = Monitordivision Kommando in Rustchuk, etc.

The reports of the Codroipo Office often included a paragraph entitled “Ciphers” which states the results on decrypting attempts of enemy’ dispatches, interpretation of abbreviations, correspondence between coded words and code groups, etc., in addition to numerous references to other reports regarding the same topic, which were evidently more confidential. As evident from the table

[6] 3rd Regiment of the Engineer Corps, Radiotelegraphic Branch of Codroipo, *Relazioni. Gennaio 1916*. (Reports. January 1916*) op. cit.,* p.1. Short codes of Austrian stations known since 1915 include: NC = Pola; IY = Lošinj; QB = Rijeka; QB = Šibenik; PY = Castelnuovo, etc.

in picture 9.1, the features of codes and ciphers adopted by each group of enemy stations have been identified, starting their classification and, in some cases, their solution since the summer of 1916[7]. The report of November-December is of cryptologic interest as it included the interpretation of several technical terms of the *Word Technical Code* called Ignaz that Austrian radiotelegraphic stations used for service communications. It comprised approximately thirty pronounceable words, out of a total of 140. Each was made of five letters, starting from "ignaz", which preceded all dispatches, and including "isaak" that corresponded to "not understood, please repeat", "knall" that meant "received correctly", "fasan" equivalent to "nothing else to transmit", etc. As will be shown later in this book, the Sacco' cryptologic discoveries in the second half of 1916 went far beyond that technical code.

All the data collected in 1916 confirmed the scarce traffic generated by Austrian field stations operating on the Italian front, consistently with the limits for transmissions established by the Austro-Hungarian Headquarters. The effects of these restrictions became more evident in May, when a group of previously intercepted stations stopped transmission and just two of them, with the GD and GM codes, remained active daily exchanging service telegrams. The ensuing scarcity of Austrian dispatches was partly balanced by the interception of telegrams transmitted from field stations of the Imperial army operating in other geographical areas, such as the Balkan peninsula and using equal or similar ciphers to those detected on the Italian front.

This necessarily concise description of the activities carried out by the Codroipo Office - assuming the denomination of 'Radiotelegraphic Detachment of the Radiotelegraphic Section of the Supreme Command' on 1 August 1916 - shows unquestionable ability in the field of interceptions and traffic analysis, which allowed the collection of a large amount of significant military information. On the other hand, the Austrian army did not yet have direction finding equipment, which were adopted systematically on the Italian front only in mid-1917[8].

Attempts of Electronic Countermeasures

One of the activities of the interception network managed by the Codroipo Office concerned the enemy's air force communications. One of the mentioned reports reads: "on 6 January (1916, A/N) on the Isonzo front, Austrian aircrafts used for artillery fire control started being equipped with radiotelegraphic stations […]. Italian radio stations in Trentino such as Arsiero, Coni Zugna and San Valentino had been reporting this information for quite some time"[9]. In fact, as already mentioned, on 13 November 1915, near the radio station of Arsiero, an enemy aircraft had been shot down as it was transmitting information to the ground regarding the outcome of artillery fire[10]. The reports issued by the Codroipo Office comprise the plaintext versions of air-to-ground enemy communications.

[7] 3rd Regiment of the Engineer Corps, Radiotelegraphic Office of Codroipo, *Relazioni. Gennaio 1916*, *op. cit.,* p.4. The ciphers of dispatches intercepted in early 1916 mostly featured groups of ten pronounceable letters or 4-5 figures. The latter type was also used by some Austrian field stations in the Balkans. Another code based on groups of 4-5 non pronounceable letters was "distributed to all Allied Countries of Central Powers for signal transmission of common interest, which possibly included warnings to submarines".

[8] M. Ronge, *Der Radiohorch*, *op cit.,* p.19. The first testing phase started in January 1917. The operational units were equipped with direction finding devices in the following May.

[9] 3rd Regiment of the Engineer Corps, Radiotelegraphic Office of Codroipo, *Relazioni. Gennaio 1916*, (Reports. January 1916), *op. cit*., p.5.

[10] General Headquarters of the Engineer Corps, Letter to the Technical Office of the Supreme Headquarters following form no.1913 of 28 February 2015.

Moreover, the interceptions carried out in January 1916 by Maria Zell's station operating in the area controlled by the 2nd Army on the Isonzo front deserve particular attention[11]. In that case, methodical listening operations were possible because of the regularity of enemy flights, which usually took place between 11 and 12 a.m., when visibility was optimal in winter. Italian radio telegraphists could therefore get ready to tune their receivers on aircraft emission frequencies. Operators found out that when aircrafts achieved the vertical axis on the target, they transmitted the telegraph signal FFF (Feuer) while after fire they repeated several times a signal, indicating the approximate estimate in metres of the distance between the hit area and the target. For example: 200 - N - 50 - W.

The Intelligence Office of the 2nd Army also provided some suggestions concerning the measures required to "make aircraft artillery fire information inaccurate or ineffective". This ahead-of-time electronic countermeasure entailed setting up adequately powerful transmitters that could be quickly tuned into the frequencies of enemy aircrafts, to interfere with their communications.

The Austrian ground station of Aidussina, pinpointed by direction finding equipment in Codroipo as located a few kilometres from Gorizia, tried to perform a similar function against some Italian stations, aiming to disturb their radio communications that, right after enemy aircraft sighting, would spread the alert across the whole area. However - as Sacco noticed - efforts to interfere were unsuccessful because "the tone of the spark-gap station of Aidussina was quite different from the tone of the Italian stations and this allows our radio telegraphists to follow warnings (alerts to other Italian stations, A/N) despite attempted disturbance by the enemy". The same Sacco adds: "the enemy seems to be quite naive in insisting on this useless effort to disturb our radiotelegraphic stations"[12].

For the same reason, the proposal set out in the above-mentioned report of the 2nd Army to adopt a method analogous to that of the Aidussina station, to interfere with the Austrian air-to-ground communications, was not immediately approved by the Engineer Corps Headquarters waiting to become more familiar with the Austrian-Hungarian equipment by, for instance, seizing other specimens[13].

True and False Ciphers

A letter of 22 February 1916 from the Intelligence Office of the Supreme Command to the 3rd Army Headquarters proves the first results of Italian efforts to break Austrian ciphers. That document mentions an elementary mono-alphabetic substitution cipher used by some Austrian radiotelegraphic stations where each letter is coded by a random two-figure number (B=93; C=62; D=33, etc.), specifying that: "the numbers changed every 15 days […]"[14]. The Intelligence Branch of the 3rd Army was asked to verify the eventual correspondence of this cipher to that used in Austrian radiograms intercepted by its stations. Evidently, that cipher shows extreme weakness

[11] Intelligence Office of the 2nd Army, *Dalla stazione radiotelegrafica di Maria Zell, Radiotelegrammi intercettati ed interessanti osservazioni, fatte in proposito dalla suddetta stazione* (Radio telegrams intercepted from Maria Zell's radiotelegraphic station and relevant remarks concerning the above-mentioned station), Bulletin no. 260, 26 February 1916.

[12] 3rd Regiment of the Engineer Corps, Radiotelegraphic Office of Codroipo, *Relazioni aprile-maggio 1916* (Reports, April - May 1916), *op. cit.*, note on p. 5. ISCAG, Coll. 220.

[13] General Headquarters of the Engineer Corps, letter to the Technical Office, 28 February 1916, *op. cit.*

[14] Intelligence Office of the Supreme Headquarters, *Cifrario per le comunicazioni telegrafiche austriache,* (Cipher for Austrian telegraphic communications), form nº 67, personal in confidence, to the Chief of the Intelligence Office, 3rd Army, 22 February 1916.

and would have been more resilient to decryption had it comprised an adequate number of null items and homophones which, however, seem to be missing in this case.
During the following March, the Austro-Hungarians conveyed some misleading radio messages - what is nowadays termed deception - by having Captain Figl prepared a cipher, easy - but not too easy - to break, applied to the dispatches. Those transmissions were concerning the fake ongoing preparation of a simultaneous attack on the Trentino and on the Isonzo front, while the Austro-Hungarian Command's real intention was to launch an attack only in Trentino. This really happened with the famous Strafexpedition, although with considerable delay compared to the date originally set.
Undoubtedly, the Italians could decrypt some radiograms transmitted on that occasion by the Austro-Hungarian radio stations. For instance, in mid-March 1916, the War Situation and Operations Office reported a radio interception about the delivery by train of ten bridge segments heading for the Tolmino area, in view of an Austro-Hungarian attack in that sector of the Isonzo front. O. Marchetti declared that the attempt on the Austrian part had failed as, in early April, the Intelligence Office stated that "the attack will be in Trentino on the plateaus and in Val Sugana […], suspecting that some poorly coded dispatches are false as spread by enemy radio stations with the intention to deceive us"[15].
In sum, the electronic warfare on the Italian front had begun!

9.2 AN INCREASE IN AWARENESS

An Alert from the Supreme Command

On an unspecified day in March, an Austrian listening radio station that had moved too close to the front line was captured by the Italians. The documentation and material seized along with the station are unknown, yet the countermeasures adopted by the Austrian Intelligence Service were so radical as to let one infer that the information fallen into Italian hands was not negligible[16].
The information achieved by the Italian Intelligence on that occasion probably led to the awareness of the Austrians possession at least of some Italian codes and ciphers. As a matter of fact, on 29 March the Operations Division of the Supreme Command informed all Armies' Headquarters and the other concerned branches of suspecting that parts of the Red Code could be held by the enemy, and peremptorily prohibited to use it for any radiotelegraphic communications[17].
The Intelligence Office reiterated the prohibition in a letter sent in the following month to all Commands which, going to some extent into cryptographic issues, reads:

> the *Red Code* usage implies some risks even despite the changes to it (modified page numbering, A/N), since the positioning and the progressive numbering on each page of the single items remain unmodified, which is enough for a skilful cryptologist to identify the changes easily, provided the large quantity of material available.
> Furthermore, the extensive use of the *Red Code* naturally compromises its secrecy[18].

[15] O. Marchetti, *Il Servizio Informazioni, op. cit*., p.115.
[16] M. Ronge, *Der Radiohorch*, *op cit*., p. 6.
[17] Supreme Headquarters, Operations Division, *Service communication n° 6462 of 29 March 1915*. AUSSME, Series F1, env.108.
[18] Intelligence Office, Letter, Ref. no. 8983, 29 April 1916, AUSSME, Series F3, env.50.

Among the possible countermeasures, the systematic substitution of the *Red Code* with the *Blue Code* “which differs from the *Red Code* only in the page numbering” was excluded[19].
However, the letter also contains some shoddy suggestions concerning for instance to use the *Green Cover Code* for communications between High Commands and the *Pocket Military Cipher* for other radio dispatches. The reasons given for these choices were the larger reliability of the former because its limited usage and the latter pretty secrecy due to variable keys changing every week.
In sum, while the diagnosis seemed correct, the recommended therapy showed evident shortcomings. Relying on the *Pocket Military Cipher* was evidently a mistake. On the other hand, the potential spread of the *Green Code* - limited in fact during the following months - might have compromised it, if a further protection by means for instance of an effective second encoding, should had not been provided.
Contrary to the Intelligence Office suggestion, the *Red Code* was suspended only temporarily, probably due to the lack of an effective alternative and it reappeared on 25 April with a different page numbering and an extremely simple over-coding implemented by adding fixed or periodically variable numbers to the code groups.
A weak form of overencoding based on addition or subtraction was frequently adopted also for other codes such as the *M13*, used for communications with Military Attachés abroad and with the colonies, until the *SI Code* introduction in the following year[20]. Picture 9.3 shows the over-encoding table for M13, to be applied as further protection to the periodically changing page numbering in a similar way adopted for the *Red Code*, but valid even for an entire year[21].

=O=

Dal		Al		N.	Dal		Al		N.
1	Agos.	15	Agos.	- 1234	1	Febb.	15	Febb.	+ 234
16	id.	31	id.	- 1511	15	id.	28	id.	+6111
1	Sett.	10	Sett.	+ 322	1	Marzo	10	Marzo	- 3344
11	id.	30	id.	- 1214	11	id.	31	id.	- 345
1	Ott.	20	Ott.	+ 2212	1	Apri.	20	Apri.	- 711
21	id.	31	id.	+ 345	21	id.	30	id.	+ 99
1	Novem.	15	Novem.	+ 233	1	Magg.	15	Magg.	+ 123
16	id.	30	id.	- 527	16	id.	31	id.	- 555
1	Dicem.	20	Dicem.	+ 111	1	Giug.	10	Giug.	+ 3333
21	id.	31	id.	+ 222	11	id.	30	id.	- 1010
1	Genn.	10	Genn.	- 1111	1	Lug.	20	Lug.	+ 2121
11	id.	31	id.	+ 444	21	id.	31	id.	+ 1011

9.3 An over-encoding table for the M13 code (ISCAG Archive)

A similar table was adopted in early 1917 in Albania for communications between the Italian task force and the local French General Headquarters. However, in this case, the table could change in each single cryptogram, allowing the coding operator to choose the numbers to add to or subtract from the code groups achieved from the *Mengarini Code*. According to Figl, breaking this code - which had been strengthened by hiding the address and reference number inside the encoded text of the dispatches - was the result of German analysts’ long, hard work[22].

[19] *ibidem.*
[20] Intelligence Office, *Istruzioni relative al cifrario diramato in data 31 gennaio 1916* (Instructions concerning the cipher distributed on 31 January 1916), no. 380, 1 February 1916, AUSSME, Series E11, env.89. It is worth recalling the M13 is the 1913 edition of the Mengarini code.
[21] Territorial Command of the Headquarters of the General Staff Corps, Intelligence Office, *Aggiunte da inserirsi nel cifrario distribuito il 31 gennaio 1916* (Additional items to be included in the cipher distributed on 31 January 1916), *ibidem.*
[22] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.178 - 179, 290.

In the last part of the letter mentioned above, the Intelligence Office also conveyed a general warning as to *Service cipher* use for radio dispatches containing confidential information, with reference to a new chipher based on groups of letters distributed in the early days of the month.

The Service Ciphers of the "C" Series

Having lost all the certaities it had shown off in August of the previous year regarding the safety of figure-based service ciphers, the Telegraphic Inspectorate decided to replace it with a cipher based on groups of letters, marked by the first letter C. The first cipher of the family, called C1[23], followed that based on groups of letters, unknown to the Austrians and reserved since the early months of war for particularly confidential correspondence of the Higher Commands radio stations.

During the early days of March 1916, "the mobile 0.3, 0.5, 1.5, 3 kW radiotelegraphic stations and the fixed stations of Udine, Treviso, Osoppo, Pieve di Cadore, Arsiè, Arsiero, Verona, Brescia, Milan received a numbered copy of a new service cipher based on groups of letters. […] which will start being used at 5 am of next 1st April"[24].

As the following ciphers of the C group, the *C1* was based on the replacement of letters, figures and words with code words formed by letters of a 17-letter Italian alphabet reduced by the exclusion of E, J, K, M, T, U, W, X, and Y. The *C1* structure was analogous to that of the figure cipher because it employed two tables, a main table and an auxiliary one, which allowed code groups of two or three letters to be generated. As for the previous numerical cipher, in cryptograms the code groups were grouped, to form sets with the number of letters varying from 2 to 6, facilitating the discovery of the cipher type[25].

In his memoirs, Figl describes the breaking process of *C1*: the reconstruction of first line of the main table needed only a few days while the sub-rows required more time[26]. The main reason behind the Austrian success was the strong similarity with the previous number-based cipher and particularly the regularity shared by both, as it clearly results from the analysis of *C1* tables shown in Annex A.

The circular radio transmission, every Saturday morning, of the key repeated three times - which is why the cipher was called 'weekly' - by the station in Treviso and using the previous key, shows the cryptographic inexperience of the STM Inspectorate. Therefore, replacing the numbers with letters did not produce any significant progress in terms of security of the *Service Cipher*.

During 1916, trying to escape enemy decryption, the ciphers of C series underwent numerous changes. In mid-June during the Strafexpedition, a new cipher called *CF* was introduced in the 1st Army, adopting a dictionary formal structure. As shown in Annex A, the representations by table or as a code are equivalent: the *CF* dictionary, including 17 pages, each with 17 lines and 6 columns, corresponds to a main table of 17 lines and an equal number of columns plus an auxiliary table of 6 lines. The *CF* code groups containing three letters were grouped in couples in the body of the cryptograms and the key word changed every day[27].

For fear that the previous versions might have fallen in enemy hands, on 20 August, nearly at the end of the battle that led to the conquest of Gorizia, the *C2* came into force, for coding

[23] The acronym C[1] initially identified the new cipher and was later changed into C1. In this book only C1, C2, etc. terms will be used.

[24] Chief Inspector of the STM, Military Journal, Service Order no. 39 of 8 March 1916 AUSSME, Series B1,105 S, Vol.88.

[25] *ibidem,* Chief Inspector of the STM, Military Journal, Service Order no. 46, 5 July1916.

[26] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p 133 and ff.

[27] O. J. Horak, *Andreas Figl Leben und Werk, op. cit*., p.160. The adoption of the *CF* is not reported in the service orders of the Chief Inspector of the STM, probably because it concerned the 1st Army only.

Headquarters telegrams, while "the *C1* could still be used for service communications"[28]. The new cipher resembled the *C1* as to the code groups in cryptograms varying from 2 to 6 letters; it was structured as a 17x17 table, with two sub-rows for each position.
Figl and his colleagues were extremely interested in the fast evolution of service ciphers and they managed to break each of them, as fast as possible, also by the help of seized specimens. For instance, during the Strafexpedition, the Austro-Hungarians caught four Italian ciphers - Ronge does not specify which ones - in addition to the scarcely relevant *Pocket Military Cipher*[29]. It should be noted, once again, that Figl never mentions the advantages achieved from those captures.

The Development of Italian Cryptologic Activities

Considering the failed attempts to obtain significant help by the Allies to break enemy ciphers, Captain Luigi Sacco continued working to decrypt at least passages of Austrian dispatches. The positive outcomes of his commitment and ingenuity led the Supreme Command to grant him the necessary resources. As O. Marchetti recalls:

> for a long time, he worked almost alone, tenaciously, until when, considering that his results had been positive and useful, his superiors realized that his research needed to be broadened and intensified and it was therefore necessary to staff that new branch of the Intelligence Service with additional resources, especially in terms of personnel with excellent language skills. That was how the Cryptographic Unit was born, later becoming more and more important[30].

In fact, the Codroipo Radiotelegraphic Office had been tasked to decrypt enemy dispatches since its creation, but the first human resources for helping Sacco in carrying out this job were available only in the spring of 1916, according to what he himself reports[31].
The entire operation was in every case extremely confidential: The Unit was officially called 'cryptographic', only after the war, according to the records of Section R of the Intelligence Service. During the entire war, any reference to Sacco's and his colleagues' work was systematically avoided and known to only a small number of top-level military and civilian authorities[32].
The Cryptographic Unit developed gradually, beginning with a few operators within the Radiotelegraphic Office of Codroipo selected by Sacco with extreme care and difficulty, given the poor cryptologic culture existing in the Army and in the Country. The number of personnel increased progressively up to about ten in the early summer, as shown in the following paragraphs.
In his Manual Sacco mentions, amongst his colleagues, Professor Remo Fedi, Tullio Cristofolini from Trento, and Mario Franzotti from Gorizia, both Lieutenants of the Engineer Corps, 'unredeemed' volunteers and with an excellent knowledge of the German language. Fedi had been a member of the unit since the beginning, while the two Lieutenants joined the team later: we

[28] Chief Inspector of the STM, *Military Journal, Service Order no. 47 of 2 August 1916,* AUSSME, Series B1, 105 S, Vol. 88. The Austrians employed for service ciphers different names from the Italian ones: the cipher based on groups of figures is called *Service Cipher I*, *C1* corresponds to their *Service Cipher II*, *CF* corresponds to *Service Cipher III*, and *C2* to *Service Ciphers IV* (O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 160 and f.).
[29] M. Ronge, *Der Radiohorch,* op cit., p.10.
[30] O. Marchetti, *op. cit.,* p.88.
[31] "Our cryptographic organization dates back to the spring of 1916" (L. Sacco, *op. cit.,* p. 308).
[32] A change in Sacco's official tasks is implicit yet not easily inferable from the change, in August 1916, of the name of Codroipo "Radiotelegraphic Office", which became "Autonomous Detachment of the Radiotelegraphic Section of the Supreme Headquarters". Consequently, the Radiotelegraphic Service had to report to the Supreme Headquarters and no longer to the Chief Inspector of the Military Telegraph Service.

know, for example, that Cristofolini was admitted in May 1917. By mentioning them in his book, probably Sacco wanted to recall those who contributed the most to the unit's work thanks to their special cryptologic aptitude, what may be defined a good 'cipher brain'.

Moreover, amongst his co-workers, Sacco mentions engineer Franco Magni as "chief of radio-interceptors and goniometer operators" who had succeeded him as chief of Codroipo office, after his secondment to Rome at the end of October 1916[33]. Until that moment, Sacco had been filling a double position, as he had been organizing radio interception and traffic analysis on the one hand and decrypting enemy dispatches on the other. He signed monthly reports on radiotelegraphic activities throughout 1916.

Tangible results regarding the breaking of German and Austrian codes and ciphers did not take long to show, together with the concrete - yet initially unsuccessful - attempts to have an impact on the nature and usage of the Italian army codes and ciphers. Before describing the initial outcomes of Sacco's generous efforts, it seems appropriate to illustrate some competitive advantages obtained during war operations by the commitment of the opponents in the radio intelligence domain.

9.3 THE GREAT BATTLES OF 1916

The Strafexpedition

On 15 May, the Austrian attack named Strafexpedition (punitive expedition) or Battle of the Plateaux took place, with the aim of breaking through the Trentino front and invade the Po Valley. It is worth to recall that at the time of this battle, Italian Communication Intelligence and Security still had lower standards than those achieved by the Austro-Hungarian army. In fact, the ability to decrypt enemy radio dispatches was just emerging and telephone interception was not yet extensively used in the area controlled by the 1st Army where the attack took place, unlike what had happened in other sectors of the front line. Therefore, timely news regarding the attack had reached the Intelligence Offices of the Supreme Command and of the 1st Army through Human Intelligence traditional channels.

During the first phase of the battle, most of Italian troops' wire connections were destroyed by artillery fire and only radio could "guarantee the most important communications", though "following the withdrawal of our front line, some of the radiotelegraphic stations were compelled to discontinue their service"[34].

Under these circumstances, the Italian frequent radio transmissions allowed Austro-Hungarian Headquarters to obtain some important operational information by decrypting Italian dispatches. According to Figl, instructions imprudently communicated via radio between 19 and 20 May by the Headquarters of the 1st Army allowed contrasting effectively an Italian counter-offensive[35].

In early June, the interception of stations with new names made Austrian commands aware of existence in the area surrounding Padua of newly established 5th Army created to support worn

[33] Franco Magni was a brilliant inventor. Sacco called him Captain, a rank he perhaps achieved after the war. In fact, during the war he remained Lieutenant.

[34] Those stations recovered or destroyed their equipment before retreating. Supreme Command, General Inspectorate of the Engineer Corps, *Relazione sulle attività delle Specialità Telegrafiche nella recente guerra* (Report on the Activities of Telegraphic Specialized Units during the last war), p. 19, ISCAG, Coll. 226.

[35] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 145. That dispatch comprised many operational details and was evidently addressed to subordinate units, infringing the prohibition to transmit this kind information especially top-down the military hierarchy.

out troops deployed on the Tridentine front[36]. The map in picture 9.4 shows the location of the new stations along with the entire deployment of Italian radio stations as of 8 June. However, since the Austrians did not yet have direction finding equipment, they could only detect a general increase in traffic and the existence of new radio stations. Consequently, Ronge's statement that the reinforcement troops had assembled near Padua could have been derived from other sources of information, or in hindsight, as it seems to be supported by a reference made by the Austrian General to "the exact data given by Cadorna and Tosti concerning the forces deployed by Italy, that we now have"[37].

The cryptographic countermeasures adopted by the Italians also included the change of the service cipher key only for the 1st Army and the adoption of a "special cipher" to transmit news collected by reconnaissance aircrafts. The Austro-Hungarian commands interpreted such measures as a sign of an imminent counterattack[38].

At the end of the battle, the Imperial army withdrawal led it to positions slightly forward with respect to the beginning of the offensive that "had burned out as a firework, with a thousand flares but no substance"[39]. Ronge, neglecting the Italian army's strong resistance, explained the final retreat with a radical change in the force balance between the two armies and with the "new war events on the Russian front" which "imposed a limit to our offensive, so glorious until that moment"[40].

From a cryptologic point of view, in late spring of 1916 and, above all, during the Strafexpedition, the Austro-Hungarian cryptologic service detected the introduction of new Italian ciphers that succeeded one another in a short time and with key daily changes, in accordance with what prerviously shown about the *C2* cipher. Ronge admitted: "the remarkable improvement of their encoding capacity is a reason of concern and generates a suspicion about the Italians having possibly surmised the existence of our listening service"[41]. Figl also agreed that the Italian commands had become especially aware about the danger inherent in the employment of radio communications and the scarce effectiveness of the protections systems adopted until that moment[42].

The role of COMINT in the conquest of Gorizia

The scenario of cryptologic competition radically changed during the Sixth Battle of the Isonzo, which took place between 4 and 17 August and led to the conquest of Gorizia. This time the Italian radiotelegraphic stations could maintain complete radio silence before the attack, since all communications were conveyed by wire, making it possible to conceal any information including those concerning the redeployment of troops from the Tridentine to the Isonzo front.

Figl does not apparently devote any space to the Sixth Battle of the Isonzo, probably due to the lack of obtained information. Conversely, Ronge points out the "harshly negative judgement of the command of the Austro-Hungarian 5th Army regarding the interception and decryption service, justified by total surprise of the Italian Army's attack against Gorizia"[43].

[36] *ibidem*, p.146.

[37] M. Ronge, *Spionaggio*, *op. cit.* p. 234.

[38] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.146 -148.

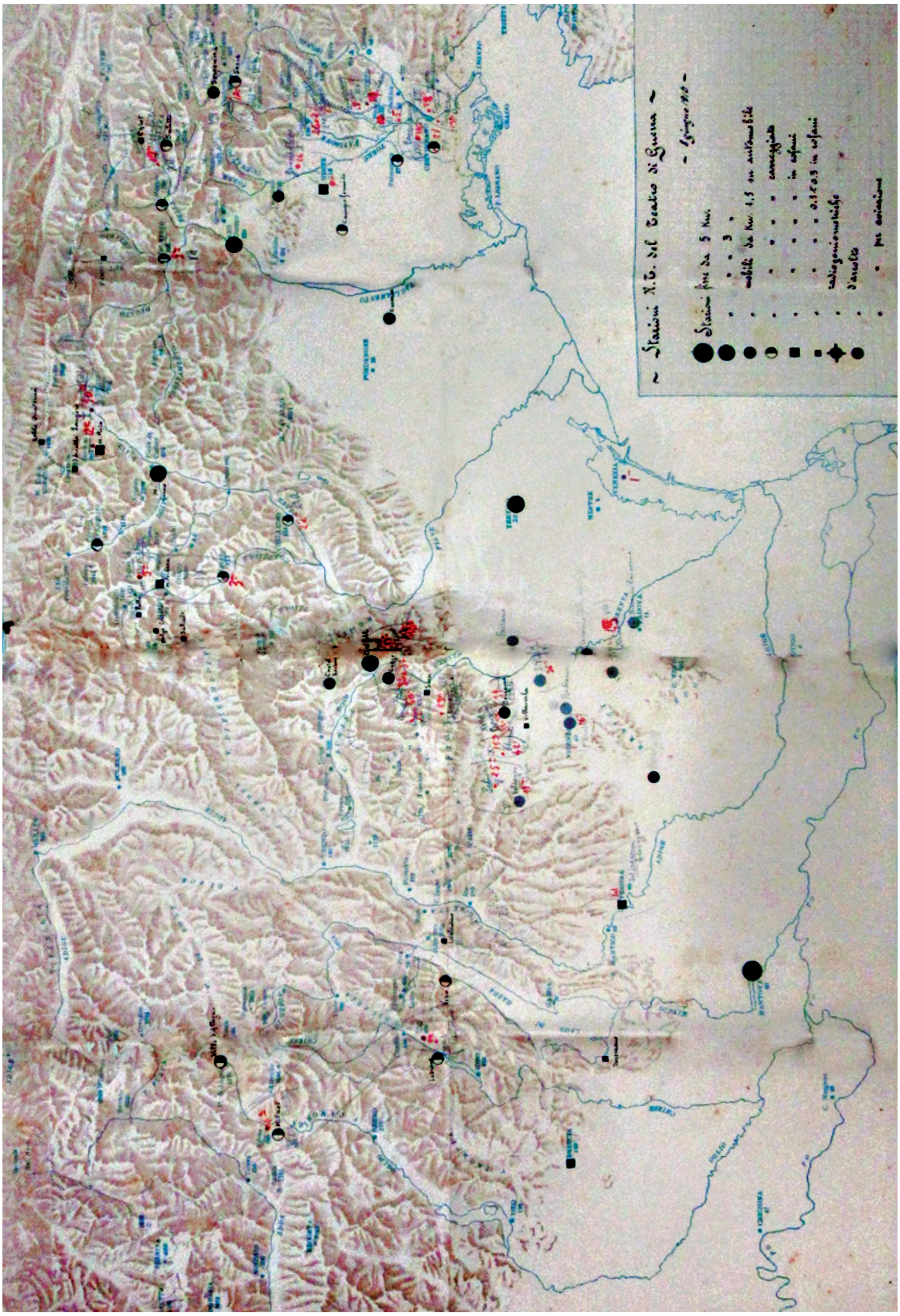
[39] *ibidem*.

[40] M. Ronge, *Spionaggio*, *op. cit.* p. 234.

[41] M. Ronge, *Der Radiohorch*, *op cit.*, p. 9.

[42] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.149.

[43] *M. Ronge, Der Radio Horch, op. cit.,* p.9. The 5th Austrian army deployed along the lower Isonzo had countered the Italian attack to conquer Gorizia.



9.4 Position of Italian radiotelegraph stations on the theatre of operations, 8 July 1916 (ISCAG Archive) Picture 4 Villa Dora, currently Villa Frova

The Austrian General admitted that, on that occasion, not only the radio listening and decryption activities had failed but the entire Austrian Intelligence Service had too. However, with rereference to the Penkalas, he thought it would be wrong to "throw the baby out with the bathwater"[44]. From this sentence it could be inferred that in the aftermath of the Battle of Gorizia, the Headquarters of the Austro-Hungarian 5th Army might have even suggested to abolish the radio interception and decryption service, considering the poor or non-existent practical results due to the lack of Italian radio dispatches with interesting operational contents.
Franz Conrad Von Hötzendorf, Chief of Staff, responded to these pungent remarks, in mid-September, endorsing the need to continue interception and decryption, in consideration of "the invaluable service rendered to the Imperial and Royal army"[45].
The Headquarters of the Isonzo armies, in the person of General Svetozar Boroevic, reiterated the negative judgement on the usefulness of Penkalas the following year, justifying his negative opinion with the poor effectiveness shown at least in that important sector of the front. Boroevic's disappointment also depended on the increasingly skilful use of the radio on the part of the Italians, who transmitted confidential information only in the case of extreme necessity and when other means of communication were not available. Certainly, the colder climate and more abundant snowfall in some areas of Trentino compared to the Isonzo front caused frequent breakdown of physical lines and considerable difficulty to have them restored in a short time, forcing resort to radio employment, for transmitting commands or relevant news.
Concerning the decrypting of Austrian radio dispatches, a contribution to the knowledge of the work and of the first successes gained by Sacco is provided in the following section written by the General's grandchild Professor Paolo Banavoglia, who describes the early results he obtained in the challenging interpretation of a notebook handwritten by his grandfather.

FIRST-HAND DOCUMENTS: LUIGI SACCO'S NOTEBOOK, 1916

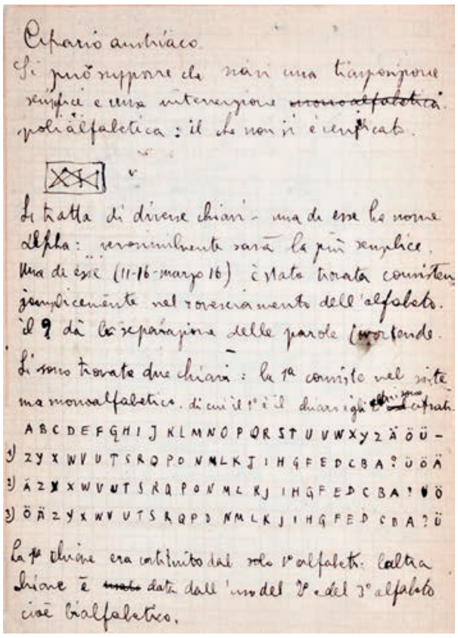
Contribution of Paolo Bonavoglia

In his house along the Tiber embankment, Luigi Sacco held a large quantity of papers, documents, photographs of his long life devoted for the most part to the radio technology but also, especially during WWI, to cryptology.
In his study room, many documents were discovered after his death regarding the activities he had performed during that war[46]. The following paragraphs focus on his 1916 notebook.

The Notebook

The small-sized notebook (13x17cm) provides an interesting contribution for clarifying the history concerning WWI's Italian Cryptography. It comprises 160 pages; the first one with the wording *Cap. Luigi Sacco – Esercizi di Cryptografia - 18 luglio 1916 - dal Kerchoff e dal Valerio* (Captain Luigi Sacco - Cryptography Exercises - 18 July 1916 - from Kerchoff and from Valerio).
Sacco would use this notebook to write day-to-day notes regarding ciphers and various issues as they emerged, which explain the difficulty to find one's way through it. The indication of the date on

[44] *ibidem*. The sentence literally reads: "Man durfte daher das Kind nicht mit der Bade ausgießen" The same page mentions the *Penkala* located at Adelsberg (the German name for Postonjna) being out of order and in need to be completely reorganized.
[45] *ibidem*, p.10.
[46] See also the paper *A 1916 notebook of Luigi Sacco during World War I*, forthcoming in "Cryptologia". This article concerns the notebook and includes pictures and tables that are also shown here.

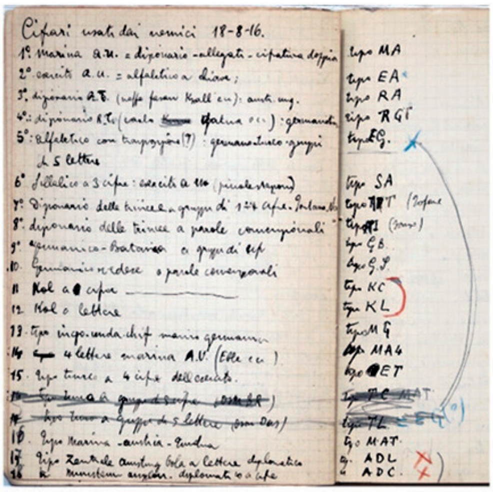


Picture 1

many, yet not all, pages is a valuable piece of information. However, the analysis of the notebook is underway and will require additional time before completion.
At first sight, the notes seem to regard the theoretical aspects of cryptography, as confirmed by the first pages on the Delastelle ciphers and simple-transposition ciphers: mathematic formulas, examples in French, where Sacco seem to be looking for mathematical methods to solve transposition-based ciphers.
Beginning from page 14[47] entitled "AU Cipher", Sacco began to alternate theoretical pages and analysis of intercepted ciphers, assumptions and hypotheses, practical examples of cryptograms, which are sometimes left unsolved and other times completely solved. Page 20 (picture 1) comprises an interesting piece of information: in relation with the analysis of an Austrian cipher, Sacco writes "One of them (11-16 March 1916) turned out to consist of merely upturning the alphabet […]". This date confirms that, even before the Spring of 1916, Sacco could decrypt Austrian dispatches but results, perhaps noted in other papers, have not been found.

A List of Known Enemy Ciphers

The following page shows a list 18 Austrian, German, and Turkish codes and ciphers and identifies the type or each of them: the list is dated 18 August 1916 (picture 2). Of course, this does not mean that he could already decrypt the messages encoded by each of those system.
The list contains a lot of interesting information. For instance, in the following pages of that notebook, Sacco shows he knew so well the Austro-Hungarian and German naval codes, reported in lines 1 and 13 of the list respectively, that he also analysed them for statistical purposes.



ENEMY CYPHERS 18/8/1916	
1, A.U. Navy = code - annexes - doble coding	Type MA
2. A.U Army = alphabetic with key	Type EA
3. R.T. code (waffe fasan krall ecc.) Austro Hungarian	Type RGT
4. R.T. code (caolo Kurve fatua ecc.) Turkish – Germanic	Type RG
5. Alphabetic with transposition (?) Turkish – Germanic, 5 letters groups	Type EG
6. Syllabic with 3 figures, A.U. army (small stations)	Type SA4
7. Trench code with 1- 4 figures	Type AT (Tofane)
8. Trench code with concealed words	Type AI (Isonzo)
9. Germanic -Batavic with figures groups	Type GB
10. Germanic – Swedish with concealed words	Type GS
11. Kol with figures	Type KC
12. Kol with letters	Type KL
13. type ingo.unda.chif German Navy	Type MG
14. 4 letters A.U. Navy (Eble ecc)	Type MA4
15. Turkish Army type 4 figures	Type ET
16. Type Austrian Turkish Navy	Type MAT
17.Type Zentrale Aust.Hung Pola diplomatic with letters	Type ADL
18. Type Ministerium ausland diplomatic with figures	Type ADC

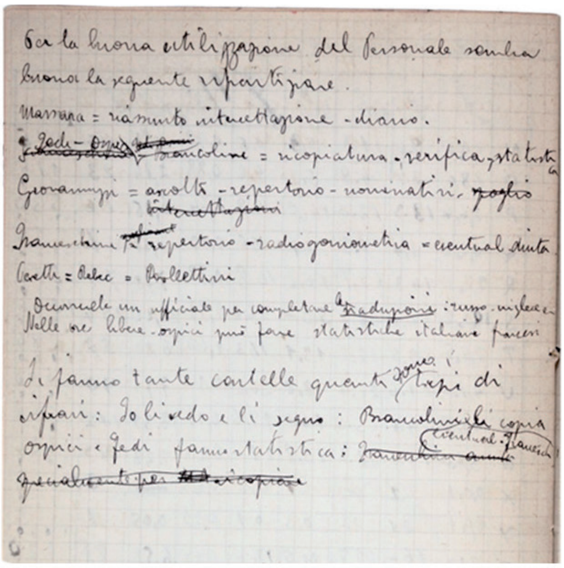
Picture 2

[47] Pages were not numbered originally. Page numbering was added by the authors.

Moreover, the cipher indicated in point 5 of the list is exemplified by transposition-based cryptograms shown in the following paragraphs, where also an example is exposed of a 3-figure syllabic cipher application that Sacco probably had too (line 6 of the list).
The notebook contains many pages full of decrypted or just analysed cryptograms, for the most part, transposition-based ciphers, but also includes mono and poly-alphabetic ciphers.

The Staff

In page 28 (picture 3) Sacco writes down a list of his own personnel. There is no date, but if the notebook was written in an orderly manner, it was likely to be August 1916. If the list is complete, as it would seem to be, during the summer of 1916 Sacco had 8 people assisting him in cryptologic activities: Biancolini, Fedi, Franceschini, Giovannuzzi, Massara, Orpici, Peretti, Rebec. The Italian Captain was not familiar with German and before all, he needed very fluent people in that language, as Professor Remo Fedi was. In the same year, the Austrian Encoding Branch in Vienna - according to Gylden[48] had no less than 26 cryptanalysts in service: the Italo-Austrian cryptologic war resembled the David and Goliath challenge.



For an efficient personnel employment the following tasks assignment seems appropriate
Massara = summary of interceptions - logs

Fedi - Orpici - Biancolini = copying, validation, statistics
Giovannuzzi = inventory, names

Franceschini = inventory - radiogonometry - eventually he helps
Peretti - Rebec = reports
We need also an Official who could complete translations from Russian and English
In free time Orpici can make Italian and French statistics

We prepare as many folders as the cypher types: I see and mark them;
Biancolini and eventually Franceschini copy them
Orpici and Fedi make statistics

Picture 3

The RT Office was placed in Villa Dora - Codroipo and Sacco's documents include a postcard (picture 4) sent to his wife Cecilia on 26 February 1916, showing the words 'my trench' handwritten near a window, that was likely his office window.

[48] Y. Gylden, *op. cit.,* p.22.

Picture 4 Villa Dora, currently Villa Frova

Two Encoded German Telegrams

The following pages full of transposition-based cryptograms are likely a selection of messages intercepted by specialized stations of the RT Office and by other stations of the Italian army. It seems that Sacco had included cryptograms that were useful to develop and test decryption methods. In the two pages shown in picture 5 - amongst the most orderly and legible ones - he reports the detailed decryption of a coded telegram shown at the bottom of the left page[49]. The decrypted text reads as follows[50]:

VERBÜNDETE TRUPPEN DES GENERAL VON FALKENHAYN HABEN GESTERN DEN FEIND GESABERT

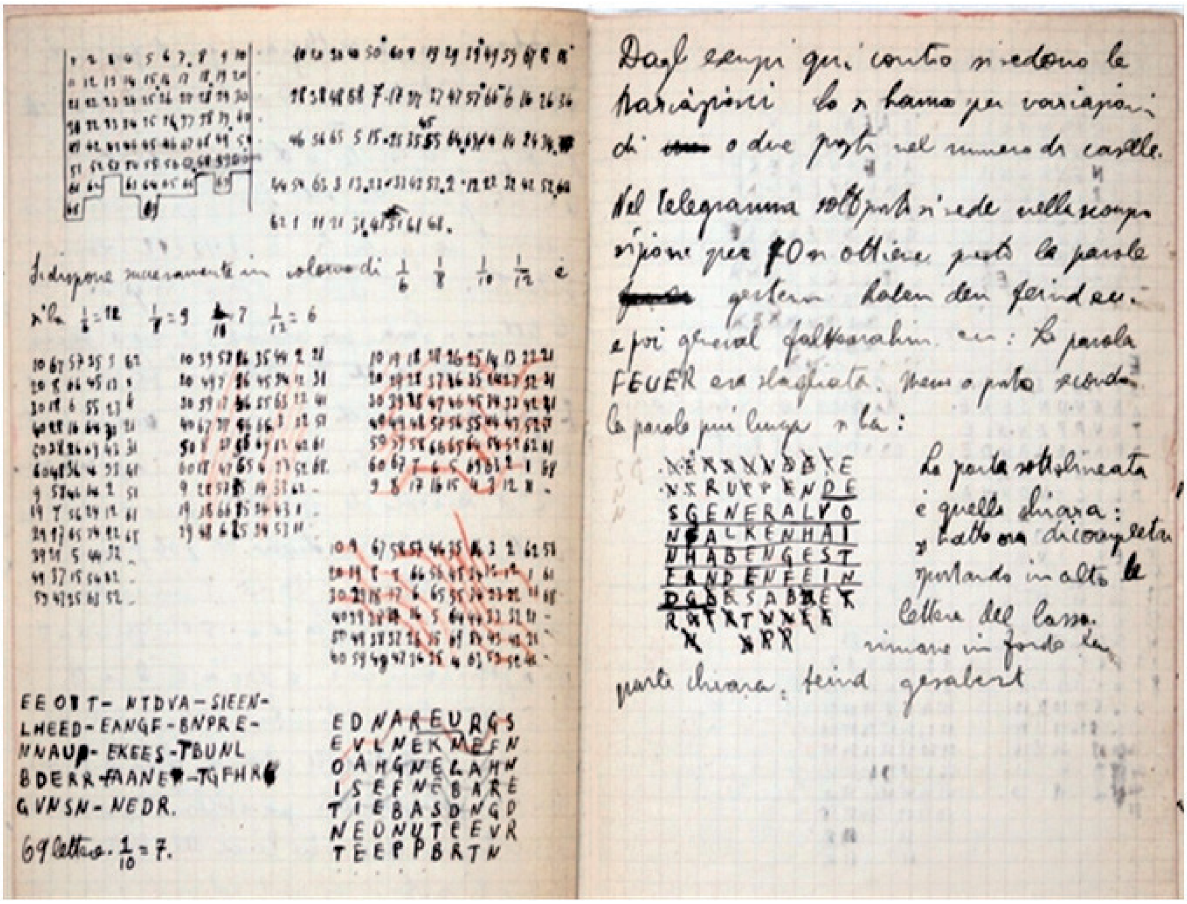
The translation is: *General von Falkenhayn's federate troops vanquished the enemy yesterday.*

The message may be contextualised chronologically, since it mentions General Paul von Falkenhayn, who on 6 September, had been assigned to command the German armies of the eastern front, where he achieved significant victories on the Romanian armies that led him to occupy Bucharest in December 1916. The telegram in question obviously refers to those victories.

The next page of the notebook reports another telegram encoded with the same technique and decrypted by Sacco. Adequately spaced and with some errors corrected, the decrypted text reads:

[49] For a detailed description of this and subsequent cryptograms see: http://www.crittologia.eu/storia/1916.

[50] The word *gesabert* means nothing in German. Was this a blunder on the part of the cipher operator? It could be *gesaubert*, past participle of the verb *saubern* = to clean, to purge. In this case it could be translated as 'beaten'.



Picture 5

BEI ORSOVA HABEN UNSERE TRUPPEN WIEDER GELÄNDE GEWONNEN. SÜDLICH VON HATZEG VERLOREN DIE RUMEN (*near Orsova our troops have gained ground again. South of Hatzeg romanians have lost [it]).*

The reference to the two Romanian towns of Orsova and Hatzeg is interesting, since after the initial Romanian advance, Falkenhayn's counterattack had started on 18 September 1916 exactly in the area between those towns. The two pages of the notebook seem to include dispatches of the German army operating in the Balkan peninsula, transmitted a few days after the mentioned events.

Other pages (picture 6)[51] display the decryption of a message made of 74 letters and reported at the top left of the page. This kind of encryption, too, is based on transposition by means of irregular rectangles, with key, that is with columns mixed according to a set order that is the key order[52]. Obviously, this kind of ciphering is more difficult to decrypt than the previous one.

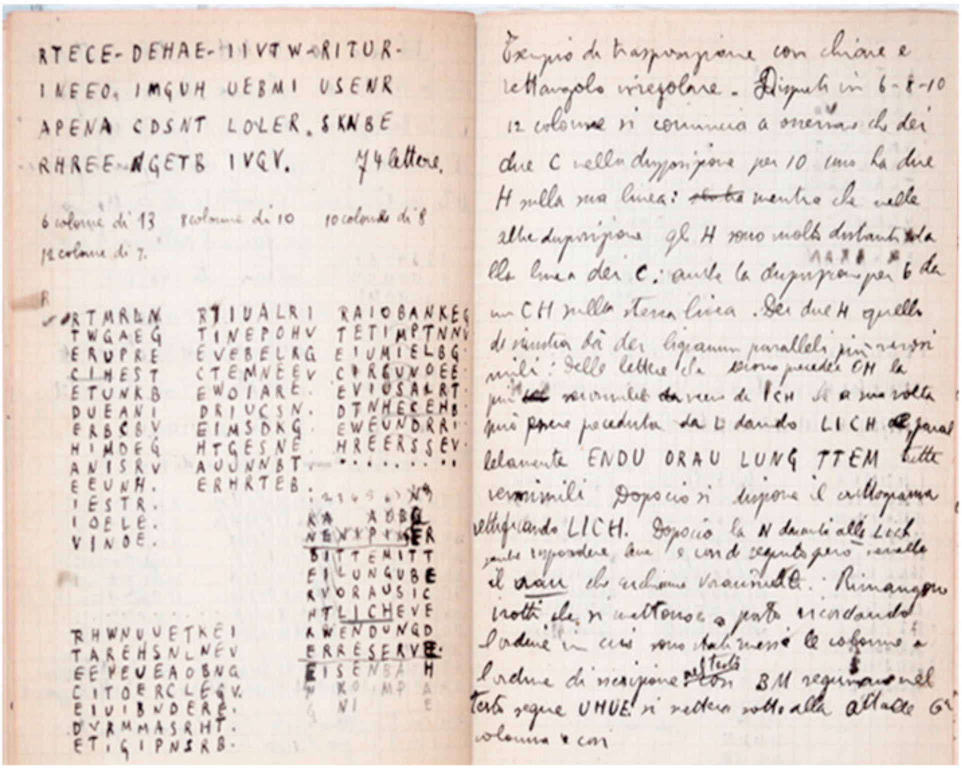
On the left, bottom of the page, the plaintext reads:

ERBITTE MITTEILUNG UBER VORAUSICHTLICHE[53] VERWENDUNG DER RESERVE EISENBAHN KOMPAGNIE (*Communication is urged regarding the predictable use of the railway company in reserve*).

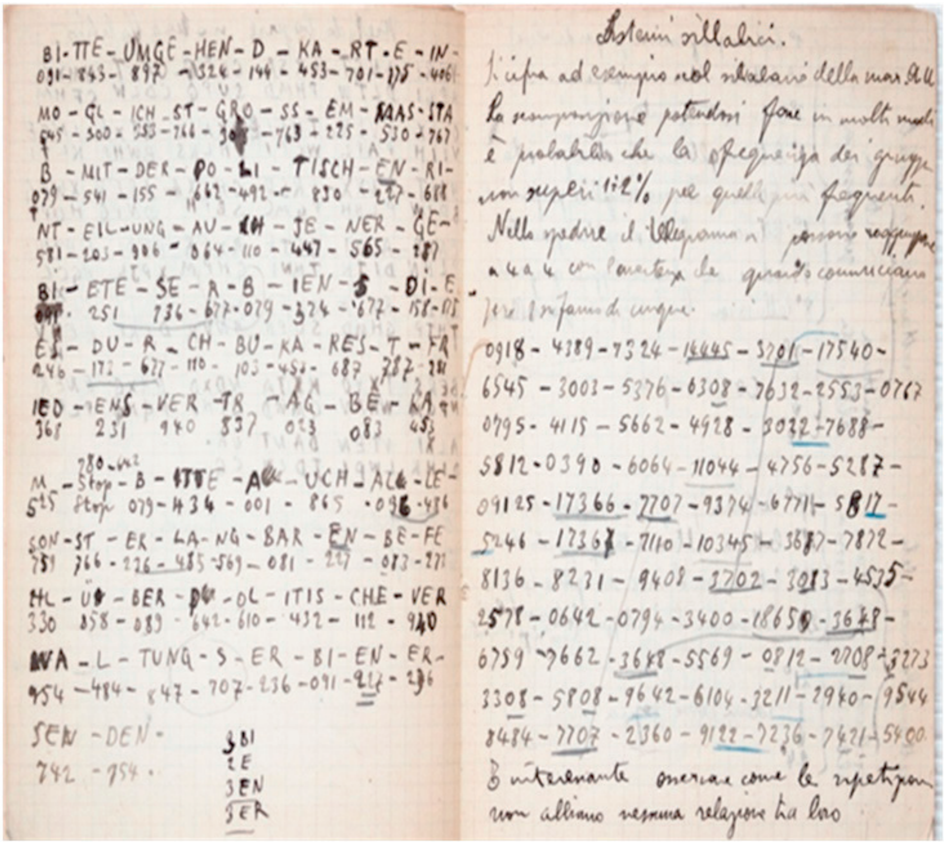
[51] The page has no date yet, as the previous one, can be dated back to early October 1916.

[52] Key-transposed encoding was described in paragraph 6.4.

[53] This is a misprint: "*vorausichtlich*" instead of "*voraussichtlich*".



Picture 6



Picture 7

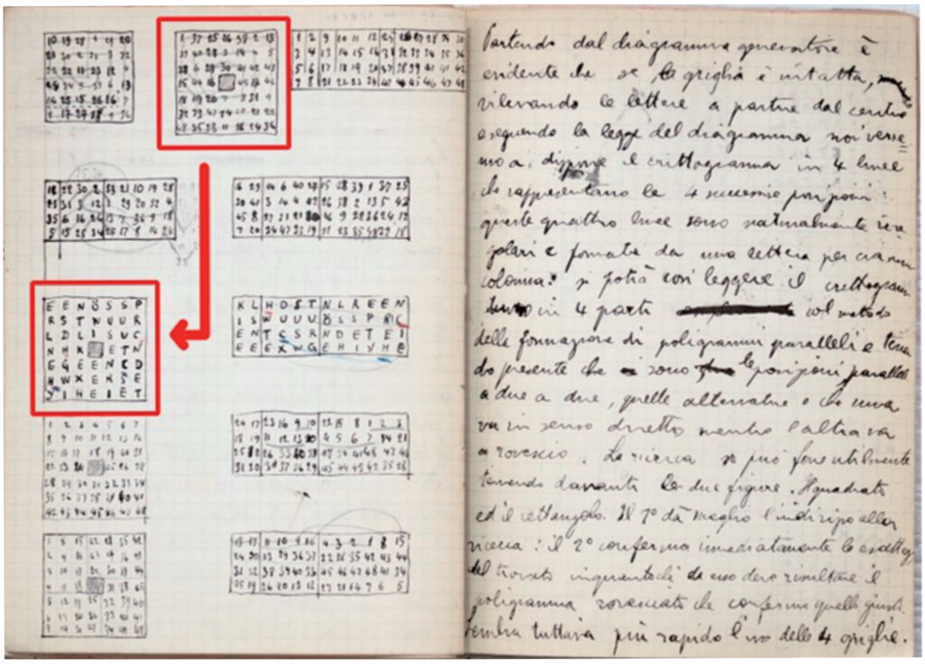
It is difficult to determine the military relevance of this message, but it is interesting that before October 1916 Sacco could decrypt messages encoded by irregular rectangles transposition with key.

A Syllabic Code

One of the following pages displays a syllabic code on the left and a short explanation on the right (picture 7).
The decrypted text reads:
BITTE UMGEHEND KARTE IN MÖGLICHST GROSSEM MASSTAB MIT DER POLITISCHEN EINTEILUNG AUCH JENER GEBIETE SERBIEN DIES DURCH BUKAREST FRIEDENS VERTRAG BEKAM. BITTE AUCH ALLE SONST ERLANGBAREN BEFEHL ÜBER POLITISCHE VERWALTUNG SERBIEN VERSENDEN
(We immediately request a map in the largest possible scale, also of Serbian territories gained through the peace treaty of Bucharest. Please, also send all orders obtained otherwise regarding the political administration of Serbia.)
The following chapter provides some additional details on this code.

Fleissner Grilles[54]

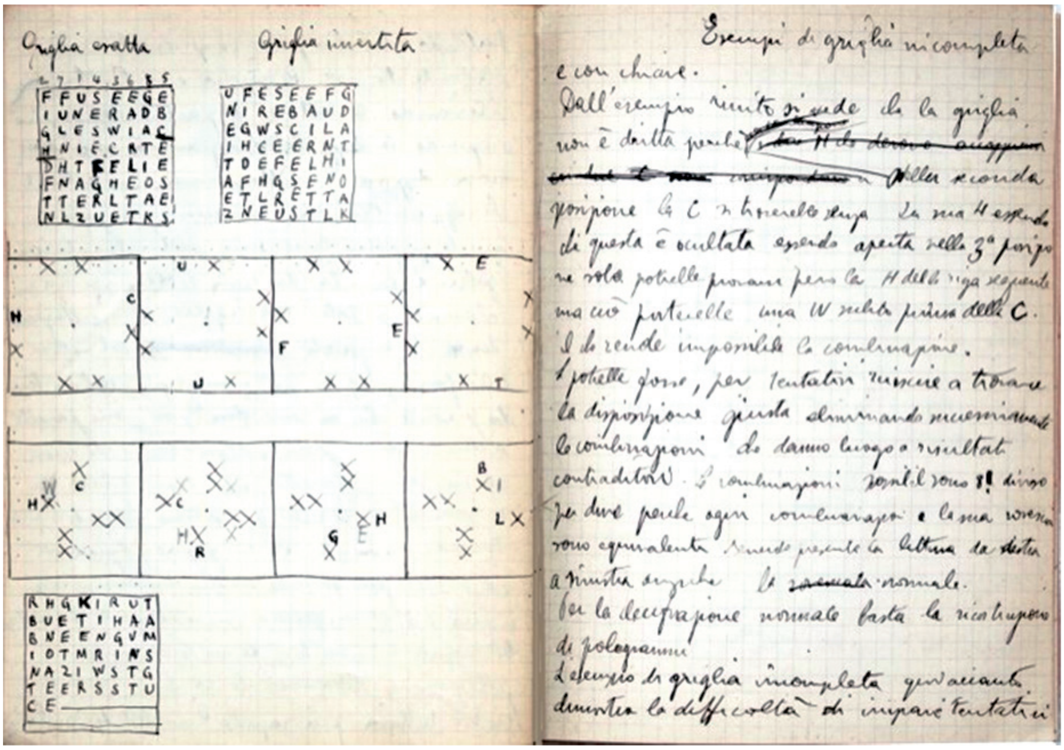
At the end of the notebook, which corresponds to the last weeks of October 1916, a section on rotating grilles includes a lot of theory and ideas for decryption of dispatch coded by means of that tool[55].
There are only three examples of cryptograms, the first of which is shown here (picture 8). Like in the case of transposition systems, also for Fleissner grilles Sacco provides the method to break the cipher as well as the solution of this cryptogram. After clearing the text from some orthographic errors and some null letters, it reads:



Picture 8

[54] The rotating grilles operation will be explained in the next chapter.
[55] The early pages of the notebook comprise a purely theoretical page on rotating grilles. The last pages include real cryptograms, probably the first ones with which Sacco had to deal.

ES WURDEN DREI PUNKTE GESEHEN ÖSTLICH WEITER SUCHEN *(three points were spotted towards east; seek further)*
This dispatch apparently refers to the sighting of ships.
The following pages show two other codes with 8x8 even grilles, therefore with no blackened box at the centre. On the right-side page (picture 9), Sacco analyses the ciphered text and suggests a general solution method, but until now, the solution of the cryptograms was not found in the notebook. In this case, a software allowed the two messages to be decrypted and they seem to be ciphered with the same grille.

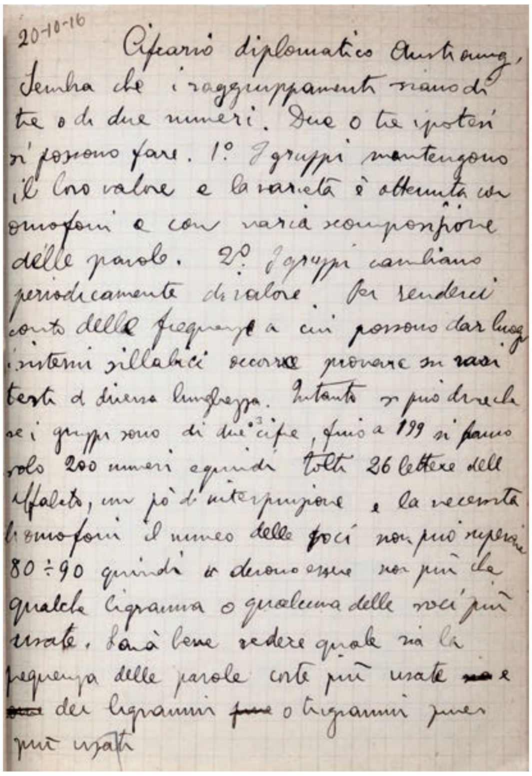


Picture 9

The decrypted text of the first message reads:
FEUER EINGESTELLT FEINDLICHE FAHRZEUGE ABGEWANDTE AUSSER SICHT FLOTTEN, K (*Cease-fire, enemy craft out of sight).*
This message is probably of the Austro-Hungarian navy since, apart from the submarines, the German fleet did not operate in the Adriatic Sea.
The second cryptogram achieved by the same grille reads: KRIEG MINISTERIUM IST ERSUCHT BEANTRAGTES GUTHABEN VON ZW *(the ministry of war is kindly asked to provide the requested financial report zw).*

The Austro-Hungarian Diplomatic Code

On a page dated 20 October 1916, Sacco formulates some initial comments on the Austro-Hungarian diplomatic code, about the code typology and the figures number of code groups (picture 10).
Moreover, the notebook contains the list of the telegrams exchanged between Karl Macchio, the Austrian ambassador in Rome, and Stephan Burian, the Austrian Minister of Foreign Affairs,



20-10-16
Cifrario diplomatico Austr. ung.
Sembra che i raggruppamenti siano di
tre o di due numeri. Due o tre ipotesi
si possono fare. 1° I gruppi mantengono
il loro valore e la varietà è ottenuta con
omofoni e con varia scomposizione
delle parole. 2° I gruppi cambiano
periodicamente di valore. Per rendersi
conto delle frequenze a cui possono dar luogo
i sistemi sillabici occorre provare su vari
testi di diversa lunghezza. Intanto si può dire che
se i gruppi sono di due 3 cifre, fino a 199 si fanno
solo 200 numeri e quindi tolte 26 lettere dell
alfabeto, un pò di interpunzione e la necessità
di omofoni il numero delle voci non può superare
80÷90 quindi vi devono essere non più che
qualche bigramma o qualcuna delle voci più
usate. Sarà bene vedere quale sia la
frequenza delle parole corte più usate e
dei bigrammi o trigrammi
più usati

Picture 10

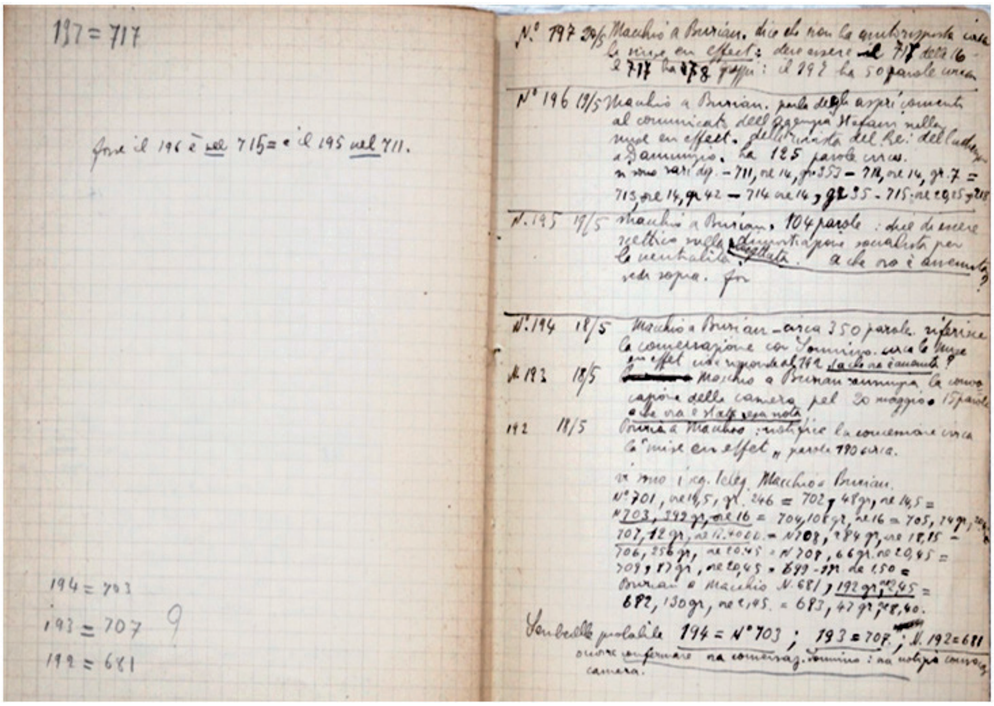
showing the last efforts, on the Austrians' part, to avoid a war with Italy before 24 May 1915. For each telegram of the list, two numbers, the date, and a short summary of the contents are reported.
Many years after the war, Sacco said that in 1916 he had asked the Minister of Foreign Affairs whether it had intercepted and kept the telegrams between Vienna and the Embassy in Rome, achieving the information that many telegrams had been intercepted and then piled up in a depot of the central post office in Rome, piazza San Silvestro, as they could not be decrypted.
Sacco requested that the whole lot of material be confiscated, but despite the possession of the cryptograms, breaking a over-encoded dictionary with 20,000 items without any other information regarding the code could be very hard to manage.
However, in the summer of 1915 the Austrians had published the Rotbuch, the red book of plain text telegrams between Burian and Macchio[56], in the attempt to show that Austria had done everything possible to avoid the war, committing a serious cryptologic error. The list closing the Sacco notebook is just based on the Rotbuch showing assumptions on the correspondence between the numbering of the Rotbuch and the numbering of telegrams intercepted by the Ministry of Foreign Affairs (picture 11). While Sacco had many encoded and plaintext telegrams yet it was not easy to associate each ciphered to a clear telegram, also because the Austrians had not published all telegrams between Burian and Macchio, having of course selected those that best served their purpose.
Sacco reveals in his Manual:

> We were in possession of many cryptograms and various plaintexts that we knew corresponded to those cryptograms, although it was not possible to associate any cryptogram and its corresponding plaintext. The cryptograms comprised groups of four letters and groups of five letters. The latter all began by 1; therefore, the code must necessarily comprise 20,000 groups[57].

He continues explaining how he finally broke this code taking advantage of a naive Austrian operator who suddenly decided to also encode the preamble in every telegram, which had been left as plaintext until that moment. Those preambles were all structured in the same manner, therefore the operator, while convinced of increasing security, was giving the cryptanalysts a tremendous

[56] David Alvarez, *Italian Diplomatic Cryptanalysis in World War 1*, Cryptologia, 20, no.1, 1966.
[57] L. Sacco, *Manuale, op. cit.,* p. 238-240. Only in the 1947 edition of the Cryptography Manual, paragraph 157 ("The Italian Cryptographic Unit during WWI") Sacco confirmed that this was exactly the Austro-Hungarian diplomatic cipher: "We would like to recall the decryption of an Austrian field cipher (N.108) as well as of the diplomatic code (N. 111)". This paragraph, just as the entire historical section, is not included in the English translation of the Sacco's Manual of 1977. It is therefore likely that Alvarez and other English-speaking researchers ignored the details of the forcing of the Austrian diplomatic code.

help! This episode confirms that a fundamental part of codes and ciphers security was an adequate training for code operators.



Picture 11

Comments on the Initial Activities of Luigi Sacco

The notebook clearly shows Luigi Sacco's work during those months when he was still chief of the radio interception service and he could consequently devote only part of his time to cryptanalysis. However, he managed to set up from nothing a cryptographic branch and was already able to complete a list of important enemy codes and ciphers and to decrypt also other types of cryptograms in addition to those listed above, as shown in the next chapters. Given that he had no previous experience in this field, the results achieved look like a miracle and show his extraordinary logical skills and his tenacity.
The foundations for the most significant successes that the Cryptographic Unit would reap in late 1916 and in the following years, were laid over the job made in those months. Sacco's most important book, the Manual of Cryptography, stemmed from that experience.

october/november 1916

The letters that Sacco regularly wrote from Codroipo to his wife Cecilia include some passages helpful to reconstruct the story of the transfer to Rome of the cryptographic group. In a letter dated Codroipo 20 October 1916 he wrote: "I have just come back from the drinking-party I threw my colleagues as a farewell […] I am actually a little sorry to leave Codroipo, where I met kind local people and officers […]".
In a letter dated Rome 2 November 1916 he wrote:

> I got to Rome in the morning, after quite a good trip. I went to see my office and I'm fairly happy with it. As I wrote to you yesterday from Padua, I am leaving tomorrow in the evening for Codroipo, where I will stay on Saturday and Sunday. […] Here is a piece of news that is not so bad: in Rome I will be working in plain clothes since the office is a confidential one. Keep this for yourself and do not even tell dad and mum […].

Sacco wrote he would go back to Codroipo for a couple of days, evidently to organize the office transfer and to collect papers and personal items. It would be plausible to assume that during that short period he might have taken the notebook and carried it to Rome.

CHAPTER TEN

The Cryptographic Unit

10.1 VIA NAZIONALE 75, ROME

The Change of Tasks

Following the reorganization of the Intelligence Service started on 5 October, Sacco, and some of his colleagues, were seconded to Rome to create a Cryptographic Unit, within Section R (Rome) of the Service, located in via Nazionale 75[1].
The Sacco's Unit was initially identified with the CFR acronym (standing for "CIFRA") which was immediately changed into CR to become RT in early December. The acronym RT was definitively changed to CR at the end of the war, in early December 1918[2]. The Unit worked in utmost confidentiality and, in fact, enemy intelligence did not identify it during the entire war. As regards Ronge boasting the superiority of his own intelligence service compared to the Italian service in terms of secrecy, O. Marchetti points out: "if the Chief of the Austrian Intelligence Service never heard of it (the Cryptographic Unit, A/N), it means we were able at keeping the secret"[3] and then he affirms that, during the war, the Unit was "a severe guardian of its own security"[4].
In the new office, Sacco could deal mainly with studying codes and ciphers as well as decrypting intercepted messages, while the coordination of listening and radiogoniometry activities, still located in Codroipo, was assigned to Lieutenant engineer Franco Magni, a well-known expert in the field. The dispatches of the Austrian army intercepted by Magni's team were immediately sent to Rome by telegraph or other means.
The daily journal of military history entitled *Attività e Notizie della Sezione R* (Activities and News of Section R)[5] provides several cryptographic information starting with some remarkable results achieved during the month of November, as shown in the following pages[6]. More in general, the number of decrypted radio dispatches listed in the journal of Section R in the last two months of 1916 was not impressive, because Austro-Hungarian radiotelegraphic transmissions on the Italian front had decreased considerably so that most of the intercepted radiograms came from other sources such as, for instance, from communications of the enemy fleet[7].
Furthermore, Sacco and his colleagues were working to organize new activities such as the study of enemy and neutral countries diplomatic codes, and the solution of cryptographic problems encountered by other bodies of the State, since Sacco's and his colleagues' expertise began to be

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[1] O. Marchetti, *op. cit.,* p.145 and f.
[2] In this book, the Unit will be called "Cryptographic" from now on, although it was officially named RT.
[3] O. Marchetti, *op. cit.,* p.88.
[4] *ibidem*, p. 132.
[5] The journal of Section R (AUSSME, B1, 101/S) is divided in sections: Secretariat; M.P. (Political-Military); M.E. (Economic), C.S. (Counterintelligence); C. (Censorship): R.T. (Decryption and Radiotelegraphy); Any Other Business.
[6] Royal Italian Army - Intelligence Service - Section R, *Attività e novità della Sezione R dei giorni 2 e 11 novembre 1916* (Activities and News of Section R between 2 and 11 November 1916), AUSSME, B1, 101 S, Vol. 248c. From now on, for the sake of brevity, references to the logs shall be made to *Section R Logs*.
[7] It should be noted that, the *Section R Logs* only mention the most interesting radio telegrams that were transmitted out of the Section R, after decrypting.

known not only to the High Commands of the Armed Forces, but also to the highest offices of the State.

New Challenges Ahead

The transfer to Rome facilitated Sacco's direct and frequent interaction with apical officials of state offices needing cryptographic support, obviously more effective than if he had remained in Codroipo. In mid-November "Captain Sacco reported to the Ministry of Foreign Affairs and to the Ministry of the Interior to arrange the terms of his service" in their support[8]. Also the Head of Section R often conferred with Giacomo De Martino, Secretary General of the Ministry of Foreign Affairs, who specifically dealt on behalf of the Minister with Intelligence affairs, to inform him about the results achieved by the Unit in decrypting diplomatic correspondence.

A large part of diplomatic dispatches was intercepted by the office of Royal Post and Telegraphs, particularly by the office of San Silvestro in Rome, where the Embassy officials of neutral countries delivered the dispatches addressed to their governments and the dispatches travelling the opposite way were received. The coded confidential diplomatic telegrams posed a hard, yet often won, challenge for Sacco and his colleagues. According to David Alvarez, during the war, the cryptographic unit managed to break the diplomatic codes of Vatican State, Austria, Germany, Switzerland, Spain, Greece, Bulgaria, United States and Bolshevik Russia[9].

The Vatican State's telegraphic correspondence was a specific case, since the Vatican not having its own network, had to rely on Italian telegraphs to communicate with apostolic Nuncios resident also in countries that were enemies to Italy. The interception and interpretation of those messages resulted to be extremely useful source of information about the political, economic, and general situation of Austria and Germany in particular[10]. The Section R journal only provides one single piece of specific information about Vatican's communications concerning the transmission on 15 August 1917 to the Ministry of Foreign Affairs of a set of 22 decrypted telegrams exchanged between the Holy See and the Nuncio in Brussels[11].

The other Vatican dispatches belong to the category generally defined as diplomatic which, once converted to plaintext, were transmitted almost every day to the relevant Ministries, first the Ministry of Foreign Affairs and sometimes to the Allied Mission in Rome. The number of wire telegrams often exceeded the number of cryptograms intercepted by radio, which shows the importance, wide scope, and complexity of the Unit's job.

Moreover, the cryptograms in private letters and telegrams intercepted by the censorship or taken from enemy agents by the Italian counterintelligence were usually difficult to interpret for the offices of Public Security. Therefore, Sacco received on his desk a large quantity of letters, telegrams and correspondence of all kinds that were suspected of being written with cryptographic or steganography methods.

[8] *Section R Logs, 15 November 1916*, AUSSME, B1, 101S, Vol. 247 c.

[9] David Alvarez, *Italian Diplomatic Cryptanalysis in World War I*, Cryptologia, Vol. XX, no.1, January 1996.

[10] David Alvarez, *I Servizi Segreti del Vaticano*, *Spionaggio, complotti, intrighi da Napoleone ai giorni nostri*, Newton Compton, Roma, 2003, p. 100 - 150. By the same author, see: *Faded lustre: Vatican Cryptography, 1915 – 1920*, Cryptologia, April 1966, Vol. XX, no. 2, p.97 - 131. These telegrams were usually conveyed through a neutral country, often through Switzerland.

[11] *Section R Logs, 15 August 1917*, AUSSME, Series B1, 101S, Vol. 294d.

To get a general idea of the variety of topics covered by the Cryptographic Unit, the meeting on 24 November 1916 between Sacco and the Chief of Censorship Unit of the Italian Post and Telegraph Ministry regarding "the supervision of telegrams by prisoners of war" may be recalled. In fact, some Italian officers who were prisoners in Austria had sent their families telegrams - forwarded by the Red Cross - which conveyed, by means of concealed languages, military information they had learned by chance or on purpose. There was an evident concern that Austrian prisoners might be doing the same.

This book only investigates the activities of the Unit concerning military cryptography and does not delve into other aspects of the multifaceted work carried out by Sacco and his colleagues during WWI[12]. In particular, this chapter illustrates some cedes and chiphers used by the Armed Forces of Central Empires and by their Allies and presumably broken by or known to the Cryptographic Unit between late 1916 and 1917.

10.2 ITALIAN ANALYSTS' SUCCESSES

The Naval Codes

The logs of Section R dated 11 November 1916 mention the "transmission to the Royal Navy General Headquarters, Venice, of the key *39842* of the Austrian Navy Code and of some r.t.g. (radio telegrams, A/N) decrypted with that key"[13].

Since the Austrian Navy Code is most likely the same placed at the top of the list composed by Sacco in August 1916 and described in some pages of his booklet full of precise data regarding also another code of the German navy, an interesting question arises regarding the circumstances under which Sacco and his colleagues got them.

It is known that before the summer of 1916, the Italian navy had exploited some opportunities to explore the hulls of sunken Austrian ships. For instance, immediately after the battle of Cattaro, on 28 December 1915, the sunk destroyer Lika had been inspected by Italian deep-sea divers tasked to recover interesting documents and above all ciphers.

Moreover, in April 1916, the Italian navy had recovered the Austrian submarine minelayer U24 - built in Germany and staffed with German personnel - which had sunk the previous month, due to the explosion of one of its mines, and had been lying in shallow waters in the Gulf of Taranto. Like all vessels of that kind, the submarine was equipped with radio trans-receiver and with both the code of the Austrian Navy and the *HVB* of the German Navy. The two code books were probably recovered on that occasion, and the submarine, still in fairly good shape, after refurbishing joined the Italian navy with the name X1.

The presumed date of the capture suggests that the edition of the Austrian code held by the Cryptographic Unit was the first of a series adopted by the Austrians navy during the war and identified with the initial acronym *KOD*. In fact, according to research carried out in the English archives, the next version called *KODEIN* was issued in September 1916, therefore after the U24

[12] For diplomatic telegrams, see: C. Colavito, *I Cifrari Diplomatici e il Reparto Crittografico dell'Esercito Italiano nella Grande Guerra*, GNOSIS, Rivista Italiana di Intelligence, 1/2019.

[13] *Section R logs, 11 November 1916*, AUSSME, Series B1, 101S, Vol. 251c.

recovery operations[14]. However, the *KOD* was still used by submarines even after September 1916[15].

To understand the structure the *KOD* series, reference can be made to the fourth version (*KODVIER*) entered service in 1918, with a first page indicating 1916 as the year of the earliest book printing (picture 10.1). Therefore, subsequent versions were developed by adding and replacing items in the original version[16].


Reserviertes Dienstbuch Nr. 54 (T). Ev. Nr. 91

Kennwort der Auflage: **Kodvier.**

Tritt in Kraft am 1. Juli 1918

Telegraphenkodex

für die

k. u. k. Kriegsmarine.

Zum reservierten Dienstgebrauche.

K. u. k. Flottenkommando, Res. Nr. 225/Ra ex 1916.

Ausgabestelle: K. u. k. Hydrographisches Amt, Seekartendepot.

Inhaltsevidenz: Telegraphenbureau der k. u. k. Kriegsmarine.

Dieser Behelf ist den Telegraphisten — auf Radiostationen nur für die Dauer des Radiodienstes — unter Einhaltung entsprechender Vorsichtsmaßregeln gegen Verlust und Mißbrauch zugänglich zu machen. Wird er in der Radiostation nicht gebraucht, so ist er von der hiefür zu bestimmenden Stabsperson in Verwahrung zu nehmen.

Wien 1916.

Aus der k. k. Hof- und Staatsdruckerei.

10.1 First page of Austro-Hungarian navy's KODVIER

The *KOD* comprises approximately 300 pages and 25,000 terms. It is paged, as *Red* and *Mengarini* codes, adopting code groups of five figures: three of them represent the page number, two figures between 00 and 99 identify words or figures on each page. Alternatively, the code groups can be made up of pronounceable words of ten letters, with six of them corresponding to the page and four to the word on each page. The pronounceable word is assembled by adding to the part of the word reported at the bottom of the page (see picture 10.2), four letters included in a single table that converts the two-figured numbers corresponding to the terms on every page. For instance, the code group that corresponds to the word "Abhang" (slope) in picture 10.2, can be 48220 or alternatively "caccialeon" if the word "leon" corresponds to number 20 in the conversion table[17]. This table varies from a version of the code to the next one or more frequently.

From the type of key sent by Sacco to the Italian navy, one can infer that the radio telegrams in question were encrypted with groups of five figures to which the number *39842* was added or subtracted ('additive' key).

When the Austrians changed the numerical key, Lieutenant Pellerani, serving at the Navy Headquarters of the Venice area, referred to the Cryptographic Unit "for the analysis of the results

[14] Nikolaus Sifferlinger: *Le intercettazioni radio austro - ungariche e inglesi nel Mediterraneo durante la Prima Guerra Mondiale*, in "La Guerra Navale 1914 - 1818", editors A. Rastelli e A. Massignani, G. Rossato, Ed., Novale, Valdagno, 2002. p. 160 e s. The author of the article referred to documents in the English archives describing, amongst other things, the codes the Italians recovered from the wreck of the U24 submarine.

[15] In case the *KODEIN* had been used, Sacco had also identified the changes made to the second edition of the code.

[16] The Austro-Hungarian navy released several versions of the code up to the sixth (*KODSECHS*), by using different over-encoding methods (J. Pricowitsch, *op. cit.,* p.453).

[17] The article by N. Sifferlinger mentioned in a previous note explains that this ciphering method was called '46'. During the war, the Austrian navy used other methods by breaking up the five basic figures in a different manner (e.g.: 1+2+2) and then by over-encoding each group with groups of letters to obtain words of ten letters. In addition, the *KODEIN* differs from the basic version *KOD* mainly due to the inversion of numbering in the left-side column on each page (99 to 50 instead of 50 to 99) and to the changed page numbering.

Seite 78

Wörterbuch.

a Hiezu Hilfstafel A. *b*

Aa	00	Ab	99	Abessini-sch	00	*Siehe gelbe Tafeln*	99	abgeladen
	01	Abänder-n	98	Abfahrt	01	Abgeb-en	98	Ablass-
	02	abgeändert	97	Abfahrt bei	02	abgegeben	97	Ablauf
	03	Abänderung	96	Abfahrt bei Wetterzulaß	03	Abgeh-en	96	ablauf-en
	04	*Siehe gelbe Tafeln*	95	Abfahrt nach	04	abgegangen	95	abgelaufen
	05	Abberuf-en	94	Abfahrt verzögert sich	05	*Siehe gelbe Tafeln*	94	Ablausch-en
	06	Abberufung	93	Abfahrt wegen	06	Abgelagert	93	abgelauscht
	07	Abbestell-en	92	Abfahrts-	07	Abgelegen	92	Ableben
	08	abbesteilt	91	Abfahrtszeit	08	Abgeordnet-er	91	Ablehn-en
	09	Abbildung	90	*Siehe gelbe Tafeln*	09	Abguß	90	abgelehnt
	10	Abbitte	89	Abfälle	10	Abgrenz-en	89	Ablenk-en
	11	Abblas-en	88	abfällig	11	abgegrenzt	88	abgelenkt
	12	abgeblasen	87	Abfall-en	12	Abgrenzung	87	Ablenkung
	13	Abblend-en	86	abgefallen	13	*Siehe gelbe Tafeln*	86	Ables-en
	14	abgeblendet	85	Abfang-en	14	Abgrund	85	abgelesen
	15	Abbrech-en	84	abgefangen	15	Abhalt-en	84	Ablesung
	16	abgebrochen	83	Abfass-en	16	abgehalten	83	*Siehe gelbe Tafeln*
	17	Abbrenn-en	82	*Siehe gelbe Tafeln*	17	Abhalter	82	Abliefer-n
	18	abgebrannt	81	Abfertig-en	18	Abhanden	81	abgeliefert
	19	Abbring-en	80	Abfertigung	19	Abhandlung	80	Ablieferung
	20	Abbruch	79	abgefertigt	20	Abhang	79	Ablös-en
	21	Abbruch tun	78	Abfertigungspunkt	21	Abhäng-en	78	abgelöst
	22	Abbruch dipl. Beziehung-en	77	Abfertigungsstation	22	abhängig	77	Ablösung
	23	Abbüß-en	76	*Siehe gelbe Tafeln*	23	Abheb-en	76	Abmach-en
	24	Abdämm-ung	75	Abfeuer-n	24	Abhelfen	75	abgemacht
	25	*Siehe gelbe Tafeln*	74	abgefeuert	25	abgeholfen	74	Abmachung
	26	Abdampf-en	73	*Siehe gelbe Tafeln*	26	Abhilfe	73	Abmarsch
	27	abgedampft	72	Abfeuerung	27	Abhol-en	72	abmarschier-en
	28	Abdank-en	71	Abfeuerungs-	28	abgeholt	71	abmarschiert
	29	Abdicht-en	70	Abfeuerungsapparat	29	Abhorchdienst	70	Abmess-en
	30	abgedichtet	69	Abfieren	30	*Siehe gelbe Tafeln*	69	abgemessen
	31	Abdichtung	68	abgefiert	31	Abhorch-en	68	Abmessung
	32	Abdräng-en	67	Abfinden	32	abgehorcht	67	abmontier-en
	33	abgedrängt	66	Abfluß	33	abgehorchte Depesche	66	abmontiert
	34	Abdruck	65	Abforder-n	34	Abkoch-en	65	Abmontierung
	35	*Siehe gelbe Tafeln*	64	Abflieg-en	35	abgekocht	64	Abnahme
	36	Abend	63	Abflug	36	Abkomm-	63	Abnehm-en
	37	Abendappell	62	abgeflogen	37	Abkommgeschütz	62	abgenommen
	38	Abenddämmerung	61	abgeflogenes eigenes Flugzeug	38	Abkommgewehr	61	abnehmender Wasserstand
	39	Abendration	60	abgeflogenes feindliches Flugzeug	39	Abkommübung	60	Abneig-ung
	40	Abendschuß	59	Abfuhr	40	Abkomm-en	59	abgeneigt
	41	Abendsituation	58	Abführ-en	41	abgekommen	58	Abnormal
	42	Abendverlesen	57	abgeführt	42	Abkürz-en	57	*Siehe gelbe Tafeln*
	43	Abendwache	56	*Siehe gelbe Tafeln*	43	abgekürzt	56	Abnütz-en
	44	Abends	55	Abgabe	44	Abkürzung	55	abgenützt
	45	Aber	54	Abgang	45	*Siehe gelbe Tafeln*	54	Abnützung
	46	Abermals	53	abgängig	46	Ablad-en	53	Abonnement
	47		52		47	[illegible]	52	
	48		51		48		51	
Ab	49		50		49		50	

~~149 : terzia~~
472 isajas

~~149 : yvonne~~
482 caccia

10.2 First page of the dictionary included in the Austro-Hungarian navy's code

obtained in identifying the new key of the Austro-Hungarian navy cipher"[18]. However, the meeting showed Pellerani's efforts had failed to achieve significant results, therefore the Unit continued to help the Navy in finding the following keys[19].
Every two weeks - the interval of time between subsequent key changes according to Sacco - the Cryptographic Unit would usually complete the process of reconstructing the new key in a few hours[20]. In addition, regarding the Austrian navy code, Sacco's Manual reads: "the over-encoding keys changed every two weeks at the latest".
It also adds that "the encoding tables (of the paragraph 59 type) would be reconstructed after a few days"[21]. Since the paragraph 59 of the Manual is dealing with "over-encoding with pronounceable words", it comes out that dispatches ciphered with the Navy Code were also decrypted when the Austro-Hungarian navy adopted code words of ten letters making up pronounceable words. This operation resulted to be more difficult as it required the rebuilding of tables variable over time and including two-part encoding lists of one hundred terms: yet it would be carried out in a few days[22].
Austrian surface vessels, especially during the last phase of the war adopted one of the following editions of the code and applied more complex over-encoding methods and variable conversion tables that changed daily. This made decryption of dispatches more difficult and considerably engaged also the English and French cryptographic services[23]. According to Kahn, some analysts of 'Room 40' at the British Admiralty were sent to Italy in the autumn of 1917 to work with the Italian navy to solve the most complex over-encoding methods[24].
Sacco's notebook also includes a description of the German Navy's code called *HVB - Handelsverkehrs Buch* (commercial book) used by merchant ships as well as by submarines and Zeppelin airships until early 1916[25]. The code words are, in this case, made up of four letters selected from a 19-letter alphabet and arranged in alphabetical order. Seemingly, the acquisition of *HVB* did not bring about great advantages because the code was already "compromised", leading to its replacement by the German Navy[26].
Conversely, the availability of *KOD* impacted the decryption of naval and submarine Austro-Hungarian communications, generating a cryptologic situation that was, at least for some time, roughly the reverse to that concerning the *Red Code* on the land front.

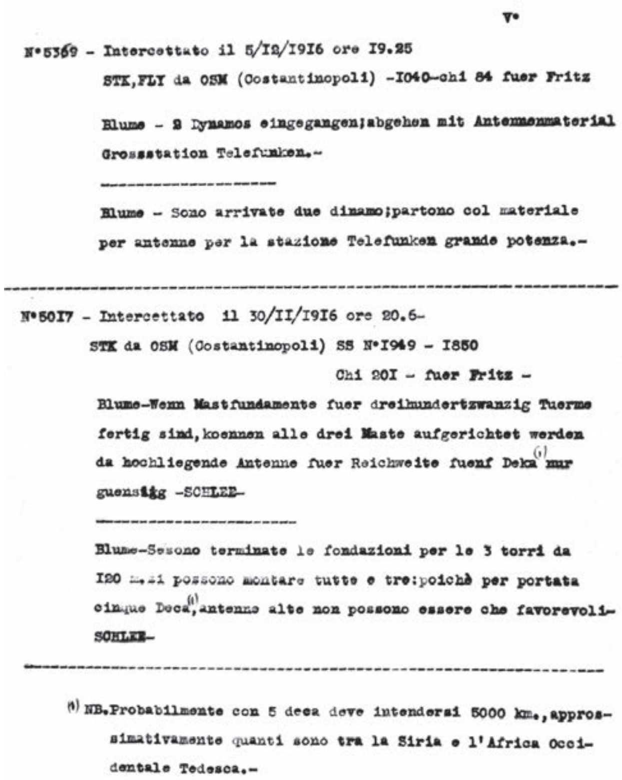
Information from the Middle East

On 10 November 1916 and on the 14th and 16th of the same months, the logs of Section R reported news regarding the decryption of radiograms exchanged between Berlin and Constantinople, between Vienna and Constantinople and between Izmir and Aydin. One of the adopted ciphers was called *German-Turkish RT* or sometimes *R2*.

[18] *Section R logs, 2 December 1916*, AUSSME, Series B1, 101S, Vol. 251c
[19] Collaboration continued over the following months, when Sacco frequently met Lieutenant Maltese, Chief of the Radiotelegraphic and Cryptographic Branch of Italian Navy.
[20] L. Sacco, *Manuale*, p.309.
[21] *ibidem.*
[22] L. Sacco, *Manuale*, p.119 -120. For clarifications regarding the methods to identify an over-encoding key, in case of known code, see pp. 235 - 237 of the Manual.
[23] N. Sifferlinger, *op. cit.,* p.164.
[24] D. Kahn, *op. cit.,* p. 278.
[25] Alberto Santoni, *Il Primo Ultrasecret, l'influenza delle decrittazioni britanniche sulle operazioni navali della guerra 1914 -1918,* Mursia, 1985, p. 58 - 60.
[26] *ibidem.*

Until the end of 1916, the Cryptographic Unit sent to the Italian navy at least 20 decrypted dispatches of this kind and on one occasion, it transmitted the 'related encoding alphabet', which was evidently well known[27]. Very often, telegrams were also distributed to the Ministry of War, to the Ministry of Foreign Affairs and to Allied Missions. Picture 10.3 displays a page included in a report of Section R comprising the plaintext versions of fifteen radio telegrams, in German language and translated into Italian, intercepted, and decrypted between late 1916 and early 1917[28].

The two telegrams shown in the picture refer to a radio communication event, namely the building in the Middle East of a new radiotelegraphic station to facilitate communications with the German troops still operating in Africa. Some other information on the same station was included in a report of the Codroipo office and inferred from radiograms exchanged between German officers stationed in Constantinople and their colleagues who were building the station. Details are provided concerning the features of the station such as the height of the antenna, supported by two 120-metre towers, and the transmission power. Whether this station was completed remains uncertain[29].



V.

N°5369 - Intercettato il 5/12/1916 ore 19.25
STK,FLY da OSM (Costantinopoli) -1040-chi 84 fuer Fritz

Blume - 2 Dynamos eingegangen;abgehen mit Antennenmaterial
Grossstation Telefunken.-

Blume - Sono arrivate due dinamo;partono col materiale
per antenne per la stazione Telefunken grande potenza.-

N°5017 - Intercettato il 30/11/1916 ore 20.6-
STK da OSM (Costantinopoli) SS N°1949 - 1850
Chi 201 - fuer Fritz -
Blume-Wenn Mastfundamente fuer dreihundertzwanzig Tuerme
fertig sind, koennen alle drei Maste aufgerichtet werden
da hochliegende Antenne fuer Reichweite fuenf Deka(1) nur
guenstig -SCHLEE-

Blume-Sesono terminate le fondazioni per le 3 torri da
120 m. si possono montare tutte e tre:poichè per portata
cinque Deca(1), antenne alte non possono essere che favorevoli-
SCHLEE-

(1) NB.Probabilmente con 5 deca deve intendersi 5000 km., approssimativamente quanti sono tra la Siria e l'Africa Occidentale Tedesca.-

10.3 A page of the report comprising 15 radio telegrams encoded with the R2 Code and decrypted in November 1916

Other information from the cryptograms included in this group concerned the detection of a fuel depot in Aleppo - of which the Allied were promptly informed - and the activities of some middle east political personalities.

The nature of *R2* is not certain. It should be noted, however, that the list made by Sacco in the previous summer included two Turkish-German ciphers (line 4 and 5). The former is an RT dictionary used by radio stations, while the latter is a transposition-based alphabetical cipher with 5-letter groups in the cryptograms. Some clues may lead one to suppose that *R2* coincides with the RT dictionary of line 4 in Sacco's list. Considering what has already been said with reference to the breaking of transposition methods, also the "Turkish-German cipher" of line 5 in the list could be easily solved by Sacco.

Finally, it is possible that some of the dispatches, mentioned in the Section's logs, received from, or addressed to Turkish radio stations, might have used different ciphering systems, such as the

[27] *Section R Logs, 12 December 1916*, AUSSME, 101S, Vol. 251c. This was a dispatch from Thessaloniki that had been intercepted on the 10th.

[28] Intelligence Service, Section R, *Radiotelegrammi decifrati, Cifrario RT Germano - Turco* (Decrypted radio telegrams, German-Turkish Cipher), March 1917, ISCAG, Coll. 223.

[29] Radiotelegraphic Branch of Codroipo, *Relazioni sul servizio d'ascolto e di radio goniometria, mar. - apr. 1917* (Reports on the Radio goniometric and listening service, March-April 1917), ISCAG, Racc. 223. From Constantinople, Major Schlee was coordinating the station implementation assigned to someone called Blume.

"Army's Turkish four-figures" reported in line 15 of the list in question, for communications within Turkey. In the logs, there is a reference to the translation of radiotelegraphic interceptions in Turkish that corroborates such an assumption[30].

10.3 A DISCLOSURE OF AUSTRIAN-HUNGARIAN CODES AND CIPHERS

A Relevant Report from Section R

The concise and unfortunately incomplete story of the Austrian codes and ciphers, known to and broken by the Cryptographic unit during WWI until April 1918, emerges from a communication that Section R sent in early May of the same year to the Intelligence Services of French General Headquarters and of the American Task Force Headquarters in response to some precise questions from the Allies concerning "Austrian radiotelegraphy and cryptography". The report contains a cover letter and eight short appendices[31].

The request might have been occasioned by news regarding the potential deployment of Austrian troops to the Western front, which happened in the following months. The famous American cryptologist and later diplomat J. Rives Childs owned this document, translated into English, along with a large amount of cryptographic material he had gathered during the war.

The author of the message - possibly Sacco or one of his colleagues - opens the cover letter by stressing the scarcity of available cryptographic material due to the limited amounts of Austrian radiotelegraphic transmissions, which occurred more abundantly on the Italian front for just a few months of 1916 and from November to 1917 on. More frequent transmissions, useful to break the Austrian army's field ciphers, were intercepted, in the periods of silence on the Italian front, above all from Austrian stations operating on the Albanian and Russian fronts (Ukraine and Bessarabia).

The same introduction to the section R report points out that "the Austrian radiotelegraphic service, unlike the German one, does not display a strictly centralized and uniform organization, as it would seem that Austrian subordinate units have great freedom of action, especially regarding service and ciphering rules". The Italian analysts also noticed "a certain inferiority of the Austrian service compared to the German one in terms of operators' skills, as well as of stations operation regularity"[32]. These characteristics could be accounted for with the infringement of the strict rules about radio transmissions by some Austrian combat units under particularly difficult operational circumstances. Moreover, it seems evident that when radio operators are mainly employed for interceptions, their performance in the sporadic cases of transmission may result to be inadequate.

The document in question also conveys a certain sense of restraint on the part of the Cryptographic Unit in providing the Allies with entire codes that were apparently available. The Unit sent only codes and cipher parts related to the examples of decrypted dispatches included in the appendices, as can be understandable in terms of secrecy, although it is also possible that the Italians preferred to maintain a certain reserve with the Allies as well.

[30] *Section R Logs, 4 January 1917,* AUSSME, Series B1, 101S, Vol. 255c.

[31] General Headquarters, Intelligence Service, Section R, *Notes on Radio Telegraphy and Cryptography of the Austrian Army, Rome, May 6, 1918*, Reply to. no. N.1753, of 27 April 1918, Childs Cipher Paper, Vol. 1, Chapter 3. The letter was signed by the Chief of the Intelligence Service, a Colonel whose name is not specified but evidently was O. Marchetti.

[32] *ibidem*.

The information that can be inferred from the report shows that when allowed to communicate via radio, in particular Austrian small stations and combat units used code and ciphers of different types, even extremely simple ones[33]. Some of those are described in the next pages based on the appendices of Section R's report and on other sources.
Only in few cases, a clear indication of the usage time frame is given for codes and chiphers shown in the document. An attempt to identify the relevant periods for some of the remaining ones will be carried aut thanks to the contents of radio decrypted telegrams shown, as examples, in the report.

Square Tables and Cipher Discs

Sacco's notebook includes several references to Austrian substitution-based ciphers, both mono-alphabetic and poly-alphabetic. Line 2 of the list written in August of 1916 mentions a key alphabetical cipher of the Austrian army, evidently a substitution cipher because the word 'transposition', generally added in that case, is missing.
On the other hand, the abovementioned communication to the Allies explains: "various types of codes and square tables (used by the Austrians A/N) are well known. A square table with an alphabets number ranging from one to thirty is used with keys". The table shown in the document looks like a Vigenère table, with 30 lines and 30 columns, where ä, ö, ű and the question mark are added to the 26-letter alphabet (see picture 10.4).
The report also comprises a specimen of Austrian cryptogram ciphered by the same 30x30 table and decrypted by identifying the key, which was the word *hoesterreich,* with the first "h" omitted on purpose in the first position of the sequence. The dispatch is shown in Annex B (picture B1).
In brief, there is no doubt that the Austrian Army, for a long time during the war, had been using this kind of ciphers, initially mono-alphabetic, then poly-alphabet with short keys, remarkably like the *Pocket Military Cipher*, which had been so harshly criticized.
Such encoding can also be obtained through disks or rulers adequately designed[34]. Since the beginning of the war the Austrian army extensively exploited, across several levels of command, encoding and decoding disks designed after the one Leon Battista Alberti had created four centuries earlier and which they called *Bolton Chiffrenrad* or *Zirkularscheiben*. These were in metal, but also in cardboard or paper with ordered or disordered alphabets[35].
A disk with ordered alphabets on both rims did not guarantee any further secrecy in comparison to a regular Vigenère table, especially when used with short keys. Messages coded by a disk where one of the alphabets is disordered, as it is the metal disk shown in picture 10.5, result more difficult to decrypt[36]. This disk has the external rim divided into 30 parts, including a disordered alphabet with the letters ä, ö and ű, while the same alphabet but in the orderly form is stamped on the internal mobile rim. The disordered alphabet allows to generate a group

[33] On the other hand, J. Prikowitsch, (*op.cit.* p.406 – 418) also describes some bulky, usually two-part *Codebücher* that were presumably used by High Commands, perhaps rarely for radiocommunications. In the *Codebücher* identified by Roman numerals from XV a XVIII, the ciphering groups comprise 5 figures. In the category, identified by Greek letters from Gamma to Lambda, the code groups were made up of letters from the Latin alphabet, which amounted to 8 in the last Lambda edition (September 1918). Finally, F, G, and M are two-part codes with code groups of 5 figures.
[34] With a chipher disk, the encoding is performed, for instance, by rotating the inner disk until the key letter coincides with a fixed reference and by reading the ciphered letter on the outer rim that corresponds to the plaintext letter on the inner disk.
[35] J. Pricowitsch, op. cit. p.422, 431.
[36] The disk was shown of a temporary exhibition at the War Museum of Mauthen, Carinthia. The Author is indebted with Filippo Sinagra for the photography.

TAVOLA CIFRANTE R.T. AUSTRO-UNGARICA (ESERCITO)

cifrato		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Ä	Ö	Ü	?
chiavi	1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä
	2	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A
	3	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B
	4	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C
	5	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D
	6	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E
	7	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F
	8	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G
	9	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H
	10	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I
	11	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J
	12	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K
	13	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L
	14	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M
	15	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	16	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	17	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	18	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	19	S	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
	20	T	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	21	U	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	22	V	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	23	W	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
	24	X	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
	25	Y	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
	26	Z	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
	27	-	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
	28	Ö	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-
	29	Ü	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö
	30	Ä	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	Ö	Ü

10.4 The Vigenère table used by the Austro-Hungarian army during WWI (Courtesy of Flavia Reed Owen Special Collections & Archives, McGraw-Page Library, Randolph-Macon College, Ashland, Virginia)

of alphabets, each depending on the way the device is used. For some of them, which adopt specific ‘combinations’ in selecting the different positions of the reference, key, plaintext and encrypted text in the two rims of the disk, the reconstruction of the related Vigenère tables may be more arduous[37]. This explains the remark reported next to the disk shown, at the bottom of picture 10.5, mentioning the high level of secrecy that can be achieved by using the device ‘correctly’, while acknowledging that Italian analysts managed to interpret dispatches encrypted also in that fashion. The origin of the remark is unknown, yet it tallies with real situation because some methods mentioned earlier and known for decades could be applied to decrypt dispatches encoded even with the most ‘secure’ procedure, in addition

[37] L. Sacco, *Manuale, op. cit.*, p. 43 - 48. Changing the way plaintext, key and initial reference are read on the external and inner rim, twelve different cryptograms are generated. The twelve cryptograms correspond to twelve different Vigenère tables; some of them contain disordered alphabets and therefore result to be more difficult to rebuild.

to other more sophisticated procedures[38].

In his book, Andreas Figl does not explicitly say that the Austro-Hungarian army used ciphers derived from the Vigenère table during WWI: yet he affirms that in that period those systems were considered reliable by the armed forces of several countries because "they guaranteed sufficient security although under specific circumstances", therefore "their application can seem admissible still today"[39].

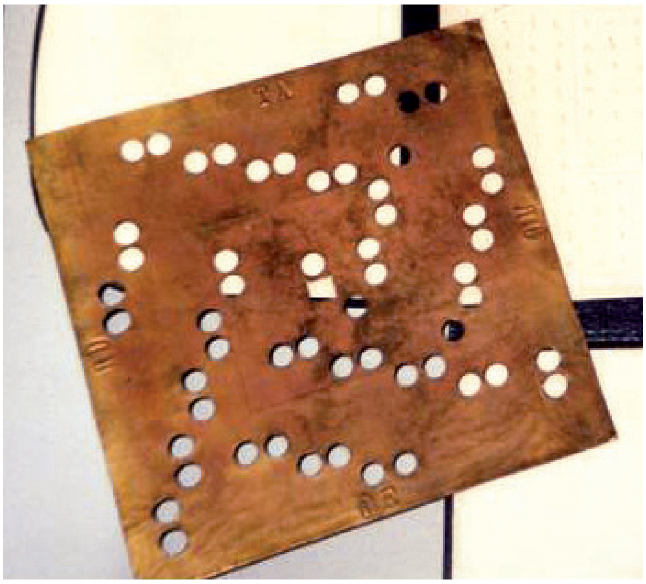
It should be noted that in operational situations occurring on the front-line during combat, the conditions Figl alludes to, such as the application of above-mentioned methods in manipulating the *Bolton Chiffrenrad* with disordered alphabets or even the frequent change of long keys, could only happen under favourable circumstances.

10.5 Austro-Hungarian encoding and decoding disk used during WWI (from F. Sinagra book)

[38] For example, the Kerckhoffs method can be applied to all poly-alphabetic systems with a short key. Sacco also describes other more complex decrypting systems (*ibidem,* p. 172 – 185).

[39] A. Figl, *Systeme des., op. cit,* p.84. The Author presents an example "adopted for subordinate units and that started being used in the 1890s".

Rotating Grilles



10.6 Austro-Hungarian rotating grille (from F. Sinagra book)

Picture 10.6 reproduces a device used by the Austrian army or navy, probably during WWI, which was displayed together the disk of the previous picture in the same exhibition at the Mauthen Museum[40].

Ciphering is obtained by writing, through the holes of the metallic plate on an underlying paper 'chessboard' (picture 10.7), the first letters or figures of a dispatch in a set order, for instance line by line and from the left to the right. To complete the encoding operation, the grille will be rotated by 90° for three times and the remaining parts of the dispatches will be written in the spaces that the grille has left empty. The holes in the metallic plate allow for 25% of the boxes in the 'chessboard' to be visible and are designed to prevent, in the three subsequent rotations of the grille, being positioned as another hole before[41].

Once the metallic grille is removed, all the boxes in the underlying sheet appear full, as shown in the sample table in picture 10.7 and the letters in the table can be transmitted in a sequence by lines or by columns, according to a set order, and then grouped in a pre-defined manner.

Some authors credit to the Austrian baron Eduard Fleissner the invention of rotating grilles that are often called by his name or *Patronen Geheimschrift*[42]. The grille of picture 10.6 is of the odd type (15x15), with the central hole used as a pivot for rotation[43], such as the original Fleissner's grille which differs from the one in the picture because of the regularity in the position of the holes, which would allow an easier solving of cryptograms.

During WWI, the violability of rotating grilles was well known by expert cryptographers like Figl and Sacco who explained the method to breaking the cipher in some pages of his notebook[44]. However, some Armies, certainly the German and Italian ones, resorted to this solution not just for a short time, because of the relative quickness and ease of encoding and decoding in forward areas of the front.

The German grilles had a different size depending on the length of the message to be transmitted. According to William Friedman, in 1915 each grille had a masculine name: Fritz was 10x10, Albert was 12x12. Later, feminine names were adopted: Berta for the 25-letter version, Clara for

[40] F. Sinagra, *op. cit*. p.146 - 148.

[41] For an easy method to build up a rotating grille, see W.F. Friedman, *Advanced Military Cryptography,* 1931 Edition, Special Text no. 166, www.nsa.gov, p. 29, 30.

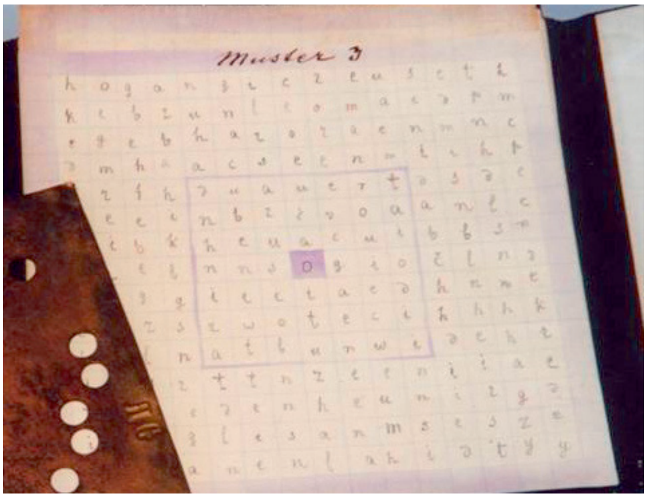
[42] Eduard Baron Fleissner von Wostrowitz Frederich, *Handbuch der Kryptographie*, Seidel & Sohn, Wien, 1881. Fleissner was a Colonel of the Austrian Army. Friedrich Bauer dates the grilles back to the 18th century (F. L. Bauer, *op. cit.,* p.93 - 94). Sacco too thought the system had been known since the 18th century.

[43] Pictures 10.6 and 10.7 also make it evident that the same grille could be used for shorter dispatches, by means of a smaller square (7x7) outlined on the metallic plate and on the underlying sheet.

[44] L. Sacco, *Manuale, op. cit.,* p.9 - 13; p.160 - 161.

the 36-letter version, Dora for 49 and so on[45].

Sacco’s notebook shows that rotating grilles were most likely used also by the Austrian-Hungarian navy. The fact that the Austrian army did not employ the grilles during WWI is seemingly proven by a sentence in one of Ronge’s letters, where he rejected the suggestion to adopt rotating grilles by declaring that they had never been used before[46]. However, the same source quotes a report of August 1918 by the 48th Division of the Austrian infantry clearly indicating that method as the most recommendable as compared to any other one in battle[47].



10.7 Table underlying the grille in picture 10.6

Small Austrian Codes

The “three-figure syllabic code of the Austro-Hungarian army (small stations)” that was the sixth on Sacco’s list discussed in the previous chapter, is recalled here to analyse the dictionary structure as it can be inferred from the telegram reported in the notebook.

Plaintext terms - alphabet letters, syllables, groups of two, three and sometimes four letters (bigrams, trigrams, etc.) - are listed in a single book, in alphabetical order along with ciphering groups made up of 3 figures between 001 and 999 reported in an increasing order. It is a one-part code not longer than thirty pages, which might have been rebuilt by Sacco or seized during the war.

Furthermore, in the above-mentioned document that Section R sent to the Allies, six codes are listed that were known and broken by the Italians. Firstly, it should be noticed that the names given to the six codes - *Carnia, CW*, *“Stern”, Tunis*, *SH*, *AK*, and the already-known *Ignaz* - did not probably coincide with the original Austrian names, known in only a few cases[48].

The codes indicated as *AK* and *SH* might date back to 1916 and result to be even simpler than a syllabic code: letters, numbers, some syllables, and commonly used words are replaced by random couples of letters whose number is 50 for the *AK* and 57 for the *SH*[49]. In the former, the couples of letters were transmitted as such, in the latter they were grouped on a five-letter basis. The Section R document includes tables and examples of decrypted radio telegrams for those codes, characterised by remarkably simple cryptology features and easy usability, so we can plausibly infer their assignment to radio stations as Service Ciphers. Annex B shows the *SH* table (picture B2), while other codes listed above will be discussed in the following chapters.

[45] W.F. Friedman, *Advanced, op. cit.*, p.30; D. Kahn, *op. cit.*, p. 308 - 309. According to Kahn, the German used them for about 4 months between late 1916 and early 1917.

[46] J. Prikowitsch, *op. cit*., p.435 - 436.

[47] J. Prikowitsch, *op. cit.,* p. 448.

[48] General Headquarters, Intelligence Service, Section R, *Notes on Radio Telegraphy, op. cit.*

[49] It is possible that the number of groups in the original cipher was higher than 50, yet the groups interpreted by the cryptographic unit were enough to decrypt whole radio telegrams.

Finally, Andreas Figl devotes an entire section of his book to ciphering through table systems (*Schlűsseltafel*), without clearly attributing them to the Austrian Army[50]. The simplest and ordered of these tables is shown in picture 10.8, where coded groups are made up of two figures. In the bottom of the same picture the plain and coded texts of a dispatch are displayed as an example of a 5-figure grouping, as in the *SH* and in many other systems.
Figl's book comprises larger tables including up to 270 positions filled in with military terms in German. Interestingly, the author takes the liberty of including the four syllables 'qua, que, qui, quo' in one of those tables, making an evident reference to the Italian language and to the same syllables used in similar tables of the *Service Ciphers*.
Tables could be easily employed as field or service ciphers, yet once some limits are exceeded, this advantage disappear. For instance, a German table comprising 570 positions with a complex system to identify the sequence of ciphering letters, was suggested to a Command of the Austro-Hungarian troops in 1918, which deservedly did not accept it due to the excessive complexity and bulkiness[51].
It is not worth to stress how easily ordered tables could be broken, in the light of what has been already explained regarding Italian service ciphers.

Systeme des Chiffrierens. Beilage 31 zu Seite 160—164.

1. Beispiel.

Einfachtafel mit Ziffern.

*	3	6	0	7	4	8	1	9	5	2
2	a	ä	ai	au	äu	b	c	ch	ck	d
6	e	ei	eu	f	ff	g	h	i	ie	j
3	k	l	ll	m, mm	n, nn	o	ß	p	pp	r
7	s	sch	sp	spr	ss	st	str	t	tt	u
4	ü	v	w	x	y	z	0	1	2	3
0	4	5	6	7	8	9	.	,	;	?
8	Ab-teilung	Armee	Artillerie	Ba-taillon	Batterie	Brigade	Brücke	Division	Eisen-bahn	Eskadron
1	Feld	Flieger	Flugzeug	Genie	Geschütz	Ge-schwader	Gruppe	Infanterie	Jäger	Kanone
9	Ka-vallerie	Kom-pagnie	Kom-mando	Korps	Mann	Mörser	Munition	Offizier	Pferd	Pionier
5	Regiment	Sanität	Sappeure	Schützen	Stab	Staffel	Train	Truppe	Wache	Zug

a. Klarschrift. 3. Kompagnie sofort Brücke bei xdorf besetzen.
b. Sigelschrift in Fünfergruppen. 42019 67338 67383 27981 28664 72238 32672 86373 63486 33401

10.8 A simple encoding and decoding table with numerical key (A. Figl, Sisteme des…. op.cit., Annex 31)

50 A. Figl, *Systeme des …, op. cit., VII Abschnitt*, p. 159-190.
51 J. Prikowitsch, *op. cit.,* p. 447- 448.

10.4 ABOUT THE SAFETY OF ITALIAN RADIO COMMUNICATIONS

A Cryptographic Report by Luigi Sacco

In 1916, the Cryptographic Units, focussed more on breaking ciphers and decrypting enemy dispatches rather than on designing codes and ciphers that could be safer than those used, until then, by the Italian army. On the other hand, the implementation of ciphers and codes that would take weeks or even months rather than a few hours or days to be solved, would require not only adequate amount of trained human resources, but also the assignment of a formal task, needful to intervene effectively in a very 'sensitive' area, especially for the aversion shown by cipher offices of High Commands to change or introduce alleged complications in their work.

Notwithstanding the absence of an official mandate, Captain Sacco - keenly aware of the binding need to improve the critical situation of Italian cryptography - wrote in early September 1916 a report in which, while highlighting the weakness of the codes and ciphers used by the Army, he identified the paths to create safer systems[52].

The report where Sacco recommends "deliberately avoiding, in our coding systems, anything that could help the enemy decrypt our dispatches", is enclosed integrally in Annex C. In five-page extremely clear and simple overview, he describes the methods to decrypt the *Pocket Military Cipher* and dictionaries such as *Red Code* and *Mengarini Code*, proving their considerable weakness.

The author then lists some general rules to prevent decryption by the Austrians, and suggests avoiding:

- any symmetry and uniformity in ciphers;
- the accumulation, in the enemy's hands, of copious cryptographic material coded with the same system and the same key;
- the frequent repetition of the same code groups in a cryptogram or in subsequent cryptograms;
- the inclusion of plaintext words into encoded texts even when these had low level confidentiality.

To overcome the mentioned weakness, he recommends to frequently change the coding systems and keys, to introduce homophones for the most common terms and to employ the double coding which allows to modify "the code groups occurrence, compared to the natural occurrences of the Italian language".

Given the clarity and accuracy of this analysis, it arouses wonder about the slowness of application in Italian army of the criteria suggested by Sacco and about the long and arduous process required for the adoption of innovative codes and ciphers.

In fact, Sacco did not only expose a diagnosis the of Italian military cryptography evils and suggest ways to remedy them, but as evidence of the set out principles, wrote a *Piccolo cifrario telefonico* (Small Telephone Code) that "when used rationally and with frequently changing keys, provides little help to the analysts"[53]. In contradiction with its reductive name, probably adopted for avoiding frictions with various Headquarters, this vocabulary can be considered as one advanced example of *trench code (carnet de chiffre):* a code family originally created for telephone communications and then used, also for radio telegraphy by many fighting armies between the end of 1917 and the beginning of 1918.

[52] L. Sacco, *Notizie sui sistemi di decifrazione e norme per il ciframento dei telegrammi*, (Information about decrypting systems and rules for coding telegrams) Codroipo, 2 September 1916, ISCAG, Coll. 223.
[53] *ibidem.*

An Innovative Contribution

The *Small Telephone Code* is a two-part dictionary with an encoding part and a decoding part. The plaintext terms include syllables, alphabet letters, numbers from 0 to 9 and many terms currently used within the Italian army, as shown in Annex C where copies of the introduction and of the two opening pages for the coding and decoding parts are shown. Each plaintext term listed in alphabetical order in the first part corresponds to a three-figure number to be drawn, in each groups of Army units having in common the same version of the code. In the decoding part, the numbers listed in an increasing order were not associated to the corresponding plaintext, before the draw.
It should be noted the abundance of homophones, together the possibility of introducing in the cryptograms many null code groups because the items within the range between 000 and 999, amount to just 550. To avoid errors in transmitting figures, Sacco added a dictionary converting code groups into geographical names, as partially displayed in Annex C.
In compliance with the general principles of Sacco's report, the "ensemble of the randomly drawn numbers of the coding part" may be assumed as the code key "which must be different in any sector of the front and change at least every month"[54]. Therefore, every operational unit had to draw the code groups valid inside its own organization, at least ones a month.
It is easy to understand that the proliferation of temporary codes thus obtained, along with the expedient consisting of dividing, when necessary, words, signatures, etc. into syllables and letters in ever-different ways can make enemy analysts' life quite difficult. How appropriate it would have been to immediately apply Sacco's principles to all Italian radio communications!
The *Small Telephone Code* does not only represent a mere example for demonstration purposes, but a precursory pattern for the cryptographic method that would be applied, with considerable difficulty and delays, over the following years. In fact, the criteria adopted provided the basis for some codes introduced during 1917 and 1918 that Austrian analysts could never break. It cannot also be excluded that the code in question, or other versions of it, were employed by some units of the Army.
Sacco's proposal should be considered as innovative mainly in terms of the drawing methodology that, starting from a single book, could easily generate, many codes independently renewable. Other armies, including the German and the Austrian ones adopted in their cryptographic systems some forms of drawing, during the last months of the war.
Basically, this kind of codes fully complies with the Kerckhoffs principle, according to which the enemies might know the systems, but they would not necessarily be able to decrypt dispatches without the key which, as Sacco correctly points out, consisted in this case, of the random sequence of code groups.
It is worth noticing that this method also represents a solution for the issue of the distribution of ciphers and, above all, of keys becoming increasingly complex due to the large spread of telecommunications, and especially of the radio, in the most forward areas of the front.

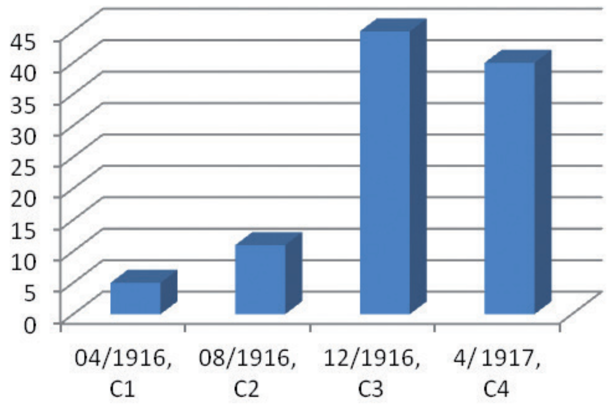
The New Service Ciphers

Between late November and early December 1916, Austrian analysts had an increasingly hard time breaking the new ciphers of the Italian radio services. This happened for the first time with the *C3* cipher, initially applied by stations with power equal or lower than 200

[54] *ibidem*

W operating within the 4th Army[55]. As usual, *C3* contains two tables: a main table with 17 columns and 11 or 12 lines, each with a different order of ciphering letters as well as an auxiliary table with 5 or 6 lines.
However, following the recommendation in Sacco's report, complete irregularity in positioning inside the table of letters, syllables, parts of words, words, and numbers from 1 to 100 is finally adopted. Figl recognizes the lack of regularity and repetitions, in addition to the presence of many homophones: for instance, the word 'General' has nine homophones. Consequently, the difficulty and time required to break the cipher increased considerably compared to the previous ones. Moreover, the introduction of the mentioned countermeasures made hard and probably impossible to fully rebuild all the contents of the main table, allowing only to perform an acceptable interpretation of most dispatches[56].
However, many inaccuracies of the Italian telegraphists in managing the *C3* facilitated the work of Figl and his colleagues. For instance, a service dispatch requesting to repeat the transmission of a telegram with another code - as the receiving station did not have the *C3* - disclosed the very existence and name of the cipher[57].
The Austrians had to make a similar effort to interpret the *C4* cipher adopted in April 1917 by radio stations with power equal to or higher than 300 W and consisting of a two-part dictionary, as shown in the next chapter[58]. The time required to break a cipher is crucial because, when it becomes too long, new ciphers could be adopted at intervals of time so frequent that they could cause a continuous blackout of the enemy decryption.
Quantifying the amount of time spent by the Austro-Hungarian analysts to break each Italian cipher is not a simple task, also because their names differ from the Italian ones, producing some complications in recognising, on each occasion, the equivalence between the two acronyms[59]. Furthermore, there was often a considerable discrepancy between the dates of the actual adoption of the various ciphers and the dates contained in Figl and Ronge's memoirs.
Yet an effort was made to round down the time required to break the single service ciphers from the date on which they had come into force, achieving the results shown in picture 10.9 which demonstrates the remarkable increase of that time interval, after the adoption of unordered systems[60]. Austro-Hungarian analysts were quite concerned about the innovations introduced into the structure of service ciphers as well as about the high frequency of substitutions[61].

[55] Chief Inspector of the STM, Military Journal, *Lettera con oggetto: Cifrario di Servizio C3* (Letter subject: Service Cipher C3), 3 November 1916, AUSSME, Series B1, 105 S, Vol.89.
[56] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.173 -175.
[57] *ibidem*. Obviously, such a repetition is an inexcusable cryptologic error.
[58] Chief Inspector of the STM, Military Journal, *Ordine di servizio 56 del 26marzo 1917, Cifrario di servizio C4* (Service Order no. 56 of 26 March 1917, Service Cipher *C4*), AUSSME, Series B1, 105 S, Vol. 89.
[59] As already mentioned in another note, the Austrian name *Service Cipher IV* corresponds to *C2* and the so-called *Service Cipher V* corresponds to *C4*. Oddly enough, the *C3* cipher was indicated with the correct acronym and was not classified in the usual manner.
[60] As regards the *C3*, the date when its structure was finally clear to the Austrian analysts is known (14 January 1917), as declared by Ronge and Figl. The 1st December 1916 was assumedly the date in which it was first used. The *C4* was adopted on 10 April and, according to Ronge, broken in the early days of the Tenth Battle of the Isonzo, which started on 12 May 1917. (M. Ronge, *Der Radiohorch*, *op cit.,* p.13). The time required for breaking a cipher generally refers to the reconstruction of the structure of the main tables, not of the sub rows comprising, for instance, the terms frequently used by the Army. In fact, immediately after the new cipher was introduced, the percentage of identified terms of that kind was low, which did not prevent more simple dispatches from being understood.
[61] M. Ronge, *Der Radiohorch*, *op cit.,* p.9.



10.9 Decryption time in number of days, and dates of adoption of some Italian Service Ciphers

Such an improvement, largely determined by the application of some Sacco's principles, could not prevent Italian service ciphers from being broken due to the considerable quantity of cryptographic material given to the enemy and especially to the frequent carelessness or mistakes made by radio telegraphists who had not been adequately trained to perform their coding tasks.

10.5 RADIO INTELLIGENCE IN LATE 1916

The Austrian Renounce to Radiocommunications

Rules limiting the radio use in the Austrian Army date back to October 1915, when a very strict directive imposed radio silence to all field stations and the systematic resort to wire connections also for telegraphy, with the exception of emergency circumstances[62]. Such directive was reiterated and gradually made stricter over the next years whenever alarming news was gathered regarding Italian interceptions: in 1918, orders were given to even seal transmitters on parts of the front line[63]. The frequency of the Italian interceptions shows that radio silence was applied more severely from May 1916 to October-November 1917, although this behaviour was 'fluctuating' probably due also to internal conflicts caused by opposing thoughts in the Austrian army. Therefore, radio telegrams intercepted by Italian listening stations were, for a large part of the war, fewer than Italian dispatches transmitted and mostly intercepted[64].
Austrian countermeasures did not only depend on some alarming information about the Italian radio capability gathered from prisoners' statements, decrypted Italian radiograms, etc., but also aimed to avoid providing the Italians with enough cryptographic material and radio information. As a matter of fact, the strategy of the Austro-Hungarian commands was well founded since, also in the period preceding the Cryptographic Unit successes, the Italians' ability in interceptions and radiogoniometry allowed to identify the positioning of radiotelegraphic stations - and therefore of enemy Commands - whenever a transmission of some unavoidable service communication began. Furthermore, interception techniques became more and more refined, actually on both sides of the front, as familiarity increased with wavelength and names of stations, with correspondence

[62] J. Prikowitsch, *op. cit.,* p. 436.
[63] M. Ronge, *Der Radiohorch*, *op cit.,* p.11, 14 e 24, 30.
[64] In 1917 and 1918 the overall number of decrypted dispatches transmitted by the Italian cryptographic unit to other offices was a few hundred per month. In addition, there was an unknown number of less important decrypted radio telegrams that were not transmitted outside the unit. Between April and December 1917, the encoded Italian dispatches intercepted (the number of decrypted dispatches is not known, A/N) in the area controlled by the 11th Austrian Army - where more than half of the intercepting stations were located - amounted, according to Ronge, to an average of 840 per month, excluded repetitions - that is telegrams intercepted by several stations.

rules and abbreviations used by the enemy, etc. Listening activity became easier also thanks to the adoption of completely stand-alone receivers, independent from transmitters. In September 1916, for the first time, the Austrian army commissioned ten receivers for interception only, delivered the following year, while the Italians had similar receivers in Codroipo and elsewhere, for about one year already[65].

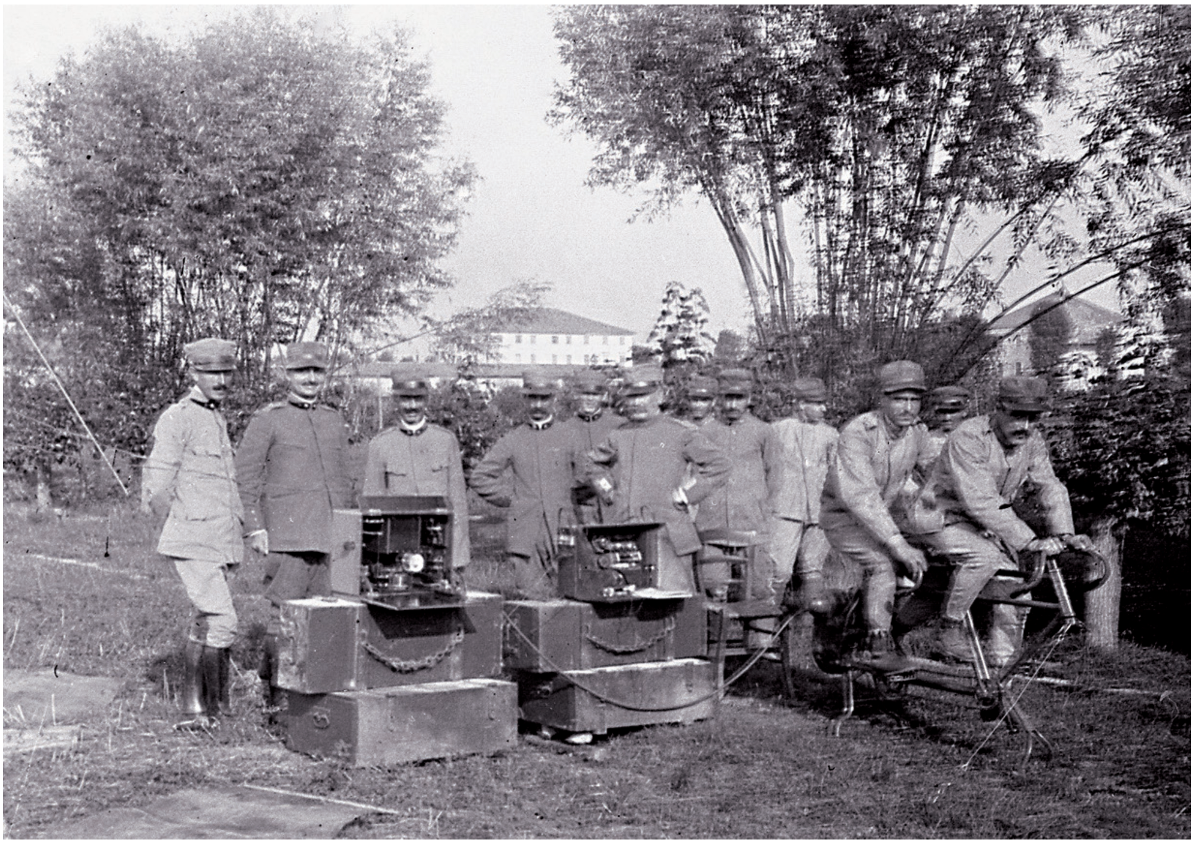
Italian Ciphers' Proliferation

Contrary to what happened on the Austrian side, the number of Italian transmitting radio stations in the war zone increased continuously, reaching the figure of about eighty at the end of 1916, also following the introduction of a considerable amount of 200 W stations that could be easily transported and powered by pedal. Picture 10.10 shows the main component of this station, completely produced in the army workshops. The top part of the picture displays the receiver case and transmitter case, while the bottom shows the tandem activating the dynamo for power source. The photograph in picture 10.11 probably refers to the delivery of the equipment to the radiotelegraphic office in Codroipo.

10.10 A 200W pedal-powered transmitting and receiving station. The transmitter is on the top right side (ISCAG Archive)

The general directive sent by the Chief Inspector of the STM to the Headquarters of the armies in April 1916, prohibits *Service Ciphers* usage in those stations and prescribes the application of other coding systems to be created locally by "each radiotelegraphic section command", in order to protect its own communications "with ciphers which, in case of loss, do not cause too much damage", since radio stations located in forward positions were evidently more likely to be captured[66]. Using different ciphers within the same army was also allowed, considering "advisable to have just the stations actually communicating with each other using the same system"[67].

[65] M. Ronge, *Der Radiohorch*, *op cit.,* p.11. The use of stations qualified for listening only was justified by the fact that in that manner "one was not tempted to transmit dispatches".
[66] Chief Inspector of the STM, Military Journal, Letter, Subject*: Servizio delle stazioni RT di piccola potenza* (Service of low-power radiotelegraphic stations), 11 April 1916, AUSSME, Series B1, 105 S, Vol. 88.
[67] *ibidem*.



10.11 A 200 W station on the field. Captain Sacco is the second from the left (Luigi Sacco's photographic archive)

Although individual armies could choose the method, they believed the most appropriate, it was advised to adopt ciphering based on rotating mechanical grilles. Although as already pointed out, that system could not guarantee much security, it found frequent application since the spring of 1916 along with the spread, in different sectors of the front, of stations with transmitting power equal to or lower than 200 W[68].

Fortunately for the Italians, small stations were not easily intercepted due to their limited transmitting power and range, which allowed rather frequently eluding enemy interception. To solve the problem, the Austro-Hungarians adopted a series of countermeasures, including an increased number of listening stations that, by the end of the year, amounted to approximately forty and were deployed along the entire front[69]. These stations intercepted some dispatches ciphered with rotating grilles in the Carnia region, but Andreas Figl and his colleagues were not sure whether other reduced power transmitters could elude interception[70]. Actually, Ronge includes only three "grille-based ciphers in the Carnia region" into the list of Italian ciphers used in 1916[71].

It may be highlighted that the multiplication of Italian ciphers, named "Vermehrung" (proliferation) in German, did not occur near the end of the war, as claimed by Andreas Figl, but was triggered by the above-mentioned directive in the spring of 1916, although limited to codes and ciphers

[68] In addition to the grilles, the Chief Inspector of the STM reported another cryptographic system shown in an attachment to the letter itself. The attachment has not been found (*ibidem*).

[69] M. Ronge, *Der Radiohorch, op cit.,* Annex 25. Some annexes comprise maps drawn by Ronge in 1943. The maps showed the position, at different dates of listening stations, of radio groups, and of *Penkalas.*

[70] H.J. Horak, *Oberst a.D. Andreas Figl, op. cit*., p.145.

[71] M. Ronge, *Der Radiohorch*, op cit., p. 52.

implemented by single units[72]. Obviously, this does not rule out dangers for security due to the use of rotating grilles or of other locally produced weak ciphers and therefore the need to monitor and eventually remove those ciphers by a team of expert cryptologists working at the central level. This finally happened in 1918, when the Cryptographic Unit issued clear and binding rules to guarantee the security of ciphers created at local level.

The Effectiveness of *Penkala*

At the end of 1916, Italian cryptographic defence was still affected by many shortcomings that enormously facilitated Austrian analysts' work. Sacco's suggestions to design more robust ciphers than the existing ones were followed slowly and reluctantly. Consequently, due to internal aversion to change, red-tape delays and personal conflict, the replacement process was long and difficult and lasted throghout 1917 and part of 1918.

Austrian analysts, taking advantage of this situation, extended their interception and decryption network that became especially effective on the Tridentine front during the severe winter period, when many wire connections broke down and the Italians were compelled to use the radio, in some cases also for confidential dispatches. At the end of 1916, several *Penkalas* were operating on the Italian front, while on the Italian side just one centre of excellence was active and comprised a little more than ten personnel[73].

With reference to the effectiveness of decryption, in terms of actual information gathered through it, Figl and Ronge highlighted, as already mentioned, the successes obtained during the *Strafexpedition.* Conversely, the situation on the Isonzo front seemed to be quite different. In fact, extreme caution in transmitting via radio non-confidential news only, made the Austro-Hungarians' great efforts to intercept and decrypt scarcely fruitful. This seemed to be the main reason for the mentioned sharp comments given, after the loss of Gorizia, by the Headquarters of the 5th Army regarding the decryption service.

Moreover, discussing the 7th, 8th and 9th Battles of the Isonzo between September and November of 1916, Ronge himself ascribes to sources other than radio interceptions the gathering of news that could prevent the Italian attacks from being a surprise, as on the contrary it had happened before the 6th Battle, due to shortcomings of the Intelligence Service as a whole, including *Penkala*[74].

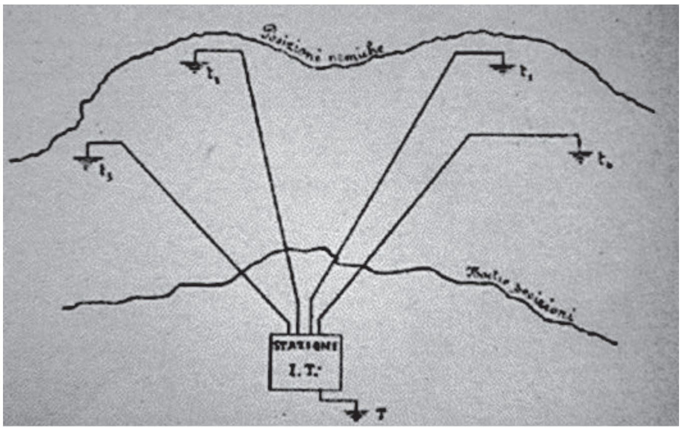
[72] O. J. Horak, *Oberst a.D. Andreas Figl, op. cit*., p. 148.
[73] The *Penkalas* mentioned by Ronge were in Bolzano, Trento, Villach, Adelsberg, Cattaro, Pola and Castelnuovo.
[74] M. Ronge, *Der Radiohorch*, *op cit*., p.10.

10.6 THE DEVELOPMENT OF TELEPHONE EAVESDROPPING

Telephone Interception Tools

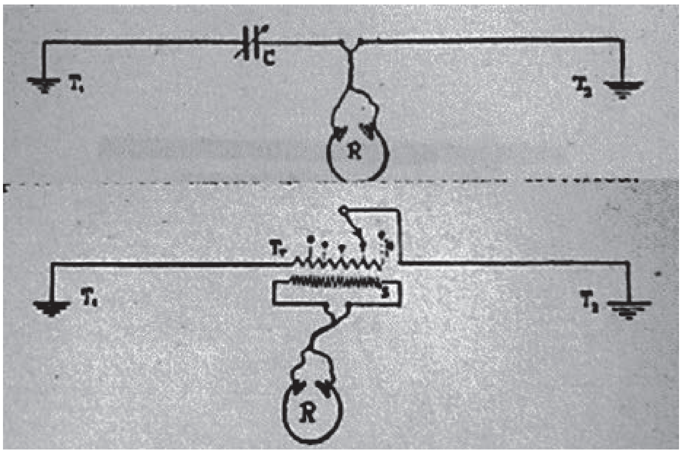
After the first tests in 1915, the necessity arose to tentatively adapt the position and length of the intercepting wires to usually unknown characteristics of the enemy circuits. Therefore, several lines with earth sockets as close as possible to enemy trenches were installed, to search for enemy conversations. Then, the available intercepting wires were explored selecting the one that provided the best listening quality[75].

The structure of a typical interception network is outlined in picture 10.12, showing a telephone interception station behind the Italian lines and many wires terminating with earth sockets (t_1, t_2, … t_n) near the enemy trenches. The greatest difficulty in realising such a network was usually found in installing and connecting earth sockets, which often required actions to be conducted by intrepid telegraphists.



10.12 Outline of a telephone interception station

After an early phase in which each Italian army implemented its own networks independently, the Information Office managed to make the sevice more homogenous and gave it the name of *I.T., Intercettazioni Telefoniche* (Telephone Interception Service). However, not all Headquarters were convinced of the usefulness of that innovation, therefore, in Marchetti's words: "the misoneism and scepticism still prevailing in some Intelligence Offices of the armies were contributing to delay improvement of the organisation which could actually be completed by early 1916"[76].



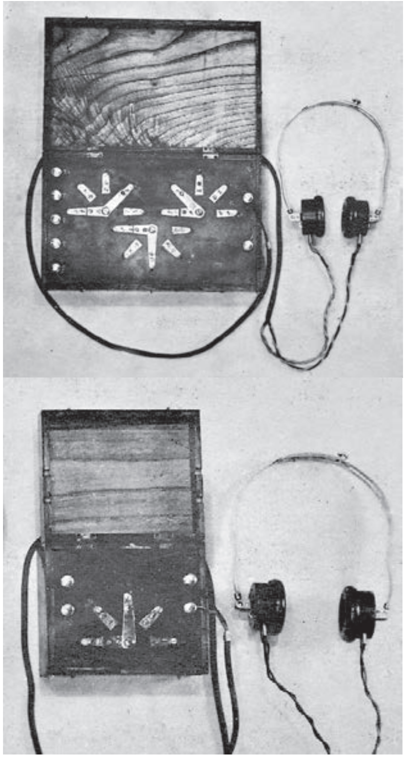
10.13 Diagram of a first telephone interception equipment

The work of specialist teams in the armies allowed continuous refinement of technical means and operational methods. Colonel Guasco and Lieutenant Carletti set up a laboratory called 'Telephone interception office' within the 24th Telegraphic Company, 2nd Army, devoted to equipment design and manufacturing, interception techniques refinement, dissemination of rules for protection against enemy listening and training of technical personnel assigned to the service[77].

[75] Ground sockets were copper plates or nets, or even just a bayonet poked into the ground. Intercepted current peaks when the intercepting wire is parallel to the intercepted circuit.

[76] O. Marchetti, *op. cit.* p. 89.

[77] G. Guasco. *Le intercettazioni telefoniche, op. cit.;* A. Carletti *op. cit*.



10.14 Interception devices implemented by the 2nd Army (ISCAG Archive)

Simple telephone equipment used during the first interception activities were replaced by specific devices basically structured as shown in picture 10.13. In January-February 1916, telegraphists of the 2nd Army produced the 'detectors of the 2nd Army type' along with a switching table for quick selection of the intercepting wires among the available ones[78]. Picture 10.14 shows the photographs of two portable detectors of this kind including the switching devices, adopted in many areas of the front[79].

In addition, in the course of 1916 the the Italians as well as the Austro-Hungarians gradually adopted valve amplifiers[80], allowing higher receiver sensitivity needed to compensate the reduction of the intercepted currents due to the replacement of single wire earth return circuits (mixed circuits) with two-wire circuits[81]. In June 1916, upon returning from one of his missions in England, Captain Guglielmo Marconi suggested the application of a particular equipment to improve listening in telephone interception. This device - most likely a valve amplifier - was delivered to the Italian army because Marconi was extremely busy with other experiments considered to be more important and he could not attend to the tests personally[82]. In the autumn of 1916, the Telephone interception office of the 2nd Army built the 'amplifier - detector of the Gorizia type' shown in picture 10.15[83], using two triodes called 'Gorizia valves' that were designed according to Professor Quirino Maiorana's recommendations and manufactured at an electric bulbs plant in Novi Ligure owned by engineer Giuseppe Longoni. The 'Gorizia valve' was largely employed during the war for the radio-communications of the Italian army and navy and included in Professor Giancarlo Vallauri's famous experiments at the Electro-technical and Radiotelegraphic Institute of the Navy[84].

[78] A. Carletti, *op cit.,* p. 17. The series condenser not only stops continuous currents or telluric currents, as well as other disturbances generated by power supplies, telegraph currents, etc., but it also minimises the circuit impedance balancing the headset inductance.

[79] The picture is taken from G. Guasco, "*Servizio d'intercettazione delle trasmissioni telefoniche*" (Interception Service of telephone transmissions), AUSSME, Series E1, env.111.

[80] Supreme Headquarters, Office of the Chief of Defence, *Fonogrammi di fonte austriaca, op. cit.;* Chief Inspector of the STM, *Comunicazioni telefoniche, op. cit.*

[81] This replacement does not cancel all the causes of eavesdropping. Ground leakage caused by imperfect isolation of twisted pairs, of insulators, etc. was difficult to eliminate in the uncertain conditions in war zones and generated currents in the ground in addition to induction effects due to unbalanced current in the two wires.

[82] Supreme Headquarters, Coordination and Deployment Office, Letter to the Ministry of War, Officer Personnel General Directorate, Subject: *Senatore Guglielmo Marconi*, Ref. no. 24598 of 14 July 1916, ISCAG Library, G. Marconi folder. At that time, Marconi was focussing on the mentioned revolutionary use of higher frequencies to increase, amongst other things, the directionality of antennas.

[83] A. Carletti, *op. cit.*, p. 22. The name given to this equipment referred to the recent conquest of the city. Excluding valves, Gorizia amplifiers were built in the electric laboratory of the 24th Telegraphist Company by servicemen with a background in the State Telegraphic and Telephone Administration.

[84] Vallauri's tests verified an equation that expresses in an analytical form the electric behaviour of a triode valve. The Gorizia valve was one of the valves used for this purpose.

10.15 The "Gorizia" amplifier (ISCAG Archive)

In October, the 3rd Army conducted tests to assess the Gorizia amplifier performance compared to that of French-made equipment[85]. French amplifiers were then used along with the 'Gorizia' ones. When the Gorizia valve became no longer available, the Telephone interception office modified the detector-amplifier adapting it to French valves[86].
Between late 1916 and early 1917, the availability of valve amplifiers allowed a more widespread I.T. service, also in the sector of the front controlled by the 1st Army, where telephone eavesdropping activities had been previously limited, due to the actual difficulty in developing an intercepting network on the mountains[87].

Some Relevant Results in 1916

Since the early months of war, Austro-Hungarian Headquarters had issued directives aimed to avoid disclosing to the enemy useful information by inappropriate telephone conversations and to instruct telephonists about the employment of concealed languages for escaping any enemy interpretation. However, these simple languages generally adopted to codifying only the words carrying the most important information did not apparently lead to meaningful results. A rough codification referred for to beverages, a much-desired item for soldiers on the front, establishing for instance a correspondence respectively between "large barrels" and cannon; "small barrel" and machine gun; "cask" or "tub" and mortar, with calibres expressed in hectolitres[88].
With some practice, the Italians managed to understand the meaning of those simple concealed words. Of course, for those who lacked that kind of expertise developed through a painstaking interception activity, the terms used by the Austro-Hungarians could seem harmless and/or unintelligible. This is what happened to a young interpreter officer just arrived on the front, who, after his first listening shift during the night, on the following morning said to the commander of the telephone interception station that he had nothing to report because the Austrians had just talked about "chocolate", "sugar" and "coffee"[89].
Since early 1916, the Chief Inspector of the STM received several reports on the results achieved within the 2nd and 3rd Armies. For example, the listening stations set up by the 3rd Telegraphic

[85] Chief Inspector of the Military Telegraphic, *Journal, Circular Letter to the Headquarters, op. cit.*
[86] Italian Marconi Company had purchased the plant in Novi Ligure and stopped the manufacture of valves. Therefore, French valves were imported at a larger extent beeing, throughout the war, those mostly available. By the end of the war, imported valves amounted to 1.500 per month.
[87] Tests in the first Army started in March 1916, gave only partially convincing results, as shown in the correspondence between the Headquarters of Engineer Corps of the Armies and the Supreme Headquarters. Cesare Pettorelli Lalattta, in *I.T.O. Note di un Capo del Servizio d'Informazioni d'Armata* (Operating Troops Intelligence Notes of a Chief of the Army Intelligence Service), Agnelli, Milano 1934, p. 135 -137 dates the beginning of systematic interception on this front-line back to March 1917, but other archive information suggests that they might have taken place a few months earlier.
[88] A. Petho, *op. cit.,* note 203, p.217.
[89] Mario Nordio, *Nel cinquantenario della Vittoria. Il telefono in trincea,* Selezionando SIP, n° 6, Roma, 1968, pp.16-17.

Section in Peteano and Ronchi provided relevant news achieved by listening activities carried out between 10 and 12 February, about the Austro-Hungarians' efforts to identify the position of some Italian batteries, their losses incurred during bombardments, the different kinds of supplies requested by frontline units, etc[90].

Phonograms intercepted in October 1916 by the interception station in Monte Rosso mention Austrian regiments that were certainly not deployed on the front line of that Army. Then, the authenticity of phonograms started being accurately verified by examining the names of mentioned officers and of the units they commanded. This leads the Italians to infer possible erroneous interpretations since "as reported by prisoners, concealed numbers and names and, in some cases, specific ciphers, were applied during the transmissions"[91]. A further hypothesis assumed that the Austro-Hungarians might be using - as the Italians had being doing for a long time - telephone interception to disseminate fake news regarding, for example, the size of their forces on the front.

Some of the communications intercepted on the front of the 3rd Army in November and December 1916 led to denounce the enemy's unfair behaviours. One of these is about the risk run by an Italian patrol leaving the trenches with the Red Cross insignia to recover the dead. At 13.35 a first communication is intercepted: "yes, I had seen an Italian medical patrol in the proximity of Strauch 11. I wanted to give an order to shoot, but now it is too late since they have left"[92].

At 14.05 a more complete conversation occurred:

> Hello, Jog, is it you commanding the company?
> Yes, the left-side company. Yes, it is me.
> Did you see the Italian medical unit too?
> No, I did not see them, and the battalion commander reprimanded me because I did not shoot.
> Yes, that was timely.
> Did you see what they were doing?
> They were taking away dead Italians. I was told they also talked with our soldiers[93].

Another telephone dispatch of 25 December requested 20 dum-dum bullet packages, forbidden under the Hague Convention[94]. The results of the interceptions just reported were part of a file providing documentary evidence of the "atrocities" committed by the Austro-Hungarians.

[90] Engineer Corps Headquarters of the 3rd Army, *Note delle intercettazioni di corrispondenza telefonica nemica fatte negli ultimi due giorni* (Notes on telephone interceptions over the last two days), Extremely Confidential, Ref. no. 326, 13 February 1916.

[91] Headquarters of the 2nd Army, Defence Staff, Letter to the Intelligence Office, *Fonogrammi di fonte austriaca intercettati* (Intercepted Phonograms from Austrian Source), ref. 725, Tricesimo, 9 October 1916.

[92] Headquarters of 3rd Army, 2nd Section (Intelligence), News sheet N. 1990, *Stralcio intercettazioni telefoniche intercettate il 27, 28 novembre* (Excerpt of telephone interceptions carried out on 27, 28 November), Hill 144 station, 28 November 1916, AUSSME, Series f3, env. 170, Austrian atrocities.

[93] *ibidem.*

[94] Headquarters of the 3rd Army, 2nd Section (Intelligence), News sheet N. 2129 A, *Intercettazioni telefoniche* (Telephone Interceptions), 24 December, time: 18.20, *ibidem.*

CHAPTER ELEVEN

Relevant changes

11.1 THE EVOLUTION OF THE CRYPTOGRAPHIC UNIT IN 1917

Activities And Organization

The logs of Section R provided a wealth of information about the number of radiograms and telegrams decrypted and distributed to many Ministries, to the allied missions in Italy, and to the Supreme Command itself. In 1917 the number of average monthly dispatches sent to other entities amounted to about 150, with a peak of almost 300 in the last months of the year[1]. To the previous ones, an unknown number of less significant decrypted communications must be added, not officially transmitted but included in reports and memoranda for the above-mentioned organisations. For example, from early 1917 until the end of the war, the Cryptographic Unit sent to the Ministry of Foreign Affairs more than one hundred 'information digests' concerning news not contained in the single telegrams and radiograms forwarded to the Ministry.

In general, the total recorded number of telegrams was higher than that of radiograms, mainly due to the continuous inflow of diplomatic correspondence to/from the embassies of neutral Countries.

In addition to the cryptographic activities, Sacco had to carry out several other tasks related, for example, to his expertise in the field of radio communications. At the beginning of February 1917, the Unit accomplished a study on small trench stations followed by a request to Guglielmo Marconi to take care personally of the supply and experimentation of some devices of this type imported from England[2].

The Head of Unit also took care of organisational aspects, including the increase in the staff. In this regard, the logs of Section R report the hiring of some officers such as the Second Lieutenants Bresciani, Modica, Giorgio Levi della Vida; Lieutenant Savino Lalloni; Officer Aspirant Perelli; and the already mentioned Cristofolini. However, despite the new enrolments, the Unit remained understaffed for the entire duration of the conflict, especially in the face of the growing commitments extended, during 1917, to the drafting of new codes.

The Unit also defined the rules for the intercepted enemy radiograms transmission via efficient and quick wire telegraph communication from the intercepting radio stations to the Section R in Rome. The General Headquarters of the Engineer Corps received this regulation on 1 December 1916 and forwarded it to all radiotelegraphic Sections a month later. The adopted cipher was called

[1] The logs include relevant data from October 1916 until March 1917. After thit date, probably for confidentiality reasons, they only report the number of radiograms and telegrams that were decrypted and information on meetings and movements of personnel.

[2] *Apparecchi Radiotelegrafici del Senatore Marconi*, (Radio telegraphic equipment from Senator Marconi) ISCAG, Coll. 284. Marconi had been reassigned from the Army to the Navy in August 1916 and took the rank of Lieutenant Commander. The request had therefore been submitted to the Ministry of the Navy, which accepted it on 1 March 1917.

Beta cipher, for 'beta' inserted as a separation marking between preamble and address, address, and text of the dispatches, etc[3].

Relations with the Allies

On 3 February 1917, "Colonel Cartier, Head of French RT Section, is welcomed by the Head of the Section R and is put in contact with the Head of the radiotelegraphic unit, having a long discussion with him". The next day "Colonel Cartier had a second meeting with Captain Sacco and left Rome on the same day"[4].

These rare pieces of news shown in the Logs of Section R undoubtedly marked the beginning of a renewed collaboration between the analysts of the Italian and French armies but deserve some comments. Colonel Françoise Cartier, or more precisely de Cartier, was Head of the 'Section du Chiffre' of the 'Deuxième Bureau', the Intelligence Service of the French Army General Staff. His unit, operating since several years before the war, had already broken numerous Germans ciphers on the western front[5]. The French Colonel had been one of Sacco's counterparts during the mission to Paris in July 1915 and on that occasion, the search for support played by the Italian Captain - at a particularly critical time due to limited Italian cryptologic skills - had failed also because of the scarce generosity of Allies.

The situation at the beginning of 1917 seemed completely different. Now the head of the famous crypto analysists from beyond the Alps, aware of the successes achieved by Sacco including those to be discussed shortly, visits him in Rome for a couple of days. The information exchanged during the Cartier visit is unknown, but a few days after the meeting, Sacco sent a report titled *Notizie sul R.T. francese* (News about the French radiotelegraphy) to the Radiotelegraphic Institute in Rome, as well as, of course, to the Chief Inspector of SMT[6].

Françoise Cartier carried out another mission to Italy between the end of October and the beginning of November 1917, to visit the French expeditionary corps arrived in the Italian rear immediately after the events in Caporetto. According to the memoirs of the French Colonel, on that occasion, he met Bardeloni and later Sacco in an undefined location of the war zone. The movements of the last Italian Officer, as recorded in Section R logs, do not seem to confirm that circumstance[7].

In mid-April, also the British Head of the Radiotelegraphic Service in Malta visited Sacco in his office in Via Nazionale.

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[3] *Section R Logs, 1° December 1916, and 8 March 1917,* AUSSME, B1, 101S, Vol. 251c and 267c. Intelligence Service, Section R, *Norme per la trasmissione telegrafica col filo dei r.t.g. nemici intercettati*, (Rules for wire telegraphic transmission of enemy intecepted radio telegrams), 1 gennaio 1917.

[4] *Ibidem.*

[5] Colonel Cartier had unofficially managed the position since 1906, and officially since July 1912. (Gérard Arboit, *L'émergence d'une cryptographie militaire en France*, Centre Française de Recherche sur le Renseignement, Paris, Note Historique no. 15).

[6] Section R Logs, 8 February 1917, AUSSME, fund B1, 101S, Vol.261c. The Military Radiotelegraphic Institute "created by the law of 13 July 1911, provided for coordination between the radiotelegraphic services of the Navy and the Army" and was a research and advanced training centre (AUSSME, Series F4, Env.12).

[7] Information about the second mission in Italy is contained in F. Cartier, *Souvenirs du General Cartier, Une visite au Grand Quartier Général italien,* La Revue des Transmissions, no. 87, 1959, p.36 - 39. These memories, collected by Cartier's family after his death, contain many errors and inaccuracies, such as the visit to Udine when the Austro-Germans had already occupied it. One cannot exclude that the meeting with Sacco may have taken place in Rome, where the French colonel went after visiting the front lines.

In addition to the news that show intensified collaboration among the Allies on technical issues in the cryptologic field, the logs of Section R provide concrete evidence of a constant transmission of dispatches decrypted by Sacco to the English and French Missions in Rome or, in place of the latter, to the Italian Mission in Paris. The exchange of information of this type, as well as of letters and telegraphic messages intercepted by censorship, was a common practice among the allies of the Entente throughout the conflict.
One cannot exclude that the visits to the Cryptographic Unit of Colonel Cartier and other allied Officers experts in the field were also intended to exchange codes and ciphers, as happened in the case of the Austrian naval cipher. Less frequent was the sharing of decrypting methods, which were part of the most jealously guarded secrets of the Intelligence Services, also because they sometimes tended to hide the use of their skills about allied diplomatic communications[8].
On the opposite side, it seems that the exchange of enemy codes was not common practice. Ronge confesses for example, that in August 1916, the Head of German Field Telegraphy had asked *Evidenzbureau* for a photographic copy of the Italian *Red Code*. He only obtained a reply letter in which the Austrians said they could not send any documentation because their knowledge of the code was incomplete[9]. We know how this news did not correspond to the truth!

11.2 CONTRIBUTIONS TO THE ENTENTE INTELLIGENCE

THE FALKENHAYN DISPATCH

The following sentence is reported in the log of Section R on 11 January 1917 with reference to the news of the previous day: “Decrypted two radiograms on Falkenhayn’s journey from an Austro-German station in Macedonia toward a Greek station. Sent to the British and French Missions, to the Ministries of Foreign Affairs, to the Navy, and to the Supreme Command”[10].
On the same day, the Section U log of the Intelligence Service informed: “Section R announced yesterday that the Cryptographic Unit - by its exclusive means - decrypted a radio telegram intercepted on the day 7th from an important station in Macedonia and directed to a Greek station, which reads, “To the General Staff. I’ll arrive on 8 or 9 January by plane to L. If necessary, I will continue by car. Make all arrangements for connection. Signed Falkenhayn”[11]. In January 1917, General Falkenhayn was in command of the IX German Army in Transylvania which, as already said, at the end of the previous year had ‘crushed’ Romania and obtained one of the greatest victories for the Central Empires throughout the conflict.
Questions arose about the interpretation of the information coming from Sections R and U, for example on the existence of two radiograms rather than just one, as Section U stated and is commonly believed. A clarification about these and other questions can be deduced from the correspondence that took place immediately afterwards among the Sections of the Intelligence Service. More specifically, a letter of 12 January signed by Colonel Garruccio contains the text of

[8] An example of generosity in this area was the delivery, in August 1914, of the SKM code recovered by the Russians aboard cruiser Magdeburg to the British Cruiser Theseus, which supplied it to the analysts of Room 40 in October of the same year (A. Santoni, *Il Primo Ultra Secret, op. cit.,* p. 58.).
[9] M. Ronge, *Der Radiohorch*, *op cit*., p.12, foot note 1.
[10] Section R Logs, 11 January 1917*,* AUSSME,101S, Vol. 255c.
[11] Intelligence Service, Section U Logs, Nov. 1916 - Mar. 1917, AUSSME, Series B1, 101D, Vol. 351d. The date of codebreaking (day 11) indicated by Marchetti (O. Marchetti, *op. cit.,* p.160), must be anticipated by at least one day.

the second radiogram including a single question in French: “What’s new in Athens?”[12]. The same letter provides information on radio communications between the Central Empires and Greece and particularly on two German stations codenamed WF and MU located in Macedonia and connected with those of Sofia and Athens. The communications were “interrupted when the Allies took control of the Greek Post and Telegraphs Offices and restored during the night between 5 and 6 December after the uprising in Athens”.

The same source reports that, on 7 January, a new Greek station named RSP located near Larissa began the transmission, in place of that in Athens, using a new cipher[13]. Hence, German station sending the dispatches was one of the two codenamed WF or MU, while the receiver coincided with the new RSP. The locality indicated with L in the German dispatch would, therefore, be Larissa.

A few days earlier, “a telegram from Emperor William to his sister the Queen of Greece had been intercepted and decrypted by the British. It announced that Falkenhayn would be ready to reach Larissa on call”[14]. It is therefore likely that Falkenhayn’s journey was related to the German attempts to support the notoriously pro-German Greek royal family and to oppose the independent, pro-Entente Government of Thessaloniki led by Venizelos, giving the journey itself and therefore the radiograms decrypted by Sacco a political value.

As far as the cryptologic aspects are concerned, the Section’s logs report notices about several German radiograms decrypted over this timeframe. For example, on 5 December 1916, the logs read, “Sent four radiograms in German field code to the Italian military mission in France (8 others already sent yesterday); 4 additional radiograms to the same mission and to the British one in France”.

By then, after the progress already made in Codroipo, Sacco could decrypt the German field dispatches with simple or double transposition with or without a key, as confirmed by the Manual where he stated: “remarkable results have been obtained against the German ciphers with simple and double transposition [...]. This group includes the cryptogram mentioned by General Marchetti [...] and related to General Falkenhayn’s journey to Greece (January 1917)”[15]. However, we know that since 7 January, Larissa station had adopted a new cipher which probably was the same of the intercepted radiograms. It could justify the two or three days taken to decrypt them.

As mentioned before, the cryptanalysis of German dispatches continued, at least for the whole month of January 1917, with different types of ciphers, obtaining information mainly concerning German troops and movements of German officers between Germany and Turkey[16].

Interceptions and Radio Stations Localisation

After the separation of the Cryptographic Unit from the ‘Codroipo Radiotelegraphic Detachment’, the latter continued to feed Sacco and his collaborators with the results of their listening and goniometric activities promptly. In March 1917, the receiving stations dedicated exclusively to listening to enemy radio communications were supported by at least ten fixed transmitting

[12] Intelligence Service, Section R, *Comunicazioni RT austro – tedesche con la Grecia*, (Austro-German RT Communications with Greece) addressed to Section U, 12 January 1917, AUSSME, Series E2, Env.66.

[13] *ibidem*. The news about the installation of the “Elassora (North of Larissa) transceiver system by German officers with the help of Greek realists”, appeared a few days earlier in the newspapers of Thessaloniki, confirming the location of this station.

[14] *ibidem*. These facts dispelled Garruccio’s doubt that Colonel Falkenausen, former German military attaché in Athens, was the author of the message.

[15] L, Sacco, *Manuale, op. cit.,* p.309.

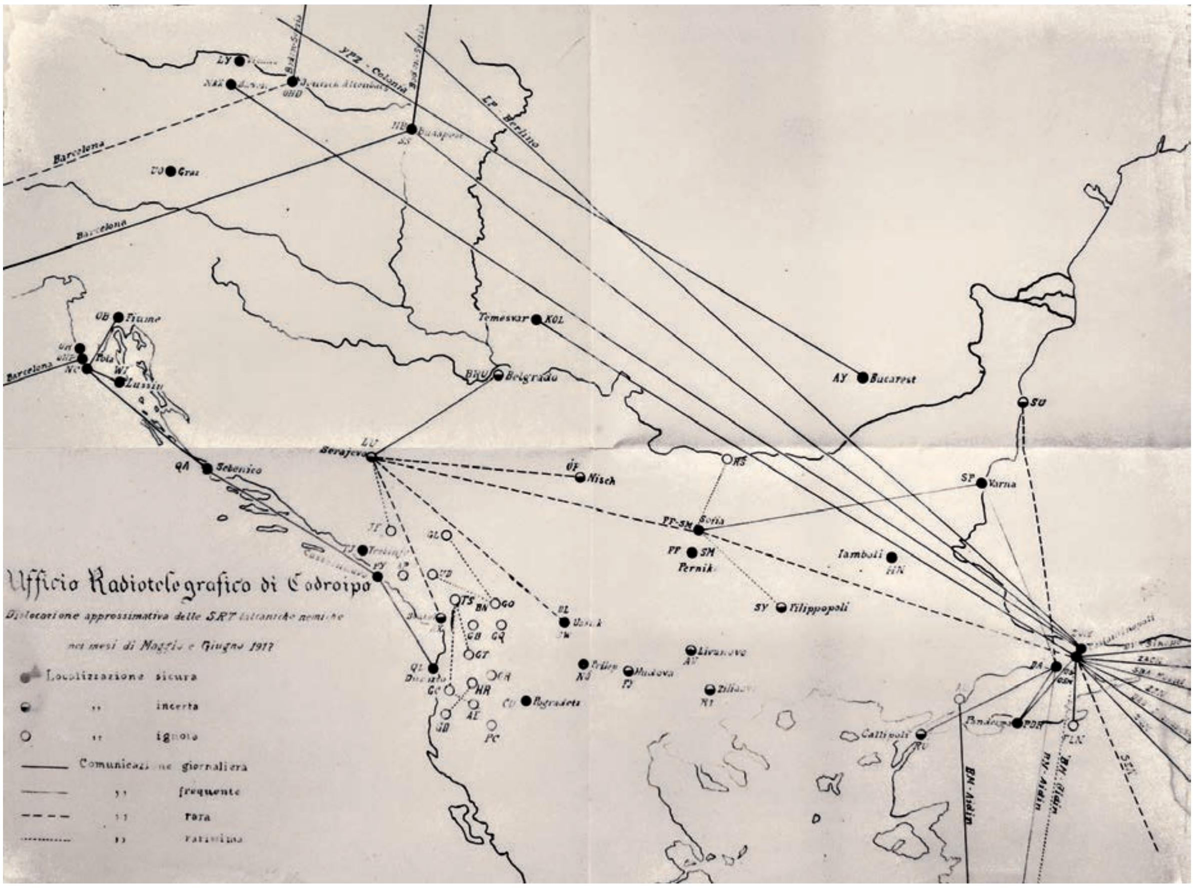
[16] Intelligence Service, Section R, *Radiotelegrammi decifrati*, (Decripted radio telegrams), ISCAG, Coll. 223.

and receiving stations carrying out mainly interception activities, which increased to thirteen in October[17].

The radiotelegraphic detachment continued to grow in importance and size, and in September 1917 it was renamed '1st Direction Radio goniometric Section' under the direct authority of the Inspector of the Military Telegraphic Service[18].

From the bi-monthly reports of the Detachment/Section, one can understand the relevance of the activity it carried out. The enemy stations were grouped based on nationality, wavelength, etc. in a manner even more detailed than in the previous year, specifying for each of them, the name, the stations it was linked to, the type and frequency of contacts, the technical characteristics, and especially the type of ciphers used[19].

Picture 11.1 summarises the detection efforts carried out in May and June 1917 against the stations in the Balkans. By comparison with the similar map in Chapter 10, one can notice the progress made, also thanks to the new installation in Lecce.

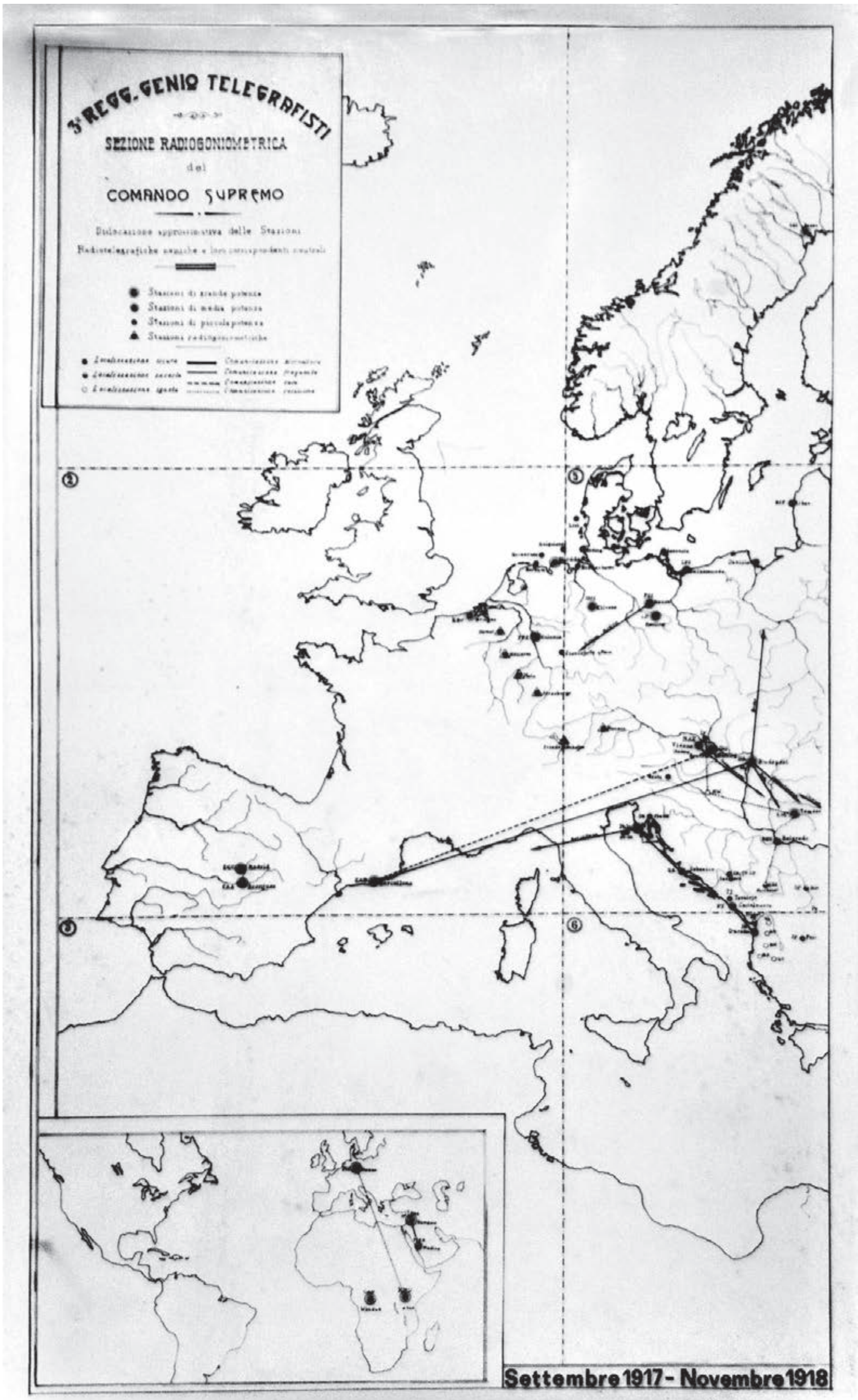


11.1 Goniometric localisation of enemy Adriatic and Balkan stations, May - June 1917 (ISCAG Archive)

[17] Codroipo Radiotelegraphic Office, *Elenco delle comunicazioni nemiche che interessa intercettare*, (List of enemy communications to be intercepted), 24 March 1917, ISCAG, Coll. 234. The fixed stations carrying out interception activities were in Udine, Mantua, Bologna, Ancona, Ravenna, Florence, Rome, and three additional stations located in the Aegean, Macedonia, and Albania.

[18] 1st Radio goniometric Section, *Relazione sull'operato della 1a Sezione, op. cit.,* p.2.

[19] Codroipo RT Office, *Relazioni sul servizio d'ascolto e radiogoniometrico*, (Report about listening and radiogoniometric service), Jan. - Feb.; Mar. - Apr.; May - Jun.; Jul. - Aug.; Nov. - Dec. 1917, ISCAG, Coll. 223.



11.2 Communications among enemy and neutral Countries radiotelegraphic stations (ISCAG Archive)

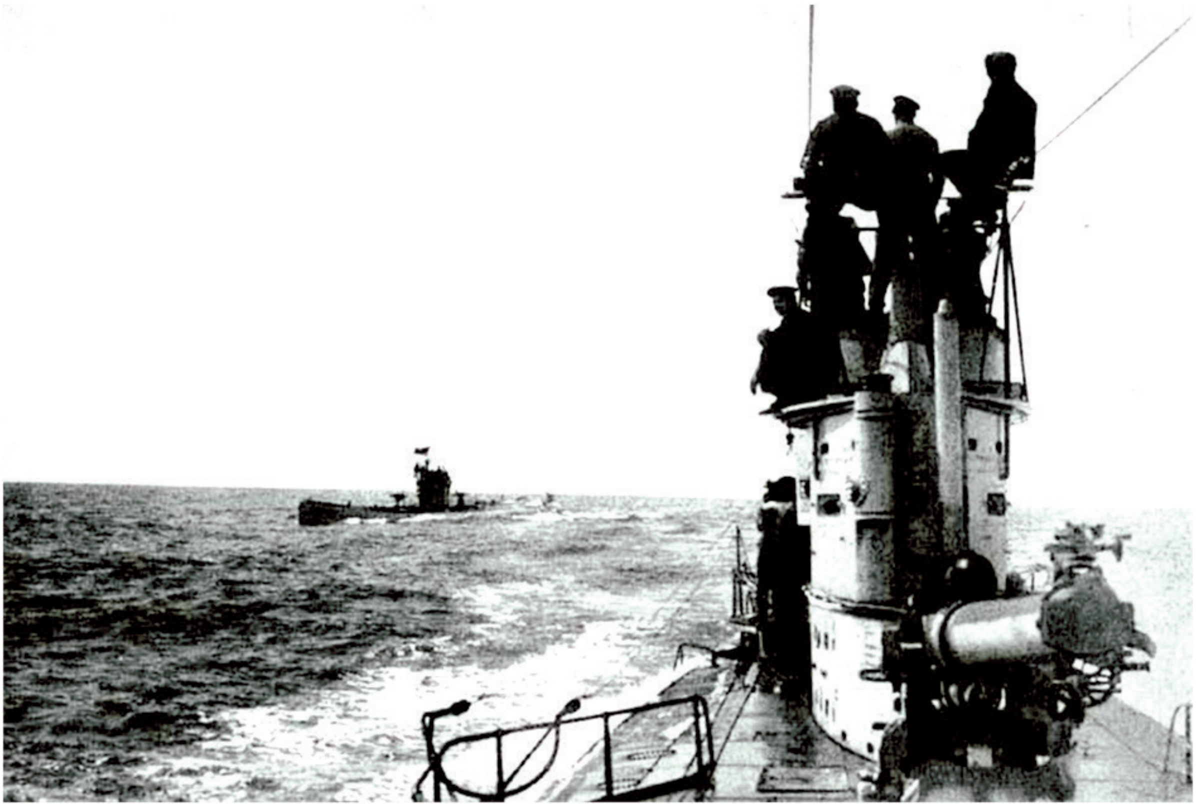
On the opposite side, as already mentioned, the first experimentation of the Austrian radiogoniometry system began only in January 1917 and, in March, the listening stations received the devices and acquired full familiarity with them around June[20]. At the same time, the Austro-Hungarians increased the number of direction finding stations also in the maritime sector after having stumbled upon a document in the summer of 1916 which made them aware of the state of progress of the Italian Adriatic radio goniometric network.
For the largest part of 1917, until the preparation of the Austro-German offensive in October, the interceptions of Austrian field stations at the Italian front became infrequent, due to the strict radio silence imposed by the Headquarters, while some Austrian stations continued to operate in the Balkan peninsula, particularly in Montenegro, Serbia, and Albania. Their regular interceptions provided useful information and material to the Italian Cryptographic Unit.
In addition to the Austrian naval and field stations, the Italian interception stations focused on fixed Austro-Hungarian stations (Budapest, Castelnuovo di Cattaro, Durres, Lošinj, Rijeka, Pula, Sarajevo, Sibenik, Timisoara, Vienna, Gratz, etc.), German stations (Berlin, Cologne, Hanover, Nauen), Bulgarian stations (Philippopolis, Jamboli, Sofia, Varna), and a Turkish station (Constantinople). Enemy high transmitting power plants such as the German one in Nauen committed to transoceanic communications, and medium transmitting power stations, such as those in Vienna, remained constantly under the lens of the Italian interception service.
Traffic analysis provided a wealth of interesting information. For example, the large number of encoded dispatches that Vienna, Pula, and Budapest exchanged with Barcelona (picture 11.2) was the result of the strong diplomatic and commercial relations between the Central Empires and Spain. These communications raised large interest from the Entente Allies, since they probably hid something related, for example, to underwater warfare[21].

Antisubmarine Warfare

The unlimited submarine warfare started by Germany on 1 February 1917, was also extended to the Mediterranean Sea where German submarines operated from their bases in Pula and Kotor. The tonnage of ships directly sunk by the ‘Pula Submarine Group’ or by naval mines it laid, increased in the months that followed, with a peak in April when, in the Mediterranean alone, the total loss of allied vessels amounted to more than 250,000 gross tonnes (GT), of which less than 10% due to Austrian submarines.
In the following months, this number gradually decreased, to approximately 35,000 GT in the last months of the war, thanks to the countermeasures put in place by the Entente, such as the development of radio interceptions, localisations and cryptoanalysis carried out in a coordinated manner by the Italian, British and French. We are not attempting to recount here the tremendous efforts made by the Allies Radio Intelligence in the Mediterranean, but just reporting some of the contributions of the Cryptographic Unit to anti-submarine warfare in the first half of 1917, as allowed by a report written by Luigi Sacco in July of the same year[22] and by some information included in the R Section logs.

[20] M. Ronge, *Der Radiohorch*, *op cit*., p.19, 21.
[21] Codroipo RT Office, *Relazioni sul servizio d’ascolto, op.cit*., Jul. - Aug. 1917. In August alone, 500 messages were sent from Pula to Barcelona, of which 100 were encoded. In the opposite direction, out of 310 messages, 100 were encoded.
[22] Intelligence Service, Section R, *Notizie Riassuntive sui Sommergibili Nemici,* (Summary news about enemy submarines), Rome, 27 July 1917, ISCAG, Coll. 223. The copy kept in the ISCAG archive is limited to April, May, and part of June and some of the last pages are missing. From the Section R logs, it appears that on 1 April Luigi Sacco had sent another report entitled

In April 1917, for instance, the three-letter radio call-signs of the German submarines were identified, of which the first two indicated the fleet they belonged to and the last the unit: "The 'FQ' two-letter group was the 'submarine fleet call'. The names of the FQ fleet units heard in April in the Mediterranean were as follows: FQC (9 April); FQWH (9 April), etc."[23].
Goniometric triangulations, even triple or quadruple, were repeated several times to identify the routes and activities of several units of the German and Austrian submarine fleet[24]. Among other results, the surveys supported the assumption concerning the presence of "submarines that transported torpedoes and ammunition between Pula or Kotor and the Western Mediterranean where they are believed to resupply the submarines that operate in the Atlantic"[25].
To this end, the Italian radiogoniometers followed the movements of the German submarine with radio call-sign FBF that operated in the Atlantic but entered the Mediterranean to rendezvous near the Balearic Islands with another submarine - supposed resupplying it - whose call-sign was PM or LO. During its two one-month trips from Kotor to the Balearic Islands, the latter called other subs, including the FBF, but neither sank nor tried to sink any allied ship.



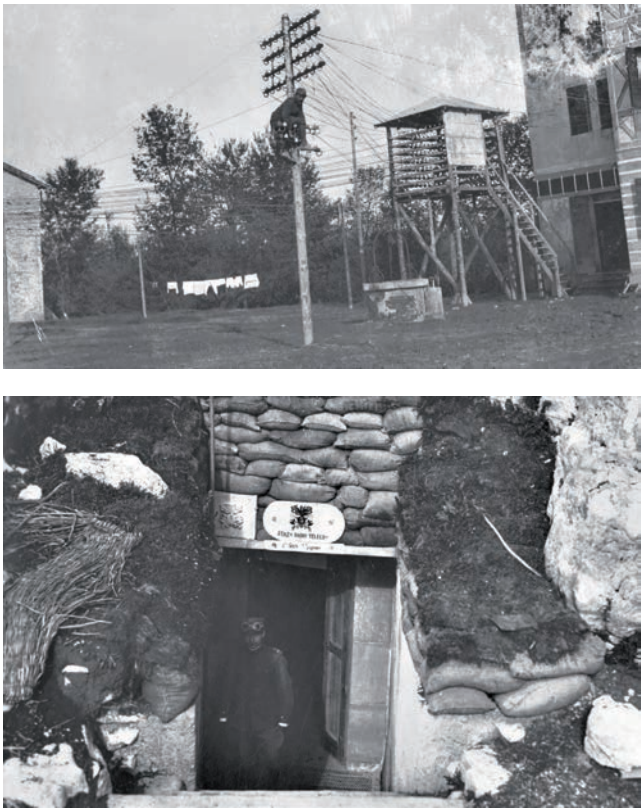
11.3 Rendezvous between German U52 and U53 boots in the Mediterranean (© Creative Commons')

Notizie e Proposte circa le Comunicazioni RT dei Sottomarini Nemici (Information an proposals on RT communications of enemy submarines), to the Head of the 4th Division of the Navy Ministry.
[23] *ibidem.*
[24] The goniometric stations used for these detection activities also belonged to the Italian Navy - whose network extended to the Adriatic, Ionian and Tyrrhenian seas - or to the Allies, such as the French stations in Thessaloniki and Florina.
[25] Intelligence Service, Section R, *Notizie Riassuntive, op. cit.*

As far as the participation of the Cryptographic Unit to antisubmarine warfare is concerned, the piece of information sent to the Italian Navy on 27 June concerning the repair of German submarine UC 53 in the Spanish port of Cadiz should be mentioned[26]. From another well-informed source, we learn that, between 11 and 29 June, German submarine UC 52 travelling from Germany to Kotor, was under repair in port of Cadiz[27]. Perhaps the U52 and U53 (picture 11.3) arriving in Cadiz from Germany in June, both with the task of laying mines in the Mediterranean, were sheltered at the same time in port of Cadiz.

11.3 TELECOMMUNICATIONS SECURITY ISSUES

The Vulnerability of Telecommunications



11.4 The vulnerability of wired connections versus radiotelegraphic stations (ISCAG Archive)

The increasingly devastating destructions caused, during the conflict by a higher number of larger calibre artillery pieces systematically severed, especially in the initial phases of attacks, the physical communications connections, including those prepared with special care, and fostered the spread of radiotelegraphy on the first lines of the front[28].

Picture 11.4 depicts the higher physical security of wireless communications compared to physical carriers and, above all, overhead lines: it shows a device for sorting telegraphic and telephone lines known as 'castle' (top part) and the protection of the radiotelegraphic station located in a cave of Monte Cengio. In the latter, the only part of the structure directly exposed to enemy artillery shots was the antenna which, when damaged, in most cases could be repaired quickly, while operators and equipment were safely preserved within equipped caves (picture 11.5). The Monte Cengio station, as many others connecting Division with Corps Headquarters of the Italian army, was equipped with 200W devices.

[26] *Section R Logs, 29 giugno 1917*. AUSSME, Series B1, 101S, Vol. 283d.

[27] Erwin Sieche, *La guerra sottomarina tedesca nel Mediterraneo 1915 – 1918,* in La Guerra navale 1914 -1918, Edito da A. Rastelli e A. Massignani, Rossato, *op.cit.,* p.70.

[28] Protecting a line from destruction during heavy bombardments required burying it at least 3 feet under the level of the terrain and inside iron pipes. These conditions could hardly be met at the front.

11.5 Internal view of the radiotelegraphic station on Monte Cengio (ISCAG Archive)

Small radio stations with even lower transmitted power became needful for connecting isolated and difficult to reach positions, such as observers in the mountains[29]. A record in this respect was the installation and activation of a radio station at the Rifugio Garibaldi (*Dreisprachenspitze*) in the Stelvio Park, 2,845 metres above sea level, by the Telegraphic Section of the 1st Army.

The spreading of radio equipment led to increased traffic and higher communications security risks, as the larger number of cryptograms intercepted by the enemy allowed the breaking of new ciphers introduced more and more frequently during 1917.

Service Ciphers

When the *C4* entered into force on 10 April 1917, the *C1* cipher was repealed for good, while *C2* remained in use only for service telegrams, except those related to the relocation of radiotelegraphic stations[30].

The *C4* codewords consisted of three letters grouped in pairs in the cryptograms: the first of the three letters indicated the page of the book, the second the column of the page, and the last the row of each column. The number of pages was 17, equal to that of letters in the reduced alphabet, and each page contained 17 rows, while the number of columns per page might change, being usually much lower than 17[31].

The Austrian sources identified *C4* as "the *Service Cipher V* that replaced *Service cipher II* in April". According to Ronge, it had been broken at the beginning of the Tenth Battle of the Isonzo, i.e., after 12 May, then more than a month after its adoption, as picture 10.9 shows[32]. On 20 June, the order of the 17 lines in all the pages of the code was reversed from the bottom to the top starting with the letter A[33]. The time the Austrian analysts needed to eventually break the new version is unknown.

Service ciphers were being replaced more and more frequently, while in general the time taken to penetrate them got longer, from a few days in 1916 to more than a month within the framework of an increasingly bitter cryptographic dispute.

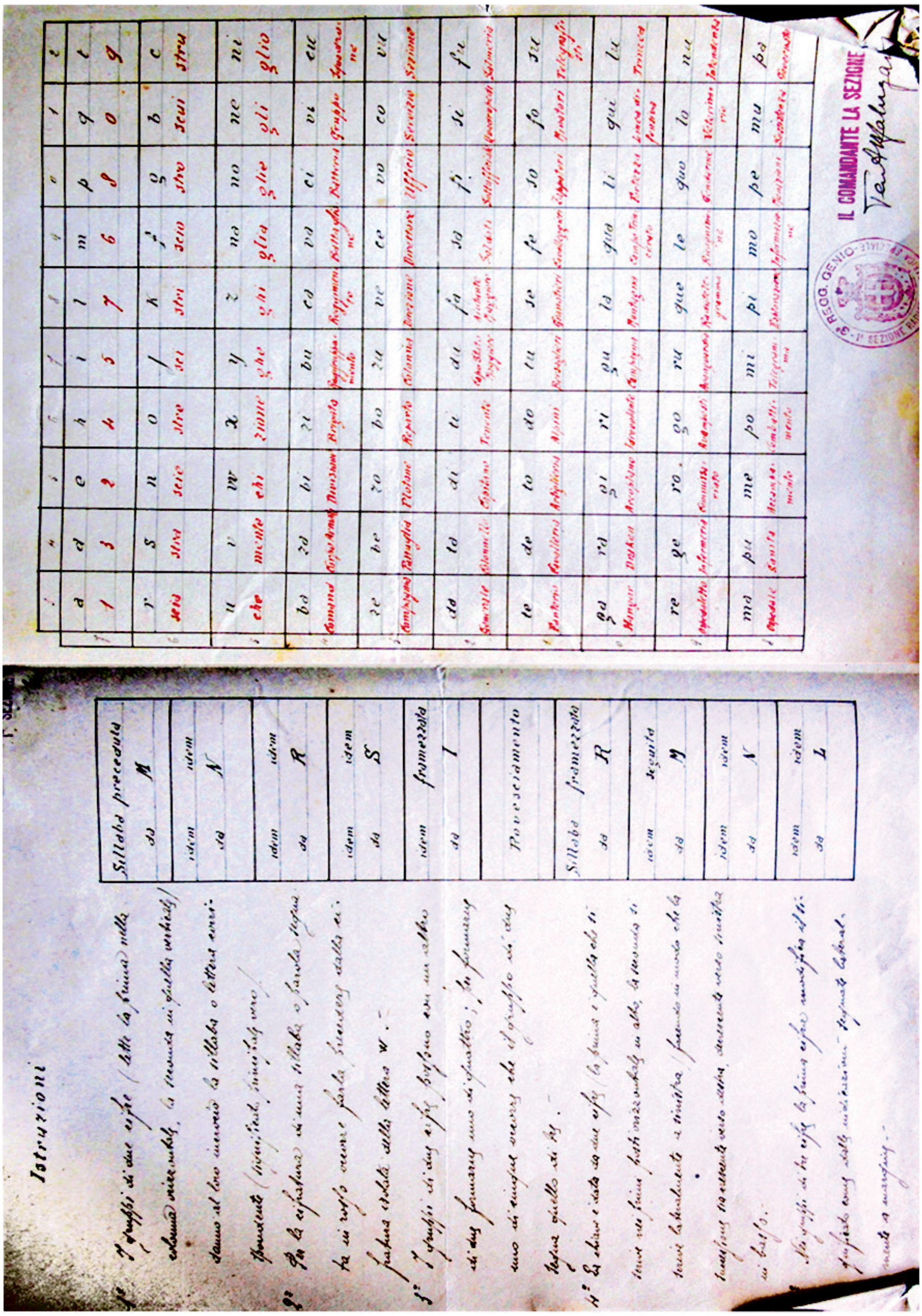
[29] There were fifty-two 200W stations in September 1917.

[30] Chief Inspector, STM, *Ordine di Servizio no. 56,* 26 March 1917, AUSSME, Series B1, 105S, Vol. 89.

[31] 17 is the number of letters making up the abbreviated alphabet of C ciphers. As already shown, in *C4* the correspondence between the code groups and the terms of the clear text was quite messy.

[32] M. Ronge, *Der Radiohorch*, *op cit.,* p. 13; Figl dedicated a short chapter to *Service cipher V*, without indicating the date the code was broken (O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p.181).

[33] Chief Inspector, STM, *Ordine di Servizio no. 59,* 8 June 1917, AUSSME, Series B1, 105S, Vol. 89.



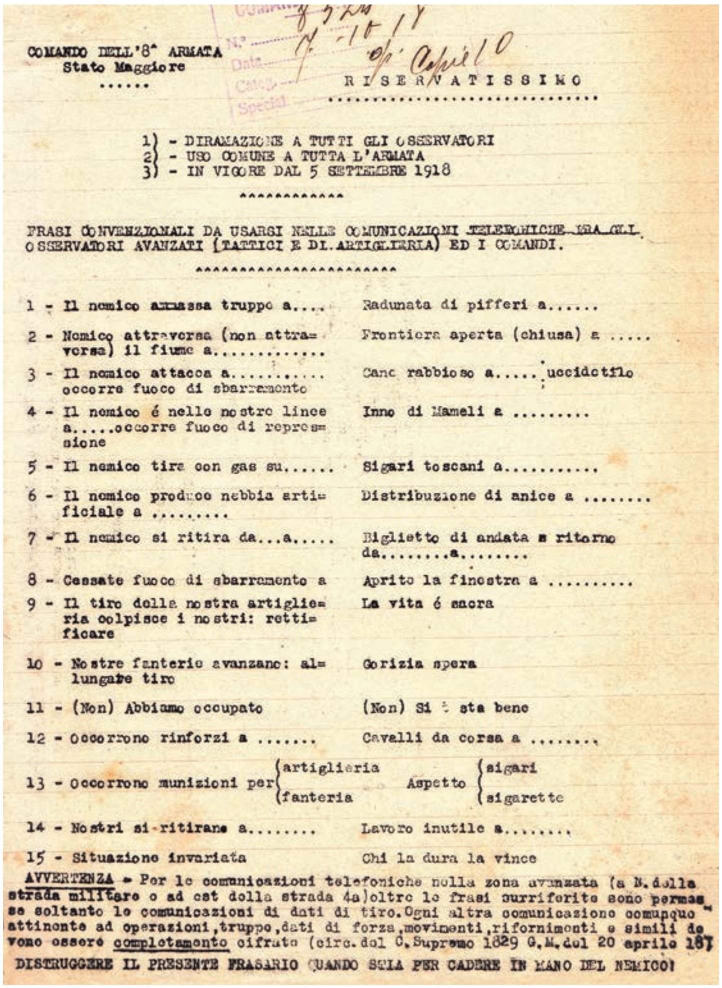
11.6 Service cipher used by Italian army units deployed to Albania, July 1917

However, the Austrian analysts were still able to decrypt many radiograms, thanks in part to the development of devices that reduced the time required for decrypting operations[34]. They waited for some Italian telegraphist to make a mistake so that they could seize opportunities on the fly, or they took advantage of captured codes and ciphers, as happened on numerous occasions, especially during the shift of the front from the Isonzo to the Piave.
The large number of ciphers used by limited groups of local correspondents made cryptoanalysis more difficult. For instance, in the whole of the special service ciphers used in radio communications between Italy and Albania and among units operating in that war zone, it is worth to mention that adopted in July 1917 by the 1st Special Radiotelegraphic Section operating in Albania (picture 11.6) The main table, the auxiliary table, and some instructions for use are fitting in a double A4 sheet. Out of the hundred positions available in the main table, the terms to be encoded are distributed in an almost disorderly manner, along the first sub-row with black lettering and the second sub-row with red figures and words of current use within that Radiotelegraphic Section[35]. The code groups read, as usual, in the first line and in the first column on the left of the main table, are composed of a two-digit number, possibly preceded by a letter from the auxiliary table for the functions indicated therein[36].
The service cipher shown in the picture does not coincide with those that Figl called *Albanien Service I and Albanien Service II* adopted around mid-1916 and mid-1917 respectively and, according to Figl, like *C1,* hence easy to break[37]. The introduction of irregularities makes this small cipher more like *C3*. It probably coincides with the service cipher of the Italian Expeditionary Corps in Albania used in autumn 1917, which Figl mentioned in another part of his memoirs, at a time when the Austrians could not interpret the radiograms encoded through it[38].

Not Only 'Grids'

As mentioned above, the 'proliferation of ciphers' started long before the last months of the war. In fact, after the instructions issued in the previous year, the Italian Armies adopted several encoding systems to fulfil different communication needs, especially to protect telephone communications that the enemy could easily intercept. Corps and Divisions followed soon.
For this purpose, initially simple tables to encode the most essential words, and 'phrasebooks' containing customary phrases transformed into groups of figures, or letters, or concealed easily pronounced words, were adopted. An example of phrasebook for communications between Headquarters and tactical artillery observers is shown in picture 11.7[39].

[34] These were the devices made by Hugo Scheuble (Otto Horak, *Andreas Figl, Leben und Werk, op. cit.*, p.175 ff).
[35] The terms in black were encoded using the two digits in the top line and in the left column corresponding to the position where the word to be encoded is found; for the terms in red, the same procedure was followed with the letter W preceding the two digits.
[36] 3rd Engineers Regiment, 1st Special Radiotelegraphic Section, *Cifrario usato dalle Stazioni della 1a Sezione RT Speciale,* (Cipher exploited by 1st Special Radiotelegraphic Section), War Zone, Albania, 14 July 1917, ISCAG, Coll. 235.
[37] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 166 -167; 185 - 186.
[38] O. J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 195.
[39] Headquarters, 8th Army, *Frasi Convenzionali da usarsi per le comunicazioni telefoniche tra gli Osservatori avanzati (tattici e di artiglieria) ed i Comandi* (Concealed sentences for telephone communications between advanced observation points, tactical and artillery and the Headqurters), adopted since 5 September,1918. AUSSME, Series F3, env.147. The phrasebook was for the transmission of fire data only.



COMANDO DELL'8^ ARMATA
Stato Maggiore
......

RISERVATISSIMO

1) - DIRAMAZIONE A TUTTI GLI OSSERVATORI
2) - USO COMUNE A TUTTA L'ARMATA
3) - IN VIGORE DAL 5 SETTEMBRE 1918

FRASI CONVENZIONALI DA USARSI NELLE COMUNICAZIONI TELEFONICHE FRA GLI OSSERVATORI AVANZATI (TATTICI E DI ARTIGLIERIA) ED I COMANDI.

1 - Il nemico ammassa truppe a....	Radunata di pifferi a......
2 - Nemico attraversa (non attraversa) il fiume a............	Frontiera aperta (chiusa) a .....
3 - Il nemico attacca a........... occorre fuoco di sbarramento	Cane rabbioso a..... uccidetelo
4 - Il nemico é nelle nostre linee a.....occorre fuoco di repressione	Inno di Mameli a ....
5 - Il nemico tira con gas su......	Sigari toscani a...........
6 - Il nemico produce nebbia artificiale a	Distribuzione di anice a ....
7 - Il nemico si ritira da...a.....	Biglietto di andata e ritorno da........a........
8 - Cessate fuoco di sbarramento a	Aprite la finestra a ....
9 - Il tiro della nostra artiglieria colpisce i nostri: rettificare	La vita é sacra
10 - Nostre fanterie avanzano: allungare tiro	Gorizia spera
11 - (Non) Abbiamo occupato	(Non) Si sta bene
12 - Occorrono rinforzi a	Cavalli da corsa a ....
13 - Occorrono munizioni per artiglieria / fanteria	Aspetto sigari / sigarette
14 - Nostri si ritirano a........	Lavoro inutile a........
15 - Situazione invariata	Chi la dura la vince

AVVERTENZA - Per le comunicazioni telefoniche nella zona avanzata (a N. della strada militare o ad est della strada 4a) oltre le frasi surriferite sono permesse soltanto le comunicazioni di dati di tiro. Ogni altra comunicazione comunque attinente ad operazioni, truppe, dati di forza, movimenti, rifornimenti e simili devono essere completamente cifrate (circ. del C. Supremo 1829 G.M. del 20 aprile 1917
DISTRUGGERE IL PRESENTE FRASARIO QUANDO STIA PER CADERE IN MANO DEL NEMICO!

11.7 Simple table of sentences turned in concealed language, 8th Italian army

From the beginning of 1916, the French - and other belligerent armies immediately after that - had encoded phonograms through *Trench Codes* called *Carnet de chiffre* or *Carnet réduit*[40]. With the spread of radiotelegraphy across the subordinate combat units, the *Trench Codes* ended up being used for this purpose as well. At the same time, they became more complex and took the form of real, small size codes. As for restricted phonograms within the higher echelons of the Italian army, such codes with both numerical and/or letter coding groups spread in Corps and Divisions.

The *NEVEA Concealed Code,* taking its name from the high mountain pass 'Sella Nevea', was drafted by the Units deployed near the Raccolana Valley, an area that saw many fights. Code groups contain a letter followed by a one, two-, or three-digits number (picture 11.8)[41].

Several paged codes have been found in the Historical Archives, Army General Staff[42], such as the *Special Code* of the 7th Corps adopted in May 1916, the *Situational Code* distributed in May 1917 to Liaison Officers, for their communication with the Supreme Command and the already mentioned *Green Code*, which came into force in January 1918 in the 5th Corps and should not be confused with the code having the same colour and used, from the war inception, for communications among the High Commands of the Army[43].

Other codes like the *Z Code*, given their cryptographic characteristics, seems have escaped any breaking attempts from Austro-Hungarian analysts. The *Z code for urgent reports* in use by the 4th Army since the autumn of 1917 is an example of an Army 'hybrid code' because it applied to communications via telephone, telegraph, radiotelegraph, flags, discs, lanterns, Morse flags, Faini equipment, etc. Each word was encoded into a group of three digits and over-encoded using

[40] Friedman stated that before and during the first two years of the war the codes were considered unsuitable for use on battlefields (W. F. Friedman, *Advanced Military, op.cit.,* p.2,3). Afterword, all belligerent armies used trench codes. See M. Giviérge, *op. cit.* and F.L. Bauer, *op. cit.,* p.76 -77.
[41] AUSSME, Series H5, env.11. A very simple, one-part code that could only be used for phonograms.
[42] Particularly in Series AUSSME, H5, env.11.
[43] AUSSME, Series E1, Env.38. The M13 (i.e., the 1913 edition of Mengarini) is also sometimes called 'the Green' because of the dark green colour of its cover.

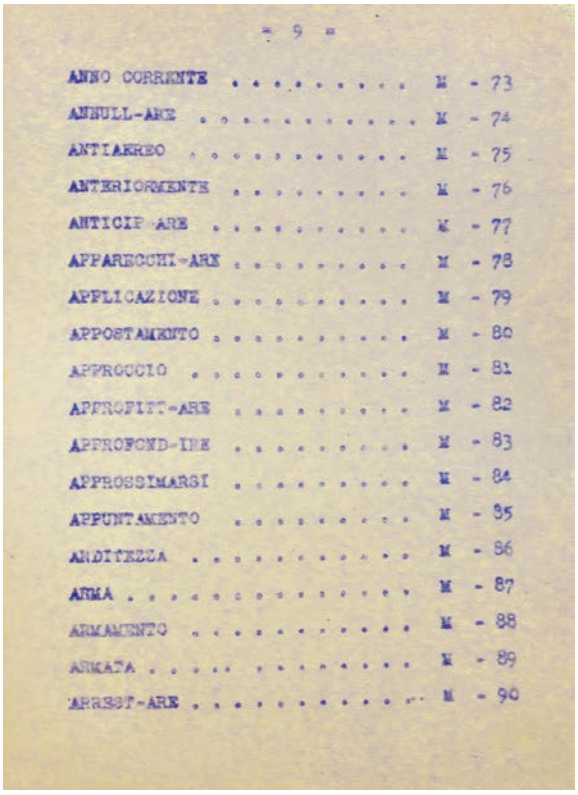
N° 38

RISERVATISSIMO

CIFRARIO CONVENZIONALE

"NEVEA"

20 Settembre 1916.



= 9 =

ANNO CORRENTE	M - 73
ANNULL-ARE	M - 74
ANTIAEREO	M - 75
ANTERIORMENTE	M - 76
ANTICIP-ARE	M - 77
APPARECCHI-ARE	M - 78
APPLICAZIONE	M - 79
APPOSTAMENTO	M - 80
APPROCCIO	M - 81
APPROFITT-ARE	M - 82
APPROFOND-IRE	M - 83
APPROSSIMARSI	M - 84
APPUNTAMENTO	M - 85
ARDITEZZA	M - 86
ARMA	M - 87
ARMAMENTO	M - 88
ARMATA	M - 89
ARREST-ARE	M - 90

11.8 Cover and first page of "Nevea" code

tables transforming each group of digits into two or three letters, which changed as a function of a chosen key[44].

However, the application to usual telephone communications of *trench codes* with figures code groups was generally not popular among the troops, primarily because of the difficulties of getting telephone operators to accept non-mnemonic systems. Even in the Italian army, especially in the early years of the conflict, telephone communications were protected by using dialects challenging to understand, such as Sardinian, or concealed languages[45].

Therefore, much more widespread for telephone communications than the previous ones were the codes with concealed words: all combat units up to Division level had at least one, which they often changed but without achieving the desired degree of confidentiality. As an example, two pages from the encoding and decoding part of the *White Cover Code* of the 3rd Army, which came into force in December 1917, are shown in picture 11.9[46]. A similar but more limited code issued by the 20th Corps was captured by the Austro-Hungarians and could be found among Ronge's papers[47].

[44] The first digit indicated the page, the second digit the row, and the third digit the column in which the corresponding word was found, in a completely unsorted way.

[45] The best-known case of the use of languages the enemy had little knowledge of, occurred in the American Army where some 'code talkers' were recruited from among fighters of Indian tribes, even more widely used in World War II (G. Robinson, *The language of victory: American Indian code talkers of WW1 and WW2,* Universe LLC, Bloomington In, 2011).

[46] AUSSME, Series B4, env.521. The 'White code' replaced the 'orange cover code' issued in September of the same year clearly to remedy to the possible loss during the retreat from the Isonzo to the Piave.

[47] M.Ronge, *Der Telephon Abhorchdienst, op. cit.,* Annex 26. The code had five tables with terms divided according to the criteria adopted in the white cover code. Annex 27 to the same document contains another small 3-digit code of the Italian 2nd Corps.

Numeri ed indicazioni relative al tempo

Uno	Noce
Due	Sparviero
Tre	Nettuno
Quattro	Viareggio
Cinque	Loreto
Sei	Alluminio
Sette	Arte
Otto	Rodano
Nove	Australia
Zero	Raffaello
Ora-e	Limone-i
Minuto-i	Pavone-i
Oggi	Stagno
Domani	Pepe
Questa sera	Dionigi
Questa notte	Eleonora
Stamane	Valenza
All' alba	Giunone

Abete	Divisione 25ª
Accademia	Dolo
Acciaio	Morale delle truppe elevato
Achille	Brigata Regina
Adamo	Montebelluna
Adele	Brigata G.
Airone-i	Gruppo -i
Alabastro	Brigata Livorno
Albicocca	Battaglione III
Alessandro	Divisione 27ª
Allodola	Cannone da 190
Alluminio	Sei
Ambra	XXIV Corpo d'Armata
Ametista	Cortellazzo
Amido	Visnadello
Amleto	Roncadelle
Angelo	Cannone da 203
Anguilla	Trincea di partenza
Anitra	Mitragliatrice pistola
Anteo	Arrestata
Antilope	Battaglione bersaglieri ciclisti
Antivari	Tezze
Antonio	Perdite gravi
Antro	Contrattacco nemico proveniente da
Apollo	San Giuliano
Aquila	Cannone da 305
Arabia	Irruzione
Arancio-i	Mitragliatrice-i
Argentina	IV Corpo d'Armata
Argento	Tiro di grossi calibri
Argilla	Divisione 63ª

— 35 —

11.9 Coding (on left) and decoding first pages of the "Withe Cover Code"

Although some systems adopted in limited sectors were acceptable in cryptographic terms, a 'do-it-yourself' approach did not grant, in general, an acceptable degree of resistance to breaking attempts. During 1917, however, a significant change in the design of codes and ciphers began to occur, since albeit gradually and painfully, their design was entrusted to experts of the Cryptographic Unit who, in addition, issued strictly defined criteria to be adopted by all the Headquarters in drafting their coding systems.

11.4 NEW CIPHERS FOR THE ITALIAN ARMY

The SI Code

The poor reliability of Italian ciphers and codes had become increasingly evident to the Cryptographic Unit.
However, some parts of the Army resisted to the innovation efforts to increase the security of cryptographic system, opposing claims of autonomy. As stated by O. Marchetti:

> The Encoding Office (of the Supreme Command, A/N) immediately protested, because of longer time required encoding and decoding operations. Unfortunately, the protest was not only academic. Quite often, the prescribed encoding complications recommended in order, at least, to lengthen duration of the enemy decrypting work were neglected[48].

[48] O, Marchetti, *op. cit.*, p. 161.

Even more categorical are Sacco's words as he added, "well known to the Cryptographic Unit, the weakness of Italian ciphers was not appreciated by the Supreme Command and gave Gen. Ronge the opportunity to boast the primacy of the Austrian crypto-analysis service"[49].

The obstacles and delays to change emerge from the cold chronicles of diaries and correspondence which, on the other hand, unveil that innovation of the codes used by the Italian army began, thanks to Sacco and his staff, in the early months of 1917, that is, well before the beginning of 1918, as is generally believed. The Cryptographic Unit, still undersized and overburdened, was also tasked with the design of some new cryptographic systems for the Army, responding to the efficient Austrian cryptologic machine. The general principle that only cryptanalysts can judge the security of a cryptographic system was gaining ground during the war, even in the Italian army.

In January 1917, an entry about this activity appears in the logs of Sections R and U of the Intelligence Service for the first time, just as Section U was asked to provide a list of terms for the *SI Code*. The following notes in the logs leave no doubt about the meaning of acronym SI, standing for *Servizio Informazioni* (Intelligence Service), namely the service for which the code was exclusively designed, at least at the beginning. In Section R logs of March there are references to the "drafting of the code for the Intelligence Service", to the "Rules to preserve secrecy", and to the "Drafting the preface", all referring to the *SI code*, which came officially into force on 1 May 1917[50].

The Supreme Command, the various branches of the Intelligence Service as well as the Military Attachés in the Italian embassies abroad were included in the initial *SI* distribution list, progressively expanded to the Military Attachés at the Allied Headquarters in war zones, the Intelligence Centres located in neutral countries, the Command of the Aegean Occupation Corps, etc[51].

The two-part *SI* code - a book of about 400 pages with more than 20,000 words - adopts code groups of five digits chosen randomly. In addition to the dictionary, the code included lists of locations, Services' Headquarters, time measurements, etc.

The Cryptographic Unit managed the *SI* by frequently replacing or adding groups to adapt it to the changing needs of its users. The first 'amendments' shown in picture 11.10 demonstrate the experimental use of the code since March 1917[52].

In his memoirs, Figl mentioned the *SI* code for the first time when he describes the analysis of some radio dispatches sent by the Italian Liaison Officer within the French HQ in Coryza (Corça in Albanian), in the autumn of 1917, that is more than six months after the dispatches encrypted with this code were sent across extensive areas such as Albania, Cyprus, Aegean, Northern Europe, etc. The Austrian Officer recognised, however, the difficulties he faced on this occasion and the impossibility of penetrating the code that the Italians continued to employ, in total safety, until almost November of 1917[53].

[49] L. Sacco, *Manuale, op. cit*, p. 309.

[50] *Section R Logs, 8 e 22 marzo 1917,* AUSSME, Series B1, 101S, Vol. 267c; *Diari Sezione U, op. cit., 13 e 23 aprile 1917,* AUSSME, Series B1, 101 D, Vol. 349d. The not-so-short time taken to create the 'SI' depended on its volume and the accuracy required to make it consistent with the type of communications it was designed for.

[51] *ibidem.*

[52] AUSSME, Series H, Env.11.

[53] O. Horak, *Oberst a. D. Andreas Figl, op. cit.,* p.195 - 196. Andreas Figl said he had interpreted a hundred terms in the code on this occasion but that his results had not improved because the messages had become rare and short.

Copia N.° 89

Riservatissimo personale

R. ESERCITO ITALIANO

COMANDO SUPREMO

Servizio Informazioni - Sezione R

PRIMA LISTA DI CORREZIONI

Cifrario S.I.

(EDIZIONE MARZO 1917)

Cifrante

III

Pagina	Numero del Cifrante	Parola errata o Numero errato	Parola e Numero da sostituire
XII	199 25	spazio vuoto	annullare il 199 25
XII	017 93	ore undici	199 25 ore undici
4	106 57	agenzia	106 57 agenzia-e
13	209 34	assent-arsi	041 34 assent-arsi
14	019 64	assai	019 64 assi
15	005 97	attaccament	005 97 attaccamento-i
16	076 39	audacia-i	076 39 audacia-e
18	041 34	spazio vuoto	annullare il N. 041 34
19	051 53	Babadagh	051 54 Babadagh
19	138 05	bad-ino	138 05 badi-ino
21	078 51	battesimo-i	024 00 battesimo-i
21	105 73	benemerit	134 01 benemerit
22	109 71	biforcagione-i	109 71 biforcazione-i
23	161 27	blindal	161 27 blindat
25	114 63	Bruxelles	179 53 Bruxelles
26	179 53	spazio vuoto	annullare il n. 179 53
26	024 00	spazio vuoto	annullare il N. 024 00
26	134 01	spazio vuoto	annullare il N. 134 01
26	04 97	cacciat	004 97 cacciat
27	50 32	caldeggi-are	050 32 caldeggi-are
30	163 34	carico-i è perduto	163 34 carico è perduto
32	075 73	cerchi	049 63 cerchi
35	139 59	circoscrit	139 59 circoscritt
37	142 80	colt in flagranza	142 80 colt in flagrante
43	006 69	consiglio-ano	006 69 consiglia-ano
43	021 90	constat-are	059 71 constat-are
43	055 54	controllare-i	055 54 controllore-i
49	059 71	spazio vuoto	annullare il N. 059 71
49	049 63	spazio vuoto	annullare il N. 049 63
54	013 58	berubat	013 58 derubat
54	062 91	giunto a destinazione-i	062 91 giunt a destinazione
55	168 24	diametr	168 24 diametro-i
58	066 29	direzione-i gener. leva e statistica	066 29 direzione-i gen. leva e truppa
58	129 68	dir. gen. pers. civ. e uff. gen.	129 68 dir. gen. pers. civ. e aff. gen.
58	116 22	disastros-i	116 22 disastroso-i
59	187 20	disinfettant	187 20 disinfettat
59	017 45	grave disordine	017 45 grav disordin
64	190 03	duraia-e	190 03 durata-e
64	099 94	eccettua-are	099 94 eccettu-are
64	083 32	dur	083 32 duv
65	154 42	Egyetertes	154 42 Egyeterbes

Copia N.° 89

(i)

Riservatissimo personale

R. ESERCITO ITALIANO

COMANDO SUPREMO

Servizio Informazioni - Sezione R

PRIMA LISTA DI CORREZIONI

Cifrario S.I.

(EDIZIONE MARZO 1917)

Decifrante

III

Pagina	Numero del Decifrante	Parola errata o Numero errato	Parola e Numero da sostituire
2	001 85	spazio vuoto	001 85 pesando
3	902 56	insolubil	002 56 insolubil
4	003 50	ultmat	003 50 ultimat
5	004 77	interdendo	004 77 interdicendo
7	006 86	proceat	006 86 processat
8	007 28	propng-are	007 28 propugn-are
13	012 43	spazio vuoto	012 43 fratera
14	013 79	spazio vuoto	013 79 impossibil spedire
15	014 73	spazio vuoto	014 73 vecchi
16	015 07	spazio vuoto	015 07 pusillanim
16	015 86	riporfat	015 86 riportat
24	023 39	spazio vuoto	023 39 il verbo che precede deve essere al condizionale
24	024 00	spazio vuoto	024 00 battesimo-i
24	023 94	ubbriachezza-e	023 94 ubbriachezza
25	024 99	shrapnel	024 99 shrapnel-s
26	025 33	consenso-i	025 33 consesso-i
27	026 38	incoraggiamento	026 38 incoraggiamento-i
28	027 07	dire	027 07 aire
32	031 66	refendario-i	031 66 referendario-i
32	031 47	gazzetta	031 47 gazzetta-e
32	031 81	istituto-i	031 81 istinto-i
33	032 40	valevol	032 40 malevol
33	032 77	erano	032 77 evano
36	035 58	carpo-i	035 58 corpo-i
37	036 76	mett	036 76 inett
40	039 96	galoppo	039 99 galoppo
40	039 48	espiandio	039 48 espiando
40	039 16	asc	039 16 ax
41	040 24	spazio vuoto	040 24 impressione-i cattiv
42	041 34	spazio vuoto	041 34 assent-arsi
42	041 85	gium	041 85 giun
42	041 36	impossessat	041 36 impossessat (si)
45	044 92	sed-urre	044 92 sedott
45	044 74	spazio vuoto	044 74 les
45	044 30	latitudini-i nord	044 30 latitudine-i nord
46	045 13	fibj	045 13 filz
48	047 67	isc	047 67 ix
48	047 20	scritt	047 20 scrittura-e
48	047 35	spazio vuoto	047 35 pervert-ire
49	048 90	spazio vuoto	048 90 spargendo
50	049 40	Schlesuvig	049 40 Schleswig
50	049 19	Basler Volksblah	049 19 Basler Volksblatt
50	049 63	spazio vuoto	049 63 cerchi

11.10 First updates to the Intelligence Service code known as "SI"

Romei's Dispatches

In the late autumn of 1917 Figl intercepted some radio dispatches transmitted by General Giovanni Romei who, he believed like Ronge, was the head of the Italian Mission at the Romanian Headquarters[54]. On the contrary, Romei had taken up the position of Head of the Italian Mission in Russia in April 1916, and at the end of the following year he resided at the Russian Headquarters (*Stavka of Mogilev*) or in nearby cities such as Kyiv, where he had received the *SI* codebook in the previous summer. The head of the Mission in Romania, on the other hand, was General Alberto Peano from 19 August 1917[55].

Romei usually forwarded his reports to the Italian Supreme Command by courier or, in some cases, by military telegraph service. In November 1917, however, following the revolutionary unrest, these means of communication became irregular and unreliable. He therefore asked General Peano the permission to transmit by the Romania mission radio, from 17 to 20 November, just over ten radiograms, some of which consisted of many pages, that the Austro-Hungarians intercepted. He then refrained from using the radio because of limitations imposed by Peano on the number and length of telegrams, but also due to availability of alternative transmission means[56].

Without specifying the date, Figl said he had 'completely broken' the *SI* code with the help of the radiograms signed by General Romei about the events on the Romanian-Russian front. He claimed he had achieved form these telegrams useful information at a time when other sources such as Russian radio transmissions had become scarce, because of the troubles in the Russian army[57].

It should be firstly noticed the huge difficulty of reconstructing the entirety of a two-part code with 20,000 or more words using a few, albeit long, cryptograms, even if the correct interpretation of a thousand terms is enough to decrypt non-complex texts. Moreover, it is also quite clear that the time the information obtained from Romei's dispatches remained valid was rather short, while Figl and Ronge eventually allude to a longer period. In any case, this undertaking represents a clear demonstration of the Figl cryptologic high skill.

In December, regardless of the Austro-Hungarian interceptions, some Officers of the Italian Mission in Russia informed the Supreme Command that the *SI* code had probably fallen into the hands of the Russian revolutionaries of Petrograd, as it resulted from news published in some Russian newspapers and achieved from an encrypted wire telegram exchanged between members of the Italian Mission, in Moscow and on the front. Consequently, the code had to be "modified immediately to avoid our secret telegrams from being decoded"[58].

In fact, on 22 December, the Cryptographic Unit "drafted and distributed the replacement tables for the SI code"[59] which gradually came into force starting from the first days of

[54] O. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 206 - 207. Ronge mentioned the *SI code* for the first time in his memoirs when he referred to the end of 1917 and said the Italian Military Mission in Romania used it (M. Ronge, *Der Radiohorch, op. cit.,* p.25).

[55] General Giovanni Romei Longhena's telegraphic correspondence from Russia began on 3 May 1916, and continued until August 1918, when he was recalled back to the Italian front. AUSSME, Series E11, env.89 and s.

[56] The messages are collected in AUSSME, Series E11, env.97, while the documents related to the shipping difficulties and the agreement with Peano can be found in AUSSME, Series E11, env.92.

[57] O. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 206 - 207.

[58] *Promemoria all'Ufficio Operazioni di Guerra e Affari Generali* (Memorandum of War Operations and general business Office) no. 265011, 12 December 1917.

[59] *Section R Logs*, Series B1, 101 S Vol. 307d. For instance, the A.ENV station in Padua demanded authorization to use the new *SI code* by a *Telegramma all'Ufficio Operazioni del Comandi Supremo del 15 gennaio 1918,* (Telegram to Operation

January for communications with the Headquarters of the 16th Corps in Vlore, and with the Defence Attachés in London, Madrid, The Hague, etc[60].
In February 1918, the Unit created a completely *New SI Code*[61].
For all the remaining months of the war, it also maintained the *SI* carefully, often issuing new coding and decoding tables. The Austro-Hungarian sources no longer mentioned this codebook. At the end of the conflict, the Italian Intelligence Service included it among the unbroken codes thanks to the "statements of personnel from the disbanded Austro-Hungarian Army who worked in cryptographic offices" who had never heard of it[62].
During 1918, the *new SI code* was also distributed to Army units outside the usual limited 'circle' around the Intelligence Service, until it spread to many Headquarters, as we will see in the following pages of this book.

From the "Red" to the "Special"

After the alarm and its temporary suspension in March 1916, the *Red code* had been reintroduced into service after just over a month by adding simple additive over-encoding and by adopting a different page numbering. However, these provisions were no significant obstacle to the Austrian cryptanalysis.
In June 1917, another simple over-encoding was applied, which entailed swapping, in the code groups, the position of the number of the page with the number of the word and adding '123' to each group of five digits. Three days later, this string was replaced with '55', because an Officer in the Headquarters of the 5th Army transmitted by radio the new key by a dispatch coded with the previous one, thus making it necessary to replace it[63]. Simple additive keys could be discovered quickly.
Nevertheless, this modification to the *Red Code*, ever since named *Special*, was only an interim solution, because after a short time, a radical change took place by introducing *coding and decoding tables*, created by the Cryptographic Unit, as shown by the logs of Sections U in the 25 June entry:

> Letter (sent) to the Ministry of War - Office of the Minister.
> Please be informed that this Intelligence Service was tasked with drafting:
> 1- Special coding/decoding tables to be applied to the *Special code*. The tables should be replaced periodically, or in case the code is lost. Distribution of the Special code should be limited to the Headquarters of large units, intendancies, and 2nd line services.
> 2- A two-parts dictionary for lower commands, replacing the *Pocket Military Cipher*.
> Sample tables for approval and distribution are attached; the dictionary will follow[64].

Office of the General Staff of 15 January 1918), AUSSME, Series E2, env.110.
[60] *Section U logs, op. cit.*, 3 January, and 21 February 1918, AUSSME, Series D1, 101 D, Vol.360d.
[61] *Section R Logs*, AUSSME, Series B1, 101 S Vol. 311d, 23 February 1918*, Completamento della prefazione del nuovo cifrario SI* (Finalization of the new Code SI Introduction).
[62] Intelligence Service, *Attività dei reparti crittografici dell'Esercito austro ungarico durante la guerra*, (Austro-Hungaric Army Cryptographic Units activity during the War), signed by O. Marchetti, Prot. 951/A, 14 March 1919, AUSSME, Series H4, Env.65.
[63] The documentation relating to the 'Special code' with additive key is contained in AUSSME, Series F2 env.117. See in particular: Headquarters, 5th Army, Telegram no. 2235, 7 June 1917; Circular Letters of the Ministry of War No. 2235, 7 June 1917, and no. 2278, 10 June 1917.
[64] *Section U logs, op. cit.*, *25 June 1917*, AUSSME, Series B1, 101 D, Vol. 349 d. The dictionary is the divisional D, which the Cryptographic Unit prepared as described in the next paragraph.

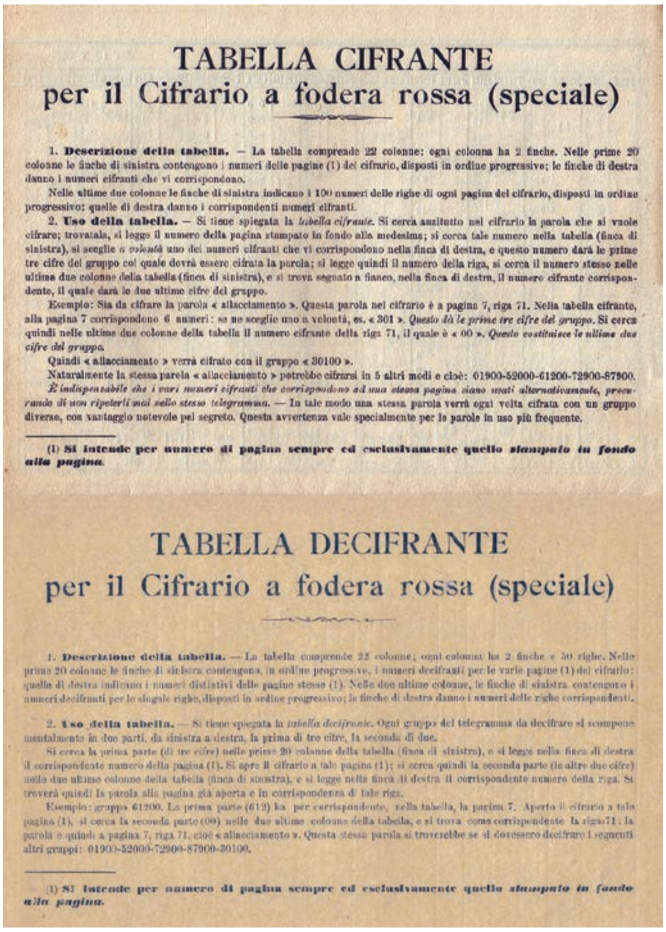


TABELLA CIFRANTE
per il Cifrario a fodera rossa (speciale)

1. **Descrizione della tabella.** — La tabella comprende 22 colonne: ogni colonna ha 2 finche. Nelle prime 20 colonne le finche di sinistra contengono i numeri delle pagine (1) del cifrario, disposti in ordine progressivo; le finche di destra danno i numeri cifranti che vi corrispondono.

Nelle ultime due colonne le finche di sinistra indicano i 100 numeri delle righe di ogni pagina del cifrario, disposti in ordine progressivo: quelle di destra danno i corrispondenti numeri cifranti.

2. **Uso della tabella.** — Si tiene spiegata la *tabella cifrante*. Si cerca anzitutto nel cifrario la parola che si vuole cifrare; trovatala, si legge il numero della pagina stampato in fondo alla medesima; si cerca tale numero nella tabella (finca di sinistra), si sceglie *a volontà* uno dei numeri cifranti che vi corrispondono nella finca di destra, e questo numero darà le prime tre cifre del gruppo col quale dovrà essere cifrata la parola; si legge quindi il numero della riga, si cerca il numero stesso nelle ultime due colonne della tabella (finca di sinistra), e si trova segnato a fianco, nella finca di destra, il numero cifrante corrispondente, il quale darà le due ultime cifre del gruppo.

Esempio: Sia da cifrare la parola « allacciamento ». Questa parola nel cifrario è a pagina 7, riga 71. Nella tabella cifrante, alla pagina 7 corrispondono 6 numeri: se ne sceglie uno a volontà, es. « 301 ». *Questo dà le prime tre cifre del gruppo.* Si cerca quindi nelle ultime due colonne della tabella il numero cifrante della riga 71, il quale è « 00 ». *Questo costituisce le ultime due cifre del gruppo.*

Quindi « allacciamento » verrà cifrato con il gruppo « 30100 ».

Naturalmente la stessa parola « allacciamento » potrebbe cifrarsi in 5 altri modi e cioè: 01900-52000-61200-72900-87900.

È indispensabile che i vari numeri cifranti che corrispondono ad una stessa pagina siano usati alternativamente, procurando di non ripeterli mai nello stesso telegramma. — In tale modo una stessa parola verrà ogni volta cifrata con un gruppo diverso, con vantaggio notevole pel segreto. Questa avvertenza vale specialmente per le parole in uso più frequente.

(1) **Si intende per numero di pagina sempre ed esclusivamente quello *stampato in fondo alla pagina*.**

TABELLA DECIFRANTE
per il Cifrario a fodera rossa (speciale)

1. **Descrizione della tabella.** — La tabella comprende 22 colonne; ogni colonna ha 2 finche e 50 righe. Nelle prime 20 colonne le finche di sinistra contengono, in ordine progressivo, i numeri decifranti per le varie pagine (1) del cifrario: quelle di destra indicano i numeri distintivi delle pagine stesse (1). Nelle due ultime colonne, le finche di sinistra contengono i numeri decifranti per le singole righe, disposti in ordine progressivo; le finche di destra danno i numeri delle righe corrispondenti.

2. **Uso della tabella.** — Si tiene spiegata la *tabella decifrante*. Ogni gruppo del telegramma da decifrare si scompone mentalmente in due parti, da sinistra a destra, la prima di tre cifre, la seconda di due.

Si cerca la prima parte (di tre cifre) nelle prime 20 colonne della tabella (finca di sinistra), e si legge nella finca di destra il corrispondente numero della pagina (1). Si apre il cifrario a tale pagina (1); si cerca quindi la seconda parte (le altre due cifre) nelle due ultime colonne della tabella (finca di sinistra), e si legge nella finca di destra il corrispondente numero della riga. Si troverà quindi la parola alla pagina già aperta e in corrispondenza di tale riga.

Esempio: gruppo 61200. La prima parte (612) ha per corrispondente, nella tabella, la pagina 7. Aperto il cifrario a tale pagina (1), si cerca la seconda parte (00) nelle due ultime colonne della tabella, e si trova come corrispondente la riga 71: la parola è quindi a pagina 7, riga 71, cioè « allacciamento ». Questa stessa parola si troverebbe se si dovessero decifrare i seguenti altri gruppi: 01900-52000-72900-87900-30100.

(1) **Si intende per numero di pagina sempre ed esclusivamente quello *stampato in fondo alla pagina*.**

11.11 Instructions for the use of encoding and decoding tables for the Red code

The distribution of the *Coding and Decoding Tables* to mobilised units only took place between the end of August and the first days of September. This delay is a clear sign of the resistance made by the Encoding Sections vis-à-vis a modest complication in the ciphering process[65].

Each table fitted on a sheet of paper that, once folded into fourths, became of pocket size, showing in all evidence the instructions printed on the back of the tables (picture 11.11)[66].

In the ciphering table (picture 11.12a), for each pair of columns, the numbers read at the bottom of the pages of *Red Book* were on the left and in boldface. On the right, the three or more groups of numbers between 000 and 999 arranged in a disordered way are intended for replacing the one on the left. The code groups had to be chosen carefully to avoid repetitions, especially within the same cryptogram.

The last two columns to the right of the table provided the match between the original figures next to the words on each page of the *Red Code* and the corresponding disordered replacement groups[67].

In the decoding table (picture 11.12b), one could see in boldface the groups from 000 to 999 inserted in the cryptograms and, next each of them, the corresponding page numbers of the *Red Code*. The last columns on the right allow to decode the digits that matched to the words contained on each page.

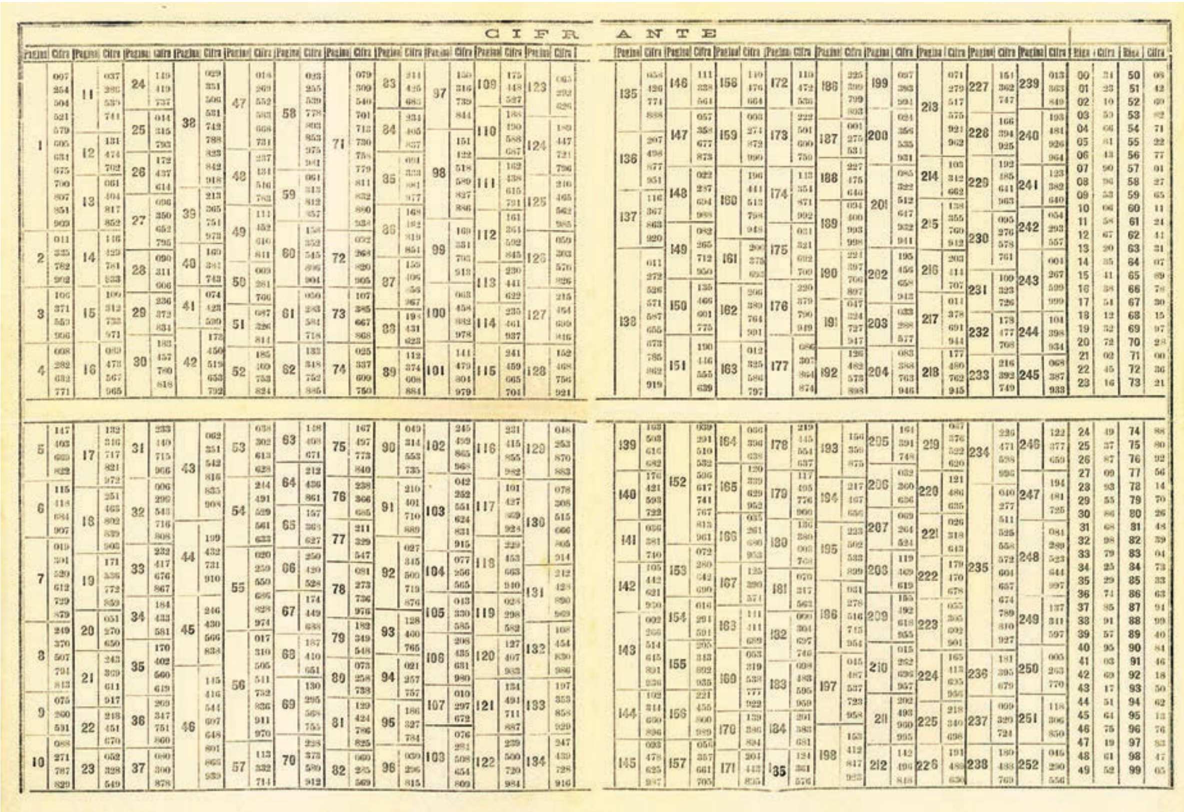
At the same time as the tables were adopted, the *Special Code* - now, the *Red Code* protected by the tables - was not more used by Brigade Headquarters or below, with the purpose of limiting the dissemination of tables and the amount of cryptographic material that the enemy could intercept.

The adoption of the tables in the summer of 1917 seems to have blocked the decryption of dispatches since Ronge never mentions them in his memoirs, while Figl briefly states “the daily change of page numbers”, showing he did not understand the new technique the Italians

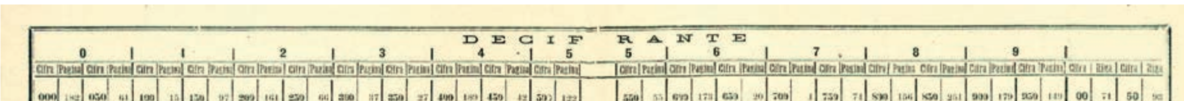
[65] The date the encoding and decoding tables were adopted appears in the confidential letter of the Ministry of War of 23 August 1917, AUSSME, Series F3, env.373. The tables had been circulating since July for final approval, as per the logs of Section U.

[66] AUSSME, Series F3, env.28.

[67] The possibility of encoding a page number with multiple groups depends on the ratio of about 1:4 between the number of pages of the *Red code* and the number of groups between 000 and 999, all of which were used in the tables.



11.12a Encoding Table for the Red code, renamed "Special code"



11.12b Decoding Table for the Red code, renamed "Special code"

had adopted neither claimed he could force the tables, as typically happened when he or his team were successful[68].
Only discussing his cryptologic activity in November 1917, after Caporetto, Figl speaks about the tables for the Special code, which concerns, indeed, a new version that has replaced the previous one, as we will show below[69]. It is therefore interesting to note that, for almost three months, including the period before the Twelfth Battle of the Isonzo and a large part of the First Battle of the Piave river, the *Special Code,* that is, the *Red Code with coding/decoding tables*, remained a mystery for Austrian analysts.
Some rather strange news appears in the same passage of Figl's memoirs. It seems he have discovered the existence of the *Blue Code* - which had been in service from the beginning of the conflict - only in August 1917. Having noted its similarity with the *Red Code*, he wondered if the Italians had adopted it with deception intention.

The Entry into Service of the Code D

The correspondence addressed to the STM Inspectorate shows that several combat units had requested a new cipher to replace the *Pocket Military Cipher* because many copies of it had fallen into enemy hands on several occasions. Then, the Cryptographic Unit - beginning from June 1917, together with many other issues at hand - started to deal with drafting a code for the Divisions and asked some of them to send the collections of their phonograms to extract the recurring terms which could be included in the dictionary[70].
This procedure, adopted also for the *SI* first edition, was consistent with the general principle of "adapting the code to the phrasebook and the communications style for which it is intended [...]. A different procedure would create many useless entries and exclude several recurring ones to be encrypted forcing to devide them into parts, which in turn makes the cryptograms longer and less secret"[71].
The September logs of Section refer to the advanced preparation of the *Divisional Code D* and inform about its sending to Section U on 7 October. It took about two weeks before the code was transmitted back to Rome with some amendments requested by the Head of Operations.
At the same time, a thousand copies of the first version of *Code D* had already been printed at the Ministry of War, and in part distributed[72], while Section U was promising the new version would have been dispatched promptly to the units waiting for it. Meanwhile, the 14th Army Corps requested the authorisation to start using some of the already printed 1.000 copies, as most likely it did, like other units[73].

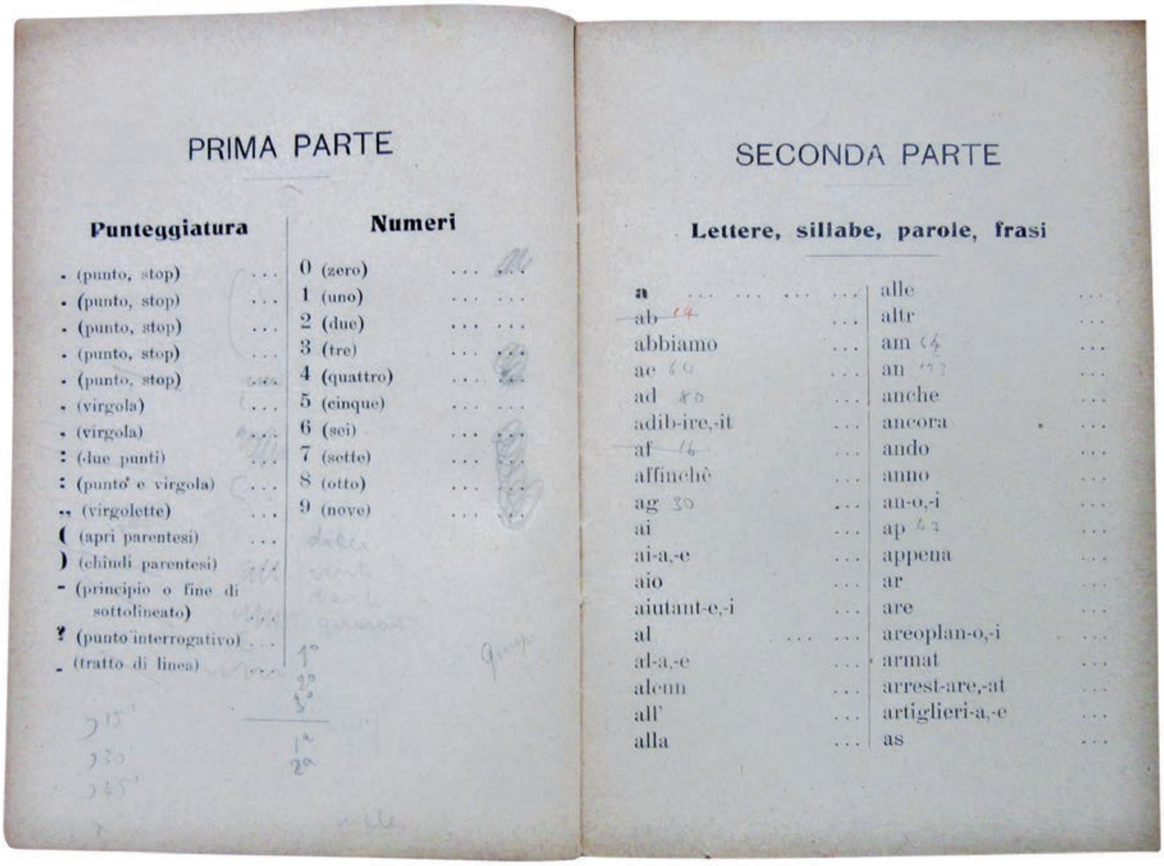
[68] O.J. Horak, *Oberst a. D. Andreas Figl, op. cit.,* p.186. Figl apparently indicated 26 September as the date when the daily change of code groups occurred, i.e., about a month later than the date of the table introduction in service.
[69] Intelligence Service, Section U, Letter no.14080, 2 November, AUSSME, Series F2, env.117; *Section U logs*, *4 November 1917,* AUSSME, Series B1,101D, Vol. 349d. The new tables entered service on 5 November for the mobilised units and on 8 November for the territorial units.
[70] *Section U logs*, *20 June 1917*, AUSSME, Series B1,101D, Vol. 349 d. The terms used in radiograms and phonograms were the same.
[71] L Sacco, *Manuale, op. cit*., p.114.
[72] *Section U log, op. cit., 19 and 21 October 1917,* AUSSME, Series B1,101D, Vol. 359d.
[73] *ibidem, 7 and 11 November 1917; 13, 18, and 20 September 1917*, AUSSME, Series B1, 101 D, Vol.355d.

After a series of bureaucratic postponements, the distribution of the final edition of the *Code D* also called *Dizionario di sillabe e parole* (Dictionary of syllables and words), occurred on 10 December and deferred, for some units, until 24 January 1918[74].
O. Marchetti recalled that "a coding and decoding dictionary for lower units" was adopted in June 1917 instead of the *Pocket Military Cipher*. The difference between the two dates - June and December 1917 - could be the result of either an error by Marchetti or the adoption, in June 1917, of a dictionary equal or analogous to the already mentioned *Small Telephone Code* compiled by Luigi Sacco in 1916. No evidence supports this assumption to date, though it is worth to mention that Ronge assumed in his memoirs of 1943 that Marchetti's pieces of information and date[75].
Summarised below are the fundamental characteristics of the *D code* taken from a 'blank form' with pencil notes corrections and comments, probably by Sacco himself, which he kept for years. This is the first release, which differed slightly from the final one. Pictures 11.13 and 11.14 show the cover and two pages of this version, respectively[76].

11.13 Cover of the "D Code", first edition (ISCAG Library)

The *D code,* a two-part booklet, including a coding and a decoding section, uses three-digit code groups and have therefore very small dimensions compared, for example, to the *SI,* in accordance with its application as a trench code[77]. The main distinctive features of the *D* are its 'temporary nature' and the related random drawn of the code group for each plain term[78]. The set of draws was the 'key to the code' that each Division or group of units was required to modify at least once a month, if the *D* code was used in radiotelegraphy. Homophones were also present as shown in picture 11.14.
This methodology application required a larger management effort by the operating units than non-temporary codes, and it did not enable communications outside a set of correspondents that shared the same version. However, the 'temporary nature' was a remarkable innovation that protected the code from cryptanalysis, for it 'fed' the enemy with several versions, variable in time[79]. In fact, the work to draw lots and draft specific ciphers for each group of units was well repaid by

[74] AUSSME, Series F2, env.45. In an official document accompanying the distribution of the code to some units, the date of 10 December has been cancelled by hand and replaced by 24 January.
[75] O. Marchetti, *op. cit.,* p.173, M. Ronge, *Der Radiohorch*, *op cit.,* p. 52a.
[76] Library of the ISCAG, Coll. XXXI A, no. 11129. The codes and ciphers contained therein were delivered by Luigi Sacco to the ISCAG library in the year 1947.
[77] The encoding section comprises 1.000 entries, the first 800 of which include punctuation, numbers from 0 to 9 (part one) and, in alphabetical order, letters, syllables, words, and phrases (part two). Another 200 items (part three) remained available for Headquarters for names of units, places, officers, etc.
[78] The three dots next to the plaintext entries indicate the three digits of the number to be drawn by lot.
[79] Gylden himself, while being critical of Italian cryptology, did not hide the problems mentioned above and at the same time acknowledged the validity of the choices made by the Cryptographic Unit. Thanks to those choices, "the classification of codes was much more difficult and considerably increased the statistical work" of cryptanalysts (Y. Gylden, *op. cit.,* p.80). This piece of information, like some others reported by Gylden on Italian ciphers, does not appear in Ronge's book and is therefore unclear how Gylden became aware of it.



PRIMA PARTE

Punteggiatura		Numeri	
. (punto, stop)	...	0 (zero)	... ...
. (punto, stop)	...	1 (uno)	... ...
. (punto, stop)	...	2 (due)	... ...
. (punto, stop)	...	3 (tre)	... ...
. (punto, stop)	...	4 (quattro)	... ...
, (virgola)	...	5 (cinque)	... ...
, (virgola)	...	6 (sei)	... ...
: (due punti)	...	7 (sette)	... ...
; (punto e virgola)	...	8 (otto)	... ...
" (virgolette)	...	9 (nove)	... ...
((apri parentesi)	...		
) (chiudi parentesi)	...		
- (principio o fine di sottolineato)	...		
? (punto interrogativo)	...		
_ (tratto di linea)	...		

SECONDA PARTE

Lettere, sillabe, parole, frasi

a	...	alle	...
ab	...	altr	...
abbiamo	...	am	...
ac	...	an	...
ad	...	anche	...
adib-ire,-it	...	ancora	...
af	...	ando	...
affinchè	...	anno	...
ag	...	an-o,-i	...
ai	...	ap	...
ai-a,-e	...	appena	...
aio	...	ar	...
aiutant-e,-i	...	are	...
al	...	areoplan-o,-i	...
al-a,-e	...	armat	...
alcun	...	arrest-are,-at	...
all'	...	artiglieri-a,-e	...
alla	...	as	...

11.14 First pages of the encoding part of the "D Code", first edition (ISCAG Library)

the remarkable resistance to codebreaking. The Austro-Hungarian analysts could not decrypt the divisional radio dispatches neither those among the many higher echelons that adopted it in 1918[80]. It should also be noted that a 'two-part, temporary' trench code devised by Sacco since September 1916 was the ideal solution to overcome the drawbacks of both one-part, over-encoded books, not always easily manageable on the frontline and to two-part codes that involved frequent replacements, with consequent distribution difficulties.

[80] The introduction and the accompanying instructions of the Code specified that it would replace the *Cifrario Militare Tascabile* and the *Special Code* at divisional level. However, the *D Code* was used much more widely.

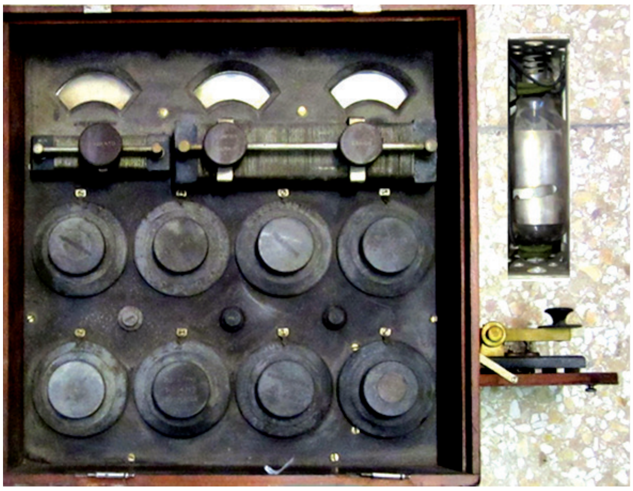
11.5 AIR FORCE AND GEO-TELEGRAPHY CODES

Air Force Radio Communications

After the first endeavours in 1915, the number of radio-equipped aircrafts grew steadily, despite the obstacles caused by the limitation of the available radio spectrum due to the use of spark transmissions and the problems encountered in the allocation of radio channels. Another obstacle to growth came from the long delivery times of the manufacturers and especially of the Italian company Marconi, which produced the renowned on-board transmitter, the 'Marconcina'. To allow communication also from strategic reconnaissance or bombing aircrafts flying well beyond

11.15 The observation post on an aircraft, with a T.Av. radio station (ISCAG Museum) enemy lines, at the beginning of 1917 the Italian Air Force technicians designed a 180 W station called T.Av. with a range of up to 60 kilometres. Three Italian companies were entrusted with its industrial production (picture 11.15)[81].

Thanks to the space and energy available on board, airships could carry transmitters of higher power than planes; moreover, reception of ground stations transmission and some kinds of radio navigation aids were also possible thanks to silence in flight. The risks of sparking fires originated from the contemporary presence in the nacelle of spark devices and hydrogen, was avoided by adopting the valve transmitters tested in 1917 by Guglielmo Marconi on Italian and English airships. A piece of transmitter equipment built in the workshops of the Army and known as *Onde Persistenti per Dirigibili, OPD* (Continuous Waves for Airships) is shown in picture 11.16.



11.16 Airship Continuous Wave Device. Top right: the transmitting valve (ISCAG Library)

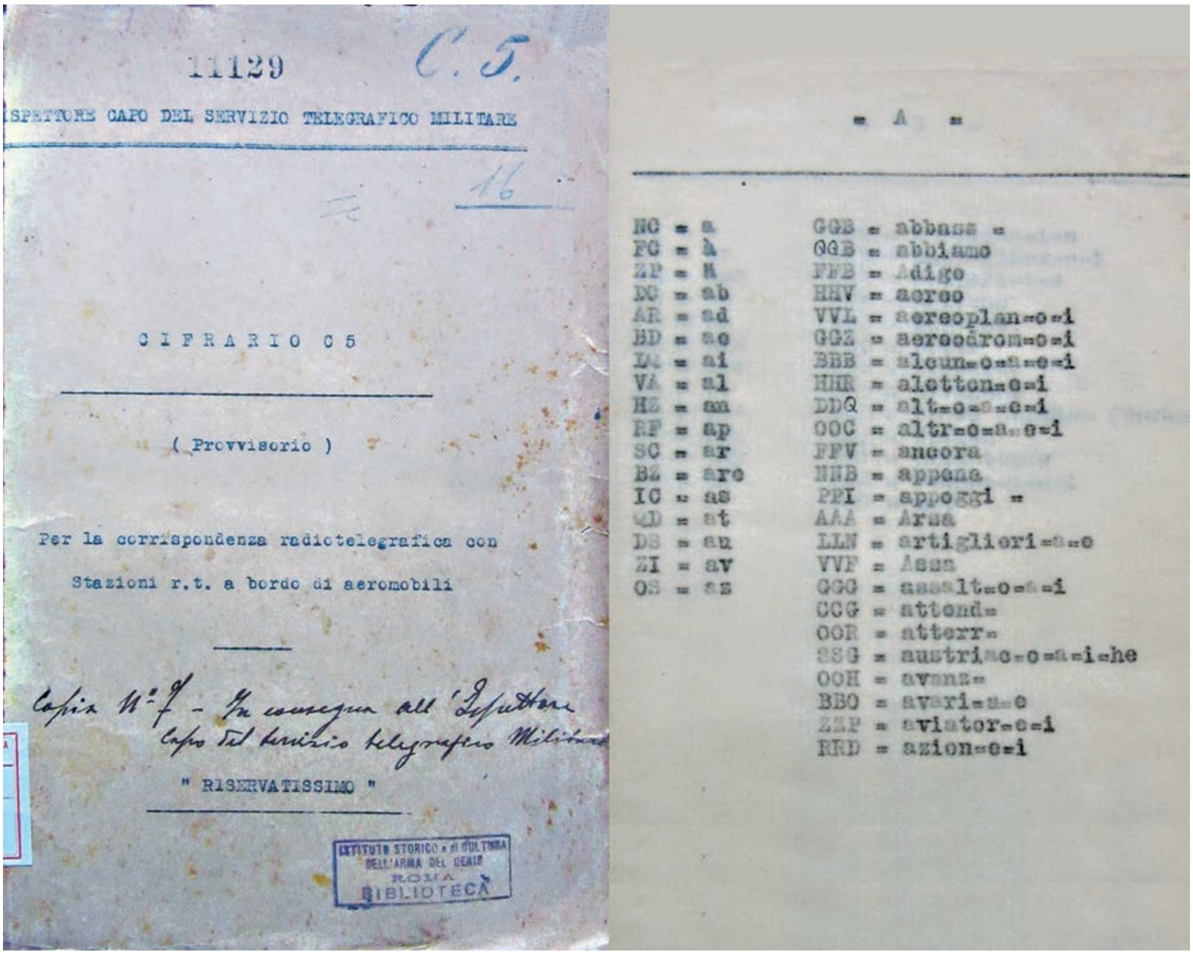
The enemy put a great deal of attention on every radio transmission connected with aeronautical services, which required protection using special ciphers. Since the airborne observers transmitted the collected information to the ground under difficult operating conditions often due to enemy fire, the simplicity of dispatches and their encoding was of primary importance. Therefore, the cipher system intended to support Artillery and Infantry consisted of table on a single page, containing a match between current terms and one or two-letter code words. Also coordinates of simple squared maps could easily be send by air observers. Not surprisingly, the Austro-Hungarian analysts interpreted these unsophisticated dispatches with equal ease, as the Italian did for those of their airborne operators. On the other hand, the information gathered by the air observers were usually of such nature that jamming the transmission frequencies of enemy aircrafts for impairing reception resulted to be, in fact, more useful than interpreting dispatches.

The *C5*, adopted by the Italian air force in the spring of 1917 (picture 11.17) can be considered one of the most complex codes for radiotelegraphic correspondence with airborne radiotelegraphic stations, mainly aboard airships[82]. Its service timeframe emerges from an apparent reference to the *C4* included in the Instructions.

The *C5* is a two-part code and uses code groups of two or three letters chosen in the abbreviated alphabet of 17 letters, customary for service ciphers. From the first page of the coding part shown in the picture, the distinction between the primary groups shown on the left and the secondary groups on the right results evident, with the regular repetition of the first letter in the groups on the right. The groups were sent as such or, like other service ciphers, combined to form sets of four, five, or six letters. No information was found in the Austro-Hungarian sources about this code.

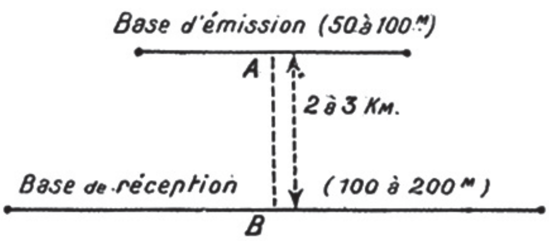
[81] The companies are: Craveri of Turin, Fratelli Marzi of Conegliano Ligure, and Campostano of Milan. Some components of the 200 W field station are included in this equipment, such as the disc spark gap.

[82] Library of the ISCAG, coll. XXXI A, no.11129. The code partially shown in the Picture, formerly belonging to the Chief Inspector of the STM is among the papers handed over to the ISCAG by Luigi Sacco in 1947 and contains handwritten notes.



11.17 Cover and one page of the C5 Code for aircrafts (ISCAG Library)

A New Communication Mean: Geotelegraphy



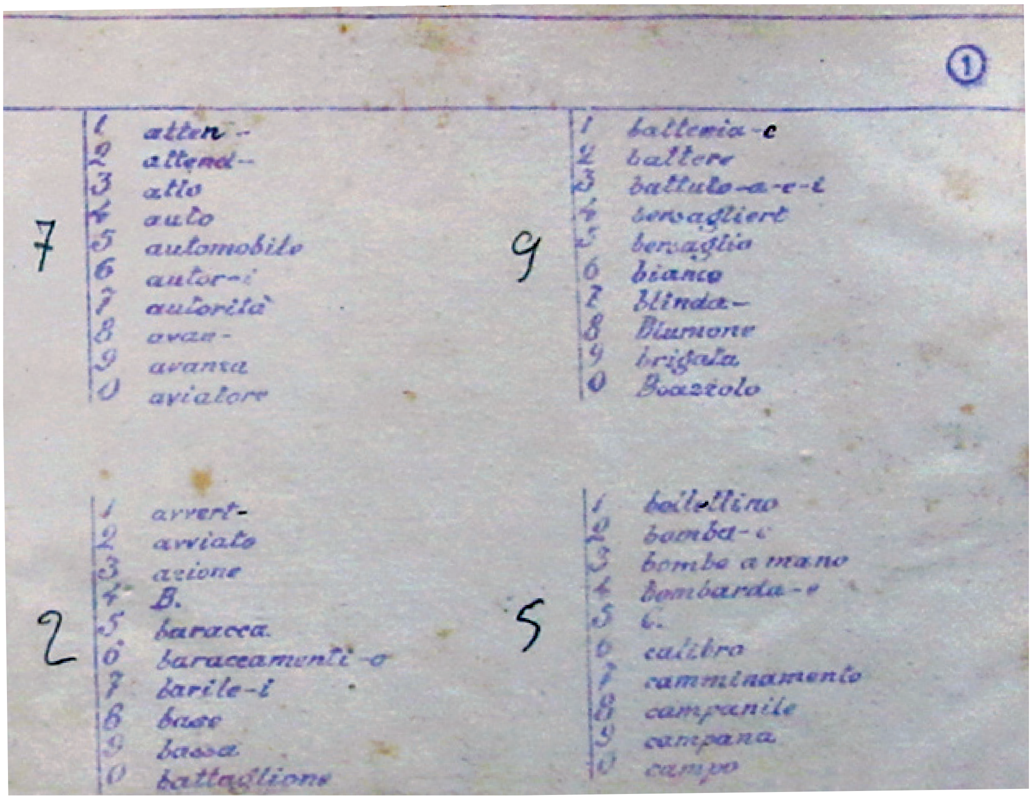
11.18 Bases of a geo-telegraphic connection

To connect the most forward posts to their Commands, a new French communication system known as Télégraphie Par le Sol, or *TPS* or also as *geo-telegraphy,* found application on the Italian front in 1917[83].

A geo-telegraphic transmitter included: a wire between 50 and 100 metres long grounded at both ends and simply laid on the terrain, a transmitting device including an acoustic frequency vibrator called 'parleur', a battery, and a telegraph key. The receiving station contained a wire of an equal or larger length than in the transmission terminal, also grounded at both ends, and an acoustic frequency amplifier to which the operator's headset was connected. The transmitting and receiving wires were called 'bases' (picture 11.18).

[83] Geo-telegraphy was tested at the end of 1915 on the initiative of General Gustave August Ferri, head of the French military Radiotelegraphy Service. It was perfected during the following year and then used by the Allied and enemy armies. (*La T.P.S.,* La Nature, Revue de Sciences et de leurs Applications, Paris, 46ème Année deuxième semestre 1918 - premier semestre 1919).

An effective TPS communication, due to the currents propagating in the ground and to induction, could reach distances of up to two or three kilometres, mainly depending on the layout and length of bases and on the nature and conditions of the ground.
Geo-telegraphy systems - assigned in the Italian Army to radiotelegraphic sections - became one of the most widespread communication tools between battalions, regiments, and brigades mostly because of their straightforward installation and usage and of the high survivability degree under enemy fire[84].
Among the drawbacks of geo-telegraphy were, in addition to the limited range of connections, the sensitivity to noise generated by electrical lines and by telephone and telegraph circuits, as well as the ease of enemy interception leading to the obligation of avoiding plaintext dispatches.
Among the papers Sacco delivered to the Museum of the Corps of Engineers, a geo-telegraphy codebook containing 18 pages including that shown in picture 11.19, has been found. The three-digit code groups were obtained by flanking the page number, the digit characterising each group of words to be changed frequently and the digit shown next to each word. During 1918, *Regimental cipher R,* more resistant to the enemy violation, was applied to geo-telegraphy communications as well.


1

7
1 atten-
2 attend-
3 atto
4 auto
5 automobile
6 autor-i
7 autorità
8 avan-
9 avanza
0 aviatore

9
1 batteria-e
2 battere
3 battuto-a-e-i
4 bersaglieri
5 bersaglio
6 bianco
7 blinda-
8 Blumone
9 brigata
0 Boazzolo

2
1 avvert-
2 avviato
3 azione
4 B.
5 baracca
6 baraccamenti-o
7 barile-i
8 base
9 bassa
0 battaglione

5
1 bollettino
2 bomba-e
3 bombe a mano
4 bombarda-e
5 C.
6 calibro
7 camminamento
8 campanile
9 campana
0 campo

11.19 A geo-telegraphy Code with three-digit encoding group (ISCAG Library)

[84] The Italian army adopted it in the spring of 1917, 100 French equipment being distributed among the Armed Forces “to ensure communication between forward lines and the Headquarters immediately behind them (the maximum range was about 3.5 km). The next supplies, whose amplifiers had greater sensitivity, had bases of a smaller size and were finally adopted on the entire Italian front where it performed admirably. At the end of the war, there were 170 systems in operation”. (Technical Division of the Supreme Headquarters, Memo for H.E. the Assistant Chief of the General Staff: *TPS equipment*, 25 March 1918, ISCAG, Coll. 225).

Due to the limited range, the high probability of interception, and the high sensitivity to noise, the geo-telegraphy technology did not survive WWI. In 1919, its application in French army became limited to backup other communication systems[85], while the Italian army saw it as a subsidiary to trench radio telegraphy.

11.6 THE FIGHT FOR TELEPHONE INTERCEPTION

I.T. Service Enhancements

Each Italian Army progressively created its network of listening stations in their areas of the front, and implemented stations and wire infrastructures varying as a function of the proximity to enemy trenches, the nature of the ground, etc. The ground sockets were installed as close as possible to enemy trenches: a not easy tasks, especially when the trenches were on the opposite bank of a river or on far away mountain.

Nevertheless, also thanks to many heroic actions remained often unknown, the number of telephone interception stations increased considerably: on the eve of the Twelfth Battle of the Isonzo, more than 60 installations were active, mainly equipped with valve amplifiers[86].

I.T. centres were set up to organise and coordinate four or more listening stations and to 'filter' the information gathered. The most important pieces of information were immediately forwarded to line Commands and the Intelligence Services of the Armies, also known as *Informazione Truppe Operanti, or ITO* (Operational Units Intelligence Office). In areas with fewer telephone interception stations, only one *Centro Raccoglitore Stazioni Intercettatrici, or CRSI* (Centre for Telephone interception Stations) was active. The network of the 2nd Army in August 1917 included six I.T. centres, each assigned to an area of the front, as shown in picture 11.20.

From early 1917, in parallel with the quantitative increase, several measures were adopted to improve the quality of service in terms of interceptions 'range' and of conversations interpretation. To contrast the countermeasures adopted by the Austrian Headquarters within a continuous competitive escalation, the I.T. Service devoted great care both to personnel training and to interception tools improving[87].

For instance, until October 1917, the Telephone interception laboratory of the 2nd Army trained "about 40 officers (centre masters, station chiefs, interpreters) and 300 personnel from other ranks"[88]. For standardization purpose, a layout of a 'model telephone interception station' was adopted, as shown in picture 11.21, where the switching board placed in the top centre and two Gorizia-type amplifiers may be easily noticed[89].

Against the constant danger of Austro-Hungarian interceptions, an 'active counter-interception' was immediately activated in response to the detection of enemy telephone eavesdropping activities, disturbing them by the current of usual telephone voice calling devices or rather by frequency

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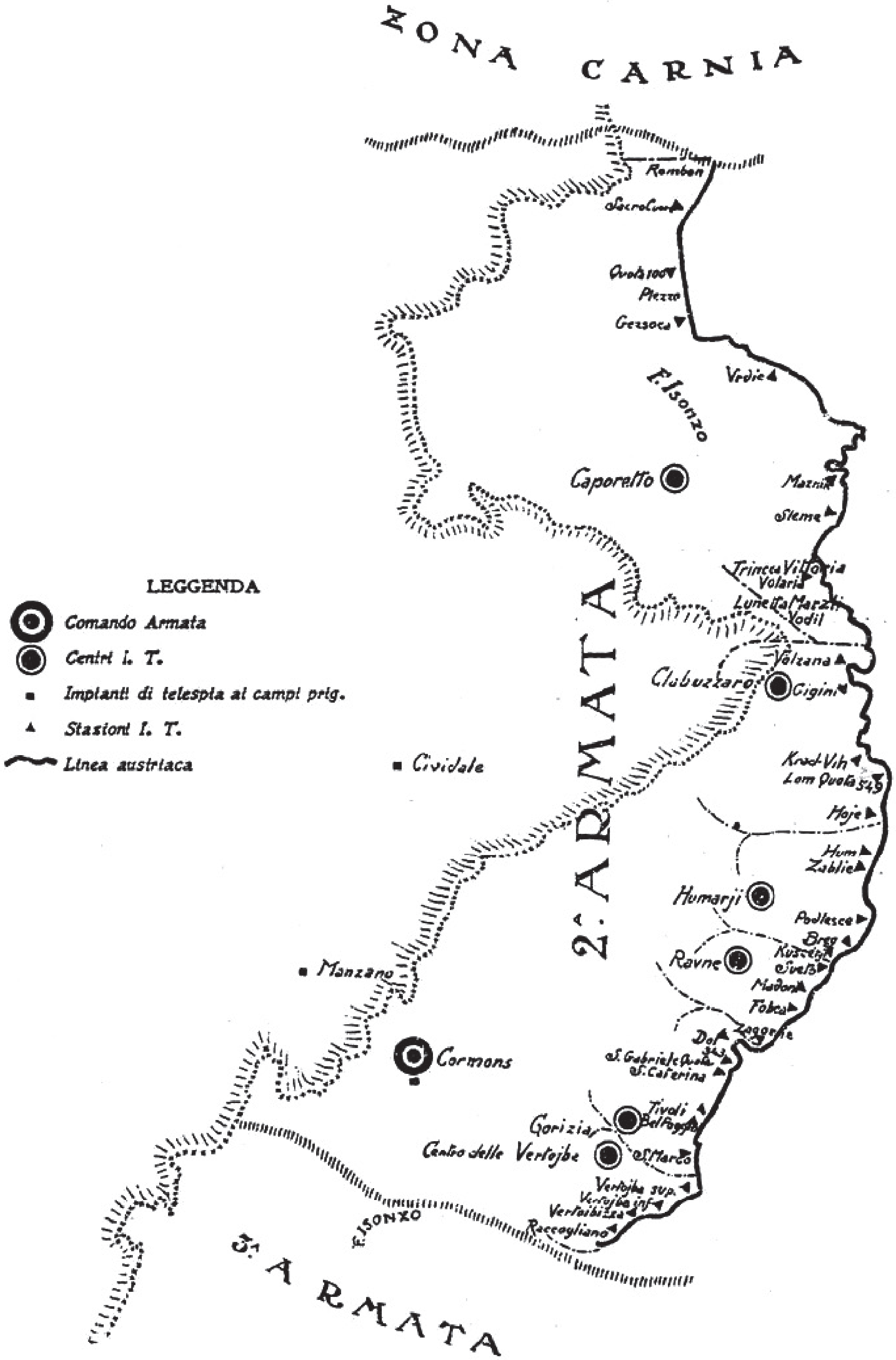
[85] Cours d'officiers-élèves de l'Ecole Spéciale Militaire - 1919, *T. P. S. Fonctionnement et Règles de service*, Paragraphe 14.

[86] The figures in the text are taken from the articles written by A. Carletti and G. Guasco.

[87] Among other things, acoustic isolation was installed in the listening booths, portable soundproof booths were designed for temporary forward installations, and the equipment used by the teams in charge of laying interception lines - i.e., copper ground plates, drum backpack, spade, etc. - was improved

[88] A. Carletti, *op. cit*., p.18.

[89] Up to 14 separate external lines could be connected to the input panel of the switch board, each with its own grounding. They could be also coupled to form 7 listening circuits.



11.20 Deployment of the telephone interception stations and of I.T. centres on the 2nd Army front (ISCAG Archive)

11.21 Model of a telephone interception station (ISCAG Archive)

generators producing currents of much higher intensity, causing loud and annoying noise for the interceptors[90].
The I.T. Service was also responsible for monitoring communications between the Italian units to verify the possibility they could be intercepted. In time, this activity took on the shape of actual censorship to ascertain, for example, the infringement of rules relating to personal or unauthorized telephone calls or to the lack of concealed languages/ciphers for relevant communications[91].

A Serious Danger for General Boroevic

Several excerpts of enemy telephone communications intercepted by the stations of Tivoli (Gorizia), Sleme and many others came from the Isonzo front concerning enemy critical operational situations.
Particularly noteworthy was the information achieved in early May about a train loaded with *Landsturm* troops, which had fallen from a bridge following an explosion, apparently causing more than 300 deaths and many injuries. "The disaster could have happened in areas near our front [...] on the railway line between Villaco and Tolmino"[92].
Some conversations intercepted on 9 August 1917, and in the following days revealed the circumstances in which a ceremony was planned in the presence of General Boroevic[93]. The first of these dispatches that the Italian telephone interception station in Volzana intercepted reads: "Hello! On Monday, 12 August, at 8 a.m., His Excellency General Boroevic will be on the Great Square of Modrejece (two kilometres south of Tolmino) to award decorations to soldiers". Two days later, the same Italian station picked up another conversation talking about Italian planes coming to "celebrate General Boroevic's arrival". Suspicious of the presence of Italian aircrafts, the Austrians decided to postpone the ceremony. Once again, this episode shows the importance of eavesdropping, primarily when telephone lines transmit information that had to remain confidential. Telephone communications and telephone interception activities increased during the fighting. "The telephone interception stations provided invaluable contributions during the two offensives

[90] A. Carletti, *op. cit.,* p. 21. A device of this type was patented by the Intercepting Unit of the 2nd Army.
[91] The reason for limiting telephone communications also lies in the fact that they are one of the main obstacles to intercepting enemy communications.
[92] Operations Division, War Operations and Situation Branch*,* Memorandum no. 9126, 10 May 1917.
[93] Information about the planned Italian air raid came from the book of Ronge titled *Les Maitres de l'espionage - 1914-1918*, *op. cit.,* p.215-218.

of May and September 1917, and collected information on movements of troops, deployment of new units, enemy losses, and morale of the troops”[94].

Right at the end of the bloody confrontation during the Tenth Battle of Isonzo started on 12 May 1917, the Chief of the 2nd Army Staff, General Badoglio, commended the Headquarters of the Corps of Engineers operating around Gorizia for the effectiveness of its interceptions. Among the papers found during this offensive were both small lists of conventional names assigned to different levels of command, and more complete lists with new concealed terms than the ones the Italians already had[95].

[94] Headquarters, Corps of Engineers, 8th Army, *Relazione sulle Intercettazioni Telefoniche* (Report on Telephone eavesdropping service), no. 6684T, 28 July 1918, p.13, AUSSME, Series E1, env.111. This report is the draft of an article published, with much rewriting, in the Bulletin of the Corps of Engineers of February 1919, titled *Servizio d’intercettazione delle trasmissioni telefoniche* (Telephone eavesdropping service).

[95] Among the captured documents are telephone ciphers, code tables, and trench codes, including their instructions. Some finds in the Italian and Austrian archives are so complete that one can believe they were captured documents.

CHAPTER TWELVE

The Great Battles of 1917 on the Italian Front

12.1 THE ELEVENTH ISONZO BATTLE

CRITICISM ABOUT THE *PENKALA*

At the end of June 1917, in the Italian army about 110 field radio stations were deployed across the entire front (picture 12.1)[1]. In particular, the network of the 2nd Army included 23 transceivers, almost half of which having a transmitting power of 200 Watt or less, to ensure communication within the Army and beyond[2]. The other Italian armies were equipped with a similar number of radio stations, while the Supreme Command had three radio stations, in addition to a backup and a listening stations.

The eavesdropping Austrian system, strengthened thanks to the layout of many listening stations, was equipped to exploit the large Italian traffic, intercepting for instance the same cryptogram even five or six times.

However, during the careful planning of the Eleventh Battle of Isonzo - the Italian offensive started on 17 August 1917, that led to conquering the Bainsizza Plateau and Monte Santo - the Italian operational dispatches were transmitted across physical lines or communication means other than radio, the latter being used only for news of marginal importance. Therefore, the Austrian stations intercepted a large amount of encrypted radio messages, but *Penkalas* could extract no useful information from them to foresee the imminent Italian offensive[3].

As already mentioned, General Boroevic, heading the Isonzo Armies where the breach occurred, requested after the end of the battle, to suspend all the interception and cryptanalysis activities, which he considered unproductive[4]. The Headquarters of the 5th Army had made the same proposal at the end of the Battle of Gorizia in 2016.

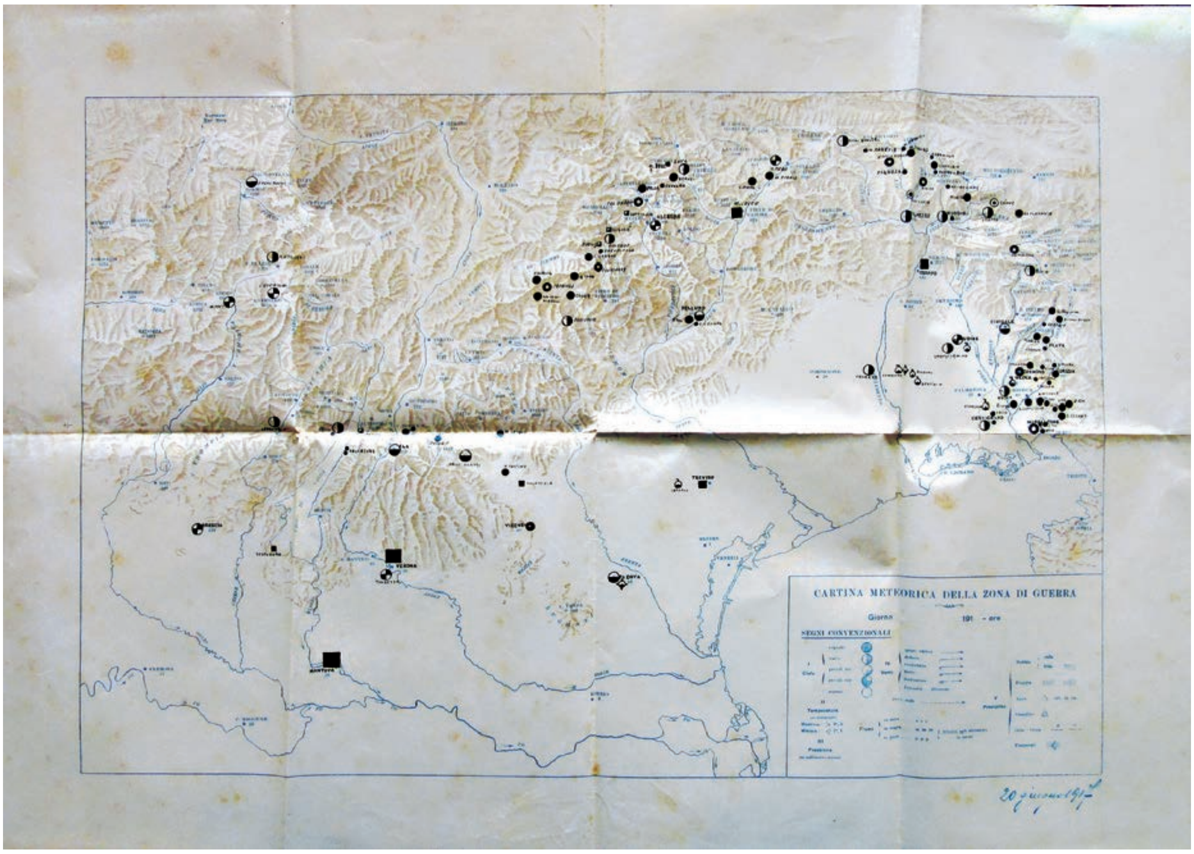
Although Ronge thought this request as originated from a simple 'dislike' between Headquarters, it is understandable that such a radical position taken by Boroevic, a highly respected General known as the 'Lion of the Isonzo', may have caused some concerns in the higher ranks of the Austro-Hungarian army. However, as the previous request, it did not generate any practical effects. Ronge wrote in his memoirs that the Austrian Supreme Command responded with a brief note boasting the usefulness of the *Penkalas* service. Moreover, it mentioned three cases - just three cases in the eleven battles on the Isonzo front - when the interception of Italian dispatches had brought operative intelligence results. Curiously, one of those cases concerned the "grouping of the 2nd

[1] ISCAG, Coll. 238.

[2] The Army Headquarters in Cividale is linked to the Supreme Headquarters via radio, to the Headquarters of the other Armies and the depending Corps and Divisions Headquarters, as well as to other locations that can hardly be reached with other means.

[3] M. Ronge, *Der Radiohorch*, *op. cit*., p.27. Across the front, the Austrians intercepted several hundred messages per month, with different content. For example, until 23 October 1917, the *Penkala* in Margburg processed slightly more than 200 Italian messages (M. Ronge, *Der Radiohorch*, *op. cit*., p.23).

[4] M. Ronge, *Der Radiohorch*, *op. cit*., p. 21.



12.1 Deployment of Italian radio-telegraphic stations in June 1917 (ISCAG Archive)

Italian Army in the Eleventh Battle", that is when Boroevic said the *Penkala* did not provide any intelligence[5].

The very prudent use of radios by the Italians along the Isonzo front and perhaps the wish of General Boroevic' armies to communicate by radio within their sector of operations rather than listening to enemy dispatches in vain, seemed to justify the above-mentioned disagreement.

Soon after the conquering of the Plateau, the Italians expanded their radio network to serve the units deployed on the occupied areas, adding a new station on the Monte Santo in service of the 'Udine' and 'Forlì' Brigades and of the 2nd Corps' observation post[6].

[5] *Ibid.,* p. 24. The cases mentioned were four, but the last one refers, in general, to the cryptographic material utilized on the Tyrol front. The other two cases refer to the Italian planning for the Third Battle of the Isonzo (first half of October 1915) and the movements of the 4th Corps on 8-9 September 1917.

[6] Chief Inspector, STM, *Relazione tecnica sul Servizio radiotelegrafico dell'Esercito operante durante la Guerra Italo - Austriaca, 1915 -1918* (Technical Report on the Army Radio Telegraphic service in the War between Italy and Austria, 1915-1918), p. 5, ISCAG, Coll. 22. In about three months after June 1917, the number of the Italian radio-telegraphic stations roughly doubled. There were: 4 fixed stations, 46 field stations with transmitting power equal of above 1,5 KW, twenty-five 500W stations transportable by pack animals, eight 300W stations from S.F.R., forty-two 200W stations in coffers and 76 stations of power less than 200W.

Information from Telephone Interceptions

On the other hand, the Italians collected by telephone eavesdropping some relevant news about the resistance and the counteroffensive the Austro-Hungarian Headquarters were organising. A bulletin of the 3rd Army based on interceptions carried out between 21 and 31 July included information on the meticulous enemy preparation, the equipment stored in caves, the extent of troops, the sectors they had occupied, and so on. The bulletin dated 2 August, reads: “After detecting intense traffic on our lines of communication, the enemy seems extremely nervous. From all the intercepted messages we deduce he expects us to act very soon”.

In effect, the increase of the Italian wire traffic detected by the Austro-Hungarian listening stations, informed their Commands about the preparation of the Italian offensive, even without providing specific information about its planning.

When the battle started, on 18 August, the Italians intercepted a large amount of telephone conversations and, according to Ronge, they (the Italians N/A) “became furious when the Austrian intercepted dispatches revealed their telephonists were chatting at the beginning of the attack”[7]. The Italians were not, in fact, immune from the habit of talking too much and incorrectly on the phone.

During the battle, the interception network of the 2nd Army followed all phases of the fighting, almost as if conversations were directly heard inside the Austrian trenches. On 28 August, a dramatic talk took place like this: “Captain, Sir, we can’t shoot because everything here is destroyed, nor can we go out because a forward enemy post is almost on us”; “hear hear, Lieutenant, can’t you find a way out?”; “hear hear, Captain, Sir, [...] we are buried like in a foxhole here”[8].

And on the same day, another telephone interception station captured the following message: “the Italians must have spies who inform them constantly. Their bombs hit the very entrance of every shelter […] this front now is worse than Gorizia’s one”[9].

As the Italian troops advanced, two eavesdropping stations also moved forward, and new ones were installed on the plateaus[10]. Those stations learned that “the enemy intended to withdraw from Monte Santo 12 hours before it occurred, and had been planned some limited actions against our most forward lines, actions that every times failed as soon as they started”[11]. In particular, at 1.42 pm on 23 August, the Italian listening stations intercepted a telephone call from the Austrian position at 615 m on the Monte Santo that read: “wait for the Brigade’s orders before abandoning the position. Move artillery pieces to rear positions …”[12].

The telephone interception reports issued by the Intelligence Office of the Headquarters of the 2nd Army in the second half of September and in early October - during the battle for the control of the deep and narrow Chiapovano Valley - revealed what was happening among the enemy units[13].

On 6 October, while Austro-Hungarian artillery and infantry units prepared to fight on the eve of the counter-offensive, an Austrian Lieutenant stated: “we can never be vigilant enough. The enemy

[7] M. Ronge, *Les Maitres, op. cit.*, p.218.

[8] *Ibidem.*, p. 219-220.

[9] *Ibidem.*

[10] IT Cabinet, 2nd Army, *Relazione sugli impianti di stazioni intercettatrici eseguiti dal 15 agosto al 30 settembre* (Report on new interception stations plants carried out from 15 August and 30 September), Lieutenant Carletti, Head of Team, ISCAG, Coll. 222.

[11] *ibidem.* The news about the enemy leaving the position came from the eavesdropping station on the Monte Santo at altitude 615.

[12] M. Ronge, *Les Maitres, op. cit.*, p.218-219.

[13] Aurio Carletti, *Il servizio della intercettazione delle comunicazioni telefoniche nemiche sull’Isonzo nel 1917*, Postal, Telephone, and Telegraph Services Digest, no. 12, December 1915, p. 794-797.

is listening, but how can we not speak? We see and hear the movements of troops. If the Italians realise it, we are ruined, Colonel”[14].

12.2 PLANNING THE TWELFTH BATTLE OF THE ISONZO

The Austrian Preparation

Figl and Ronge described the offensive organization in every detail, including the assignment of the *Penkala AOK XIV*, under the command of an Austrian officer, to the Headquarters of the 14th Austro–German army, which would have launched the main attack against the Italian lines. This *Penkala* comprised personnel from both Armies and relied on two German and two Austrian interception stations[15]. Two others *Penkalas* were deployed across the Isonzo front, in addition to Marburg’s *Penkala,* with about thirty listening stations[16].
After being summoned, on 7 October, by Emperor Charles - who was “extremely interested in the planning” - Ronge reached the front, where he inspected the stations and remained until the attack took place “to verify that the radiotelegraphic stations would provide a faultless service”[17]. Of course, the Ronge attention focussed on systems he believed useful to collect intelligence rather than on the radios needed to communicate between units, a matter for which he was not responsible.
Despite the large number of assets deployed, Ronge stated that radio communications listening before the battle had yielded no practical results. Figl also wrote he found no helpful suggestions to understand how much the Italians knew about the plans of attack or to grasp information about their countermeasures[18].
On the contrary, the Commander of the 14th Army, General von Below, mentioned in his memories, as a positive outcomes achieved by radio interception, the new that “the enemy, advised by that scoundrel Maxim the Rumanian, had sent backup forces to the planned targets of the attack, namely the Matajur and the Xum”[19]. However, despite some sporadic news, we can eventually infer that radio interception brought little operational advantage to the Austro-German forces on the eve of the Twelfth Battle of the Isonzo, because of radio silence generally respected by the Italian station and of an incomplete knowledge of the Italian codes, as shown below.
As far as radio communications within the Austro-Hungarian army are concerned, Italian interceptions resumed in October 1917 detecting an increase of enemy traffic before the attack, mainly generated by German stations.
In fact, the greater part of Austrian combat units was not equipped with radio communication devices, as attested by several testimonies as for instance by General Alfred Krauss, the Commander of the Austrian Corp belonging to the 14th Army, tasked with attacking Italian troops in the Plezzo (Bovec) Basin. In referring to the unsuccessful efforts around Mount Rombon and Vrsic, where

[14] *ibid*.
[15] O.J. Horak, Oberst a.D, Andreas Figl, *op. cit*., p.189. The Commander of *Penkala* AOK XIV was Captain Karl Kovacevic.
[16] M. Ronge, *Der Radiohorch*, *op. cit*., Annex 34.
[17] M. Ronge, *Spionaggio, op. cit.,* p.312 - 313.
[18] O.J. Horak, Oberst a. D, Andreas Figl, *op. cit*., p. 147.
[19] Francesco Fadini, Otto von Below, *Caporetto dalla parte del vincitore, Il Generale Otto von Below e il suo diario inedito,* Mursia, 1992, p. 241. The book is based on unpublished papers of the German General. Lieutenant Maxim was a deserter. He revealed the plans of the attack to the Italians.

his troops encountered lousy weather and active resistance by Italian forces on the first day of the battle, he wrote:

> My request for telegraphic (radio) stations to issue orders to forward command posts during operations was never met […]; bad weather had disrupted all wireless lines in a short time, and we had no connections. We received no updates from forward units, nor could the Corps Headquarters send reports to the Army Headquarters or Marburg[20].

Then, to stress the lack of radio communications once again, he added:

> The Germans had wireless stations within all Divisions; therefore, they were always, at least, connected[21].

General Otto von Below also said in his memories that the 1st Austrian Division under his command "lacked light machine guns, radio stations, and horses"[22]. The Chief of Staff of the same Army, General Konrad Krafft von Delmessingen, confirmed the deficiency of radio equipment for communications between Austro-Hungarian units in the book he wrote about some of the events analysed here[23].
On the contrary, the Germans were equipped with wireless systems having different powers and size, suitable to ensure communications also within Divisions. For example, the 'Tactical Instructions for the 12th German Division', protagonist of the quick movement toward Caporetto, stated:

> Among the divisional radiotelegraphic units, the station 316 will be deployed at Ravna within the divisional tactical Headquarters. The large radiotelegraphic equipment will move together with the divisional staff. The 24th Infantry Brigade will receive a medium-size telegraphic device. The 63rd Infantry Regiment will receive a medium-size telegraphic device. The 62nd and the 23rd, a small-size telegraphic device[24].

On the contrary, in the Austrian army, the Corps and Division Commanders did not enjoy the luxury of a radio station. Because of a constant fear of Italian interception and decryption, the Austrians even during the planning of a large movement of their troops, when the front was expected to shift until to the Tagliamento River, continued to rely only on interceptions and to limit radio emissions drastically, hence accepting significant operational limitations.

[20] The entire sentence appeared in Alfred Krauss' report: *Lo sfondamento di Plezzo, settembre - novembre 1917*, Italian version, AUSSME, Series E12, env.127 and in Alfred Krauss' book, *Le cause della nostra disfatta*, Itinere Progetti, Bassano del Grappa, 2014, p. 193. In our text, the word 'radio' was included in brackets before 'telegraphic' as the context made it self-evident.
[21] *ibid.,* Artillery fire had destroyed the Italian telegraphic and telephone lines, or the withdrawing units severed them. The weather, on the other hand, had knocked down the improvised telephone lines to connect German and Austrian units.
[22] F. Fadini, Otto von Below, *op. cit.,* p. 242.
[23] Konrad Krafft von Delmessingen: *1917 Lo sfondamento dell'Isonzo,* Mursia, 1981, p.111, 213, 280.
[24] 12th Infantry Division, *Istruzioni speciali n° 245, Ott.1917*, in HQ, 2nd Army, Intelligence Section, *Notizie sull'avanzata austro- tedesca dall'Isonzo al Piave* (News on the Austro - German move from Isonzo to the Piave river), p.49, AUSSME Series H4, env.28.

The Commission of enquiry on the Battle of Caporetto stated categorically in its report that "even the smaller (enemy) units down to Regiment were equipped with radiotelegraphic devices". The gross mistake probably derived from the belief that the Austrian units were equipped like the German ones, showing the superficiality of the Commission' analysis on radiocommunications[25].

Radio Intelligence Before the Attack

In October, unlike the previous months, some Austro-Hungarian radio stations started transmission activity, but very sparingly. The larger number of radio messages detected by the Italian interception stations on the Isonzo front, from about the middle of the month, together with the presence of several German field radios, was interpreted as the sign of the planned attack[26].

The goniometric stations in Codroipo and Padua pinpointed the enemy transmitting stations "along a line from the sea to the region of Trieste up to northern Langefeld; some more were localised around Tolmino" with a clear distinction between "stations having Austrian or German call signs"[27]. Even if the operating sectors of these stations overlapped slightly, they were in fact part of two separate networks. Over the same period, traffic also increased between coastal radio stations and Austro-Hungarian ships.

Therefore, in mid-October, the Italian listening and radio goniometric stations had already identified three networks, namely the German field network, and the Austrian field and naval networks. These maintained their own distinctive characteristics during the following operational phases, also when the enemy field radio stations began moving. A clear distinction also existed between German and Austro-Hungarian traffic, with a strong predominance of the former, notwithstanding the 1:10 ratio between the two Armies on the Italian fronts.

The cryptograms intercepted by the Italian listening stations were promptly routed to the R Section of the Intelligence Service in Rome, where the only Army Cryptography centre was on duty. On 25 October, the Chief of the Intelligence Service submitted to the Assistant Chief of the General Staff, General Porro, a note with the results obtained by the Cryptographic Unit and the praises for its chief, Major Sacco, recently promoted[28].

The Austro-Germans tried to spread disinformation between 15 October and 8 November by setting up 13 German transmitting stations in the Tyrol area as a diversion. They attempted to 'rebalance' the number of German radio stations along the Isonzo River to let the Italians believe the attack would come from two directions[29]. Ronge believed the transmissions in Tyrol would contribute to spreading fear among the Italian Headquarters of an Austro-German offensive in Trentino at the same time as the attack along the Isonzo, leading Cadorna to strengthen the Italian formations in

[25] Caporetto Commission report, *op. cit*., p. 227.
[26] 3rd Telegraph Engineers Regiment, 1st Radio-goniometric Section, *Stazioni RT campali austro - tedesche* (Austro German RT field stations), Bullettin 4, 3 January 1918, ISCAG, Coll. 249. This 21-page typewritten report was signed by Lieutenant Magni, an officer directly involved in the events. The same Section issued the *Relazione sull'operato della 1a Sezione Radio Goniometrica nella presente guerra*, (Report on the activity of 1st Radio Goniomtric Station in the present war), November 1918, p. 3, ISCAG, Coll. 242, where Lieutenant Giuseppe Dotto wrote, "Before the offensive in October 1917, the goniometric office could pinpoint a concentration of enemy field stations, especially around Tolmino, and follow their movements".
[27] 3rd Telegraph Engineers Regiment, 1st Radio-goniometric Section, *Relazione sull'operato*, *op. cit.,* p. 1.
[28] *Section R logs,* 26 October 1917, AUSSME, Series B1, 101S, Vol. 303d. One can reasonably assume these congratulations addressed the whole activity of the Cryptographic Unit to that date, in addition to some specific successes it had eventually obtained in the days that preceded the Austro-German attack. Sacco had been promoted to the rank of Major in April 1917.
[29] M. Ronge, *Der Radiohorch*, *op cit*., p. 23; O.J. Horak, *Oberst a. D, Andreas Figl*, *op. cit*., p. 149.

this area[30]. However, the moving of seven Infantry brigades to the Tyrol front, avowed by Ronge, cannot be demonstrated on the basis of the available documentation.

The Telephone Dispatch Announcing the Attack

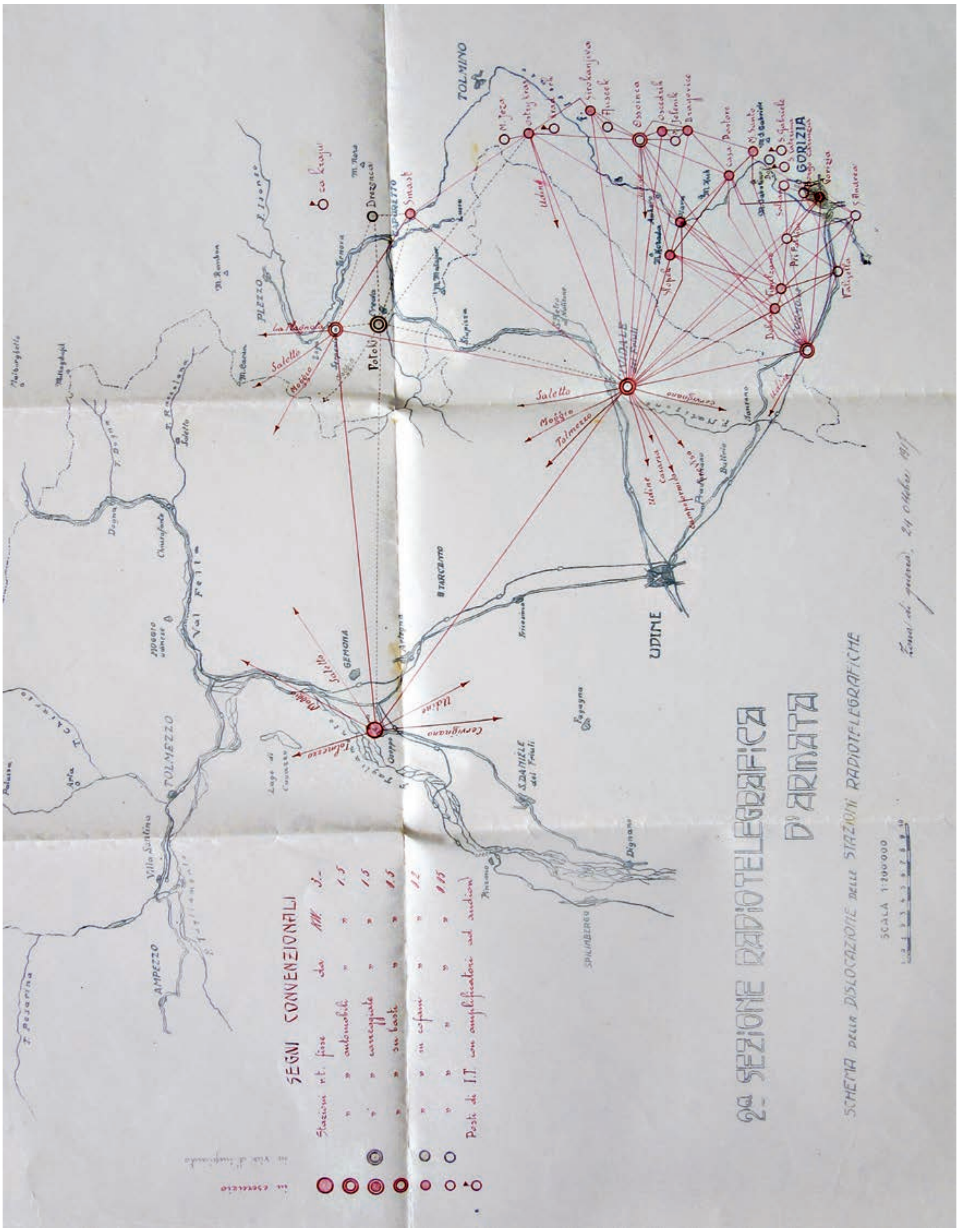
According to the listening stations reports of the 2nd Army, the interception efforts continued through the months of September and October[31]. Ronge acknowledges that during the Austro-German planning for the Twelfth Battle of the Isonzo, "some interesting pieces of information about our planned offensive were collected (from the Italians, A/N) through telephone interception"[32].
Since the end of September, concrete hints demonstrated the preparation of a massive attack by a large force massed around Bovec and Tolmino. Between the 3rd and the 10th October, conversations were heard that announced the presence of German batteries and troops coming from the Western front, and of new Austro-Hungarian contingents previously deployed in Russia or in Trentino. The frequency of conversations including news on the German support, and the talks among German Officers clearly showed how significant the German presence was, also in terms of the size of troops. The Austrian and German units stationing around Plezzo and Tolmino "had just arrived at the front. Perhaps they were unaware of the stringent regulations on telephone communications. They talked thoughtlessly and seamlessly over the phone, to the point that communications from the divisional and Corps' Headquarters were also intercepted"[33].
At 11 am of 23 October, the radio station in Sleme intercepted the orders to attack, issued by the 14th Austro-Hungarian Army. The content of "the telephone message reached all the Italian involved Headquarters about 12 hours before destruction fire" revealing that the gas attack would begin at 02.00 hours during the night between the 23rd and the 24th of October[34].
Without recalling here the debate on information provided to the Supreme Command by the Intelligence Service on the eve of the Battle of Caporetto, it is demonstrated that many Italian telephone intercepting stations provided precise and detailed information on Austro-German planning, from the first days of October until immediately before the attack when the German soldiers exchanged words of encouragement like '*Hurra!*' and '*Deutschland über Alles!*'.

12.3 THE EFFECTS ON THE ITALIAN RADIO COMMUNICATIONS

The Stations Deployment

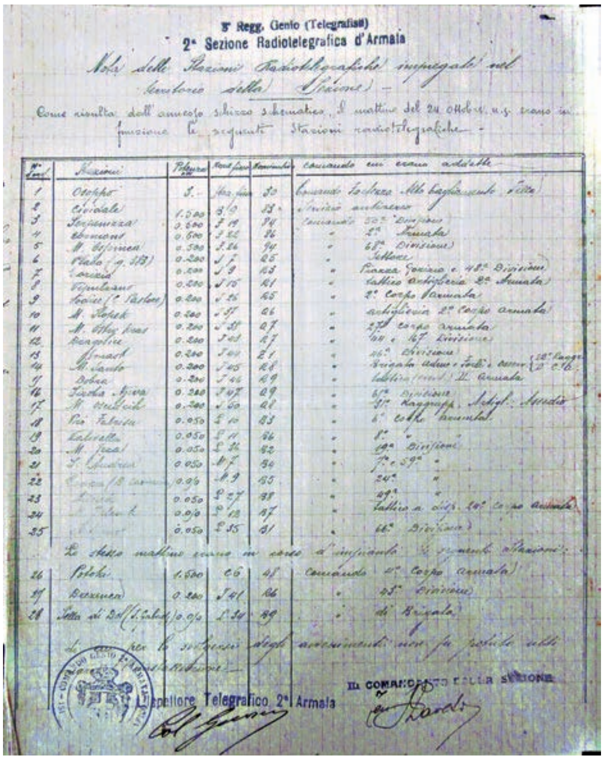
Besides the shortcomings discussed later, the Italian radio stations served almost all divisional Headquarters and, in some cases, Brigade Headquarters and Artillery Groups. The radio network of the 2nd Army, which the 14th Austro-German Army attacked on the night between the 23rd and 24th of October, included 28 field radio stations of different transmitting power, and the fixed

[30] M. Ronge, *Spionaggio, op. cit.,* p. 312.
[31] A. Carletti, *Il servizio della intercettazione, op. cit.,* Year 7, No. 10, December 1936, p. 516 - 524.
[32] M. Ronge, *Les Maitres, op. cit.*, p. 220.
[33] *Ibidem.* Some aspects of planning were also evident, such as the restoration of the bridge in Tolmino, and the availability of new offensive weaponry, such as hand grenades whose power was unknown at the time.
[34] Headquarters, Corps of Engineers of the 8th Army, *Relazione sulle Intercettazioni, op. cit.,* p.13.



12.2a Map of radiotelegraphic stations of the Italian 2nd Army before the attack on 24 October 1917 (ISCAG Archive)

stations located in Osoppo and Gorizia (picture 12.2a)[35].
This last picture as well as the records of the radio-telegraphic Section of the 2nd Army (picture 12.2b) show that the Headquarters of the 7th Corps and its subordinate 62nd and 3rd Divisions did not appear as part of the radio network, since they had relocated shortly before, in the frame of the initiatives aiming to block the Austro-German offensive. Moreover, when the attack began, some stations comprised in the network were still setting up: two of these stations were assigned to the 4th Corps Headquarters, and to the depending 43rd Division Headquarters, which also were transferred only a few days earlier and had to face the enemy offensive without relying on radio communications[36].
In short, there was a significant lack of wireless connections just in the area where the Italian lines had been breached. Out of the three Corps directly involved in the breakthrough (4th, 7th and 27th), the only Headquarters with a functioning radio device was the 27th Corps under the command of General Badoglio. It was equipped with a 200-Watt radio station stored in multiple transportable 'coffers' and could be connected to the depending Divisions or units operating in the adjacent sectors, to the Headquarters, 2nd Army in Cormons, through Cividale del Friuli, and to the Supreme Command in Udine.


3° Regg. Genio (Telegrafisti)
2ª Sezione Radiotelegrafica d'Armata

12.2b List of radiotelegraphic stations of the Italian 2nd Army with indication of the stations being installed on 24 October (ISCAG Archive)

The unavailability of radio stations in many Headquarters of the 2nd Army Corps and Divisions was not considered, until now, a factor behind the scarcity of connections between most significant combat units after the devastating bombing that anticipated the Austro-German attack.

24TH OCTOBER 1917

The report of the Telegraphy Inspectorate of the 2nd Army reads: "no wireless stations of the 4th Corps was active on the 24th October (the equipment at the Headquarters and of one Division was installed but not operational). On the contrary, the stations of the 27th Corps worked throughout 24 October, and some even on the next day. The other radio stations ceased working as soon as their respective Headquarters ordered them to do so"[37].

[35] 2nd Army Inspectorate of STM, *Organizzazione dei servizi di comunicazione della 2a Armata prima dell'offensiva nemica*, (2nd Army Communication Services organization before enemy attack), p. 3 - 4, ISCAG, Coll. 232. The Picture is in AUSSME, Series E1, env.105.
[36] Only the 50th and 46th Divisions of the 4th Corps in Srpenica and Smast were connected to the network, but not to the Headquarters they reported to. The 32nd Reserve Division was also without radio. The other incomplete installation served the Headquarters of two brigades.
[37] Inspectorate for Telegraphic Services, 2nd Army, *Organizzazione, op. cit.,* p. 6.

In fact, the violent bombing brought on early 24 October had no disrupting effects on the greater part of the Army wireless stations. Among those assigned to the 27th Corps, only the station of the 19th Division on Mount Jeza was hit and destroyed, while the Headquarters station stopped working in the afternoon. The 65th Division station in Siroka Njiva remained operational until the morning of 25 October when the telegraphists destroyed all the equipment to avoid enemy capture. Concerning the 4th Corps stations, over the first day of combat, the only active stations installed at Smast and Srpenica assigned to the 46th and 50th Divisions respectively, were also destroyed by their staff. The installation in Potoki assigned to the Corps Headquarters, not yet operational, was "quickly disassembled and sent to the rear, while antennas were abandoned due to the quick turn of events. The Corps Headquarters had already redeployed without issuing orders"[38]. The radio station assigned to the 43rd Division and being installed in Dretzka disappeared without a trace, possibly because the enemy captured it[39].
The other 22 radio stations of the 2nd Army continually worked during 24 October. The statement of the Commission of enquiry on the battle of Caporetto saying that the "scarce radiotelegraphic communications" had been interrupted by the first bombing of enemy artillery was therefore incorrect[40]. On the other hand, Figl dedicated significant portions of his memories to what he believed was odd radio silence on the Italian part throughout 24 October and Ronge, probably relying as in many other cases on the information contained in Figl's *Cryptographic Memories,* recalled the "silence of the Italian radios" on that day and the "spianto" (end of operation activity) of same Italian stations on the next day[41].

Incompetence and Heroism

Based on the memoirs of Colonel Cannoniere, Commander of the Artillery Forces of the 27th Corps and other testimonies, the radio installation assigned to the Corps Headquarters was initially installed on mount Ostrykraz and it followed the Commanding Officer, General Badoglio, as he moved to Kosi on 22 October, lefting a receiver behind[42].
On 24 October, Badoglio redeployed again the Headquarters to the Kambresco Caves - the Headquarters winter location - and then to Liga. Dispatch riders and Officers of subordinate units travelled back and forth in a frantic attempt to get orders from their Headquarters.
According to von Below, the position of the radiotelegraphic station in Kosi and its services for the Headquarters, 27th Corps had been discovered two days before the attack, that is, just after they had moved to Kosi. The artillery units of the 14th Austro-German Army targeted it from the beginning of 24 October, hence forcing the station and the Headquarters it was assigned "to move from location to location". When artillery fire damaged the antenna, the station was promptly repaired and relocated, together with the Headquarters, to preserve them from incoming fire. Found by radio goniometers and targeted again, it "started wandering, was hit again, broadcasting messages about its impossibility to exercise command"[43].

[38] Second Radio-telegraphic Section of the Army, *I movimenti delle Stazioni radiotelegrafiche dal 24 al 31 ottobre,* (RT station displacements from 25 until 31 October), ISCAG, Coll. 235.
[39] *Ibid.*
[40] Commission's report, *op. cit*., p. 224.
[41] M. Ronge, *Der Radiohorch*, *op cit*., p. 23; O.J. Horak, Oberst a. D, Andreas Figl, *op. cit*., p 189 - 192.
[42] Artillery Headquarters, 27th Corps, *Memoria al Comando Artiglieria della II Armata, a firma del Colonnello Cannoniere,* (Memorandum of 2nd Army Artillery Headquarters signed by Colonel Cannoniere) 31 January 1919, AUSSME, Series H4, env.28.
[43] The story that Von Below allegedly told appears in F. Fadini's book *Caporetto, op. cit*., p. 183-184. The incident was confirmed by some other sources mentioned in the book.

There were most likely some exaggerations in the story told by von Below. Given the time required to repair the antenna, redeploy to a new position, and install the equipment and antenna again, no more than two redeployments could have occurred while the station was operational, that is, from Kosi to Kambresco, and then to Liga. As a matter of fact, according to the report of the 2nd radiotelegraphic Section, the station was "abandoned and destroyed at 17.00 after it remained operational until 13.00, although the antenna had been hit repeatedly by grenades. Only the codes and two coffers with devices were salvaged"[44].

In conclusion, it can be inferred that one of the reasons Badoglio 'wandered' in the morning of the 24th would be his attempt to protect the radio station from enemy artillery shells, since it remained the only available means for trying to contact the depending units and the Headquarters, 2nd Army in Cividale.

Considering the events, in the dramatic moments when the front was broken, people may have made serious mistakes, also in radio transmission without, for instance, taking any precautions to prevent enemy localisation and interceptions. However, the story told by von Below proved Badoglio and his staff had little awareness of the risks associated with radio emissions and were completely ignorant about the appropriate countermeasures to avoid the enemy tracking success[45].

Quite perplexing is also Badoglio's testimony before the Commission of enquiry, where he stated he had agreed with the Army Inspector for Telegraphy on 9 October to "install a radiotelegraphic station at every command post of the depending Divisions and at the Corps' new location in Kosi. With more time available, the programme would have been implemented in full"[46].

The Badoglio request really included the implementation of a new station in Kosi, but he had made up for it by moving Mount Ostrykraz's equipment and antenna to that location. The suspicion then arose that the General pretended to demonstrate the absence of a radio station while being in Kosi on 24 October, in the attempt to hide his misadventure.

On the contrary, special mention should be made of the heroic resistance of the Monte Santo station. "Until the last moment - caught in a fierce struggle and under relentless enemy artillery fire - it maintained close connections with the radiotelegraphic stations of other Headquarters, and the artillery observatory of Dragovice. Lastly, it only talked to the stations of the Supreme Command (Udine) and waited for the order to withdraw when all the other radiotelegraphic stations, even those in the deep rear, had already removed"[47]. Once the Supreme Command issued the order, the station ceased operations in the afternoon of 26 October. Its personnel escaped the encirclement bringing the equipment that was destroyed and abandoned later along the way due to the lack of adequate means of transport.

[44] Radio-Telegraphic Section of the 2nd Army, *I movimenti op. cit.,* p.1 - 2. The two coffers obviously contained the transmitting and receiving equipment of the 200W station. In the report there is no indication of the reason for the ultimate station failure.

[45] Apparently, this station transmitted even plaintext messages. Sending encoded, short messages at large intervals of time could have prevented the enemy radio goniometers from pinpointing the position of the sending station, an activity that required some minutes.

[46] Commission of enquiry on the Battle of Caporetto, Excerpt from the Badoglio Report, *Offensiva nemica dell'ottobre e contropreparazione per parte del XXVII Corpo*, (October enemy attack and 27th Corp counter preparation), AUSSME, Series H4, env.65.

[47] Inspectorate General, STM, *Relazione Tecnica sul Servizio radiotelegrafico dell'Esercito, op. cit.,* p. 18, ISCAG, Coll. 242.

12.4 FROM THE ISONZO TO THE PIAVE

The "Spianti" of Italian Radio Stations

Between 25 and 28 October, most of the remaining radio network of the 2nd Army were progressively dismantled. Enemy artillery fire had destroyed only two of those stations, hence confirming their high degree of survivability while the operators dismantled most of the others, including the permanent 3 kW installation in Osoppo, pending the lack of suitable transportation means. The telegraph operators of the 2nd Army units that could retreat orderly, frequently managed to save codes and other confidential documents, but moving portable or coffer-stored equipment to the collection centre in Codroipo had only been possible in a limited number of cases.
The 1.5 KW truck-mounted radio station located in Cormons that served the Army Headquarters was miraculously saved and reactivated in Poscia, near Pordenone, where the Headquarters and the associated radiotelegraphic Section had found temporary shelter before reaching their destination in Este. From 28 October to the end of the month, no other radio station within the 2nd Army operated any transmission.
Ronge described the dramatic situation of Italian radio communications with intense satisfaction: "as soon as a radio station was forced to leave a position, it was required to send a telegram saying 'spianto' (end of operation activity, N/A). Then it transmitted again on the new position further down, trying to establish communication with its Headquarters, but our offensive pushed it back even more […]"[48]
In real terms, in addition to the two mentioned redeployments of the Cormons Station of the 2nd Army mentioned above, all the stations of the 3rd Army, which began their retreat on 27 October, moved orderly toward the Trasimeno, than to the Piave Rivers without transmitting anything along the way. Only the 1.5 kW field stations assigned to the Army Headquarters and to the 13th, 8th, and 23rd Corps, during the ten days required for the redeployment across the Piave River, made little use of radio communications, in fact no more than three times each[49].
To ensure communications among other Headquarters during retreat, the Telegraphic Companies made enormous efforts to adapt the state-owned or private wired networks to the needs of the Army, as described in the reports of the Armies' Telegraphic Service Inspectorates.

Intercepting Italian Radio Dispatches

During the dramatic first days of the battle, General Badoglio was not alone in misusing radio, since other dispatches with requests for backup or statements of powerlessness due to the lack of weapons, ammunition, etc. have been broadcasted and intercepted by the Austro and German stations[50]. During the first attack, then some 'spianto' messages and radio-goniometric detections may have provided useful information on the Italian lines of retreat. Moreover, Ronge mentioned only a successful radio interception by the 10th Austrian army which achieved "an idea of the intentions of Italian Headquarters and of the movements and grouping of troops in Carnia", exploiting this knowledge for operational purposes[51].

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[48] M. Ronge, *Spionaggio*, p. 313.
[49] Third Radio-Telegraphic Section of the Army, *Copia del Diario Storico Militare, dal 26 ottobre 1917 al 28 febbraio 1818* (Copy of military log, 26 October 1917- 28 February 1918), War Zone, 28 February 1918; *Relazione sulla sistemazione delle comunicazioni radiotelegrafiche durante il ripiegamento dal Carso al Piave*, (Report on RT communication arrangement during the retreat from Carso to Piave), ISCAG, Coll. 242.
[50] O.J. Horak, *Oberst a. D, Andreas Figl, op. cit.,* p 191.
[51] M. Ronge, *Der Radiohorch, op. cit.,* p, 26. Allegedly, the 10th Austrian Army became aware of the order issued to the troops deployed along the Upper Tagliamento to retreat from the Forcella - Losco - Medina line and of the situation in the Cadore

No other specific reference to dispatches successfully decrypted during the Twelfth Battle of the Isonzo and the following Italian retreat can be found in the memories of Ronge and Figl, while German sources added some data achieved alo by traffic analysis. General Krafft reports the interpretation of some Italian dispatches starting on 31 October, when the "dismantling of radio stations from Trentino to Cortina d'Ampezzo" announced the retreat of the 4th Army from the Dolomites. It was a clear sign the Italians wanted to "make the Piave River their new line of defence and signalled that the defence of the Tagliamento river - in fact quite vivid here and there - served the only purpose of covering the general withdrawal"[52].
On the 2nd of November, the installation in Pordenone of a radiotelegraphic station assigned to the 3rd Italian Army and the radio messages about the arrival of 100.000 French soldiers "suggested that the enemy (i.e., the Italians, A/N) intended to establish a strong position along the Tagliamento"[53].
On the next day, the Headquarters, the 14th Army received a summary of some dispatches showing that the Italians wanted to maintain their position along the Tagliamento, and northbound, along the Degano Creek, up to the front in Trentino". However, at that time, the information was not anymore up to date, since "no longer consistent with the events"[54].
The afore-mentioned messages suggested different hypotheses about General Cadorna's intentions and demonstrated the difficulty to deduce reliable information from radio interceptions. At times, it also depended on a certain degree of prudence the Italian commands had in using radios to issue operational orders, despite the severe conditions of the retreat.

Communication Issues Within the Austrian Army

During displacement from the Isonzo to the Piave, the Armies of the Central Empires faced considerable difficulties in laying wired connections as quickly as required by the speed of advance and moreover the Italians systematically sabotaged the physical lines, so that in most cases their prompt repair turned out to be almost impossible in occupied territory. While German Divisions coped with this lack by means of radio communications, Ronge himself admitted that the shortage of adequate transportation means within telegraphic units - in fact, a must for establishing timely wire connections - had caused severe shortfalls in communications, which in turn caused "explicit blames by the German Command against the Austro-Hungarian army"[55]. The few Austrian radio stations, whose emissions the Italians had intercepted and pinpointed, were definitely insufficient to provide adequate service. Perhaps some of those stations even violated the orders issued by high commands on the use of radio emissions.
The lack of an efficient telecommunications system in the Austro-Hungarian army was considered the cause of several inconveniences, such that occurred when the German and Austrian divisions "crossed paths", with consequent delays in their movement to reach the bridges over the Tagliamento river, before the Italians could blow them up[56]. Actually, if the 2nd Austro-Hungarian Army moved - or had allowed the Germans to move - southbound, they would have probably crossed the retreat

area around Comelico - Agordino, which may have led to the capture of several Italian prisoners.

[52] K. Krafft, *op. cit.,* p. 233 -.234.
[53] *ibid.*, p.258.
[54] *ibid.*, p. 263.
[55] M. Ronge, *Der Radiohorch, op. cit.,* p. 26.
[56] Christian Ortner, *Caporetto,* International conference on "*Sacro egoismo" o "fellonia senza pari"? Austria e Italia nella Prima guerra mondiale*, ("Sacred selfishness" or "unparalleled felony"? Austria and Italy in the WWI), 27 - 29 May 2015, Österreichisches Historisches Institut, Rome.

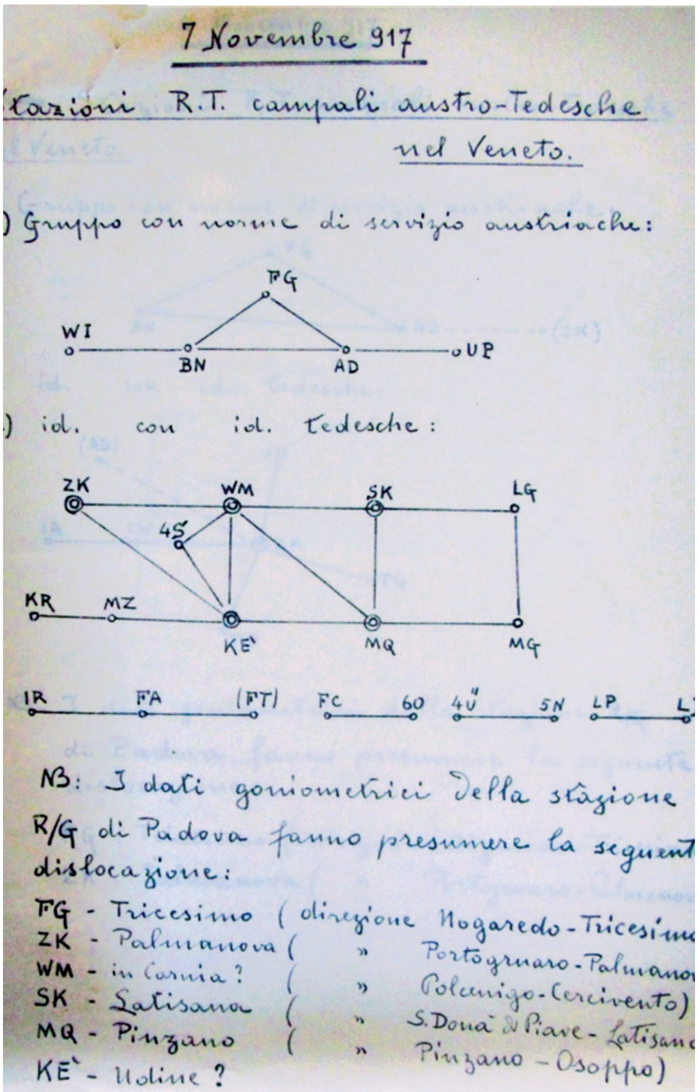
path of the Italian 3rd Army and blocked its way to the Tagliamento, thus dooming it to destruction and inflicting a deathly blow onto the Italian army[57].
General Krafft suggested as a cause for this failed outflanking attempt the scarce flexibility of Austrian Headquarters and the long delay along the Austro-Hungarian communication channels, stating that "their high commands remained far behind and issued orders one after another. Once received, however, those orders were no longer consistent with the situation on the field"[58].
The communications anomalies caused adverse effects also on interception and cryptanalysis efforts, as the Austrian sources admitted delays up to 36 hours in the transmission to the *Penkalas* of the dispatches intercepted by the listening station because, in some cases, telegrams were delivered by hand to the nearest telephone post and relayed to the decryption service only after a long wait[59].
When referring to the planning, a few months later, of the Second Battle of the Piave river, Ronge recognised that "all precautions had been taken to avoid deadlocks to operations, as it had been the case during the Battle of Caporetto", where 'deadlock' probably meant the disruption of communications[60].
However, when the results of the offensive, such as the one that began on 24 October, go beyond all expectations, it is understandable that the problems encountered could be judged as secondary and attributed to intrinsic faults of telecommunications systems, contrary to what had happened after the defeat of the Austro-Hungarians in Gorizia and on the Bainsizza Plateau.

The Fate of the Radio Goniometric Section

During the critical retreat from the Isonzo to the Piave, the interception and localisation activities of the 1st radio-goniometric Section never ceased, except in the three days needed for the "adventurous" transfer from Codroipo to Arcella (Padua), which started on 28 October, and in the few days required to redeploy equipment. In this eventful situation, the telegraphists of the Section "managed to salvage almost all their equipment and those from other telegraphic sections, which had established a temporary detachment in Codroipo"[61].
The Italian Intelligence Service showed strong concerns for the destiny of the radio-goniometric Section when the delivery of intercepted enemy dispatches stopped for some days. On 29 October, the Chief of Section U asked the Inspectorate of STM that "the radiotelegraphic station formerly located in Codroipo - wherever it was - should transmit the intercepted enemy dispatches to Section R by means of the conventional alphabet adopted since last January"[62].
Further evidence of the importance of the job carried out by the Section and the other eavesdropping radio stations lies in the telegram sent to Section U by Chief of the Intelligence Services, Colonel Marchetti who underlined the need to continue and even intensify "the listening activity through the radiotelegraphic stations in Treviso, Verona, Padua, and the station previously located in Codroipo", and invited them to send the intercepted enemy dispatches to Section R by telegraph[63].

[57] K. Krafft, *op. cit.,* p.232 - 237; A. Krauss, *op. cit.,* p.196.
[58] K. Krafft, *op. cit.,* p. 280. Krafft wrote, for example, that if General Boroevic had to be informed on the presence of German units in Latisana - i.e., the destination of the right wing of the 2nd Austrian Army - he would have probably changed his orders (*ibid.*, p. 233).
[59] M. Ronge, *Der Radiohorch, op. cit.,* p. 26. Other issues emerged for organisational reasons, such as the loss of intercepting stations, or the lack of synchronisation between the movement of personnel and equipment.
[60] M. Ronge, *Spionaggio, op.cit.,* p. 342.
[61] 3rd Telegraph Regiment, 1st Direction Finding Section, *Relazione sull'operato, op. cit.* p.3.
[62] Section U, Intelligence Service, *Comunicazione urgente* (Urgent communication), Prot.n. 14006/S, 29 October 1917, ISCAG, Coll. 223.
[63] Section U log, *Copia di telegramma in arrivo del 30 ottobre 1917*, (Copy of telegram arrived on 30 October 1917), *ibid.*

Before the Inspectorate of STM could provide reassurance about the fate of the Section, on the first days of November this resumed its functions, setting up five listening stations around Padua as well as in the following weeks on other parts of the front, together with a network of radio-goniometric stations[64].
It also submitted daily reports to the Situation Office of the Supreme Command to communicate the movement of enemy units together with attached hand-drawn maps of pinpointed stations (an example is shown in picture 12.3)[65]. The same information and the intercepted dispatches were, of course, regularly forwarded to the Cryptographic Unit[66].



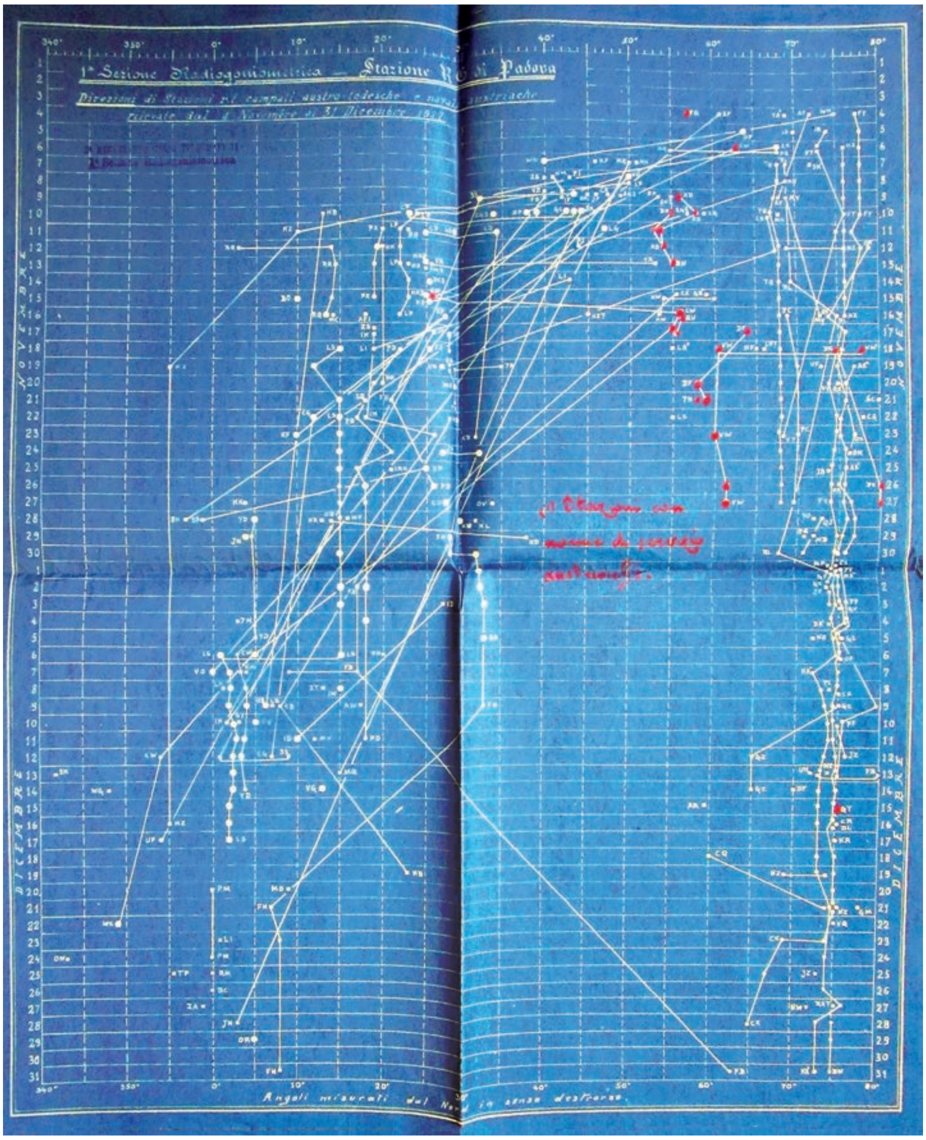
12.3 Example of daily detected radio relations among German and Austro-Hungarian radiotelegraphic stations (ISCAG Archive)

[64] The first listening stations was deployed in Altichiero, Vigodarzere, S. Antonino, Villa Tiziano e Villa Massa, followed by those in Portomaggiore and Parma. The radio-goniometric stations were in Asolo, Portomaggiore and San Niccolò di Trebbia.
[65] The chart in picture 12.3 is taken from a page of the daily report of the 1st Radio-Goniometric Section on 7 November 1917, ISCAG, Coll. 223.
[66] *Section U logs*, November 1917, AUSSME, Series B1, 101D, Vol. 359d.

12.5 THE FIRST BATTLE OF THE PIAVE RIVER

Radio Traffic Analysis

Expecting a possible Austro-German breach on the Monte Grappa, throughout the month of November, the 1st radio-goniometric Section stood ready to redeploy further backwards, from Padua to the Adige river. However, during November and for most of December, it continued to intercept and localize the German and Austrian stations, providing a large amount of interesting material to the Cryptographic Unit in Rome and handy information about the location of enemy units.



12.4 Movements of the German and Austro-Hungarian radiotelegraphic stations detected by the radio goniometric station in Padua from 4 November to 21 December 1917 (ISCAG Archive)

The analysis of traffic confirmed a persistent imbalance between the German and Austrian networks due to the larger number of the German stations and to the different approaches of the two Armies in radio usage. Only the Austrian navy relied on frequent radio transmissions, in some circumstances[67]. In November, the stations of the Section intercepted an average of 23 dispatches per day with a maximum of 40, with a ratio between dispatches originating from the German and Austro-Hungarian networks larger than 4 to 1.

It is well known that two or more radio-goniometric stations working in parallel can locate enemy transmitters, relying on direction of emissions found by each station which nevertheless could report its results in worksheets like the one drafted by the Asolo station and shown in picture 12.4 where the almost illegible red dots around the centre indicate the “stations with Austrian service standards”[68].

The Austrian field stations, after a moderate activity in November, transmitted only on some rare occasions during the first half of following month. On the contrary, the German field radio traffic was still intense until the middle of December, when it started to gradually disappear, confirming the belief that the German divisions were moving from the Italian to the Western front[69]. Conversely, the radio silence among the Austro-Hungarian ranks was ascribed to the “reduction in service provided by field stations since all communications between higher commands were relayed by wire”. However, the naval stations along the coast. from the Falconera port near Caorle, to the bay of Panzano in the Gulf of Trieste, remained still active[70].

Austrian and German Codes

The report drafted by Section R of the Intelligence Service and sent to the Allies in May 1918, described some Austrian codes “used after November 1917”[71]. In spite of the scarcity of available intercepted material, the Cryptographic Unit broke, as already mentioned, at least seven codes employed by the Austrian army until April of the following year. One significant pieces of information in that document concerned “two codes used at the Piave front in November 1917, namely the *Stern* for service communications and the *CW code* for military messages”.

The same report included the coding and decoding parts of the *Stern*, together with a sample of a decrypted Austro-Hungarian cryptogram both shown in Annex B (pictures B.3 and B.4). The Italians nicknamed *Stern* (German for “star”) after the the separator between words in the encrypted dispatches[72]. Very similar to the *Stern* was the *Tunis* code used in Bessarabia, which only differs from the former for the 5-letter codewords. The word ‘tunis’ had the same function as ‘stern’ in the previous code.

The codes that the Italians labelled as *CW* and *Carnia*, each having 1,000 entries, were probably adopted from October/November 1917, when the Austro-Hungarians also “switched to the codes”[73]. David Kahn, making this statement, obviously referred to service and field codes, since

[67] 3rd Telegraph Operators Regiment, 1st Radio-Goniometric Section, *Bollettino N° 4, op. cit.* p.2.

[68] The picture shows that the Austrian stations, unlike the German’s, only seemed active in exceptional circumstances, that is, immediately before and after the most significant attack actions between 9 and 27 November.

[69] 3rd Telegraph Operators Regiment, 1st Radio-Goniometric Section, *Bollettino N° 4, op. cit.,* p. 4 - 21.

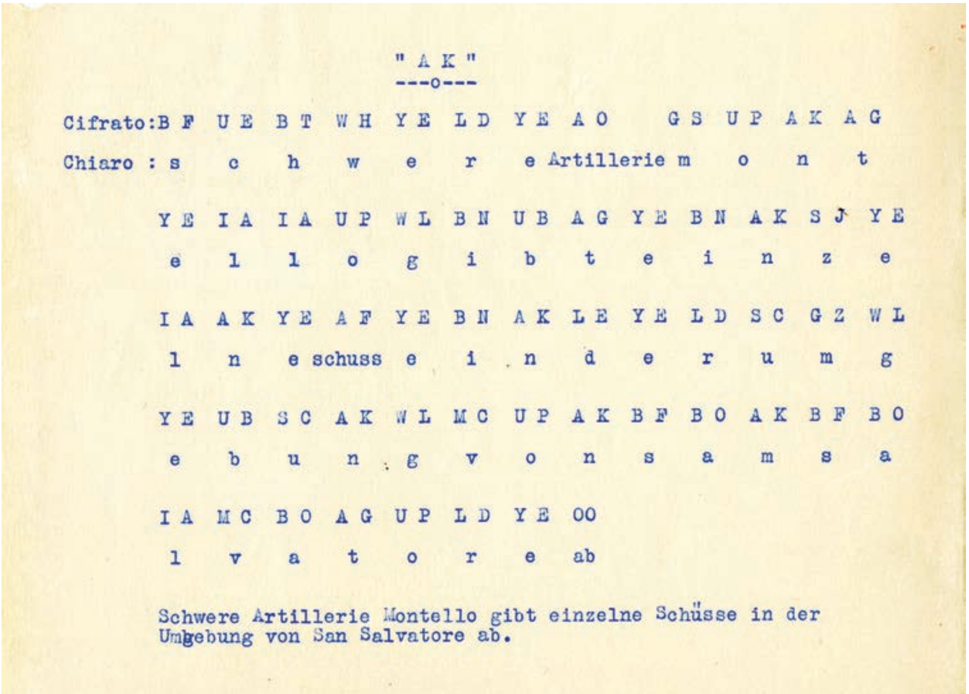
[70] *ibid.* p. 21.

[71] General Headquarters, Intelligence Service, Section R, *Notes on radio Telegraphy, op. cit.*

[72] The code groups of the Stern known to the Cryptographic Unit correspond to 84 one-letter, two-letter, or three-letter plaintext groups and include pronounceable five-letter words, from “adele” to “wirth”, or two digits between 15 and 99. In the latter case, a third digit often precedes these two.

[73] D. Kahn, *op. cit.,* p. 319.

the Austrian navy, other Army Headquarters, and diplomacy had been relying on several different codes, including large ones, from before the war.
The few disparches using the *Carnia* code a one-part book which comprised a thousand groups from 000 to 999, had been decrypted in full. A list of about 100 entries is included in Annex B, together with one of the two radiograms attached to the document drafted by Section R (pictures B.5 and B.6).
The *CW* code used only in November 1917 had yet not been completely broken.
The *AK* and probably *SH* codes described in the previous chapters remained in use also during the Italian resistance along the Piave front: in fact, a decrypted telegram protected by the *AK* code (picture 12.5) reads, "the (Italian, A/N) heavy artillery of Montello fires single shots against the San Salvatore area"[74].


"A K"
---o---

Cifrato:B F U E B T W H Y E L D Y E A O G S U P A K A G
Chiaro : s c h w e r e Artillerie m o n t

Y E I A I A U P W L B N U B A G Y E B N A K S J Y E
e l l o g i b t e i n z e

I A A K Y E A F Y E B N A K L E Y E L D S C G Z W L
l n e schuss e i n d e r u m g

Y E U B S C A K W L M C U P A K B F B O A K B F B O
e b u n g v o n s a m s a

I A M C B O A G U P L D Y E OO
l v a t o r e ab

Schwere Artillerie Montello gibt einzelne Schüsse in der
Umgebung von San Salvatore ab.

12.5 Austro-Hungarian radiogram decrypted at the Piave front (courtesy: Flavia Reed Owen Special Collections & Archives, McGraw-Page Library, Randolph-Macon College, Ashland, Virginia)

In addition to those codes, the 5-letter service abbreviation list known as *ignaz* - several entries of which the Italians already knew - was used for communications among Austrian radio stations up to the following year.
The previous examples show that the simplicity of some ciphering systems used by radio stations and Austro-Hungarian combat units was almost bewildering!
Finally, in response to the questions posed by the Allies about the general characteristics of Austro-Hungarian ciphers, Sacco and his staff stressed that the same codes had been used for a long time, whereas the keys were changed frequently, even daily, though only for some of them.
In October and November of 1917, even the Germans used, on the Italian front, primarily three-letter and sometimes two-letter codes, likely analogous to *trench codes* that they had exploited

[74] The San Salvatore Castle in Susegana, on the left side of the Piave, was heavily bombarded by the Italians.

across the Western front since early 1917. The simple tables known as *Befehstafel* (command tables) - with two-letters code groups as the Austrian *AK* - were not very arduous to interpret and remained in service in the lower units of the German army until February 1918.
In some passages of his notes, Lieutenant Magni showed knowledge about the orders radioed from German stations. It seems, therefore, possible that he had decrypted some dispatches with the help of the analysts sent from Rome in early December.

The Italian Cryptographic Decentralization

Through the redeployment from the Isonzo to the Piave no important documents about interception and cryptanalysis activities by the Italians fell into Austrian hands. In fact, the radio-goniometric Section had removed the most important documents when it left Codroipo and destroyed the others. Moreover, radio-goniometric, and cryptographic tasks have not been still assigned to the Armies' Intelligence Offices.
A Cryptographic Services within the Armies will be established in early 1918, while the decentralisation of cryptanalysis had already occurred at the beginning of December of the previous year, as stated in the report of the 1st radio-goniometric Section: "the Intelligence Service established a 'Cryptographic Detachment' within the Section to decrypt the telegrams we have intercepted"[75].
Moreover, an entry dated 2 December in the Logs of Section U revealed that the Cryptographic Unit dispatched Lieutenant Franzot to the 1st radio-goniometric Section to "immediately decrypt the intercepted radio telegrams", adding that "the Section would make available to him all the intercepted radio telegrams, in addition to forwarding them to Section R"[76].
After the decentralisation, telegrams of the enemy field stations using codes already broken, could be decrypted upon interception, and directly sent to the Headquarters deployed on the front, reducing not only the time required for the entire managing process of intercepted telegrams, but also the workload on the overburdened Unit in Rome. It is worth to notice that the decision to decentralise the cryptologic activities was taken during the First Battle of Piave River due to the increasing number of German and Austrian cryptographic material achieved on the front in November 1917.
Of course, this partial decentralisation, and mostly the widened spread of cryptologic activity in the spring of following year, required a stronger commitment by Major Sacco in establishing new operating units and in setting up a group of analysts who could work on their own, in order to quickly decrypt the enemy field dispatches and even to cooperate with the Cryptologic Unit for solving new enemy codes and ciphers.

Changes to the Italian Codes and Ciphres

The number of coding and decoding tables of the *Special Code* available to the units of the 2nd Army at the end of August 1917 was around a few hundred[77]. Some of them were lost and captured by the enemy or burned during the Caporetto battle or the retreat, as demonstrated by

[75] 3rd Telegraph Operators Regiment, 1st Radio-Goniometric Section, *Relazione sull'operato, op. cit.,* p.3.
[76] *Section U logs,* December 1917, AUSSME, Series B1, 101D Vol. 359d. Lieutenant Franzot returned to the Cryptographic Unit in Rome on 15 March 1918, and Lieutenant Franchini replaced him (*Section R Logs* AUSSME, Series B1, 101S).
[77] Intelligence Office, Section U, Letter 1022 P, 18 January 1918, AUSSME, Series F4, env.260.

many communications such those coming from the Headquarters, 4th Corps[78], or by the Medical Directorate of the 8th Corps which admitted to have lost “the *Red code* containing the old encoding and decoding tables and the *Pocket Military Cipher*”[79]. As a consequence, new tables were quickly issued and distributed between 5 and 8 October to replace the old ones.

The Austrian sources nicknamed the new tables as *Special Red Code II*, following the *Special Red Code I* with simple group swap and addition key, which they had easily broken in June[80], while the encoding/decoding tables issued in August were not included in their numbering, confirming the lack of knowledge about those tables.

Breaking the second version of the tables required great efforts and unspecified time which, with a safe guess, could be estimated around two weeks[81]. In this respect, Figl described the method used to rebuild the tables at length, without making any mention of the quite probable availability of the previous version captured during the battle, which made the breaking task more straightforward, since the new version of tables could not be very different from the previous one, due to the minimal time available to generate them.

Ronge stated that the three *Penkalas* deployed in Udine, San Vito al Tagliamento, and Vittorio Veneto worked in parallel coordinated by Figl and faced strong difficulties in breaking the new tables. Conversely, in describing the method used to unveil the secrete of the tables, Figl alluded only to his own work and affirmed his visit to *Penkalas* was only to teach them on how to use the broken tables[82].

During the time required to cracking the code no Italian dispatch encoded with the *Special code* could have been decrypted, as happened in the previous two months[83].

Similar reasons led to replacing the *Service Cipher* after redeployment. On 2 November, the Chief Inspector of the STM ordered the radio stations to replace the *C2* and *C4* ciphers with the *CFbis* because he believed “that the radiotelegraphic station of the 2nd Army in Drezenka, equipped with a copy of the *C2*, had fallen in enemy hands, and that a 0.5 kW station of the 3rd Army had lost a copy of the *C4*”[84]. Therefore, no evidence supports Ronge’s statement that the reason for replacing the ciphers was the “stronger attention of Italians to enemy decryption”[85].

In his memoirs, Andreas Figl highlighted the difficulties in grasping the structure of the new cipher because a daily changing over-encoding caused serious issues. From the scarce information available, it seems this method made the Austrian understanding of the dispatches meaning neither quick nor complete. “With the new *CFbis* cipher”, Figl said, “they put an end to the previous 1-part, fine-looking, predictable systems as the CII (*C1*) and C IV (*C2*)”[86]. Once again, the evaluation of Ronge - who believed the Italians were “wasting time” replacing their ciphers - was incorrect.

[78] Intelligence Office, Section U, *Lettera all’Ufficio Coordinamento e Mobilitazione* (Letter from Coordination and Mobilization Office), *2 novembre 1917,* AUSSME, Series F4, env.260.

[79] *Section U logss, op cit*., *4 novembre 1917*, AUSSME, Series B1,101D Vol. 349d.

[80] M. Ronge, *Der Radiohorch*, *op cit.,* p. 52.

[81] O.J. Horak, *Oberst a. D. Andreas Figl, op. cit.,* p.193 -194. Figl’s departure on 24 November probably coincided with the end of the process.

[82] *ibid.*, p. 23.

[83] O.J. Horak, *Oberst a. D, Andreas Figl, op. cit.,* p. 193. The method Figl affirms to have used could rise raise some doubts, especially when he mentioned as the ‘hint’ to start codebreaking, the correspondence between row numbers 00 to 35, i.e, the original row in the Red Code and the corresponding encoding, respectively.

[84] Inspectorate General of the STM, *Diario storico,* 1 November 1917, AUSSME, Series B1, 105 S, Vol. 90.

[85] M. Ronge, *Der Radiohorch*, *op cit.,* p. 23.

[86] O.J. Horak, *Oberst a. D, Andreas Figl, op. cit.,* p. 193.

Probably, the artifices making the *CFbis* so difficult to break originated from the study carried out by the Cryptographic Unit on the Service Ciphers in September 1917[87].

In conclusion, during most of November 1917 including the critical moments of the First Battle of Piave river, the Austrian cryptanalysis suffered a temporary black out concerning the most widespread Italian codes, namely the *Special* and *CFbis,* with evident consequences on the flow of information from the *Penkalas* to their Headquarters. Whereupon, in the last days of November, about at the end of the First Battle of Piave river, the Italians had almost completed their telephone and telegraphic wire networks and the Austrians could not expect to extract many useful operational information from radio interceptions.

12.6 THE COMMISSION OF ENQUIRY

The 'Source' of the Commission

The harsh judgement on the Italian cryptology expressed by the the Commission of enquiry on Caporetto and mentioned in Chapter 1 above, finds no basis in the interviews carried out because the Commission did not ask any specific question on Communication Intelligence to the numerous witnesses or to any captured Austro-Hungarian Officer.

As far as it has been possible to ascertain so far, the only source available to the Commission about the cryptographic activities during the war would be the letter sent by O. Marchetti to the General Staff of the Ministry of War on 14 March 1919[88]. The proof the Commission owned that letter, or at least parts of it, is the quotation in the final report of almost an entire sentence concerning the radio-goniometric detection of the Italian army withdrawal paths after Caporetto. The Commission, however, avoided quoting the paragraph that followed, where Marchetti specified the Italians radio-goniometric service performed better than the Austro-Hungarians' one.

The most relevant information contained in the letter was only taken from "recent disclosures made by Officers who served in the cryptographic branches of the disbanded Austro-Hungarian army" and outlined, during their interrogations, "the huge advantages that knowledge of the (Italian, N/A) cryptographic secrets had brought to the Austrian General Staff".

Obviously that document - a mere 5-page letter - could not deal with the details of the activities carried out by the cryptographic units of the Austro-Hungarian and of the Italian armies during the war. Nor did it contain a specific reference to the events occurred in the last months of 1917, or to the situation of Italian cryptology when the paper was drafted in 1919, as it would seem more appropriate given its purpose. Briefly, the author reported what some imprisoned Austrian analysts stated, without dealing with the evolution of military codes on either side of the front or the development of the Italian cryptologic skills which became more evident in the last part of the war, as described in the next chapters.

In this respect, Marchetti mentioned some codes the Austro-Hungarians Officers claimed that they had not solved, such as the *D code* and the *SI code*, conceived in 1917, as well as the regimental *R* and the inter-allied code - *I.A.* for short, which he mistakenly called *L.A.* - that were adopted in 1918[89]. By limiting the list only to what the Austrian Officers revealed, Marchetti neglected to

[87] *Section R logs*, *op. cit., Studio sul Cifrario RT* (Study on RT Cipher)*,* 29 September 1917, AUSSME, Series B1, 101S, Vol. 300d.

[88] Intelligence Service, *Attività dei Reparti crittografici op. cit*.

[89] It is worth to mention that the Commission used the expression "almost all", in referring to the codes and ciphers known to the Austrians, most probably considering only the four codes Marchetti said the Austrians did not break during the conflict.

enumerate other significant codes and ciphers dealt with in following pages. Moreover, he barely mentioned the activities and the successes of the Italian Cryptographic Unit, just explaining that the methods used by Austro-Hungarian and Italian cryptanalysts were almost identical.
It may also be newsworthy to report the reasons that led O. Marchetti - the Head of the Italian Army Intelligence Service - to draft this letter, where he emphasized the statements of some Austrian Officials for urging the Ministry of War "to take immediate measures to protect cryptographic secrecy and to reorganise that special service" in a post war period when the importance of military cryptography was probably underestimated. The statement that "the aforementioned information is significant [...] in the light of current dangers that must be addressed as quickly as possible" confirms the above purpose[90]. In fact, the Kingdom of Serbians, Croats, and Slovenians - which later became the Kingdom of Yugoslavia - born from the ashes of the Austro-Hungarian Empire, had inherited a part of the *Penkalas* of the Austrian army. Keeping the guard up by avoiding the reduction of personnel or even the disbandment of a Cryptographic Unit was a must.
Most probably, Marchetti himself could not have expected that his letter would end up in the hands of the Commission of enquiry, and perhaps for this very reason, he vehemently attacked the judgment of the Commission in his book arguing that:

> through radio-goniometric detection, the enemy could pinpoint our stations and make assumptions on the location of our higher echelons. However, we did or were able to do the same, just as we knew some of the enemy ciphers and found, or could extract their variable keys, in the same way as we obtained information from the radiotelegraphic interceptions, we had been familiar with for a long time. It was not perfection, not at all; but we were not in that terrible state of inferiority that the Commission of enquiry suggested[91].

Remarks on the Report of the Commission

After describing the difficulties of the Austrian interception and cryptanalysis service during the advance from the Isonzo to the Piave, any comments on the kind words the Commission spent on the "excellent enemy services" would seem useless. The same could be said about the even less rational and unbalanced note attached to those words, even if some remarks seem appropriate in this respect.
With reference to radio-goniometry and traffic analysis, it is undeniable that they helped the Austro-Germans collect information about the movements of the Italian Headquarters. However, based on the information regarding the activities of the 1st radio-goniometric Section during the redeployment and the First Battle of the Piave river, it is reasonable to recognise at least comparable capabilities on both sides of the front. Moreover, under those circumstances, the Austro-Germans had the possibility to make fewer detection attempts than the Italians, as these last suffered the problematic conditions of the withdrawal imposing limitations on the use of wireless communications and relied, as far as possible, on the landlines available in the crossed areas.
Regarding the security of Italian radio-communications until the end of November 1917, when the Italians returned to wires:

[90] Intelligence Service, *Attività dei Reparti crittografici op. cit.,* p. 2.
[91] O. Marchetti, *op. cit*., p.182.

– The coding/decoding tables of the *Special Code* for Higher Echelons was only broken in the last ten days of November;
– Radio-communications seldom relied on the *Pocket Military Cipher*. To this end, some subordinate units already utilised the first version of the *D code*;
– In early November 1917, the *CFbis service cipher* - which the Austrian analysts had significant trouble managing - replaced the *C2* and *C4* that the Austrians knew well, causing their decrypting blackout that lasted about 20 days.

In short, in the timeframe considered, the Austrians had only partial knowledge of the Italian cryptographic systems. In practical terms, it is likely that the decrypting of some dispatches achieved by the *Penkalas* of the 14th Austro-German Army during the shift of the front, succeeded because some Italian stations were still using *C2* and *C4*, which remained active until the first days of November.

In conclusion, it seems demonstrated that the entire approach of the Commission showed approximation and poor situational awareness about radio Intelligence on both sides, especially during the critical period of late 1917.

12.7 A DISCONCERTING REVELATION FOR THE AUSTRO-HUNGARIAN HEADQUARTERS

The Plunder of Caporetto

In moving across the front and beyond, the Austrians recovered several documents attesting the telephone listening activities of the Italian telephone interception service. Ronge himself recognised that:

> unfortunately, only in the fall of 1917, we learned that the Italians had utilized a large amount of listening stations since 1916. In less than six months, in the area between Wippach (Vippacco) and Mount Rombon, they had listened to about 5.200 radio dispatches by exploiting a large amount of our deserters and fugitives who knew Italian[92].

The number of intercepted telephone dispatches mentioned by Ronge almost coincided with the number in the upper part of picture 12.6 showing the translation of an Austrian Intelligence Service document captured in July 1918. The picture refers to the activities carried out by the I.T. service between September 1916 and February 1917 on the front of the 2nd and 3rd Armies. The total number of intercepted phonograms and conversations reached about 10,000, with a daily average of around 60.

The first comment in this respect concerns the period of the eavesdropping, which shows how intense the work of the I.T. Service had been from 1916, when the number of intercepting stations was lower than in October 1917. Moreover, Aurio Carletti, commenting the Austrian document, pointed out that:

> this statistical data must come from documents fallen into the hands of the enemy, which can only consist of daily interception reports issued by the Headquarters of the Armies. If we

[92] M. Ronge, *Spionaggio, op. cit.*, p.227.

TAV. V

COMANDO 4/A. ARMATA

UFFICIO INFORMAZIONI

Sezione Interrogatori e Documenti

(Traduzione)

N° 4231 di prot.I.

11 Luglio 1918

SCHIZZO DIMOSTRATIVO DIFFUSO NELL' ESERCITO OPERANTE AUSTRO-UNGARICO PER AMMONIRE COMANDI E TRUPPE SUL PERICOLO DELLE INDISCREZIONI TELEFONICHE

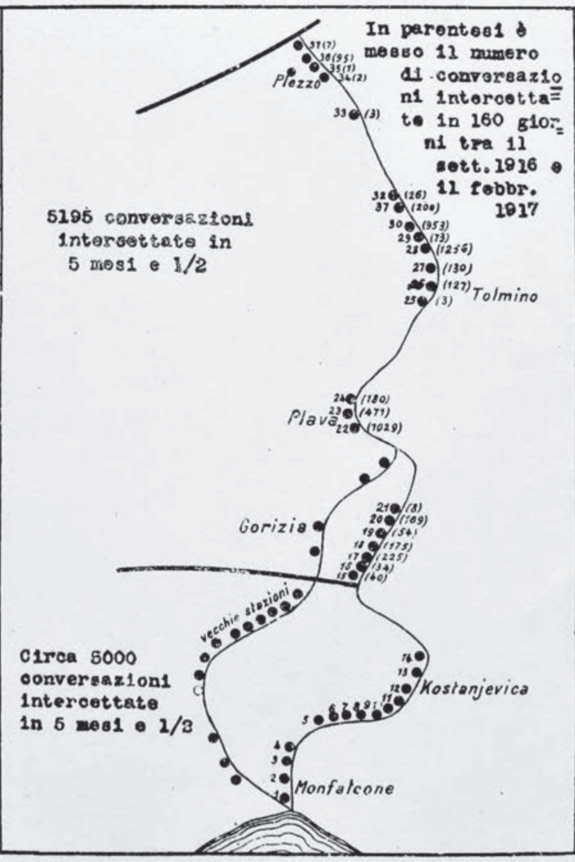
Da distribuire fino alle primissime linee .

QUELLO CHE GLI ITALIANI HANNO SORPRESO

DELLE NOSTRE CONVERSAZIONI TELEFONICHE

Circa 10.000 conversazioni telefoniche sono state intercettate in soli 160 giorni ossia cinque mesi e mezzo da 38 stazioni nemiche.
(risulta da documenti catturati)

1	Off.d'Adria	20	Castagnevizza
2	Mandria	21	Sacro Cuore
3	P.Trig. 121	22	Zagora
4	Q.208	23	Plava
5	P Trig.208	24	Globna
6	Nuova Villa	25	Hrad vrh
7	Lukatic	26	Woltschach
8	Boscomalo	27	Gabrije
9	Korite	28	Vodil vrh
10	Kostanjevica	29	Mrzli vrh
11	Lokvica	30	Sleme
12	Pt.363	31	Rodeci rob
13	Pecinka	32	Krn
14	Fajti	33	Slatenik
15	Merna	34	Vrzelinom
16	Vertojbica	35	Pendici Rombon
17	Vertojba inf.	36	Cukla
18	Vertojba sup.	37	Rombon
19	Tivoli		



Quanto sangue avranno costato le imprudenze di quelli che parlavano per telefono .
Ora gli italiani dispongono di stazioni ancora più numerose ed assai perfezionate .

12.6 Translation of a document drafted by the Austro-Hungarian Intelligence Service and seized by the Italians (ISCAG Archive)

> consider that the information in those reports was only a small portion of those intercepted, we can have an idea of the considerable number of phonograms we collected[93].

The number of interceptions could be even larger if one considers the conditions of a large part of these bulletins when the Austrian Intelligence Service found them because, as Ronge stated, many had been partially or totally burned, and some others had been submerged in water to make them unreadable.
It seems the Austrians became fully aware of the quantitative and qualitative importance of Italian interceptions only when they recovered the above-mentioned documents. It is surprising to note that until November 1917, despite the 'permeability' of the front mainly due to the information obtained from interrogations of prisoners and deserters, the Italians were able to keep a partial secret on their initiatives in this sector.
The merit of creating this secrecy curtain is largely due to the telegraphists and interpreters of the Telephone interception Service. In this regard, the head of the *I.T.O. Office* (Intelligence Office) of the 1st Army stated, "the entire staff is subject to strict discipline, [...] that makes keeping secrets a habit. And never ever - this is the greatest pride that always moved me - has any of those humble men ever betrayed his duty of office throughout the war"[94].

Austrian Attempts to Stop the Information Flow

The interrogation of prisoners and several captured documents showed that the Austro-Hungarian Headquarters were aware the Italians intercepting capability of their telephone communication nearly from the beginning of the war. For instance, some documents captured by the Italians contained information achieved by Austro-Hungarians through interrogation of prisoners about "a practical telephone and radio interception courses held in Vicenza and attended by Officers." The same sources referred to successful Italian telephone eavesdropping activities "in spite of all the orders we had issued"[95].
These pieces of information, together with others, confirmed the countermeasures the Austro-Hungarian Headquarters repeatedly ordered to assume, using for instance conventional codes and languages of the Empire other than German[96]. However, the documents captured by the Italians also seem demonstrate the view of the Austrian Headquarters ascribing to the correct procedures in telephone installation and maintenance an efficacy at least comparable with the protection of content of the dispatches.
Instead, the security of message contents should enjoy larger care than that of communication links, especially on the front, where the minimum technical requirements concerning the telephone circuits electrical isolation, balance, etc. achieved in normal circumstances could not be granted always.
We do not know how many intercepted telephone communications, out of 10,000 mentioned in the document in picture 12.6, had been encoded. However, from the results of the Italian interceptions we can infer that a large part of them was in clear words or protected by a simple concealed language, so that the Italian note accompanying the above-mentioned document can assert: "since the enemy

[93] A. Carletti, *Il Servizio delle intercettazioni telefoniche, op. cit.,* p. 23.
[94] C. Pettorelli Lalatta, *op. cit.*, p.137.
[95] Information Office, Headquarters 2nd Army, *Traduzione di documenti di comandi nemici riguardanti il pericolo delle intercettazioni telefoniche* (Translation of enemy Headquarters documents concerning Telephone interception dangers), Bulletin no. 2268, 16 September 1917. The Austrian HQ, 62nd Infantry Division issued this document on 15 August 1916.
[96] *ibid.*

(the Austrian A/N) disregarded the precautions dictated by its Headquarters, we could recover a huge amount of enemy communications, many of which were sometimes very significant"[97].
Among the causes for the high number of communications that the Italians had intercepted and interpreted, we cannot exclude a certain Austrian assumption of technological superiority over them, indeed a trait of the Austro-Hungarian army, especially among the highest ranks.
Of course, the Austrians were engaged in listening activities as well. Once the Italian Headquarters realised, since June 1916, that the Austrians persisted in their interception efforts "in some regions (i.e., Carnia and Isonzo), despite a two-wire telephone network had been laid in the forward area", they established additional technical requirements. Moreover, they ordered "to always use a concealed or encoded language for confidential telephone dispatch transmission" and added, as a conclusion that "all things considered, one should *never rely on the secrecy of telephone communications"* (this sentence was written in boldface and with a bigger font, A/N)[98]. Similar orders were reaffirmed during 1917, especially after events showing that the enemy had exploited their interception activities[99].
Nevertheless, in many circumstances the regulations on the secrecy of telephone communications issued by the Italian Headquarters have not been fulfilled, as happened among the Austrian troops.

[97] *Ibid.*
[98] Inspectorate General of the STM, *Diario storico, Circolare ai Comandi del Genio d'Armata. op. cit.,* p.3.
[99] War Operations and Situation Office, Telegram no.5984 copied in the phonogram of General Etna to the 15th and 51st Divisions on 31 March 1917.

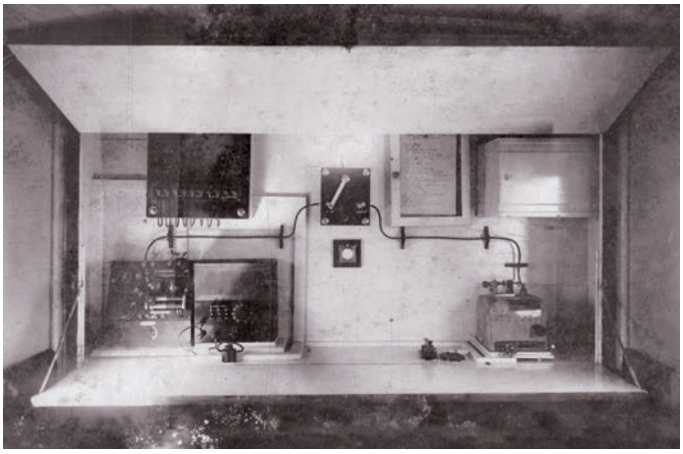
CHAPTER THIRTEEN

A Balance of Forces

13.1 SPREADING OF RADIO AND CRYPTOLOGY IN THE ITALIAN ARMY

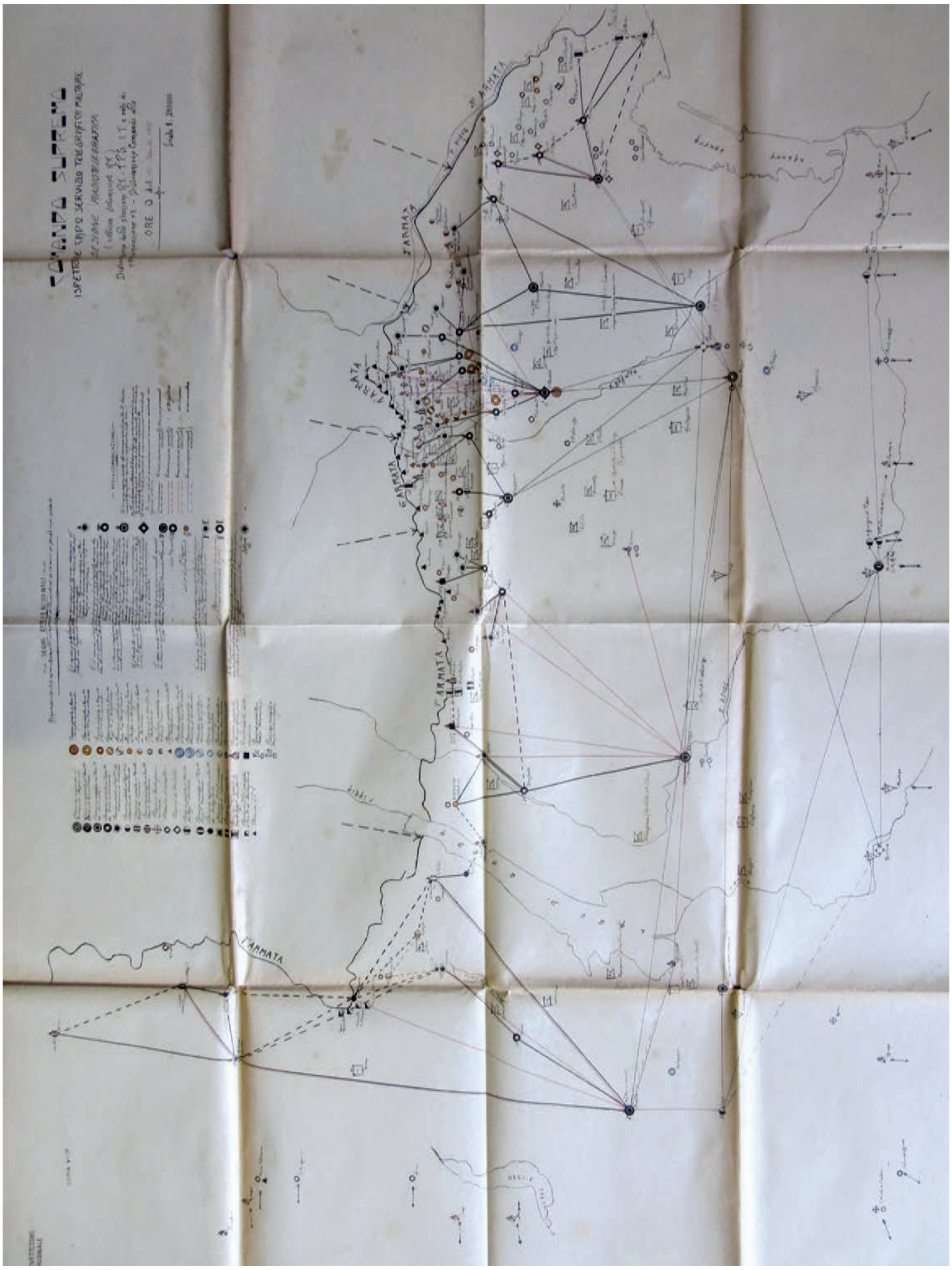
Radio Services Diffusion

The radio systems available to the Italian Army in early 1918 allowed connections between higher echelons and minor units at the front, aeronautical communications, anti-aircraft services, data transmission for artillery, broadcasting of war bulletins and of meteorological data, etc[1].
The location of stations dedicated to those different activities across the front were shown in maps like that included in picture 13.1 which also encompass telephone interception stations and geo-telegraphy systems. The number of radio equipment in the field was growing at a fast rate, despite the reduction in the size of the combat front compared to the period prior to October 1917, also depending on the urgent requests for new connections coming from combat units. The limitation to a further spread of radio devices stemmed from the restricted production capacity of the manufacturers so that, to cope with the scarcity of supplies, the Army tried to increase its own production by establishing the Electro-technical and Radiotelegraphic Construction Workshop in Rome, during 1917[2]. Nevertheless, the supply of telecommunications equipment continued to be unsatisfactory until the end of the conflict.
Radio communications devices were in high demand within the Divisions, as the war increasingly demonstrated the fragility of other means.
Indeed, the Brigade Headquarters had received some ‘trench stations’ since the beginning of the year, but the distribution to all Brigades was not completed before the end of the conflict also because the difficulties of extending adequate training to a large amount of operators.
For instance, in the early months of 1918, the Marconi Wireless Company received an order for a considerable number of 100 W continuous wave transceivers, but the supply pace of these equipment - required also to link the airfields with their Headquarters (picture 13.2) - turned to be rather slow[3].



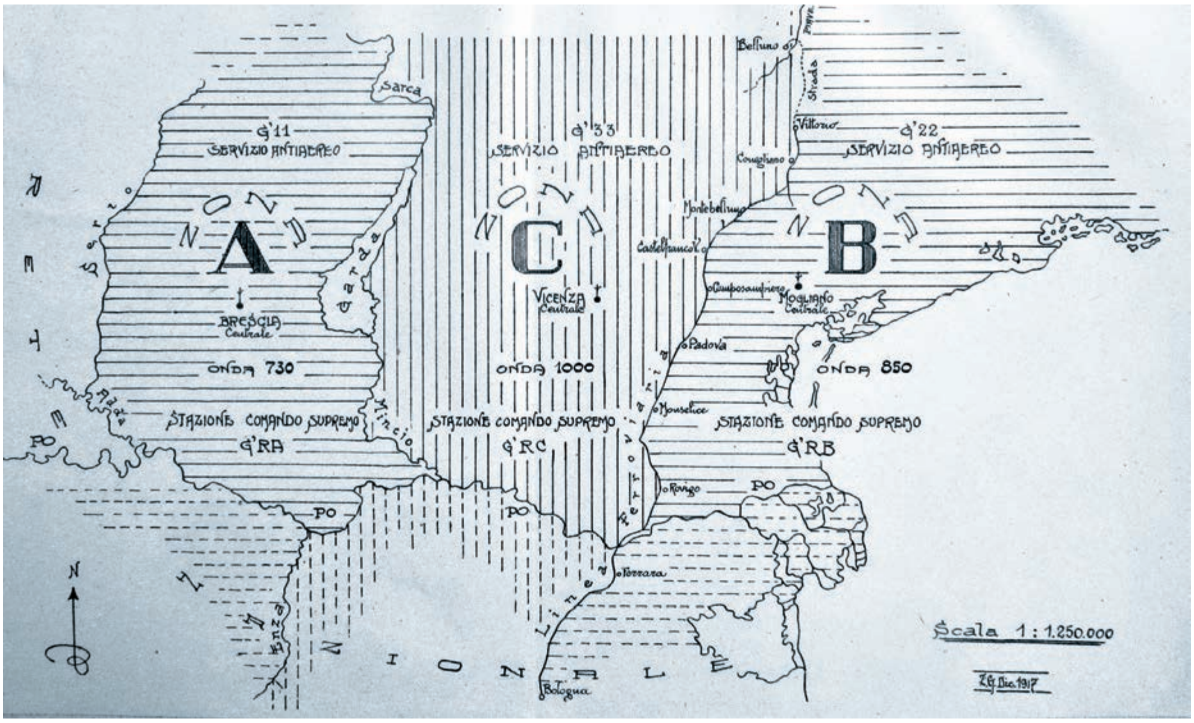
13.2 100W Continuous Wave van-borne station for aeronautical communications (ISCAG Archive)

[1] Chief Inspector of STM, Letter to the Coordination and Mobilisation Branch, *Servizio Radiotelegrafico*, 14 February 1918, ISCAG, Coll. 225.
[2] The workshop dealt with building telecommunication equipment. It acquired the laboratories of the Airships Battalion of the 3rd Engineer Regiment. At the end of the war, its strength was of about 200 military workers.
[3] Chief Inspector, STM, *Relazione Tecnica sul Servizio Radiotelegrafico dell’Esercito, op. cit.* p. 9; Circular Letter No. 7880, 11 March 1818, ISCAG, Coll. 226. For communications along the first line, lower power stations were also requested such as S.F.R. (50 W equipment) and Marconi (40 W equipment).



13.1 Map of radio stations used by the Italian army in April 1918 (ISCAG Archive)

The increasing number of radio communication systems in service forced to review the criteria for electro-magnetic spectrum usage: "the war area was divided into three large Radiotelegraphic Zones, each with a transmission wavelength for exchanging messages within the Zone" (picture 13.3)[4]. In the following months, the geographical separation was replaced by one based on the Armies zones.



13.3 Radiotelegraphic areas established in early 1918 (ISCAG Archive)

Finally, mindful of the difficulties encountered to transport radiotelegraphic stations during the redeployment from the Isonzo to the Piave, great care was taken to ensure the mobility of the Radiotelegraphic Sections by assigning them van stations (picture 13.4), trucks to transport engine-generators, accumulators, etc. and buses for their personnel[5].

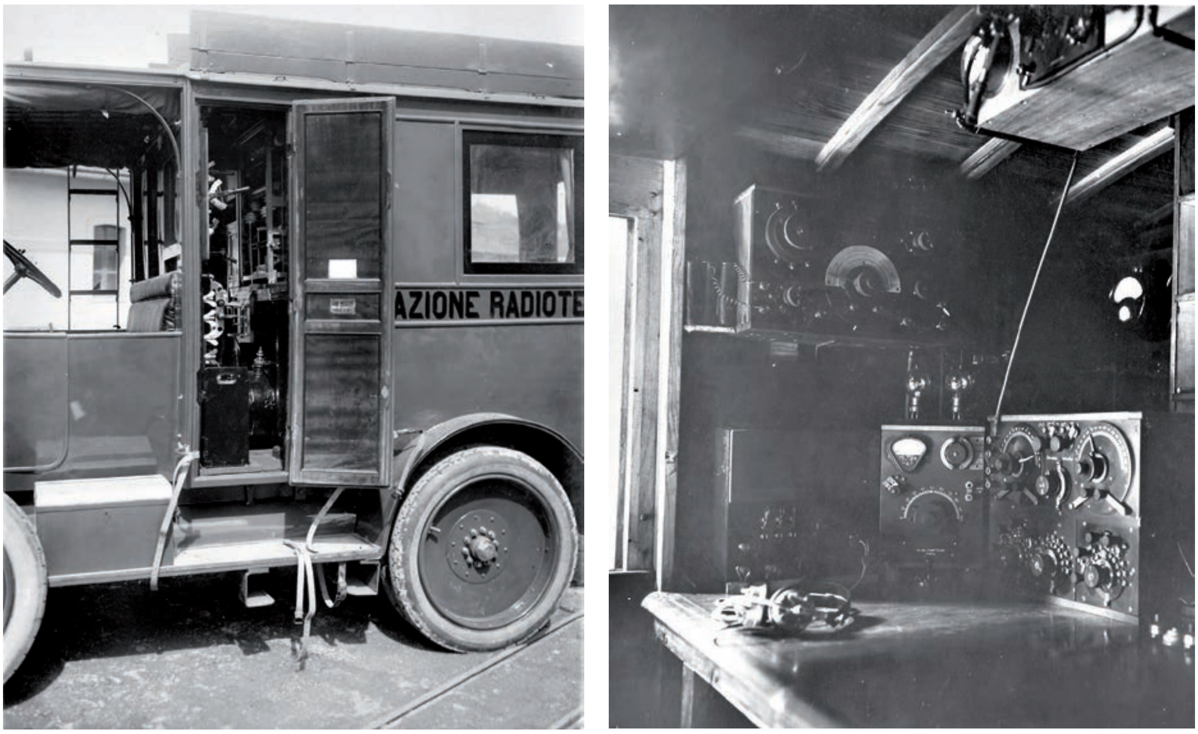
Technology Evolution

Among the innovations that influenced the wireless interception means and procedures, increased speed radio communication were implemented by means of various automatic transmission methods. The instructions of a device produced by Marconi Wireless for transmitting and receiving telegrams at a speed of 100 words per minute, affirm that "with high-speed transmission, the interception of emissions is more difficult for the stations the messages are not directed to"[6]. A

[4] Chief Inspector of STM, *Nuova organizzazione del Servizio Radiotelegrafico dell'Esercito Operante*, (New organization of I.T.O. Radio Telegraphic Service), Service Orders no. 68 - 75, 1 January 1918, ISCAG, Coll. 232.

[5] General Headquarters, Corps of Engineers, *Comunicazione all'Ufficio Coordinamento e Mobilitazione, Dati sui materiali delle unità mobilitate del Genio,* (Communications to the Coordination and Mobilization Office, Data on materials available to Corps of Engineers Units), 4 ottobre 1918. One Telegraphic Section in an Army had 10 van stations and trucks. One section in a Corps had between 14 and 19 van stations and trucks.

[6] Marconi Wireless Telegraph Co., *Trasmissione e ricezione radiotelegrafica a grande velocità* (High speed radio telegraphic transmission and reception), ISCAG, Coll. 234. From a technical standpoint, it was an adaptation to radio transmission of the



13.4 Mobile radiotelegraphic station and installed equipment (ISCAG Archive)

device for recording high-speed radiotelegraphic messages radiated by some high-power German stations and then replicate them at lower speed was designed and tested by Franco Magni, Chief of Codroipo Office, in April 1917[7].

One of the most significant technological innovation in telecommunications during World War I was the industrial production of high vacuum valves, enclosed in high sensitivity receivers suitable, for instance, to intercept low power enemy transmissions and to increase the range of connections between aircraft and ground. The 'Bardeloni Receiver', built at the mentioned Workshop in Rome and named after the Engineer Corps Officer who designed it, found widespread use across the Italian Army (picture 13.5)[8].

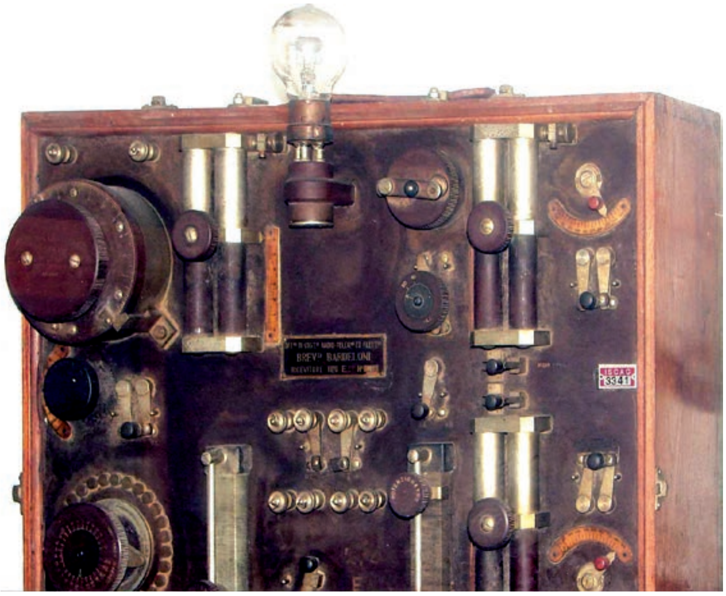
By means of high vacuum valves, continuous wave (CW) transmitters were also built, with distinct advantages over traditional spark gap ones, such as the frequency band limitation and hence the possibility to allocate a much higher number of transmission channels in the available spectrum, as well as the reduction of energy consumption and size. The difficulty of interception was another positive aspect of this innovation, especially if the enemy did not have proper receivers to scan for continuous-wave emissions[9].

Wheatstone system used in wired telegraphy.

[7] Lieutenant Franco Magni, *Nuovo dispositivo per registrazione automatica* (New device for automatic recording), Codroipo, 29 April 1917, ISCAG, Coll. 234.

[8] With some modifications, it took the name of 'Epuratore Bardeloni' to indicate its higher resistance to noise and interference. These devices were patented under the name of Cesare Bardeloni. (C. Bardeloni, *La discriminazione di segnali RT esercitata sopra uguali lunghezze d'onda*, in L'Elettrotecnica, 3 February 1922, p. 79 – 84).

[9] The British troops that arrived in Italy in November 1917 largely used continuous-wave trench stations. During the last two months of 1917, in the area under the command of General Conrad, the Austrians intercepted only one British dispatch versus 264 French encoded telegrams (M. Ronge, *Der Radiohorch, op. cit.,* p. 27).



13.5 A Bardeloni receiver (ISCAG Archive)

In the Italian army, in addition to the 100 W transmitters mentioned above, other CW stations were distributed. For instance, the 2nd Corps deployed to the Western front, was equipped with CW telegraphic transmitters for communications between Headquarters down to Division level[10]. In picture 13.6, the red lines represent the radio links implemented with this type of equipment, while the blue lines refer to connections between the Brigades by spark gap transmitters, and finally, the black lines refer to geo-telegraphy used down to the Battalions[11].

In the last months of the war, many tests of voice transmissions by means of CW radio equipment carried out on the Italian front demonstrated the feasibility of this kind of communications in operative conditions. Two Marconi Wireless radio telephone field devices delivered to Genoa in December 1917 were tested and compared with the equipment provided by SFR, in early 1918[12]. Ronge provides some information about a radio interception, occurred on 5 October 1918, of two Italian stations talking about an eavesdropping school[13]. In short, intelligence-related issues subsisted, as expected, also in the field of radiotelephony, so much so that some commands harshly challenged this technology because of the difficulties in efficiently encoding voice communications at the time, as demonstrated by the eavesdropping successes in wire telephony.

Radio Interception and Cryptographic Service Within the Italian Armies

As explained in more detail in the following pages, the strategy adopted by the Austrian Headquarters of severely restricting the radio transmission had undergone a profound modification in the first months of 1918. The consequent extension of the Austrian radio-communication network and the increase of the produced radio traffic highlighted by the Italian radio surveys, induced Intelligence Service, with the assistance of Sacco, to issue a new *Ordinamento del Servizio di intercettazioni radiotelegrafiche, radiogoniomentria e decrittazione dei dispacci nemici* (Organisation of the radiotelegraphic interception, radiogoniometry and decryption of enemy dispatches).

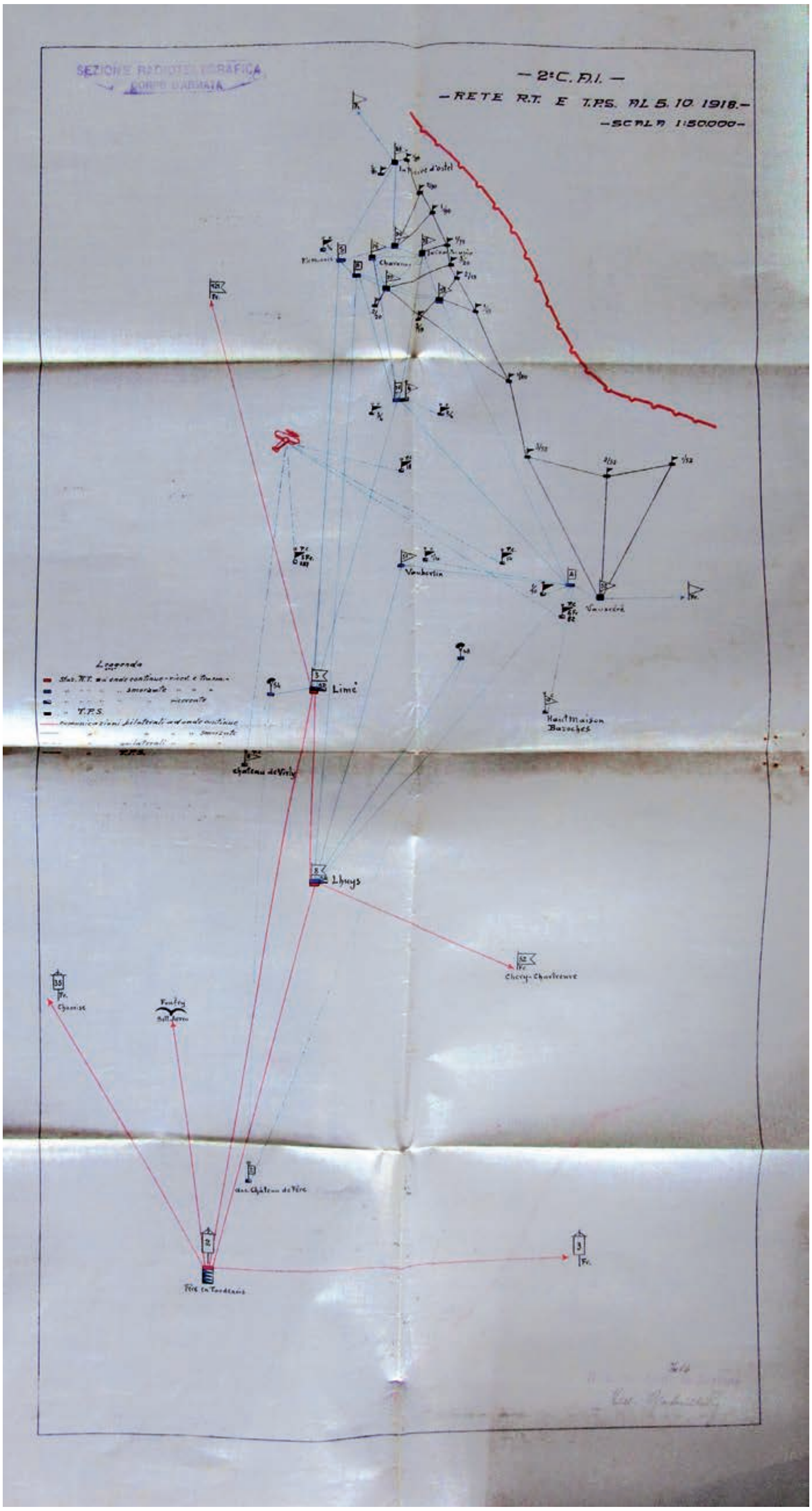
The foreword to the letter announcing that decision of the Supreme Command to the Headquarters of the Armies and to the Chief Inspector of the STM reads:

[10] Mario Caracciolo*, Le truppe italiane in Francia*, Mondadori, Milano, 1929, p. 217 - 218.

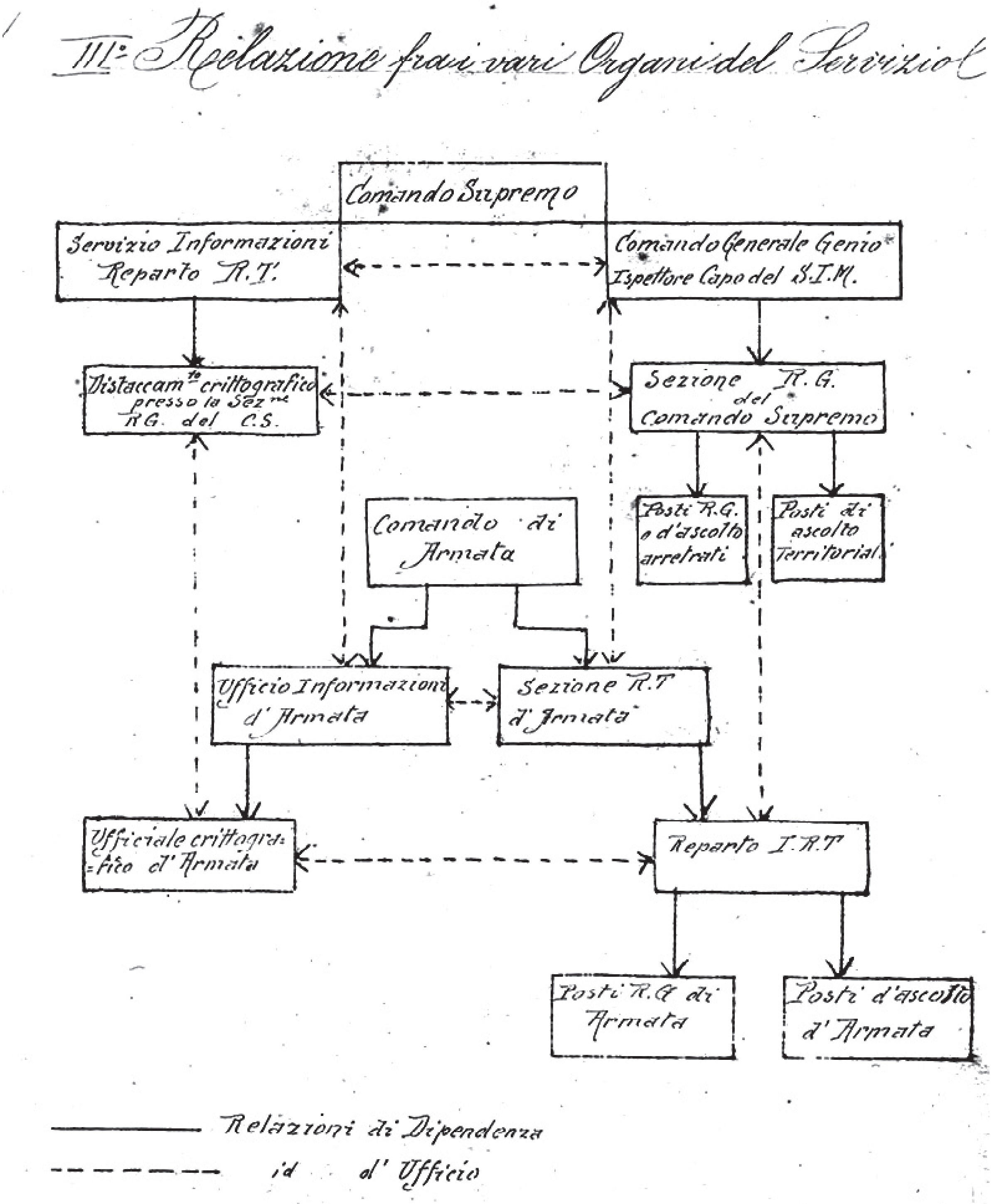
[11] ISCAG, Coll. 242.

[12] Communication from Marconi Office to the Army Operations Office, Technical Division, *Complessi radiotelefonici trasmittenti* (Wireless Telephone Transmitting devices), 6 December 1917, *ibidem*.

[13] M. Ronge, *Der Radiohorch*, *op cit.,* p.40.



13.6 Radiotelegraphic network of the Italian 2nd Army Corps operating in France (ISCAG Archive)



13.7 Organisation of the Radiotelegraphic Intelligence Unit and Cryptographic Unit of the Armies

The general trend among the belligerent armies to increasingly use small radiotelegraphic stations to communicate between units at the front - in fact, a consequence of the growing violence of artillery bombing - have made radiotelegraphic interceptions a more and more valuable source of information about the enemy. Hence, there is a need to extend the number of radiotelegraphic direction-finding and listening stations near the enemy

> line, and to decentralise the service to exploit results in a faster and more productive manner[14].

A Radiotelegraphic Interception Service was therefore set up within each Army, equipped with direction finding stations. Moreover, at least one Officer - a cryptography specialist - was detached from the Cryptographic Unit and assigned to the Army Intelligence Service with the mission to decrypt, when possible, the enemy dispatches and forwarded them, along with the encrypted ones to the Cryptographic Unit in Rome. In addition, he had to "study the enemy ciphers and sharing the results with the Armies".

The functional relationships and the flowchart of the new organisation, are shown in the graph of picture 13.7[15].

The implementation programme envisaged a gradual but quick creation of 18 listening stations and eight detached radio goniometric stations, in addition to those managed directly by the 1st Radio goniometric Section. All data collected by the new stations were sent also to this Section which issued daily bulletins of enemy radiotelegraphic communications and graphical representations of the positions of Austrian radiotelegraphic stations on the Italian front every ten days.

To support the realization of the new organization and to train its personnel, Sacco reached the war zone where he remained from 8 through 15 March and then again from 24 March to 9 April, delivering specialisation courses to instruct cryptographic officers and personnel assigned to the new tasks[16].

13.2 "UNBREAKABLE" CODES

The Diffusion Of The D Code

The specimens adopted by several division Headquarters and preserved in the archives of the Italian army, highlight the widespread adoption of the *D cod*e. Picture 13.8 shows the first page of the encoding and decoding parts used by the 53rd Division.

The Headquarters always kept a backup version available to replace the one in service as soon as they suspected it had fallen in enemy hands. In case the replacement of the version in use was unfeasible, over-encoding with a daily variable key had to be applied[17].

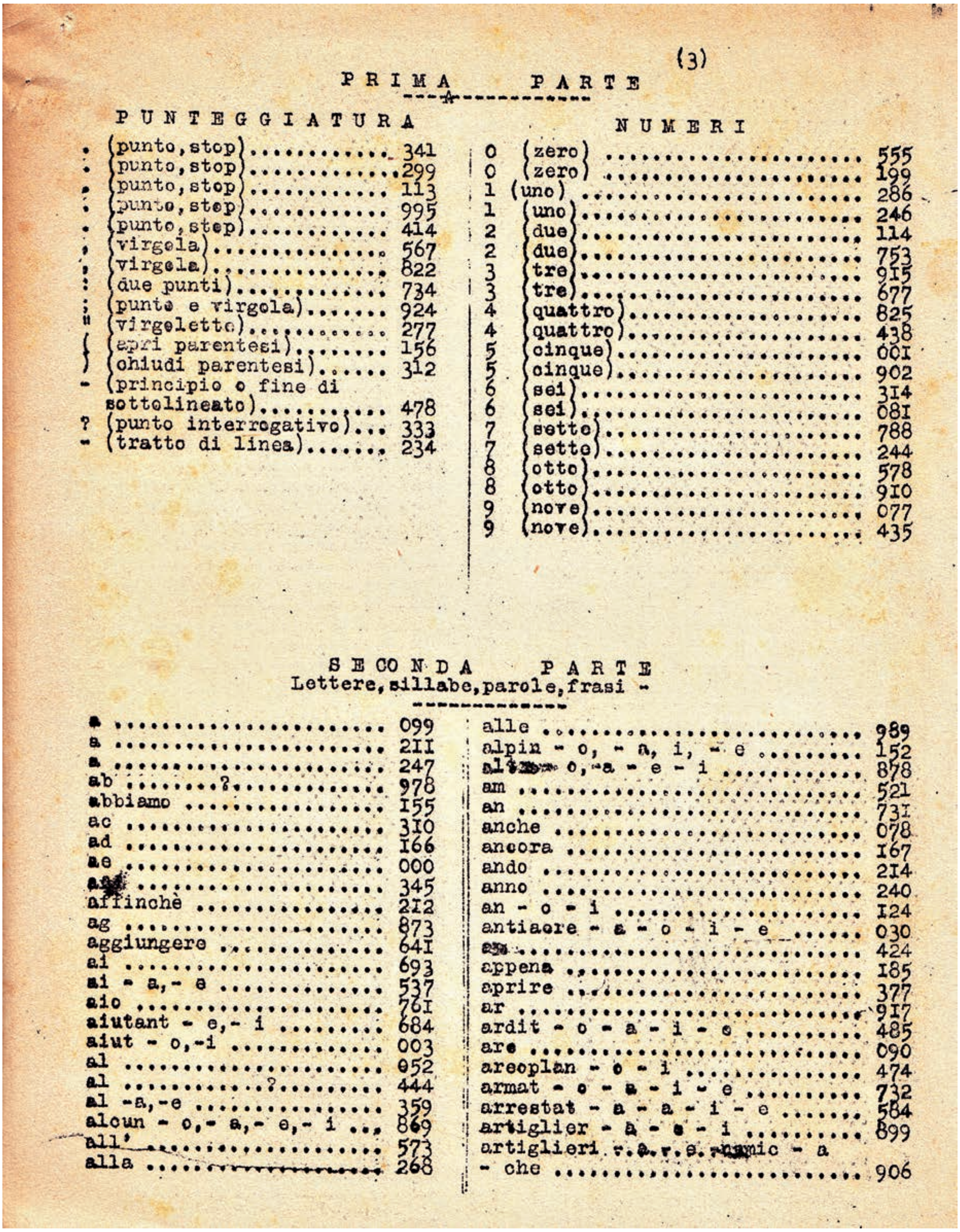
All the operating units equivalent to Divisions, even if not equipped with wireless equipment, adopted the *D code* for transmitting phonograms, and the usage of this code gradually became common in other groups at levels above Division as well. For example, and this is by no means an isolated case, the 4th Army Artillery Command applied the *D code* for all communications with subordinate units, from the Corps' Artillery Command down to the observers. The Cryptographic

[14] Intelligence Service, *Ordinamento Servizio Intercettazioni Radiotelegrafiche*, (New Regulation for Radio Interception Service), Circular Letter no. 2438P, 22 April 1918, ISCAG, Coll. 226.

[15] *ibidem.*

[16] *Section R logs, op. cit., 15 April 1918,* AUSSME, Series B1, 101S, Vol.315d; *Section U logs, op. cit., 24 March 1918,* AUSSME, Series B1, 101D, Vol.360d.

[17] The adoption of an additive numerical key was suggested. In dispatches, the encoding groups could be further grouped in pairs, thus creating six-digit groups.



(3)

PRIMA PARTE

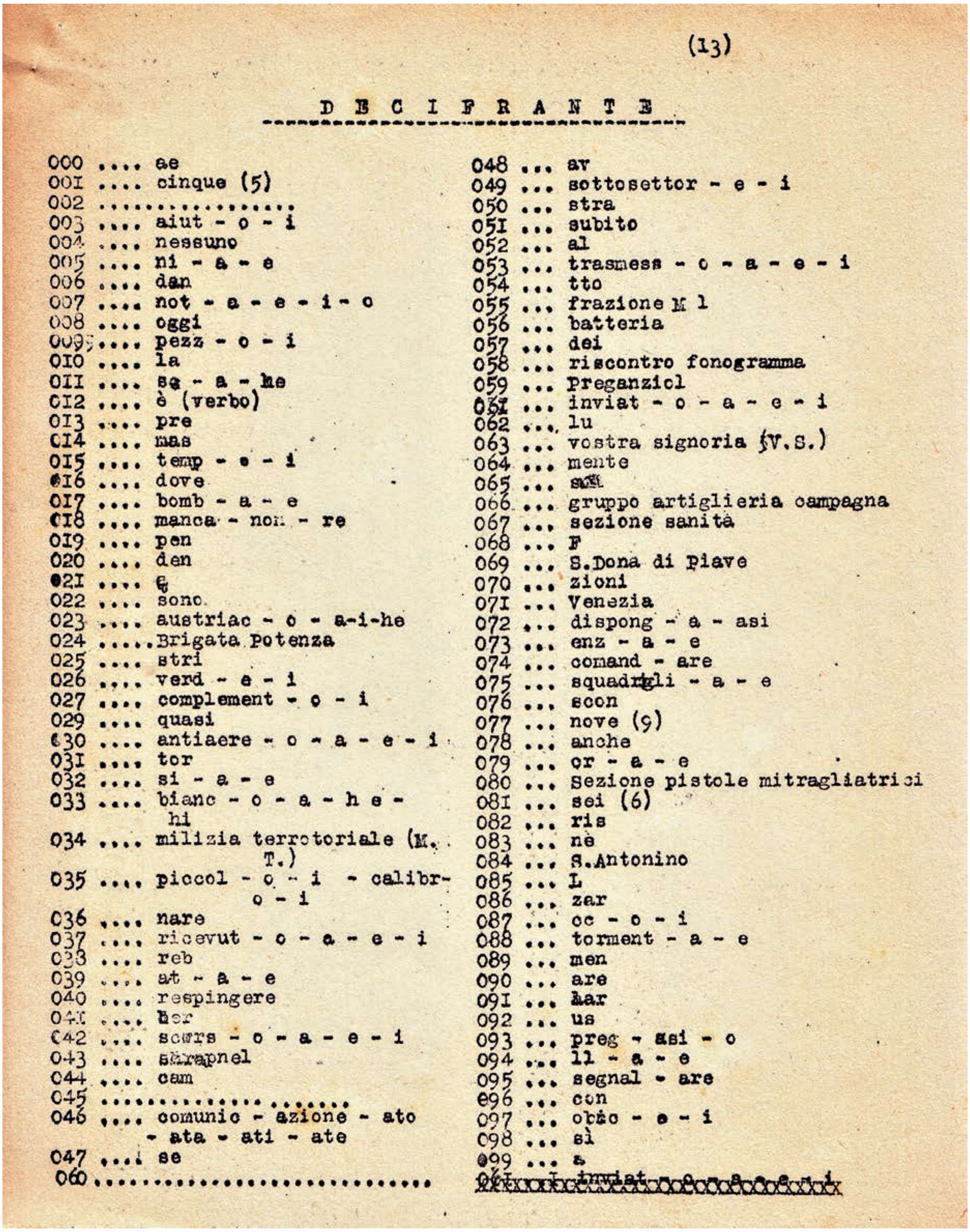
PUNTEGGIATURA		
.	(punto, stop)	341
.	(punto, stop)	299
.	(punto, stop)	113
.	(punto, stop)	995
.	(punto, stop)	414
,	(virgola)	567
,	(virgola)	822
:	(due punti)	734
;	(punto e virgola)	924
"	(virgoletta)	277
(	(apri parentesi)	156
)	(chiudi parentesi)	312
-	(principio o fine di sottolineato)	478
?	(punto interrogativo)	333
-	(tratto di linea)	234

NUMERI		
0	(zero)	555
0	(zero)	199
1	(uno)	286
1	(uno)	246
2	(due)	114
2	(due)	753
3	(tre)	915
3	(tre)	677
4	(quattro)	825
4	(quattro)	438
5	(cinque)	00I
5	(cinque)	902
6	(sei)	3I4
6	(sei)	08I
7	(sette)	788
7	(sette)	244
8	(otto)	578
8	(otto)	9I0
9	(nove)	077
9	(nove)	435

SECONDA PARTE
Lettere, sillabe, parole, frasi -

a	099
a	2II
a	247
ab ?	978
abbiamo	I55
ac	3I0
ad	I66
ae	000
af	345
affinchè	2I2
ag	873
aggiungere	64I
ai	693
ai - a, - e	537
aio	76I
aiutant - e, - i	684
aiut - o, -i	003
al	052
al ?	444
al -a, -e	359
alcun - o, - a, - e, - i	869
all'	573
alla	268
alle	989
alpin - o, - a, i, - e	152
alt - o, -a - e - i	878
am	521
an	73I
anche	078
ancora	I67
ando	2I4
anno	240
an - o - i	I24
antiaere - a - o - i - e	030
as	424
appena	I85
aprire	377
ar	9I7
ardit - o - a - i - e	485
are	090
areoplan - o - i	474
armat - o - a - i - e	732
arrestat - a - a - i - e	584
artiglier - a - e - i	899
artiglieri r.a.r.e. nemic - a - che	906

13.8a First page of the encoding part of the "D code" filled by a Divisional Headquarters (ISCAG Library)


(13)

D E C I F R A N T E

000 .... se
001 .... cinque (5)
002 ....
003 .... aiut - o - i
004 .... nessuno
005 .... ni - a - e
006 .... dan
007 .... not - a - e - i - o
008 .... oggi
009 .... pezz - o - i
010 .... la
011 .... sc - a - he
012 .... è (verbo)
013 .... pre
014 .... mas
015 .... temp - e - i
016 .... dove
017 .... bomb - a - e
018 .... manca - non - re
019 .... pen
020 .... den
021 .... e
022 .... sono
023 .... austriac - o - a-i-he
024 .....Brigata Potenza
025 .... stri
026 .... verd - e - i
027 .... complement - o - i
029 .... quasi
030 .... antiaere - o - a - e - i
031 .... tor
032 .... si - a - e
033 .... bianc - o - a - h e - hi
034 .... milizia terrotoriale (M. T.)
035 .... piccol - o - i - calibr- o - i
036 .... nare
037 .... ricevut - o - a - e - i
038 .... reb
039 .... at - a - e
040 .... respingere
041 .... ber
042 .... scwrs - o - a - e - i
043 .... shrapnel
044 .... cam
045 ....
046 .... comunic - azione - ato - ata - ati - ate
047 .... se
060 ....

048 ... av
049 ... sottosettor - e - i
050 ... stra
051 ... subito
052 ... al
053 ... trasmess - o - a - e - i
054 ... tto
055 ... frazione M 1
056 ... batteria
057 ... dei
058 ... riscontro fonogramma
059 ... Preganziol
061 ... inviat - o - a - e - i
062 ... lu
063 ... vostra signoria (V.S.)
064 ... mente
065 ... san
066 ... gruppo artiglieria campagna
067 ... sezione sanità
068 ... F
069 ... S.Dona di Piave
070 ... zioni
071 ... Venezia
072 ... dispong - a - asi
073 ... enz - a - e
074 ... comand - are
075 ... squadrigli - a - e
076 ... scon
077 ... nove (9)
078 ... anche
079 ... or - a - e
080 ... Sezione pistole mitragliatrici
081 ... sei (6)
082 ... ris
083 ... nè
084 ... S.Antonino
085 ... L
086 ... zar
087 ... oc - o - i
088 ... torment - a - e
089 ... men
090 ... are
091 ... har
092 ... us
093 ... preg - asi - o
094 ... ll - a - e
095 ... segnal - are
096 ... con
097 ... obic - e - i
098 ... sì
099 ... a
~~061 ... inviat - o - a - e - i~~

13.8b First page of the decoding part of the "D code" filled by a Divisional Headquarters (ISCAG Library)

Unit became aware of this evolution, and in the last months of the conflict included this code among those in service inside units above the Division[18].

In his memoirs, Ronge mentioned the *D code* only once, that is, when it was found on an Italian Cavalry Officer captured on 9 July 1918, also mentioning in a note that the code had been adopted shortly before, showing little knowledge not only about the time of code introduction, but also of the possible similarity with the 'syllables and words cipher' that Ronge believed had been adopted in June of the previous year[19].

However, besides acquiring the code booklet on that occasion, any Austrian attempt for decrypting dispatches encoded with the *D* was unsuccessful, apart from eventual messages coded with the edition found on the captured Italian Officer and only before it was radically modified under its instructions for use.

The R Code

In April 1918, the *R (Regimental) code* was distributed to the Headquarters of the Infantry Regiments and equivalent units of other combat Arms. It was meant to provide a handy cipher protecting the secrecy of phonograms, but also of radiograms exchanged between smaller combat units.

13.9 Cover of the Instruction Manual for the "R code" (ISCAG Library)

Picture 13.9 shows the cover of the 15-page user's manual preserved in the Archives together with two copies of the code - one partially filled, and one empty - contained in a sheet that, when folded into four parts, became of pocket size[20].

As for the *D code*, the basic feature of *R* is the drawing of the code groups. The specimen in picture 13.10, filled by a fighting unit is useful to briefly explain its characteristics. A single sheet contains four coding tables identified with letters from **a** through **d**[21]. This last table is also used in combination with table **e** like the auxiliary tables of the service ciphers. The other three tables **f**, **g** and **e** were used for decoding purposes[22].

[18] Intelligence Service, *Norme per l'uso e la compilazione di cifrari, op. cit.*

[19] M. Ronge, *Der Radiohorch*, *op cit.,* p. 35 - 36. Immediately after that, Ronge reported about a dispatch from the Italian 16th Corps that reads, "the enemy has the D code". Ronge adds that, as a countermeasure, they ordered "the replacement of digits from 0 to 9 with other random digits". This hypothetical over-encryption method did not match the instructions of the code.

[20] Library of the ISCAG, coll. XXXI A, n°11129.

[21] AUSSME, Series B4, env. 521. There were about 100 plaintext words in total, of which 70 in table **a,** and 30 left to the discretion of regimental Headquarters in table **b**; 30 individual letters, endings, and numbers in table **c**. These were all encoded through three-digit code groups. There were also 80 syllables with two-digit code groups (Table **d**). The 3-digit numbers ended in 0 or 1.

[22] For the groups ending with figures other than 0 and 1, table **f** should be used in combination with table **e.**

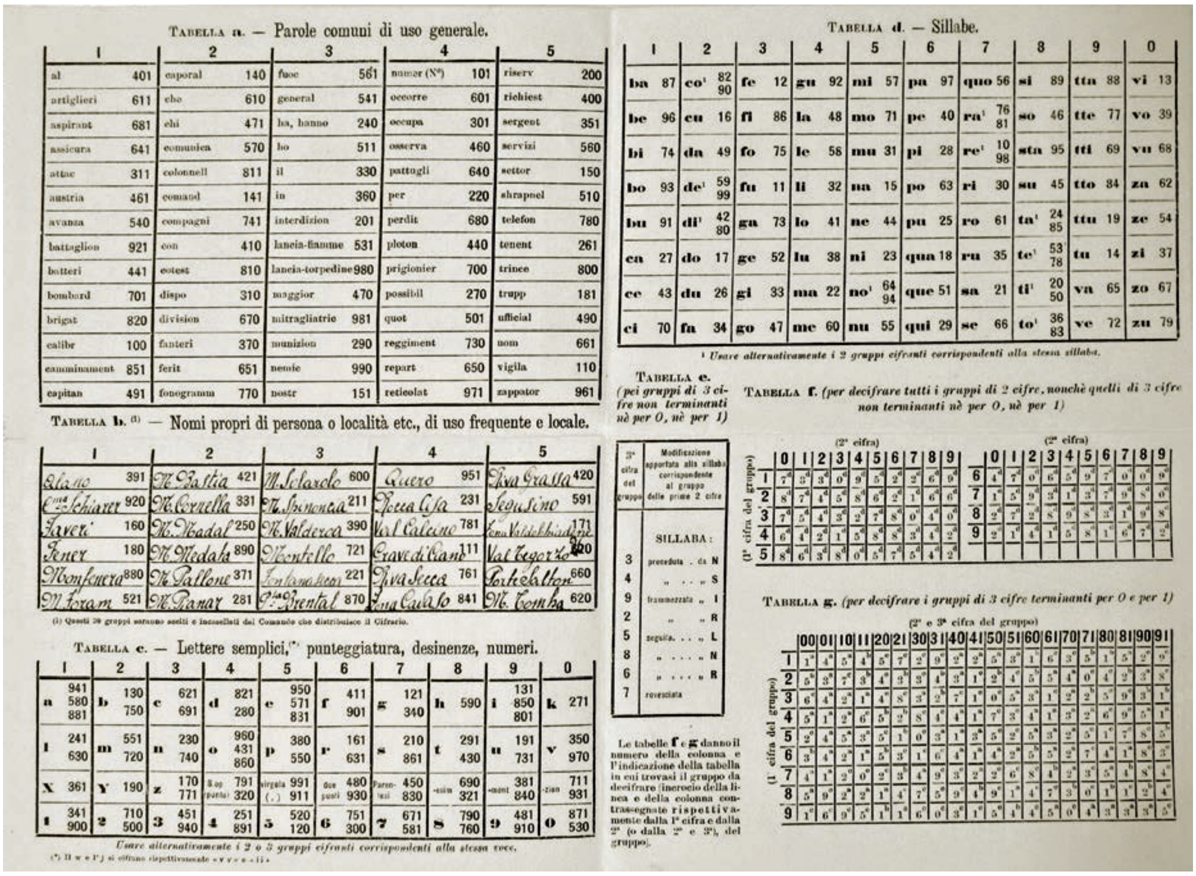


TABELLA a. — Parole comuni di uso generale.

1		2		3		4		5	
al	401	caporal	140	fuoc	561	numer (N°)	101	riserv	200
artiglieri	611	che	610	general	541	occorre	601	richiest	400
aspirant	681	chi	471	ha, hanno	240	occupa	301	sergent	351
assicura	641	comunica	570	ho	511	osserva	460	servizi	560
attac	311	colonnell	811	il	330	pattugli	640	settor	150
austria	461	comand	141	in	360	per	220	shrapnel	510
avanza	540	compagni	741	interdizion	201	perdit	680	telefon	780
battaglion	921	con	410	lancia-fiamme	531	ploton	440	tenent	261
batteri	441	cotest	810	lancia-torpedine	980	prigionier	700	trince	800
bombard	701	dispo	310	maggior	470	possibil	270	trupp	181
brigat	820	division	670	mitragliatrie	981	quot	501	ufficial	490
calibr	100	fanteri	370	munizion	290	reggiment	730	uom	661
camminament	851	ferit	651	nemic	990	repart	650	vigila	110
capitan	491	fonogramm	770	nostr	151	reticolat	971	zappator	961

TABELLA b. (1) — Nomi propri di persona o località etc., di uso frequente e locale.

1		2		3		4		5	
Elamo	391	M. Tattia	421	M. Solarolo	600	Quero	951	Piva Grassa	420
C.te Schiaver	920	M. Cornella	331	M. Spinoncia	211	Rocca Cisa	231	Segusino	591
Faveri	160	M. Badal	250	M. Valderoa	390	Val Calcino	781	[illegible]	171
Jener	180	M. Medala	890	Montello	721	Grave di Ciano	111	Val Tegorzo	200
Monfenera	880	M. Pallone	371	Fontanasecca	221	Piva Secca	761	[illegible]	660
M. Foram	521	M. Panar	281	C.ra Grental	870	[illegible]	841	M. Tomba	620

(1) Questi 30 gruppi saranno scelti e inscritti dal Comando che distribuisce il Cifrario.

TABELLA c. — Lettere semplici,(*) punteggiatura, desinenze, numeri.

1		2		3		4		5		6		7		8		9		0	
a	941 580 881	b	130 750	c	621 691	d	821 280	e	950 571 831	f	411 901	g	121 340	h	590	i	131 850 801	k	271
l	241 630	m	551 720	n	230 740	o	960 431 860	p	380 550	r	161 631	s	210 861	t	291 430	u	191 731	v	350 970
x	361	y	190	z	170 771	[illegible]	791 320	virgola (,)	991 911	due punti	480 930	Parentesi	450 830	-ssim	690 321	-ment	381 840	-zion	711 931
1	341 900	2	710 500	3	451 940	4	251 891	5	520 120	6	751 300	7	671 581	8	790 760	9	481 910	0	871 530

Usare alternativamente i 2 o 3 gruppi cifranti corrispondenti alla stessa voce.

(*) Il w e l'j si cifrano rispettivamente «v v» e «ii».

TABELLA d. — Sillabe.

1		2		3		4		5		6		7		8		9		0	
ba	87	co'	82 90	fe	12	gu	92	mi	57	pa	97	quo	56	si	89	tta	88	vi	13
be	96	cu	16	fi	86	la	48	mo	71	pe	40	ra'	76 81	so	46	tte	77	vo	39
bi	74	da	49	fo	75	le	56	mu	31	pi	28	re'	10 98	sta	95	tti	69	vu	68
bo	93	de'	59 99	fu	11	li	32	na	15	po	63	ri	30	su	45	tto	84	za	62
bu	91	di'	42 80	ga	73	lo	41	ne	44	pu	25	ro	61	ta'	24 85	ttu	19	ze	54
ca	27	do	17	ge	52	lu	38	ni	23	qua	18	ru	35	te'	53 78	tu	14	zi	37
ce	43	du	26	gi	33	ma	22	no'	64 94	que	51	sa	21	ti'	20 50	va	65	zo	67
ci	70	fa	34	go	47	me	60	nu	55	qui	29	se	66	to'	36 83	ve	72	zu	79

¹ Usare alternativamente i 2 gruppi cifranti corrispondenti alla stessa sillaba.

TABELLA e. (pei gruppi di 3 cifre non terminanti nè per 0, nè per 1)

3ª cifra del gruppo	Modificazione apportata alla sillaba corrispondente al gruppo delle prime 2 cifre
	SILLABA:
3	preceduta . da N
4	" . . . S
9	frammezzata . I
2	" . . R
5	seguita. . . . L
8	" . . . . N
6	" . . . . R
7	rovesciata

Le tabelle f e g danno il numero della colonna e l'indicazione della tabella in cui trovasi il gruppo da decifrare (incrocio della linea e della colonna contrassegnate rispettivamente dalla 1ª cifra e dalla 2ª (o dalla 2ª e 3ª), del gruppo).

TABELLA f. (per decifrare tutti i gruppi di 2 cifre, nonchè quelli di 3 cifre non terminanti nè per 0, nè per 1)

TABELLA g. (per decifrare i gruppi di 3 cifre terminanti per 0 e per 1)

13.10 Specimen of fully filled R code (ISCAG Library)

According to the *R* instructions,

> in no case should the code remain in service for more than a month. In normal circumstances, it must be replaced every fifteen days or more often, when the flow of communications is high or important actions have been finalised, or when there is a well-founded suspicion that the enemy intercepted our communications, or even when the code is frequently used for radiotelegraphic communications. Therefore, as soon as the Regiment Headquarters distributes a new version, it should request a new one to its Division Headquarters and keep it ready for immediate distribution.

The *R code*, as one could expect, was captured on several occasions by the Austro-Hungarians. Among Ronge's documents, a blank specimen appears captured in the area around Pasubio, but without any instruction manual[23].

As for the *D code*, even when the enemy managed to capture a completed copy of *R*, it did not imply the possibility of systematically decrypting dispatches, as both met the mentioned Kerckhoffs principle which states that a cryptographic system must remain safe even when the enemy captures it, unless he knows the key represented, in these cases, by the code groups extracted by lot and frequently changed.

[23] M. Ronge, *Der Radiohorch*, *op cit.,* Annex 67.

Rules for New Ciphers Design and Usage

The implementation of *D* and *R* codes aims also to restricting only to non-confidential communications the several codes and ciphers proliferating within the Armies and their depending units, often for multiple usage: in telephony, as well as for optical signalling, geo-telegraphy, and, sometimes, radiotelegraphy.

Some of them - mostly low secrecy systems - were the likely reason why Austrian decrypting activities continued until the last months of 1918. For example, the 3rd Army introduced in early April and modified in September a *Cifrario per collegamenti a mezzo di radiotelegrafia, geofonia, eliografia e bandiere* (Code for radiotelegraphy, geophony, heliography and flags), including a list of sentences organised by sectors such as “attack and defence”, “artillery”, “losses”, “prisoners”, etc. each with its corresponding two-letter code groups[24]. This one-part code did not meet the fundamental cryptologic requirement, not least because it had to be entirely replaced in the case of capture. However, surprisingly it remained in use for about five months without any modification.

For these reasons, the Cryptographic Unit was induced to issue rules that all combatant units had to follow in designing ‘home-made’ systems. After excluding paged and other codes previously widespread among the Armies, the new regulations stated that “the match between plaintext items and code groups must be completely arbitrary: any more or less regular sequence would hinder the secrecy of the cipher itself”[25].

In short, the *D code* was the model to follow even for the number of homophones required for the most common letters and syllables. Moreover, the words to be included in the new deliveries had to be “chosen starting from the telegraphic texts already transmitted, dealing with subjects similar to those foreseen for the code application”[26].

The ‘centralised control’ established for each new and old cipher spurred controversy with some Headquarters of the Armies, which invoked the need to use simpler codes, especially for telephone calls. The Headquarters, 3rd Army argued that it was impossible to use the D and R codes, or other similar numerical codes for phonograms, and insisted on maintaining systems identical to those described above and mainly concealed languages[27]. The debate in this regard with the Intelligence Service lasted until the end of the war.

13.3 THE EFFECTIVENESS OF THE ITALIAN “RADIO INTELLIGENCE”

Austrian Radical Changes

As previously mentioned, in March 1918, the Austrian army officially resumed radio transmission and repealed previous restrictive instructions, issuing new rules for correspondence and coding applicable to wireless stations assigned to higher echelons down to Divisions.

A renewed confidence on the usefulness of radio communications based on the experiences of the previous battles and/or the ‘push’ by the German allies may have influenced the decision to abandon

[24] AUSSME, Series B4, env.521.

[25] Intelligence Service, *Norme per l’uso e la compilazione di cifrari* (Rules for use and compilation of codes and chiphers), Circolare, no. 45 RT, 25 luglio1818, AUSSME, Series F2, env.45.

[26] This criterium was applied to the ‘Divisional Code’ based on statistical analysis conducted since early 1917 on a large set of dispatches exchanged among Divisions.

[27] Headquarters, 3rd Army*, Linee e comunicazioni telefoniche*, (Lines and telephone communication), letter no. R.I. 2892, 26 August 1918, AUSSME, Series E2, env.89.

a 'strategy' peculiar to the Austrian army compared to that adopted by the other belligerent Armies. However, in the following months, the intensity of radio usage fluctuated, following the events occurring on the front, but probably also for divergence of views among the higher Headquarters. The new encoding system for radio stations came into force on 20 March 1918 and was based on the *Ignaz Technical Code* - which the Italians already knew - and a new two-part, three-digit code known as the *3stelliger Radiocodex*. An overencoding table could also be associated which consisted of a disordered series of three-digit numbers to be added to the code groups, by indicating at the beginning of each telegram the number chosen as the first adopted in the over coding list[28]. Whether and to what extent the table was used in practice is not known.

On the 20th of April, however, an unexpected event occurred: the Austrians intercepted an Italian radio dispatch containing some information obtained from the interception and decrypting of an enemy (Austrian) telegram. Therefore, the Austro-Hungarian Headquarters ordered their Isonzo Armies to "put a lead seal" onto their transmitters, thus preventing any radio transmission, and extended the same ban to the Navy stations[29].

Therefore, the *3stelliger Radiocodex*, probably used without over-encoding tables possibly giving rise to the decrypting mentioned by the Italian intercepted dispatch, remained in service not for long, at least in most of the front. Lead seals did not last long either, since in fact before the Second Battle of the Piave river, that is, at the end of May1918, Austro-Hungarian radio traffic became strong again.

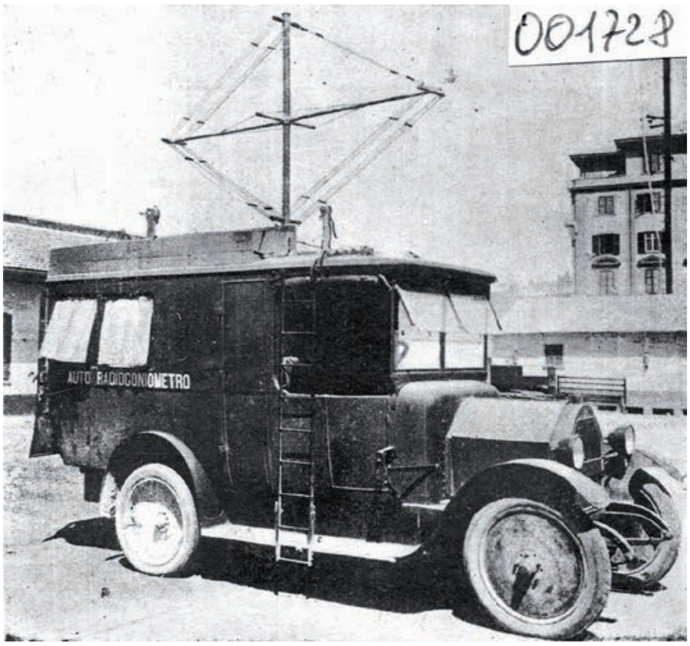
On that occasion, new two - books divisional codes of limited size without over encoding were introduced, for the entire front or for single armies which, as shown in the next paragraphs, the Italians broke with some effort and much insight, during the Battle.

The Preparation of the Second Piave Battle

The brilliant results obtained by the 1st Radio goniometric Section in November and December of 1917 continued in the following year when its network included some direction-finding mobile stations (picture 13.11)[30].

In this regard, the report of the Section reads:

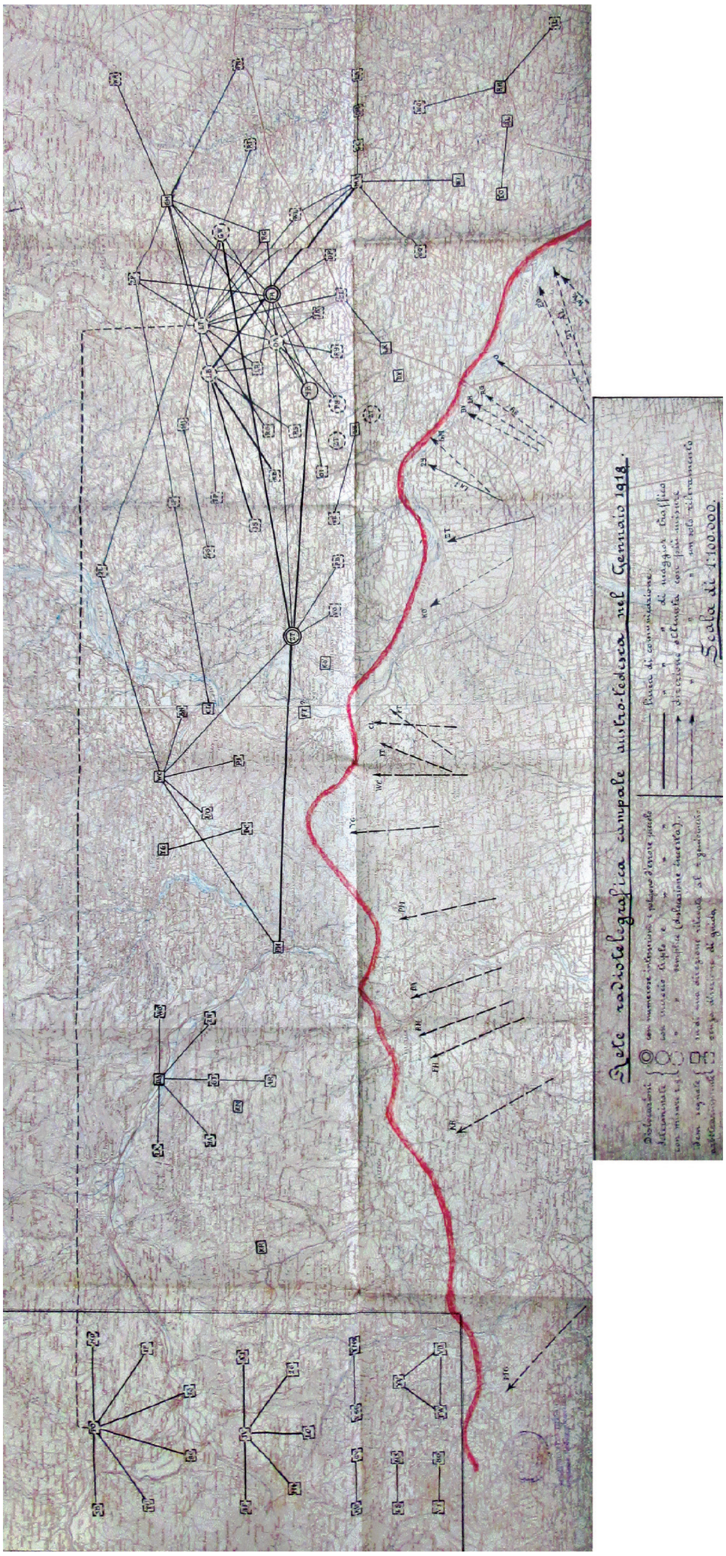
> To monitor the increasing number of German and Austrian radiotelegraphic field stations, the Section set up mobile direction-finding stations with its means. By January 1918, three of these stations had been implemented and located in Dueville, Postiama and Rosa. Through the goniometric network that these stations formed with



13.11 A mobile direction-finding station (ISCAG Archive)

[28] J. Prikowitsch, *op. cit.*, p. 426 e s.
[29] M. Ronge, *Der Radiohorch*, *op. cit.,* p.30.
[30] 1st Direction finding Section, *Relazione sull'operato, op. cit.,* p.3.

Bellini-Tosi fixed stations, we could follow the movements of the enemy radiotelegraphic stations during combat[31].



13 12 Austro-Hungarian field radiotelegraphic network as detected by the Italian First Radio goniometric Section in January 1918 (ISCAG Archive)

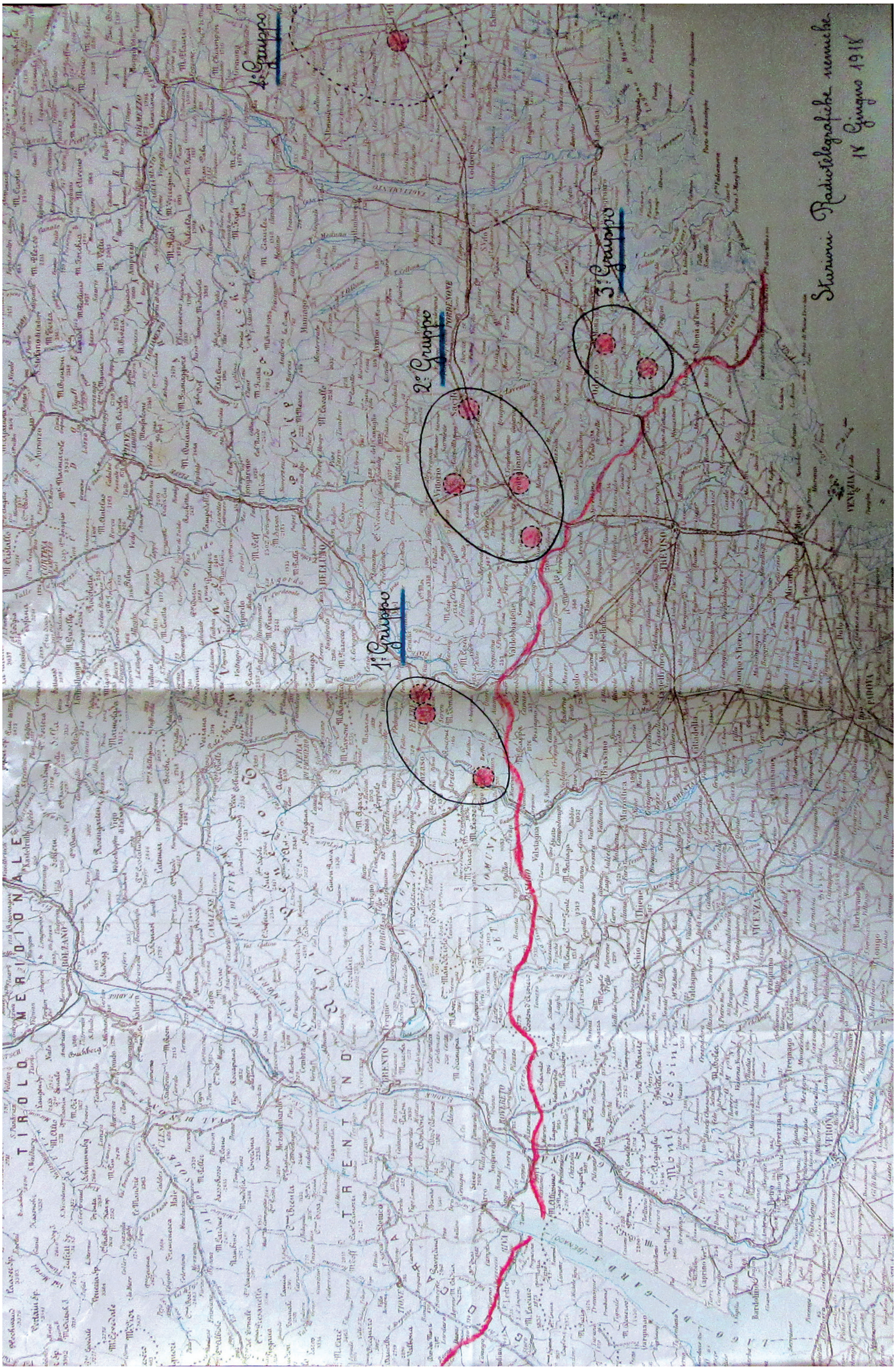
[31] *ibidem.*

Despite the limited traffic generated by Austrian stations, frequently updated summary maps of the type shown in picture 13.12 were drawn since January 1918[32]. In the months that followed, the recognition of vast network "ranging from the east of Trento to the sea" was perfected. It included four groups of stations respectively located in Trentino, in the area between Astico and Brenta, in the area east of the Piave river, and at the east of Tagliamento. All stations had been identified, together with their more frequent links, the frequencies used, etc[33].
As already mentioned, at the end of May, at the starting for the Second Battle of the Piave river preparations, Austrian radio traffic quite vividly resumed and the silent cryptographic struggle between the opposing sides became tight again, hence showing that the Italian analysts' knowledge and skills had become comparable to those of the enemy.
In June 1918, as the Battle began, the Italians were well prepared even in Radiocommunication Intelligence. Luigi Sacco had been at the front at least from 15 June and his contributions to identify and pinpoint enemy radiotelegraphic stations in the early days of battle are testified by a report he wrote from the war zone. As a preliminary information, he wrote that "the enemy radiotelegraphic activities resumed on 28 May; until the morning of 15 June, radiogoniometry research localised all the enemy stations between the Brenta and the Piave rivers, mainly in the Feltre, Fronzaso, and Primolano area"[34].
Sacco then described the development of the Austrian radio communications in the days from 15 through 18 June. The map in picture 13.13 indicating the locations of four groups of main stations, is attached to his report. The first group, belonging to the 11th Austro-Hungarian Army, was pinpointed in the region of Feltre; the second group deployed across Conegliano, Vittorio, and Sacile, where the 6th Army operated; the third group located around Motta di Livenza was part of the 5th Army. The fourth group stationing in rear position east of the mid-Tagliamento, with three active stations, could coincide with General Boroevic's Headquarters.

The Radiograms of Conegliano Veneto

In addition to locating the Austrian stations, Sacco committed himself to decrypting the intercepted dispatches. He described the main characteristics of the new code the Austrians had adopted on the first day of the attack, saying it was a "two-part code made of a thousand three-digit groups", without any over encoding.
Given the resistance to cryptoanalysis of two-part books, the Austrian Headquarters likely believed the time to break the new code, adopted on 15 June, could be larger than the expected duration of battle started with ambitious goals to be achieved in a few days. However, they had not taken into due account the galliard resistance of the Italian army, nor they had considered some cryptographic faults, that is, the 'laziness' of a telegraph operator who, instead of searching in the dictionary for code groups corresponding to entire words, encoded messages letter by letter. He felt more at easy this procedure because the letters were grouped at the beginning of the code. To this respect, Sacco wrote:

[32] 1st Radio Goniometric Section, *Bollettino n°5, Servizio RT campale dell'Esercito austro - tedesco nel Veneto nel mese di gennaio 1918*, (Austro-German field RT Service in the Veneto region in January 1918), ISCAG, Coll. 249.
[33] 3rd Telegraphic Engineers Regiment, 1st Radio goniometric Section, *Bollettino n°7,* March 1918, ISCAG, Coll. 249.
[34] Intelligence Service, RT Unit, *Riassunto sull'attività RT nemica* (Summary of the enemy radio activity), signed by Luigi Sacco, War Zone, 18 June 1918, ISCAG, Coll. 249.



13.13 Deployment of Austro-Hungarian radiotelegraphic stations at the beginning of the Second Battle of the Piave River (ISCAG Archive)

> after the first days of somewhat rational use of the code, we were lucky to intercept radio dispatches in which the abundance of repetitions indicated letter-by-letter encoding had been frequently used [...] On 20 June, two radio dispatches (of this type, A/N) were intercepted from an Austrian station that radiogoniometry pinpointed on the *Colle della Guardia*, near Conegliano[35].

Letter-by-letter encoding greatly facilitates cryptanalysis because operators could apply frequency analysis which usually requires having many cryptograms available. In this case, however, Luigi Sacco just needed two radio telegrams to start breaking the code, thanks to his intuition, which Bauer did not hesitate to define as "splendid"[36].
Firstly, he noted that in the two cryptograms labelled 'Conegliano dispatches', the last three-digit twelve groups were the same and that some of those code groups were repeated at the end of both cryptograms. Then, he superimposed two parts of the code groups to make the repetitions (073, 834, and 729) coincide, as in the following table. Assuming each of them represented a letter and guessing they corresponded to the "A", "I" and "O", respectively, he finally interpreted the set of 12 groups as corresponding to the words "radio station", as follows:

	492	073	065	834	729	
598	255	073	255	834	729	264
		A		I	O	
	r	a	d	i	o	
s	t	a	t	i	o	n

This was consistent with the words 'radio station' included in the common ending part of many other cryptograms[37].
By identifying the meaning of 8 code groups, other matches between groups and letters were found, which led to "complete decoding of a good number of code groups" after only six days from the beginning of the Austrian offensive, that is, from 21 June onwards. During the final phase of the Battle of the Piave river, data obtained from radio decryption and confirmed through interrogation of prisoners and deserters, left Italians understand that the Austro-Hungarians "had thrown the last division into the furnace and no longer had reserves. From that moment on, we knew we had won the battle"[38].
Sacco related this episode as an example of the damage caused by hasty and incorrect coding. Undoubtedly, the Austrian code included code groups that matched the words 'radio', 'station' and 'radio station'. However, the operator adopted a quicker and more comfortable letter-by-letter

[35] *ibidem.* That was one of the stations of the 2nd Group included in the map on picture 13.13.
[36] F L. Bauer, *op. cit.*, p. 242. Bauer assumed that the splendid idea had something to do with Sacco being an engineer. Later, to avoid disappointing anyone, he also said the Austrians did an equally good cryptographic work during the war, and explicitly mentioned Colonel Andreas Figl.
[37] L. Sacco, *op. cit.,* p. 233.
[38] O. Marchetti, *op. cit.,* p. 234 - 235.

encoding, with the purpose of using only the first page of the code instead of searching for these words in the following pages[39].

However, in the author's opinion, the Headquarters of the Austro-Hungarian Radiotelegraphic Service were equally at fault, as they adopted a two-parts code, regardless of its expected 'life span'. Sacco himself admitted that "the widespread two-part but not over-encoded books made of a thousand entries could not resist the efforts of crypto-analysts but for a few days or weeks, depending on the larger or smaller traffic volume"[40].

Radio Communications in the Second Battle of the Piave River

After a radio silence observed before the battle inception, as soon as the Austrian attack began, the Italians resumed radio communications too, although in controlled and limited mode, adopting countermeasures to avoid the enemy could intercept useful information by radio. They heavily relied on landlines and used wireless communications only when indispensable, such as to receive information from aircraft. The Chief Inspector of the STM acknowledged that:

> Radiotelegraphy also provided a constant link between the ground and the air, where our countless, daring aircrafts could signal our artillery the enemy targets in the esplanade covered by the 'Piave'. Quick radiotelegraphic reports about inbound enemy aircraft, [...] scrambled swarms of our brave aircraft towards the reported locations. These events explain how radiotelegraphy made an active contribution to our numerous and splendid victories in the air[41].

The encoding and decoding tables and over-encoding were frequently changed. The keys of the *CFbis* service cipher were replaced on the 16th, 18th and then again on the 23rd of June, so much so that during little more than a month there were about ten changes. On 5 August, a completely new service code known as *SB* was introduced, which will be dealt with in the next chapter.

Ronge himself recognised "the difficulties connected with the different systems introduced by the Italians", even though he maintained that "the radiotelegraphic interception service supported the Headquarters very well"[42]. Figl, on the other hand, only recalled some cryptograms decrypted on the first day of the fighting and said nothing about the events of the cryptographic battle that followed. According to him, that battle cost resulted to be much higher than 200,000+ dead, injured, or missing people in the Austro-Hungarian ranks, since its disappointing conclusion caused the loss of people' trust in the Army and represented the decisive turning point in the course of the war, that is, the beginning of the end of the Hapsburg Empire[43].

[39] L. Sacco, *op. cit.,* p. 234.

[40] *ibidem.*

[41] Chief Inspector, STM, *Relazione sul Servizio Telegrafico, Telefonico, Ottico e Radiotelegrafico durante l'offensiva austriaca del Giugno 1918,* (Report on Telegraphic, Telephonic, Optical and Radio telegraphic Services during June 1918 Austrian attack), ISCAG, Coll. 232.

[42] M Ronge, *Spionaggio*, p.333 - 334.

[43] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 211 - 213.

13.4 THE SWITCHING TO NEW CODES IN THE AUSTRIAN ARMY

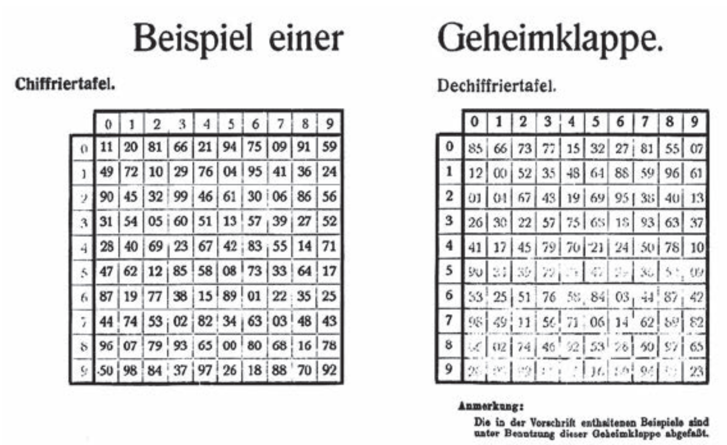
Signalordung and Schlüsselheft

The replacement of the Austrian two-parts codes take place in July 1918, with a new method reproducing a divisional system applied by the German army since January of the same year: the so called *Schlüsselheft*[44].

The new system consisted of two parts: the first called *Signalordung* (Signalling Regulations), was a booklet that set out the communication rules at divisional level, while the second was a one-part code called *Schlüsselheft* (Encoding Booklet) with two tables for encoding and decoding, named *Geheimklappe* (Secret Handkerchief).

The *Schlüsselheft* could be applied to radiotelegraphy as well as to telephone communications, light signals, and geo-telegraphy[45]. This code consisted of 38 pages including an alphabetical dictionary; a list of letters, syllables, and numbers; some short standard messages to be used in combat; a series of abbreviations and a blank list, to be drawn up by each command. There were no traces of homophones in any list. Such a code ensured no secrecy and could only be used as such only in particular circumstances, for example for short communications by aircraft in flight.

Over-encoding was therefore needed through encoding and decoding tables (*Geheimklappe)*. An example of the two completed 'handkerchiefs' is shown in picture 13.14[46]. Each combat unit had to fill the 100 empty boxes of the coding table with random numbers from 00 to 99, drawn by lot and changed frequently to ensure secrecy. For over-encoding, two numbers from the code groups achieved from the *Schlüsselheft* were read on the first line and the first column of the encoding table and replaced with the group found at the intersection of the corresponding column and row. The decoding table, filled as a function of the drawing by lot, are used subsequently.



Beispiel einer Geheimklappe.

Chiffriertafel.

	0	1	2	3	4	5	6	7	8	9
0	11	20	81	66	21	94	75	09	91	59
1	49	72	10	29	76	04	95	41	36	24
2	90	45	32	99	46	61	30	06	86	56
3	31	54	05	60	51	13	57	39	27	52
4	28	40	69	23	67	42	83	55	14	71
5	47	62	12	85	58	08	73	33	64	17
6	87	19	77	38	15	89	01	22	35	25
7	44	74	53	02	82	34	63	03	48	43
8	96	07	79	93	65	00	80	68	16	78
9	50	98	84	37	97	26	18	88	70	92

Dechiffriertafel.

	0	1	2	3	4	5	6	7	8	9
0	85	66	73	77	15	32	27	81	55	07
1	12	00	52	35	48	64	88	59	96	61
2	01	04	67	43	19	69	95	38	40	13
3	26	30	22	57	75	68	18	93	63	37
4	41	17	45	79	70	21	24	50	78	10
5	90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36	[illegible]	09
6	53	25	51	76	58	84	03	44	87	42
7	98	49	11	56	71	06	14	62	89	82
8	[illegible]	02	74	46	92	53	26	60	97	65
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16	[illegible]	94	[illegible]	23

Anmerkung:
Die in der Vorschrift enthaltenen Beispiele sind unter Benutzung dieser Geheimklappe abgefaßt.

13.14 Filled encoding and decoding handkerchief (F. Sinagra' book)

These tables allow to over-encoding only the first two digits out of the three in each code group of the *Schlüsselheft*. One weak point eventually useful to enemy analysts, lied in the lack to replace the third digit. Moreover, for as long as each version of the tables remained valid, the absence of homophones in the code could generate code groups repetitions, useful for analysts to start breaking the cipher. In a second edition of the cipher, four-digit code groups were used that could

[44] Two-parts codes were totally compromised also when captured during war actions.

[45] It also included the visual signals made by strips of cloth spread on the ground for transmitting signals to the overflying planes.

[46] The entire codebook is included in a book to be published by F. Sinagra, from which the picture has been taken.

be entirely replaced by over-encoding thanks to tables different from those shown in the previous picture.
The successes achieved by the Italians in breaking this new type of codes will be described in the next Chapter.
Meanwhile, also the design of codes for small radio stations - previously left to the initiative of individual divisions or lower-level units - was also regulated, by the Central Cryptologic Unit of the *Evidenzbureau* who cross-checked every new system proposed by the units or by the Military Telegraphs Command, as was the case among the Italians[47].

Comments on the Transition From Ciphers to Codes

The need to frequently replace the ciphers required all the belligerent Armies to research systems that imposed a high toll of effort on the enemy before it could break them, without at the same time making the encoding and decoding work any tougher.
In the evolution of encoding methods, one can identify similar trends among the most important Armies in the field. French cryptologist Giviérge recognized this phenomenon and wondered whether it could come from “ideas that are in the air” or more likely from information contained in documents mutually seized during the fighting[48].
Cryptanalysts who tried to penetrate enemy secrets may have contributed to the trend mentioned above by employing the achieved knowledge also to improve their own systems. This process was eventually helped by the concentration in a single organisation of code designers and decrypting specialists, based on the widespread belief that “only experienced cryptanalysts can judge the security of a cryptographic system,”[49] as the experience of the World War I had shown so far.
Giviérge himself and then Kahn observed a tendency common to many armies, between the second half of 1917 and the beginning of 1918, to abandon albeit not entirely the transposition techniques and their numerous variations, adopted since the early years of war for radio station service and for communication of subordinate units. These ciphers were replaced by short regular codes with over-encoding or by two-part codes with - and more often without - over-encoding[50].
Sacco also recalled this trend as well, asserting with reference to all combat fronts: “near the end of the war, in the large land units, two-part codes of 1,000-4,000 code groups were adopted. Of these, books without over-encoding were changed every two or three weeks, while over-coded ones every two or three months”[51].
As shown above, a similar transition from ciphers to codes occurred, at different times, also in the Italian and Austrian armies. Moreover, it may be noticed that the already illustrated solution to protect those codes with various drawing by lots methods, adopted by Sacco since September 1916, took place also within German and Austrian armies in the course of 1918.

[47] J. Prikowitsch, *op. cit*., p 431.
[48] Marcel Giviérge, *Questions de Chiffre, op.cit.,* N° 33, March 1926, N° 34, May 1916, translated in English by the USA War Department and published in the Signal Corp Bulletin (*Cryptography and Cryptanalysis reprinted from the Signal Corp Bulletin,* p. 15 -16).
[49] F.L. Bauer, *op. cit.* p. 207, *Maxim N°2 of Cryptology*.
[50] M. Giviérge, *Questions de Chiffre, op.cit.,* p. 15; D. Kahn, The Codebreakers, *op. cit.,* p. 314 -315.
[51] L. Sacco, *Manuale, op. cit*., p.285.

13.5 TELEPHONE EAVESDROPPING ACROSS THE PIAVE FRONT

Telephone Interception Efforts

The shorter front resulting from the shift from the Isonzo to the Piave, together with the difficulty of installing earth sockets on the other bank of the river, led to a reduction in the number of the Italian listening stations, which became 21 in January 1918 and increased to 28 in October of the same year, as shown by the radio telegraphic maps. However, according to the Inspectorate of the STM, the number of telephone listening stations operating in October 1918 was higher than those reaching the number of 63 in October, as it included besides the fixed, also the mobile stations, equipped with cabins and systems that could be easily disassembled and redeployed along the Piave front[52].

A letter from General Caviglia, the Commander of the 8th Army, showed the difficulty of picking up enemy conversations along the Piave. He referred to some unsuccessful attempts of crossing the river to install earth sockets[53]. However, in other cases, such attempts were successful, as the vivid description of Guasco proves:

> Because of the characteristics of the river's bed and the geological nature of the terrain, [...] we deemed necessary to attempt using picks on the opposite bank, which was still in Austrian hands. For this purpose, we had to cross the river with the telegraphic interception line made of an underwater cable or to build an aerial wire line with one or more suspended spans.
> By taking advantage of darkness at night, a group of brave telegraphists crossed the river in boats protected by escort patrols and laid the copper plates on the enemy side. The operation, despite the abundant rifle and machine guns fire, was a total success[54].

Even if such attempts were repeated frequently, the Austrians managed to discover the earth sockets connected to temporary listening stations and to destroy them rather quickly, forcing Italians to make new crossings in other locations along the river. A more straightforward solution to the problem was to increase the inductive effects using large wire coils based on a technique experimented since the early days of the conflict[55].

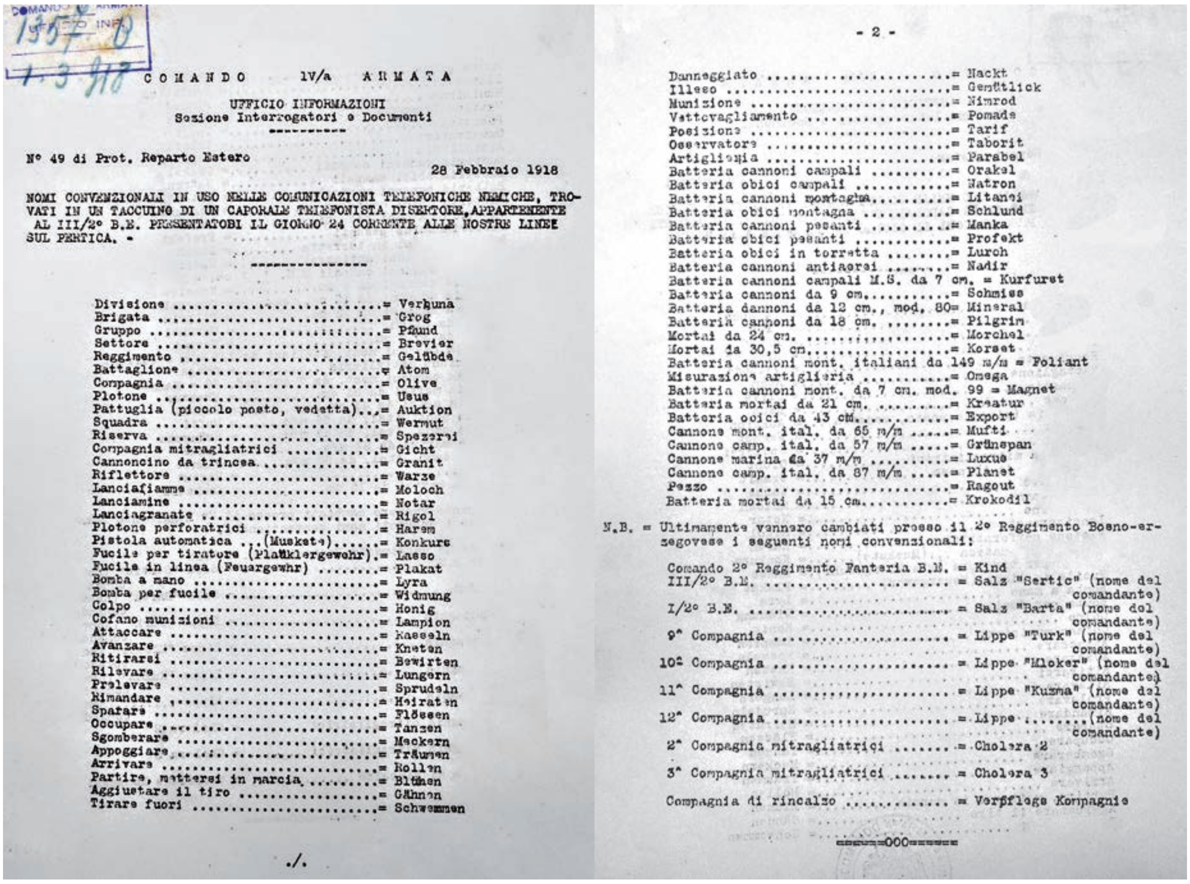
Guasco also recalled one of the actions carried out by the Italian Telegraph Operators, nearly at the end of the war: "the last installation was made on the Ponte della Priula in October 1918, a few days before our victory. Despite the difficulties in crossing the river with four intercepting lines due to destroyed bridges, we exploited bundles of wires the bombing had not damaged to establish a prompt Intelligence Service. We were able to intercept between 20 and 30 messages a day in Hungarian" and to collect valuable information on the condition of the Austro-Hungarian army as it tried a last resistance before surrendering[56].

[52] Chief Inspector, STM, *Relazione tecnica sul Servizio, op. cit*., p.12.
[53] Headquarters, 8th Army, General Staff, *Telefoni per le comunicazioni nella zona di prima linea* (Telephones for communications in front line area), no. 5803, 14 August 1918, AUSSME, Series F3, env. 147.
[54] G. Guasco, *Le intercettazioni, op. cit.,* p.249.
[55] *ibidem*, several interceptions were carried out by induction, thanks to wire spirals whose grounding connections were not installed on the other bank of the river.
[56] *ibidem*, the historic Ponte della Priula, in the province of Treviso, had been destroyed during combats.

Peculiar and Significant Information

The Italian operators often listened to Austro-Hungarian telephone conversations, where often even just a few words were encoded by means of simple tables or using concealed languages well known by Italian interpreters because captured in various ways (picture 13.15) or rebuilt based on enemy phonograms[57]. The Intelligence Offices of Corps and Armies filled several reports with precise information on the tables and small ciphers they had captured. In 1918, the French army in Italy too seized a telephone cipher where letters had been transformed into numbers incremented by 3 – namely: a=2; b=5; c=7;...., z=77 - and then each number was converted again into a letter according to the following scheme:

h a b e l f r a n z
1 2 3 4 5 6 7 8 9 0.



1357 INF
1.3.918

COMANDO IV/a ARMATA

UFFICIO INFORMAZIONI
Sezione Interrogatori e Documenti

N° 49 di Prot. Reparto Estero

28 Febbraio 1918

NOMI CONVENZIONALI IN USO NELLE COMUNICAZIONI TELEFONICHE NEMICHE, TROVATI IN UN TACCUINO DI UN CAPORALE TELEFONISTA DISERTORE, APPARTENENTE AL III/2° B.E. PRESENTATOSI IL GIORNO 24 CORRENTE ALLE NOSTRE LINEE SUL PERTICA. -

Divisione ....= Verhuna
Brigata ....= Grog
Gruppo ....= Pfund
Settore ....= Brevier
Reggimento ....= Gelübde
Battaglione ....= Atom
Compagnia ....= Olive
Plotone ....= Usus
Pattuglia (piccolo posto, vedetta)....= Auktion
Squadra ....= Wermut
Riserva ....= Spezerei
Compagnia mitragliatrici ....= Gicht
Cannoncino da trincea ....= Granit
Riflettore ....= Warze
Lanciafiamme ....= Moloch
Lanciamine ....= Notar
Lanciagranate ....= Rigol
Plotone perforatrici ....= Harem
Pistola automatica ...(Muskete).......= Konkurs
Fucile per tiratore (Plänklergewehr).= Lasso
Fucile in linea (Feuergewhr) ....= Plakat
Bomba a mano ....= Lyra
Bomba per fucile ....= Widmung
Colpo ....= Honig
Cofano munizioni ....= Lampion
Attaccare ....= Kasseln
Avanzare ....= Kneten
Ritirarsi ....= Bewirten
Rilevare ....= Lungern
Prelevare ....= Sprudeln
Rimandare ....= Heiraten
Sparare ....= Flössen
Occupare ....= Tanzen
Sgomberare ....= Meckern
Appoggiare ....= Träumen
Arrivare ....= Rollen
Partire, mettersi in marcia ....= Blühen
Aggiustare il tiro ....= Gähnen
Tirare fuori ....= Schwemmen

./.

- 2 -

Danneggiato ....= Nackt
Illeso ....= Gemütlick
Munizione ....= Nimrod
Vettovagliamento ....= Pomade
Posizione ....= Tarif
Osservatore ....= Taborit
Artiglieria ....= Parabel
Batteria cannoni campali ....= Orakel
Batteria obici campali ....= Natron
Batteria cannoni montagna.............= Litanei
Batteria obici montagna ....= Schlund
Batteria cannoni pesanti ....= Manka
Batteria obici pesanti ....= Profekt
Batteria obici in torretta ....= Lurch
Batteria cannoni antiaerei ....= Nadir
Batteria cannoni campali M.S. da 7 cm. = Kurfurst
Batteria cannoni da 9 cm..............= Schmiss
Batteria dannoni da 12 cm., mod. 80= Mineral
Batteria cannoni da 18 cm. ....= Pilgrim
Mortai da 24 cm. ....= Morchel
Mortai da 30,5 cm.....................= Korset
Batteria cannoni mont. italiani da 149 m/m = Foliant
Misurazione artiglieria ....= Omega
Batteria cannoni mont. da 7 cm. mod. 99 = Magnet
Batteria mortai da 21 cm. ....= Kreatur
Batteria obici da 43 cm...............= Export
Cannone mont. ital. da 65 m/m ......= Mufti
Cannone camp. ital. da 57 m/m .....= Grünspan
Cannone marina da 37 m/m ....= Luxus
Cannone camp. ital. da 87 m/m .....= Planet
Pezzo ....= Ragout
Batteria mortai da 15 cm..............= Krokodil

N.B. = Ultimamente vennero cambiati presso il 2° Reggimento Bosno-erzegovese i seguenti nomi convenzionali:

Comando 2° Reggimento Fanteria B.E. = Kind
III/2° B.E. .... = Salz "Sertic" (nome del comandante)
I/2° B.E. .... = Salz "Barta" (nome del comandante)
9^ Compagnia .... = Lippe "Turk" (nome del comandante)
10^ Compagnia .... = Lippe "Mloker" (nome del comandante)
11^ Compagnia .... = Lippe "Kuzma" (nome del comandante)
12^ Compagnia .... = Lippe ....(nome del comandante)
2^ Compagnia mitragliatrici .... = Cholera 2
3^ Compagnia mitragliatrici .... = Cholera 3
Compagnia di rincalzo .... = Verpflege Kompagnie

======000======

13.15 Lists of concealed names used in telephone communications by an Austro - Hungarian unit, seized and translated by the Italians

From phonograms and enemy conversations, the Italian learnt more and more frequent complaints - already started on the previous year - about the uneatable rations, the scarcity of bread and even

57 *ibidem*.

water[58], in addition to the usual information on the effects of artillery fire and its 'correction', and on the movements of troops. The shortage of flour forced to resort to the "reserves of the population" in Veneto to alleviate the meal issues among soldiers. Collected information concerned even the "lice removal" practices within the German divisions of the 14th Army before they returned to Germany[59].

In the intercepted conversations, reference was sometimes made to the propaganda activity the Italians were carrying out more and more effectively, especially to soldiers of the Austro-Hungarian Empire belonging to ethnic groups other than German. On 18 May, the Intelligence Office of the 6th Army intercepted a phonogram of the enemy Intelligence Service saying that "the Italians have 4 or 6 Czech prisoners who have volunteered to work on the Italian front. Their task is to invite the Austro-Hungarian troops to desert by singing the Czech national songs and thus suborn their own countrymen"[60]. The Czech volunteers became, by the end of the war, an entire combat division at the Italian-Austrian front.

Launching flyers from planes, balloons, etc. was one of the means of propaganda both armies frequently used. On 29 May 1918, a conversation was intercepted about some wooden bullets fallen beyond the Austrian lines that opened upon impact and released thousands of flyers. One of the speakers said those bullets had landed somewhere, in places unknown to him[61].

Many valuable information was also obtained for instance before and during the Second Battle of the Piave river. Max Ronge reported that, "through telephone interception, the enemy learned even the exact time at which it (the Austrian attack N/A) was to begin. The Ponte del Salton station in the Grappa area had rendered this invaluable service to the Italians"[62].

Italian Countermeasures

Italian telephone communications were, of course, also dangerously exposed to enemy interceptions. In August 1918, the Commander of the 2nd Army, General Caviglia admitted with discourage that, "telephone operators feel this uncontrollable need to chat. They tell the enemy everything they know or believe to know. All the instructions given to prevent them from following this behaviour had failed. The only viable option was to remove most telephone equipment and send the telephone operators to fight"[63].

These risks justified the increasingly rigorous technical countermeasures adopted in 1918, and the continuous recommendations addressed to the Italian troops, like in sample of the poster shown in picture 13.16.

Since these advices did not always prevent the abovementioned operators "uncontrollable needs", many technical countermeasures were taken in the summer of 1918, such the separation of the first-line telephone networks from rear networks. Communications were only possible through switchboards set at the limit between the two zones, at about 3 km from the trenches[64].

[58] Intelligence Office, 1st Army and 3rd Corps, *Notiziario N° 27*, Cat. H, eavesdropping on 1 December 1917, AUSSME, Series E1, env.43.

[59] Intelligence Office, 4th Army, *Stralcio intercettazioni* (Extract form eavesdroppings), Prot.2545, 16 December 1917, AUSSME, Series E1, env. 297.

[60] 6th Army, Category H, *Intercettazioni telefoniche* (Telephone eavesdroppings), AUSSME, Series F2, env.187.

[61] *ibidem*.

[62] M. Ronge, *Spionaggio*, p.343. This piece of information in the Ronge' book is not coming from a primary source, but from the book of Amelio Dupont, *La battaglia del Piave*, Edizioni del Littorio, Roma, 1929.

[63] Headquarters, 8th Army, General Staff, *Telefoni per le comunicazioni, op. cit.*

[64] Supreme Headquarters, *Circular letter no.12829*, 20 august 1918; Chief Inspector, STM, *Circular Letter no.37880*, 23 August 1918, ISCAG, Coll. 232. To avoid creating long complex, and sometimes not adequately isolated circuits which the enemy could intercept more easily, manual telephone switching stations had to be built between the inner and outer zone.

Comando del XXIII Corpo d' Armata

STATO MAGGIORE

ATTENZIONE!

IL NEMICO VI ASCOLTA E INTERCETTA LE NOSTRE COMUNICAZIONI

1. — Le linee siano sempre a circuito metallico.
2. — Non parlate che per ragioni di servizio.
3. — Non dite mai per telefono cose che possano essere utili al nemico.
4. — Non dimenticate di far uso di parole convenzionali.
5. — Non svelate al nemico i numeri e i nomi delle nostre unità.
6. — Parlate se possibile in dialetto.
7. — Verificate frequentemente l'isolamento delle linee e le cartine paraffinate degli apparati e dei centralini.

13.16 Leaflet containing provisions for avoiding enemy telephone eavesdropping

Other provisions like the elimination of all telephone lines within the Regiments and the reduction to the bare minimum "of the lines for the forward observers" accompanied the afore mentioned measures. Furthermore, trying to reduce the risks of conveying information to the enemy, the orders and regulation issued in 1916 were stressed, establishing that "for all the remaining telephone lines - i.e., for artillery and infantry Headquarters, air defence, photoelectric service, etc. up to 10 km from the first trench - all communications about operations, troops, force data, movements, supplies and the like, must be encrypted".

Luckily for Italians, their enemies encountered serious difficulties in organizing the eavesdropping service, mainly because the lack of interpreters. By intercepting some animated telephone discussions between Austrian Officers, the Italians became aware of the serious problem faced by the '*Spetelf*'- the name given by the Austro-Hungarian to their telephone interception service - concerning shortage of interpreters with adequate knowledge of Italian and especially of local dialects. The Austrian Commands tried to remedy this shortcoming by setting up training schools where the Italian language was taught[65], but the intercepted conversations mentioned above demonstrated that the achieved results were often unsatisfactory[66].

[65] M.Ronge, *Der Telephon Abhorchdienst, op. cit.,* p. 693.

[66] In his book Finzi rhetorically addressed the Officials whose name he learned through the interceptions and mocked them (C. Pettorelli Lalatta, *op. cit.* p. 272).

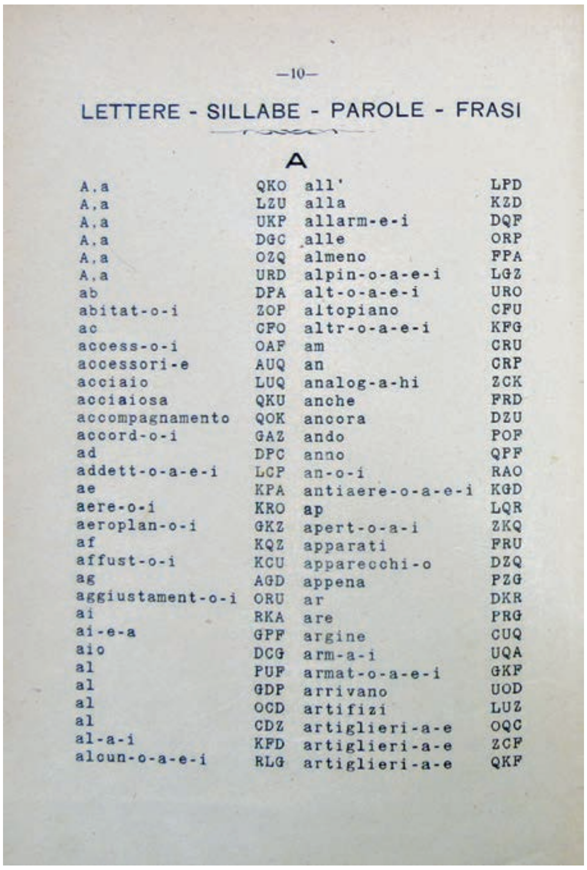
CHAPTER FOURTEEN

The Path to Victory

14.1 LAST CIPHERS FOR THE ITALIAN RADIO STATIONS

The "S Code Group"

The new *SB* service system was a two-part code distributed on 6 July and entered service on 5 August 1918 to replace the *CFbis* for communications between radio stations of Headquarters down to Divisions[1]. The first letter B identified the code as a release of the series characterised by the initial "S", which also included versions *SA, SC*, and *SD*. The *SA* was most likely implemented before the *SB* but distributed to all Radiotelegraphic stations only in October.



—10—

LETTERE - SILLABE - PAROLE - FRASI

A

A,a	QKO	all'	LPD
A,a	LZU	alla	KZD
A,a	UKP	allarm-e-i	DQF
A,a	DGC	alle	ORP
A,a	OZQ	almeno	FPA
A,a	URD	alpin-o-a-e-i	LGZ
ab	DPA	alt-o-a-e-i	URO
abitat-o-i	ZOP	altopiano	CFU
ac	CFO	altr-o-a-e-i	KFG
access-o-i	OAF	am	CRU
accessori-e	AUQ	an	CRP
acciaio	LUQ	analog-a-hi	ZCK
acciaiosa	QKU	anche	FRD
accompagnamento	QOK	ancora	DZU
accord-o-i	GAZ	ando	POF
ad	DPC	anno	QPF
addett-o-a-e-i	LCP	an-o-i	RAO
ae	KPA	antiaere-o-a-e-i	KGD
aere-o-i	KRO	ap	LQR
aeroplan-o-i	GKZ	apert-o-a-i	ZKQ
af	KQZ	apparati	FRU
affust-o-i	KCU	apparecchi-o	DZQ
ag	AGD	appena	PZG
aggiustament-o-i	ORU	ar	DKR
ai	RKA	are	PRG
ai-e-a	GPF	argine	CUQ
aio	DCG	arm-a-i	UQA
al	PUF	armat-o-a-e-i	GKF
al	GDP	arrivano	UOD
al	OCD	artifizi	LUZ
al	CDZ	artiglieri-a-e	OQC
al-a-i	KFD	artiglieri-a-e	ZCF
alcun-o-a-e-i	RLG	artiglieri-a-e	QKF

—37—

A

ACD	Comando Supremo	AGF	Venezia
ACF	Ten. Gen. Tassoni	AGK	cu
ACG	____ Divisione	AGL	Bormio
ACK	zi	AGO	grupp-o-i
ACL	Ten. Colon. Bardeloni	AGP	gia
ACO	ra	AGQ	quadrett-o-i
ACP	ripiega	AGR	O (zero)
ACQ	ospedaletto	AGU	der
ACR		AGZ	Cavalese
ACU	ca	AKC	respint-o-a-e-i
ACZ	zon-a-e	AKD	carr-o-i
ADC	Sebenico	AKF	pomeriggio
ADF	preg-o-asi comunicare	AKG	verranno
ADG	temporanea	AKL	barcon-e-i
ADK	quando	AKO	sse
ADL	Com. 4ª S.R.T. d'Armata	AKP	stre
ADO	sotto	AKQ	Colloredo di Monte Albano
ADP	stu	AKR	meno
ADQ	vicinanz-a-e	AKU	Ten. Colonn. Levi
ADR	dispong-a-asi	AKZ	avere
ADU	nemic-o-a-i-he	ALC	relativ-o-a-e-i
ADZ	qui	ALD	che
AFC	incendi-o-i	ALF	Gen. Giustetti
AFD	vist-o-a-e-i	ALG	ritiro
AFG	- (tratto di linea, di separazione, di congiunzione etc.)	ALK	vari-o-i
		ALO	ne
AFK	trasmess-o-a-e-i	ALP	us
AFL	vettovagliare	ALQ	4 (quattro)
AFO	inviare	ALR	probabilmente
AFP	il	ALU	co
AFQ	su	ALZ	radiotelegrafic-o-a
AFR	Com.te 56ª S.R.T. di C. A.	AOC	corp-o-i
AFU	Monte Pertica	AOD	cos
AFZ	tal	AOF	montagn-a-e
AGC	quel	AOG	ci
AGD	ag	AOK	non

14.1 First page of the encoding and decoding parts of a S-series service code (ISCAG Library)

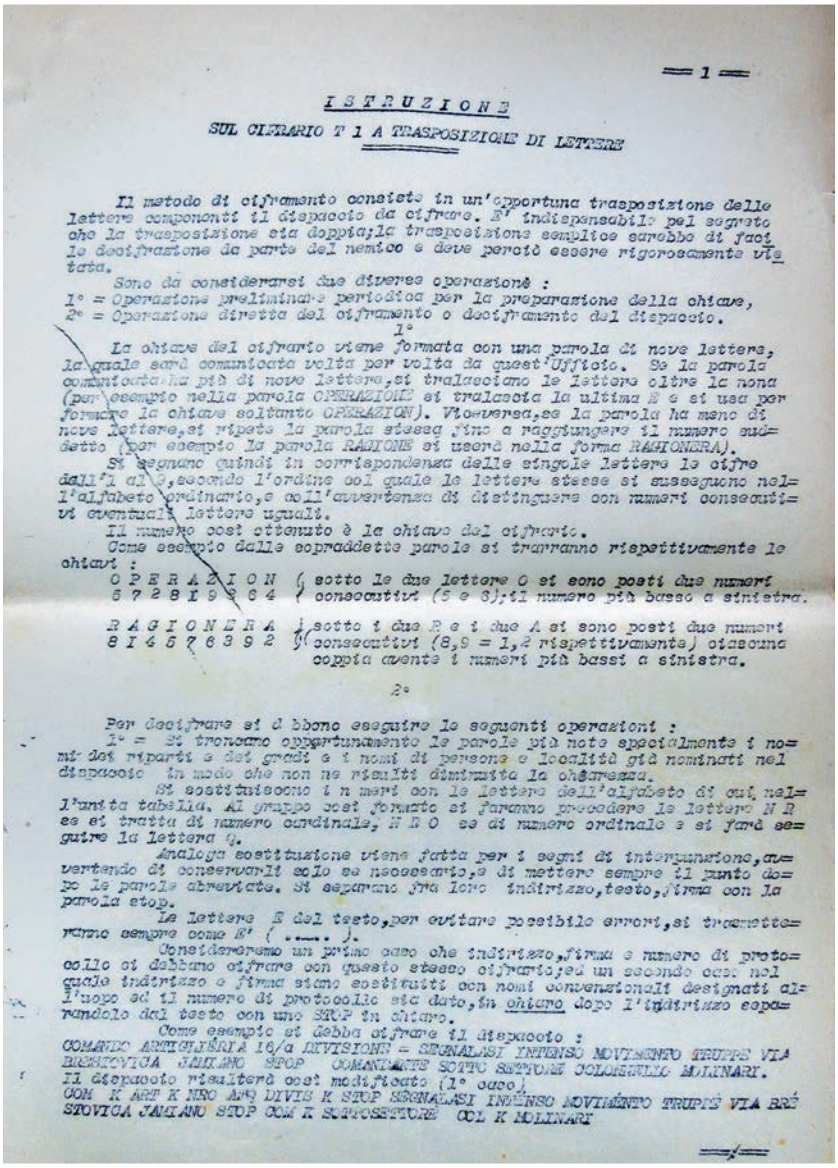
[1] Chief Inspector STM, Diari, *Circolare riservatissima N° di Prot. 28590 del 6 luglio 1918 e Circolare riservatissima, N° di Prot. 32246 del 25 luglio 1918, ambedue con oggetto: Cifrario di Servizio SB* (Very confidential circulars both concerning; Service Cipher SB), AUSSME, Series B1, 105S, Vol. 91.

All the S family adopted three-letter code groups taken from a 13-letter Italian reduced alphabet, giving rise to 1.716 possible code groups[2]. In picture 14.1 where one page of coding and decoding parts is shown, in addition to the random choice of the code groups, the plenty of homophones can be noticed for letters such as “a” and common terms such as “artiller - y - ies”.
With the purpose of modifying the three-letter groups obtained from the dictionary, all the *S* codes, applied over-encoding with a key designated at the beginning of each dispatch by a three-letter ‘indicator’. Each key led to a position in the ‘table of keys’ where the replacements to be made for each letter of the groups resulting from the first encoding were shown[3]. The encoding telegraphists chose the key at their own discretion and therefore over-encoding could vary from a dispatch to another. In cryptograms, pairs of code groups created sets of six letters.
The introduction of the S system triggered a relevant issue for the Austro-Hungarian analysts, so much so that, in referring to the great efforts made to incept the break of SB, Figl wrote: “with daily indicators, the enemy was much better protected against us than in all previous ciphers. Our good fortune was that he only had all the worthy ideas towards the end of the war. If the enemy had started the war with these lists of conventional names, with the list of indicators and with the CSB, who knows...”[4].
Figl attempted to break the code by steps and faced considerable difficulty. It took him about ten days after the beginning of September to create a list of over-encoding indicators, that is, more than a month after the code was used for the first time[5]. Of course, finding those indicators does not imply he was able to identify the tables and the approximately 1,700 items of the two-part code.
To the success of the Austro-Hungarian Chief analyst largely contributed recurrent ‘non-compliance’ of the Italian operators with the regulations, as for instance the infrequent replacement of keys. In fact, the circular letter for the distribution of the *SA*, entered service on 20 October, explicitly ordered the operators to “observe the fundamental rule of using all indicator groups of the table (of keys), and not just one or two, as many do. This would remove all the advantages of double encoding without diminishing the burden of entailed work”[6].
The partial breaking of the *SB*, as Figl himself acknowledged, remained the last success of the *Penkalas*. However, it was not exploited for long, as the Italians replaced it with new Series S codes - namely *SA* and *SC* - and adopted the *T1* service cipher, hence frustrating all enemy efforts. These new codes and cipher were never quoted by Austrian sources, except for the *SA* which Ronge claimes he discovered on 27 October because an Italian radio telegram started declaring to use SA with over coding, but he does not state any decrypting of the following part of the cryptogram[7].
The *SC* code was also available before the end of the conflict, as for a circular letter dated 23 October, where the indicator groups to be used in the mixed-use of the S ciphers, are listed[8].
The last delivery in the Series S, the *SD* code, occurred after the armistice.

[2] 13x12x11 = 1,716.
[3] Even the table of keys contained an encoding and a decoding part since substitutions of the 13-letter occurred in a completely random manner.
[4] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 221 - 224; CSB stands for Code SB. Unlike Figl reported, there were no ‘daily indicators’, but rather changing from message to message (M. Ronge, *Der Radiohorch*, *op. cit.,* p. 38).
[5] O.J. Horak, *Oberst a.D. Andreas Figl, op. cit.,* p. 221 - 224.
[6] Chief Inspector, STM, *Circolare riservatissima del 13 ottobre 1918,* ISCAG, Coll. 229.
[7] M. Ronge, *Der Radiohorch*, *op cit.,* p. 41. Ronge writes about a cipher called C-S-A in service since 1st August 1918 for the Italian Air Force, forced on 26 September (M. Ronge, *Der Radiohorch*, *op cit.,* p. 47). On the contrary, the enter service of SA for all radio stations starts from 20 October. The two ciphers do not match.
[8] Chief Inspector, STM, *Circolare riservatissima del 23 ottobre 1918* (Very confidential circular of 23 October 1918), ISCAG, Coll. 226.

The T1 Service Cipher

After the *SB* adoption, the previous *CFbis* remained valid for radio communications within the Divisions, unless the Headquarters directly encoded messages by the *D* or *R* codes. On 1 September, with the entry into service of the new *T* cipher, for communications between radio stations of Divisions and those of their subordinate units, the *CFbis* was finally dismissed[9].



== 1 ==

ISTRUZIONE

SUL CIFRARIO T 1 A TRASPOSIZIONE DI LETTERE

Il metodo di cifRamento consiste in un'opportuna trasposizione delle lettere componenti il dispaccio da cifrare. E' indispensabile pel segreto che la trasposizione sia doppia; la trasposizione semplice sarebbe di facile decifrazione da parte del nemico e deve perciò essere rigorosamente vietata.

Sono da considerarsi due diverse operazioni :
1° = Operazione preliminare periodica per la preparazione della chiave,
2° = Operazione diretta del cifRamento o decifRamento del dispaccio.

1°

La chiave del cifrario viene formata con una parola di nove lettere, la quale sarà comunicata volta per volta da quest'Ufficio. Se la parola comunicata ha più di nove lettere, si tralasciano le lettere oltre la nona (per esempio nella parola OPERAZIONE si tralascia la ultima E e si usa per formare la chiave soltanto OPERAZION). Viceversa, se la parola ha meno di nove lettere, si ripete la parola stessa fino a raggiungere il numero suddetto (per esempio la parola RAGIONE si userà nella forma RAGIONERA).

Si segnano quindi in corrispondenza delle singole lettere le cifre dall'1 al 9, secondo l'ordine col quale le lettere stesse si susseguono nell'alfabeto ordinario, e coll'avvertenza di distinguere con numeri consecutivi eventuali lettere uguali.

Il numero così ottenuto è la chiave del cifrario.

Come esempio dalle sopraddette parole si trarranno rispettivamente le chiavi :

O P E R A Z I O N (sotto le due lettere O si sono posti due numeri
5 7 2 8 1 9 3 6 4 (consecutivi (5 e 6); il numero più basso a sinistra.

R A G I O N E R A (sotto i due R e i due A si sono posti due numeri
8 1 4 5 7 6 3 9 2 (consecutivi (8,9 = 1,2 rispettivamente) ciascuna coppia avente i numeri più bassi a sinistra.

2°

Per decifrare si debbono eseguire le seguenti operazioni :
1° = Si troncano opportunamente le parole più note specialmente i nomi dei riparti e dei gradi e i nomi di persone e località già nominati nel dispaccio in modo che non ne risulti diminuita la chiarezza.

Si sostituiscono i numeri con le lettere dell'alfabeto di cui nell'unita tabella. Al gruppo così formato si faranno precedere le lettere N R se si tratta di numero cardinale, N R O se di numero ordinale e si farà seguire la lettera Q.

Analoga sostituzione viene fatta per i segni di interpunzione, avvertendo di conservarli solo se necessario, e di mettere sempre il punto dopo le parole abreviate. Si separano fra loro indirizzo, testo, firma con la parola stop.

Le lettere E del testo, per evitare possibile errori, si trasmetteranno sempre come E' (..—..).

Consideremo un primo caso che indirizzo, firma e numero di protocollo si debbano cifrare con questo stesso cifrario; ed un secondo caso nel quale indirizzo e firma siano sostituiti con nomi convenzionali designati all'uopo ed il numero di protocollo sia dato, in chiaro dopo l'indirizzo separandolo dal testo con uno STOP in chiaro.

Come esempio si debba cifrare il dispaccio :
COMANDO ARTIGLIERIA 16/a DIVISIONE = SEGNALASI INTENSO MOVIMENTO TRUPPE VIA BRESTOVICA JAMIANO STOP COMANDANTE SOTTO SETTORE COLONNELLO MOLINARI.
Il dispaccio risulterà così modificato (1° caso)
COM K ART K NRO ARQ DIVIS K STOP SEGNALASI INTENSO MOVIMENTO TRUPPE VIA BRESTOVICA JAMIANO STOP COM K SOTTOSETTORE COL K MOLINARI

==/==

14.2 First page of the instructions for the T1 service cipher (ISCAG Library)

[9] Chief Inspector, STM, *Circolare riservatissima del 24 agosto 1918* (Very confidential circular of 24 August 1918), ISCAG, Coll. 229.

The instructions of the *T1* show it adopted double transposition methods with a 9-letter key changed daily according to tables distributed to radiotelegraphic stations every month[10]. The drafter of the instructions, probably Sacco himself, recommended to implement double transposition, because "the single one would make decoding easier to the enemy and therefore had to be strictly forbidden" (picture.14.2)[11].

Similar ciphers were already widely used, especially throughout the German army from the first months of the war. For instance, the French analysts managed to decrypt dispatches coded by the German ÜBCHI cipher, mainly because their enemies left the keys unchanged for several days, increasing the probability of detecting telegrams of equal length within a large amount of cryptographic material: indeed, a prerequisite to apply a decoding process known as 'multiple anagrams technique' which was already known at the end of the 19th century[12].

Conversely, a long enough key replaced daily posed serious obstacles to the double transposition forcing, especially if encoding was producing 'incomplete rectangles' and provided, of course, that the operators avoided carelessness and errors in encoding[13]. Combined with the scarcity of cryptographic material, this explains why the Austrian crypto analysts never mention the *T1* chipher.

The ciphering system was sound enough to remain valid after the war, at least through 1919. The *T2* version introduced in April of that year, used keys with variable length between 8 to 10 letters, instead of exactly 9, replaced any other day[14].

14.2 OTHER RELEVANT PRODUCTS OF THE CRYPTOGRAPHIC UNIT

The Inter-Allied Code (I.A.)

By November 1917, six French and five British divisions had arrived in Italy and reached the front lines by the end of December 1917. In the spring of the following year, part of these troops returned to the western front while three French and two British divisions remained in Italy to fight.

Their telecommunications systems had to be linked with those of the Italian army to ensure rapid and effective communication between Staffs and then among the units deployed to adjacent sectors on the front. As of wireless communications, compatibility of frequencies and a suitable three-language code, known as *I.A. code*, had to be arranged.

Section R's logs of 8 December 1917, reported that, on the previous day, Major Sacco had reached the Headquarters of the Supreme Command in Padua "to settle the issue of drafting and using ciphers for correspondence with the French and British allies"[15]. During the four-day mission, the foundations were laid to adopt the inter-allied code and the Italian Cryptographic Unit was tasked

[10] Library of the ISCAG, coll. XXXI A, n° 11129. The key was a 9-letter word transformed into a numeric key through the method explained in the previous chapters.

[11] *ibidem*.

[12] F. L. Bauer, *op. cit.* p.95 - 98; 421 - 423. This method can be applied to all transposition systems. It consists of superimposing two or more messages of equal length and then putting together pairs of columns with the purpose of finding the one with the most likely bi-grams in the language of the messages. The chosen columns are then put together with the remaining columns to find the group with the most likely tri-grams. One should be able to start seeing fragments of the messages in plain text, to which the remaining columns of the cryptograms are approached one after another to find the messages' content.

[13] The examples in the *T1* Instruction Handbook portrayed only incomplete rectangles, that is, the last row had variable length based on the number of letters contained in the messages, as it happens with a fixed columns number.

[14] The double transposition with frequently variable key found large application during the WWII too.

[15] *Section R logs, 7 December 1917*, AUSSME, Series B1, 101S, Vol. 307d.

with arranging it. The logs of Section U of the Intelligence Service confirmed the inter-allied code was distributed in March 1918[16].

Sacco was proud abut the commission received to create the I.A. code. In referring to the alleged reorganisation of the Italian Encoding Service by the Allies claimed by Gylden, he stated that the collaboration of the Italian Cryptographic Unit with the French and the British had been "strictly limited to the exchange of enemy keys, except for the drafting of the inter-allied code, which we took care of"[17].

The I.A. - a two-part code with three-letter code groups, which could be grouped in pairs in telegrams - was changed frequently, as required to prevent breaking attempts. For instance, in June, the Chief Inspector of the STM requested Section R to create a new inter-allied radiotelegraphic code in three languages to replace the one in service[18], and about a month later, two allied liaison officers, one French and one British, visited Section R "to agree on some changes to the *I.A. code*"[19].

I.A. resisted to cryptanalysis, as proved by the lack of mentions by Austrian sources and by its inclusion the among the unbroken Italian cryptographic systems, according to the statements made by Austrian analysts captured at the end of the war[20].

High Commands Codes

The new editions of the *Blue* and *Special* codes, announced in July 1918, did not see the light during or after the conflict, since replaced by the *SI code* for the communication among High Commands, with later addition of the *Grey Tables*.

However, the old codes were finally and completely dismissed only on 5 October, at the same time of the new *Grey Tables* official adoption, as per written order of the Chief Inspector of the STM, where he established that:

> NO radiotelegraphic stations shall accept radio-telegrams to be transmitted with a 5-digit encoding that carry the indications 'Special', 'Blue', 'Green'. Of the telegrams with 5-digit group encoding, only those fully encoded with the indication 'GREY' can be accepted and transmitted by radio stations without further encoding[21].

After the events described in the previous chapters, which led to the creation of the new *SI* at the beginning of 1918, the latter was gradually adopted outside the correspondents with the Intelligence Service[22]. The prior availability of the *SI code* down to the Infantry and Cavalry Division Headquarters allowed the distribution of the new *Grey Tables* to all the units included in the address list shown in picture 14.3.

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[16] *Section U logss, 14 March 1918,* AUSSME, Series B1, 101 D, Vol.360d.

[17] L. Sacco, *Manuale, op. cit*. p. 309.

[18] Chief Inspector STM, *Logs, 14 June* 1918, AUSSME, Series B1, 105S, Vol.91.

[19] *Section R logs, 23 July 1918*, AUSSME, Series B1, 101 S, Vol. 321d. The two officers were the French Captain Plattard and the British Lieutenant Fleure.

[20] Intelligence Service, *Attività dei Reparti crittografici, op. cit.* Actually, in one of the sheets with pencil notes probably taken by Ronge himself and kept together with his memoirs, the annotation C.I.A appears. It probably referred to the inter-allied code, but its bare mention does not imply the code had been broken.

[21] Chief Inspector STM Logs, Service Order no.29, October 2, 1918, *Telegrammi da trasmettere per radio* (Radio Telegrams to be transmitted by radio), AUSSME, Series B1, 105 S, Vol. 92.

[22] Based on the logs of Sections R and U of the Intelligence Service, the changes to the *SI code* occurred on 5 April, 23 May, and June 1918, while in September the grey tables were distributed.

Copia N. 160

Riservatissimo Personale

d)

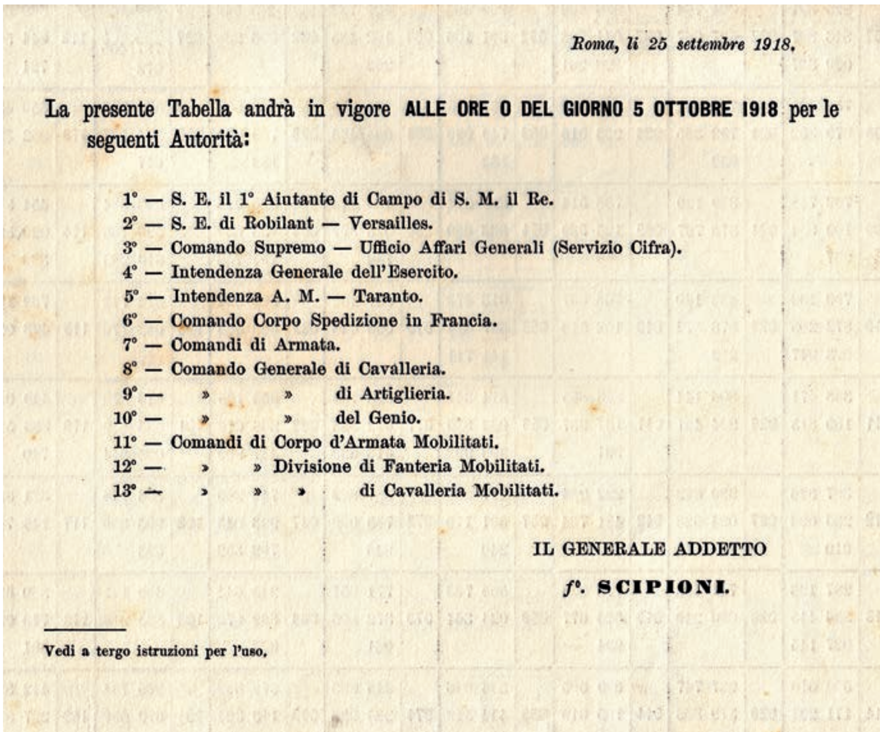
R. ESERCITO ITALIANO

COMANDO SUPREMO

Servizio Informazioni – Sezione R

TABELLA GRIGIA

Cifrante



Roma, lì 25 settembre 1918.

La presente Tabella andrà in vigore **ALLE ORE 0 DEL GIORNO 5 OTTOBRE 1918** per le seguenti Autorità:

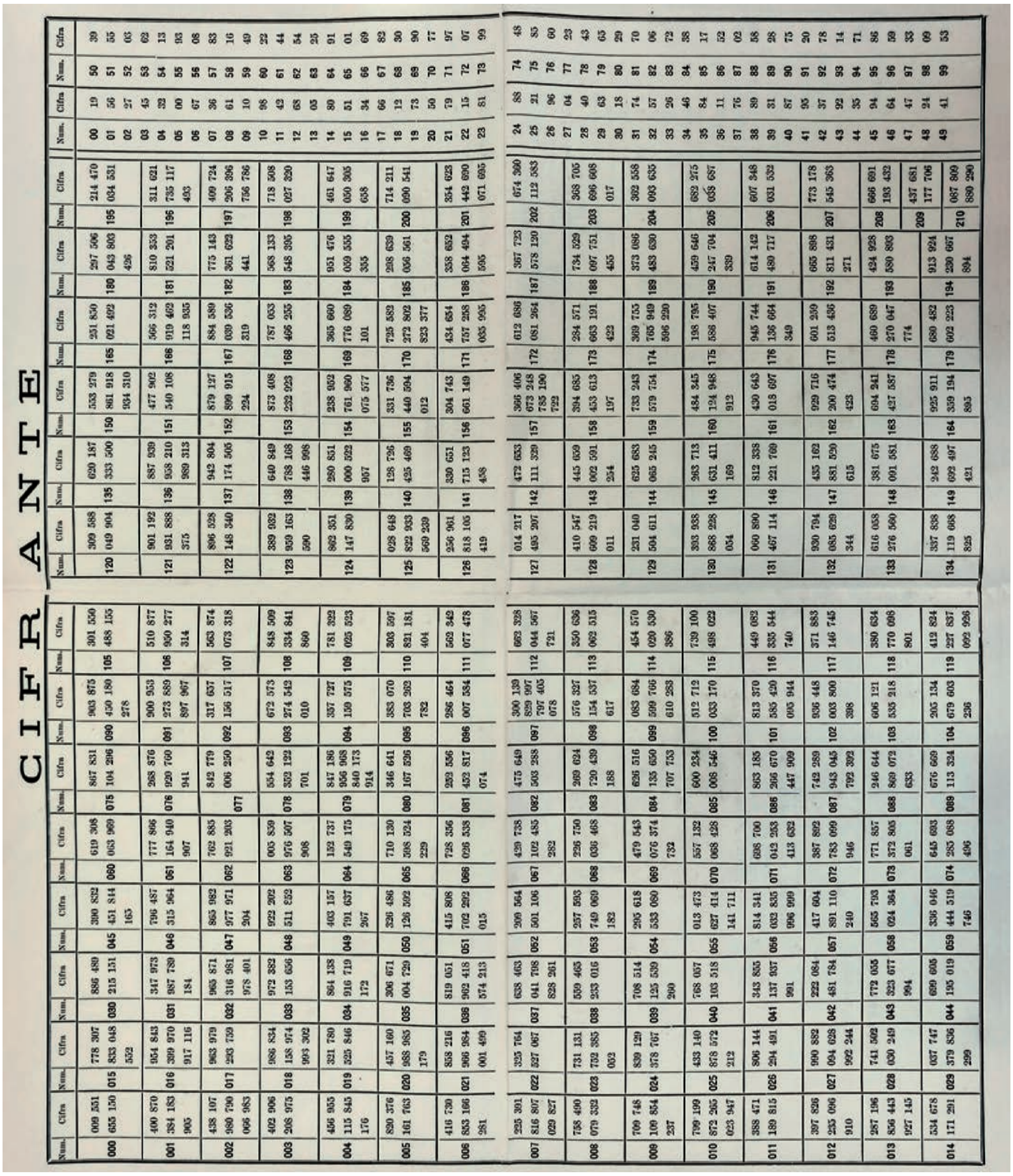
1° — S. E. il 1° Aiutante di Campo di S. M. il Re.
2° — S. E. di Robilant — Versailles.
3° — Comando Supremo — Ufficio Affari Generali (Servizio Cifra).
4° — Intendenza Generale dell'Esercito.
5° — Intendenza A. M. — Taranto.
6° — Comando Corpo Spedizione in Francia.
7° — Comandi di Armata.
8° — Comando Generale di Cavalleria.
9° — » » di Artiglieria.
10° — » » del Genio.
11° — Comandi di Corpo d'Armata Mobilitati.
12° — » » Divisione di Fanteria Mobilitati.
13° — » » » di Cavalleria Mobilitati.

IL GENERALE ADDETTO

f°. SCIPIONI.

Vedi a tergo istruzioni per l'uso.

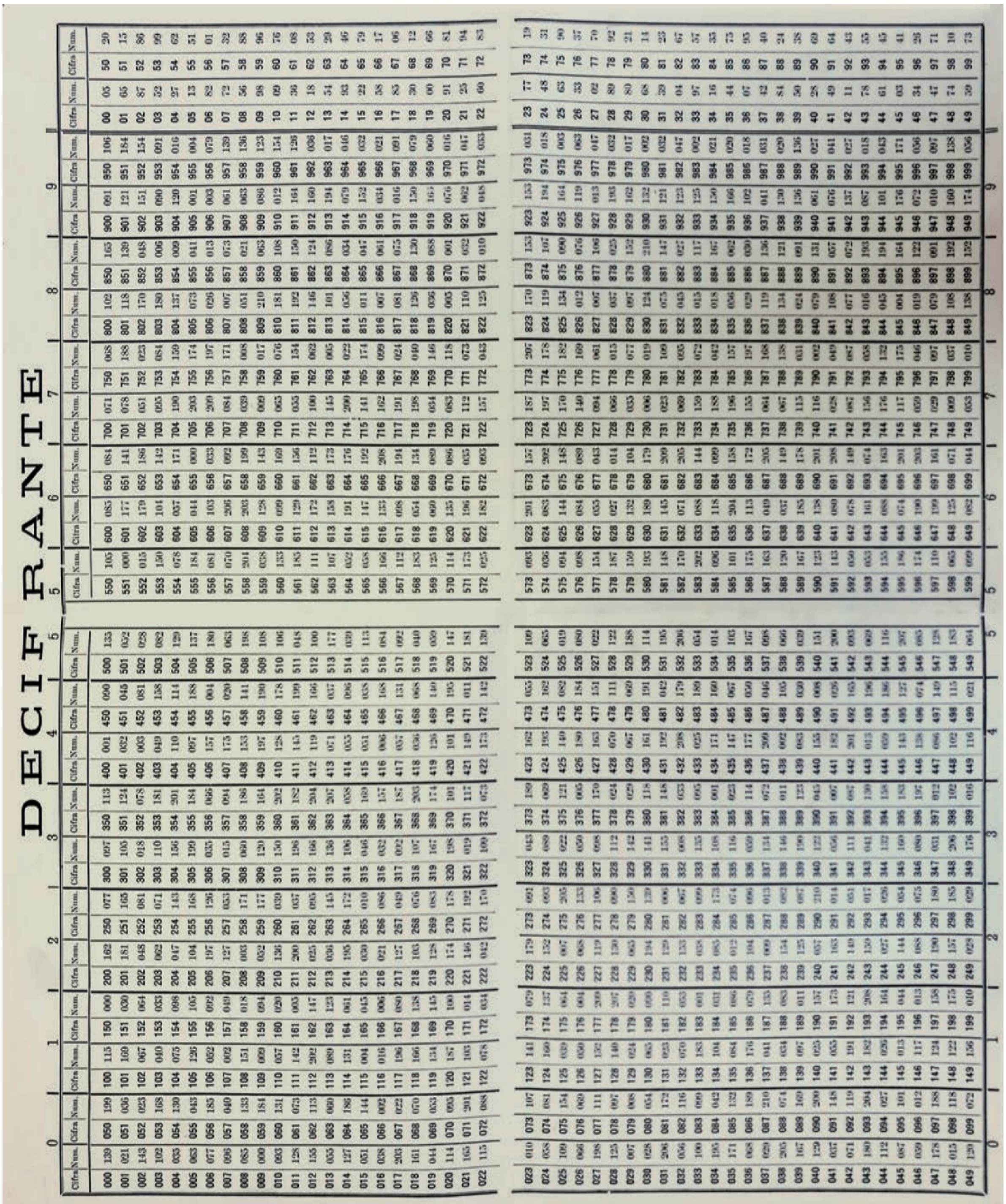
14.3 Cover and address list of the Grey Encoding Table



14.4 Grey Encoding Table

A brief description is enough to explain the structure of the grey coding and decoding tables exposed in pictures 14.4 and 14.5 respectively, because of their likeness to those already examined for the *Special code*[23]. Five different digits replaced the five digits of each code group obtained from the *SI code* as follows: one of the available options (4 to 7) shown in the left of each column replace the first three digits of each group between 000 and 210 listed in the corresponding position

[23] AUSSME, Series H5, env.11. The grey tables adopted the same principle of the Special Code's tables, even if the SI code was not paginated.



14.5 Grey Decoding Table

to the right; the same applied to the last two digits of the code groups, with a single substitution option[24].

As mentioned before, the reference to the *SI code* by Austro-Hungarian sources is limited to the events occurred in the autumn/winter of 1917, while no reports were filed concerning new versions

[24] The new tables were applied only to *SI*, as the maximum value of the first three figures of the code groups was 210, as per the 21.099 items in *SI* last release.

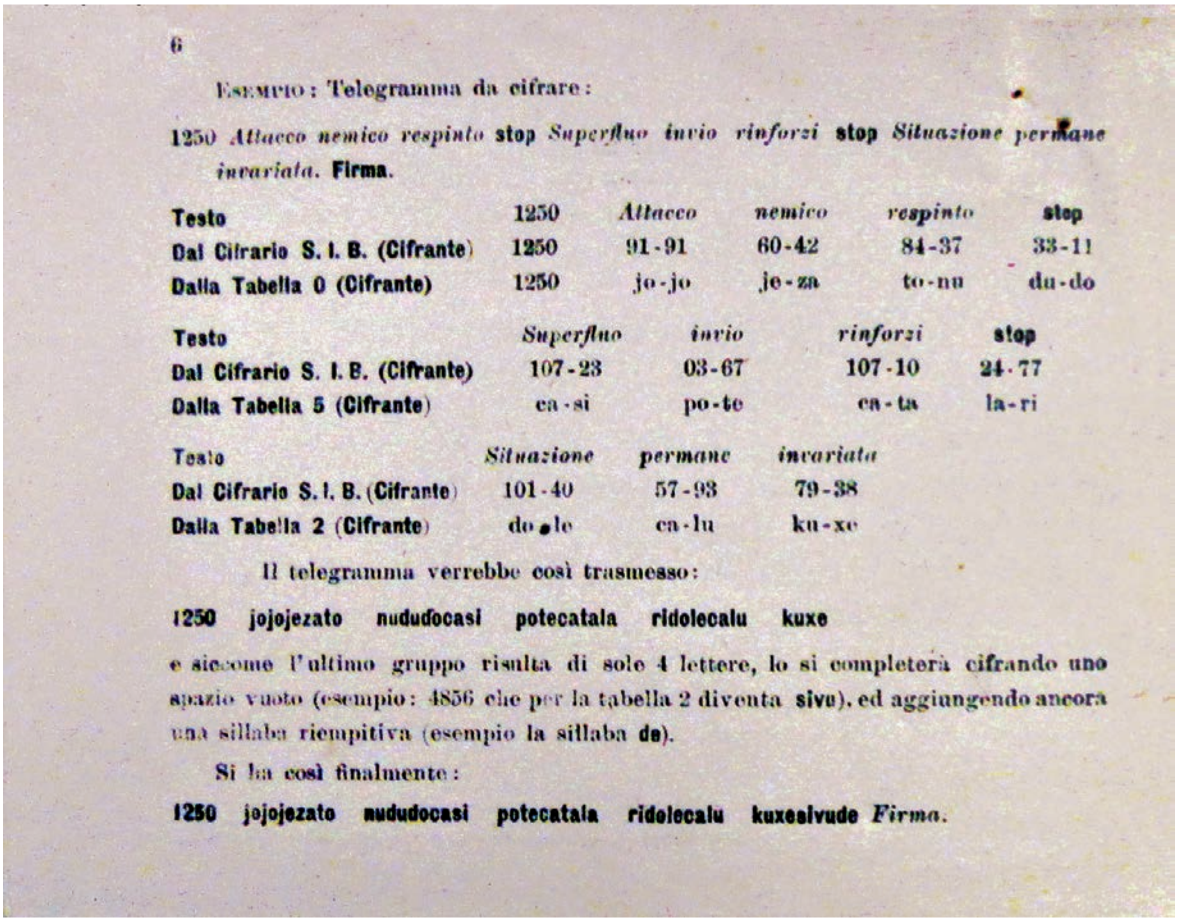
of the code and tables adopted in 1918, which evidently were never broken. The only mention of a "not yet decoded grey code" appeared in the last part of Ronge memoirs, for he believed it was used within the 4th Army alone[25].

One can infer that during the planning and development phases of the decisive events that culminated into the Battle of Vittorio Veneto, the Austrian analysts could not break any relevant dispatch from the Italian Headquarters down to Divisions, as well as any service dispatches encoded with the *SA* or *T1*, in addition to *D and R* codes.

Replacing the most important codes and ciphers on the eve of the last battle on the Italian front - in fact, a long-planned initiative to win the last resistance of the Austro-Hungarian army - may not have happened by chance, but instead demonstrated the maturity reached by the Cryptographic Unit and its Chief.

A New Code for the Intelligence Service

Given the widespread adoption of the *SI code*, the Intelligence Service asked the Cryptographic Unit to generate a new code for communications with the Intelligence Centres abroad and among



6

Esempio: Telegramma da cifrare:

1250 *Attacco nemico respinto* **stop** *Superfluo invio rinforzi* **stop** *Situazione permane invariata*. **Firma.**

Testo	1250	*Attacco*	*nemico*	*respinto*	**stop**
Dal Cifrario S. I. B. (Cifrante)	1250	91-91	60-42	84-37	33-11
Dalla Tabella 0 (Cifrante)	1250	jo-jo	je-za	to-nu	du-do

Testo	*Superfluo*	*invio*	*rinforzi*	**stop**
Dal Cifrario S. I. B. (Cifrante)	107-23	03-67	107-10	24-77
Dalla Tabella 5 (Cifrante)	ca-si	po-te	ca-ta	la-ri

Testo	*Situazione*	*permane*	*invariata*
Dal Cifrario S. I. B. (Cifrante)	101-40	57-93	79-38
Dalla Tabella 2 (Cifrante)	do-le	ca-lu	ku-xe

Il telegramma verrebbe così trasmesso:

1250 jojojezato nududocasi potecatala ridolecalu kuxe

e siccome l'ultimo gruppo risulta di solo 4 lettere, lo si completerà cifrando uno spazio vuoto (esempio: 4856 che per la tabella 2 diventa **sivu**), ed aggiungendo ancora una sillaba riempitiva (esempio la sillaba **de**).

Si ha così finalmente:

1250 jojojezato nududocasi potecatala ridolecalu kuxesivude *Firma*.

14.6 Over-encoding method for the S.I.B. Code (ISCAG Library)

[25] M. Ronge, *Der Radiohorch*, *op. cit.,* p.41.

the Sections of the Service. The new *S.I.B.* - where "B" designates the second version of the *SI* - was distributed on 14 October to the abovementioned entities[26].
The *S.I.B*. included a two-part dictionary with 4-digit code groups and over-encoding tables marked with numbers from 0 to 9 which convert each pair of digits taken from the dictionary into two-letter syllables, then grouped in ten-letter pronounceable blocks[27]. In each cryptogram, the tables were changed whenever a sentence ended with 'STOP' using the message's reference number for choosing the numbers of tables, but backWards. Picture 14.6 shows an excerpt from the *SIB* Instruction Handbook that explains how to perform over-encoding.
For messages of a less confidential nature, the Intelligence Service continued to rely on the *SI code* while some irrelevant correspondence was still encoded with *M13* with over-encoding. There is no evidence that the *S.I.B. code* had been adopted by all the correspondents of the Intelligence Service before the end of the conflict, because of the difficulty to quickly reach some remote locations.
There is evidence, instead, that the *S.I.B.* - together with the *S.I.* with grey tables and some other unbroken systems mentioned above - have remained in force for quite some time even after the Armistice signature.

14.3 A SHIFT IN THE FORCE RATIO

The Unbroken Italian Ciphers

The most relevant cryptographic systems likely not broken by the Austrian cryptoanalysts have been selected and shown in the table below, excluding those used by individual Armies, such as the *Z code,* or for specific uses, like *FT* or *C5*, despite the lack of any mention from the Austrian sources. The periods in which some codes remained unsolved, as it occurred to *Red* and *Blu codes,* are also not considered.
Nor any reference is made in the following table on codes eventually derived from the Sacco's *Small Telephone Code* of September 1916, or on the *Coding and decoding dictionary* entered service, according to O. Marchetti and Ronge, in June 1917, whose existence could not be proved with certainty.
The criteria adopted in selecting the cryptographic systems included in the table can be summarised as follows.
The *Green code,* very sparingly exploited by the highest Italian Commands and some other Units after the beginning of the war, does not appear in the Austrian sources, except with reference to another code with the same colour of the cover but different structure and purpose, being used by minor units at the local level only.
The temporary structure of *D* and *R code*s prevented their general lasting breaks.
As said above, the *R, D,* together with the *I.A*. (Inter-Allied), and *S.I.* (1918 edition) were part of a short list of unbroken codes and ciphers compiled by O. Marchetti, based on statements made after the war by imprisoned Austrian officers who served in the *Penkala*. Moreover, both the *S.I.* for the whole of 1918 and the *I.A.* have never been mentioned by the Austro-Hungarian sources.

[26] Intelligence Service, Section R letter, *Nuovo Cifrario S.I.* (New code SI), October 14, 1918, AUSSME, Series F3, env. 28.
[27] Intelligence Service, *Istruzioni sulle tabelle pel cifrario SIB*, (Instructions concerning tables to be applied to SIB Code), Library of the ISCAG, Coll. XXXI A, no. 11129.

Ronge testified the resistance of the *Grey Tables* to any decoding attempt, knowing them only by the word 'grey'[28].
The *S.I.* and *D* systems shared at least two other characteristics. In both cases, they were second editions largely disseminated and employed outside the Army units for which they were originally conceived.
As far as the Service, *T1, SC,* and *SA* are concerned, these were never mentioned by Austrian sources, except for the *SA* in the circumstances already shown[29].
The list may not, however, considered as exhaustive because for instance some ciphers, which Italian documents rarely mentioned, were not found in the archives, preventing any possible identification and description[30]. Further research on the subject may bear surprising results, also concerning unbroken codes and ciphers.

A List of Unbroken Italian Codes and Ciphers			
ID	***Name***	***Users***	***Date of entry in service***
	Green	Supreme Command and Armies' Headquarters	Onset of War
D	Divisional	Initially, within Divisions	December 1917 or before
IA	Inter-allied	Among allied Headquarters	Late 1917 - March 1918
SI	Intelligence Service	Initially, within the Intelligence Service	January 1918
R	Regimental	Within Regiments	May 1918
T1	Service Cipher	Small Radio Stations	September 1, 1918
Grey	Grey Tables for S.I.	High Commands up to Division	October 5, 1918
S.I.B.	Intelligence Service 'B'	Intelligence Service	October 14, 1918
SA	Service Code 'SA'	Large Radio Stations	October 20, 1918
SC	Service Code 'SC'	Large Radio Stations	Before October 23, 1918

Last Flashes of the Austrian Comint

Decrypting of Italian dispatches, for example, those still encoded with the *Special*, *Blu* and *CFbis* continued during 1918, except for limited time spans when new over-encoding tables were introduced from time to time. There was, however, a falling trend in the number and significance of Italian decrypted dispatches due to several causes including - inter alia - the internal difficulties of the Austrian Service, the limitations imposed to Italian wireless transmission and the gradual adoption of more resistant codes across the Italian Army.
Ronge referred to the first of these reasons at length and explained the drawbacks of the reorganisation carried out at the beginning of the year and the contrasts between the Headquarters of the Field Radiotelegraphic Service and the Cryptographic Service.

[28] M. Ronge, *Der Radiohorch, op. cit.*, p.41.
[29] *ibidem*. The unique radiogram mentioned by Ronge would be as follows: "we use the 2-part S-A cipher". Usually, the Austrian interception dates followed the dates the codes were adopted: in this case, October 27, instead of October 20.
[30] Among these are, for example, the Series V ciphers (V1, V2, V3) used before October 1917. Because of an explicit opposition by Section R, these were not renewed, nor V4 was ever published after the front shifted from the Isonzo to the Piave.

Moreover, after the Austro-Hungarian attempt to break through the Piave/Grappa front and their Divisions redeployment to the initial positions across the river, the efforts of the High Commands to support the morale of the troops could hardly be successful. The effects of the new situation also reflected in the efficiency of radio interception. Ronge stated that, because of the proven loyalty of their Officers, the *Penkalas* continued to operate until the last days of resistance to the Italian attack started on 24 October, but on the contrary the efficiency of the listening stations had become unsatisfactory, leading to lively protests by the Intelligence Service against the Headquarters of the Telegraphic Radio Service with a consequent tightened discipline against telegraph operators[31]. Some of them, captured in mid-September, witnessed the discontent among their ranks, revealing that "much greater severity has been adopted in the radio service recently, and some radiotelegraph operators have been put on trial for not complying with the regulations [...]. The severity of discipline is such that many radio telegraphists applied to be transferred to other units"[32].

The other factor reducing the Austro-Hungarian radio intelligence effectiveness was the limited use of radio that the Italians did, by systematically relying on physical networks once the front on the Piave and the Grappa had been stabilised. Ronge himself noted that, in response to the radio silence imposed on the Austrian units in April, the Italians had adopted a similar approach too[33].

Among the most relevant difficulties the Austrian radio decrypting service encountered in the last months of the war, the improved resistance of Italian codes and ciphers and the greater caution in encoding operations are worth mentioning. The steady increase in the number of unbroken Italian new cryptographic systems and the time taken to break some others inevitably led to a reduction in the number of dispatches that could be decrypted.

Finally, when in October 1918, the *Grey Tables* and the *SA* and *SC* service systems were adopted, breaking them would have been difficult given the short time between their introduction into service and the Austrian final withdrawal. The grip around the Austrian analysts was definitively tightening, even if the *Penkalas* interpreted, until the last days of the war, some dispatches covered by small inadequately updated ciphers.

In fact, the Austrian decrypting activity continued, until the 1st of November, to search for information in a rampant flow of cryptograms protected by mostly unknown encoding systems, and generated by the many motorised radiotelegraphic stations, accompanying the advance of Italian troops after crossing the Piave. According to Ronge, in the last days of October, the Austrians intercepted and correctly decrypted from twenty to thirty dispatches per day, on the whole front, in the face of many hundreds of telegrams produced by the Italian stations[34].

The decrypted telegrams were mostly protected by coding systems not yet replaced or created within units that had not yet abandoned their 'dangerous traditions'. Moreover, for less confidential communications, old encoding systems were still used to reduce to a minimum the cryptographic material with new codes supplied to the enemy.

[31] M. Ronge, *Der Radiohorch*, *op. cit.,* p.40 - 41.

[32] Headquarters, 6th Army, Intelligence Office, *Riassunto di vari interrogatori fatti ai Telegrafisti addetti alla stazione di intercettazione "SPETELF" N. X. catturati in Val Brenta il giorno 14 corrente*, (Summary of questionings Telegraphists working in no. X SPETELF station, seized in val Brenta on 14 September), September 22, 1918. *Spetelf* was the Austrian Army name for their Telephone Interception Service.

[33] M. Ronge, *Der Radiohorch*, *op. cit.,* p.31.

[34] M. Ronge, *Der Radiohorch*, *op cit.* Annexes from 75 to 78 contain the Italian messages the Austrians focused on between October 26 and November 1.

Therefore, most of the decrypted radiograms contained little useful information. In some cases, they were just service communications between radio stations. Some of them used difficult to interpret concealed expressions, such as “a pair of boots necessary for the company” or “a candelabrum needed to decorate a room”, etc. Others dealt with hydrometric services, reporting for instance the level of river waters or meteorological news for the air force. Only a few of these telegrams imprudently mentioned actions planned by Air Squadrons or the position and movements of some Divisions[35].

In any case, we must admire the spirit of sacrifice of the Austrian telegraphists and of the *Penkala* staffs who, in the critical situations caused by the withdrawal and disintegration of their Army, continued to fight a cryptographic struggle almost lost, along with the war.

14.4 VITTORIO VENETO

The Austrian Radios Revealed Expectation for Italian Attack

In the last months of the war, RDF proved the Austrian stations were still operational after the Second Battle of the Piave River and generated a significant amount of precious cryptographic material for Italian analysts, making faster their decrypting processes.

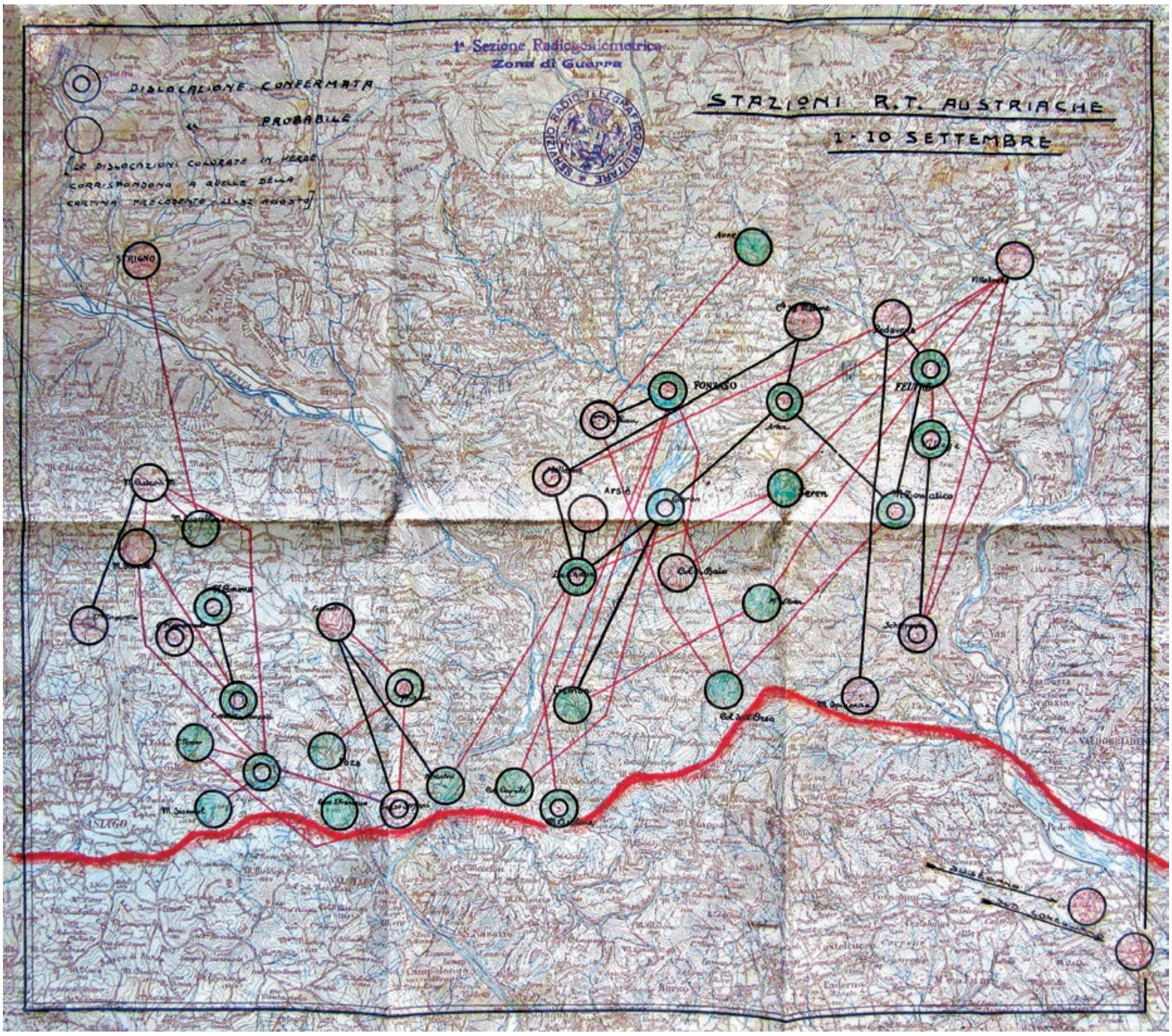
After decentralisation, the information obtained from the Italian direction finding and interception stations[36], together with those from three French and one British station, were forwarded to the 1st Radio goniometric Section twice a day. The Section issued regular daily reports, in addition to three or four graphs a month as the one shown in picture 14.7, where green colour indicates the stations already identified in the previous map[37].

The decrypting activities were now partially carried out within the Armies and at the 1st Radio goniometric Section. For example, in a document of the 6th Army dated September 1918 it reads, “on this 14th day at 12.10 pm the following encoded communication by the enemy radiotelegraphic station located in La Chiesa (Val Cismon) was intercepted and decrypted: “What happened to the Spetelf station? Signed Lieutenant Mottnitz”. The Officer’s concern was justified because the loss of a listening station dedicated to telephonic interception (*Spetelf*) could have significant consequences and offer the enemy important information on techniques and methods used in this field.

A later radio interception at 3.22 pm on the same day revealed that “Lieutenant Mottnitz asked again about that station, as he had not received an answer yet”. The close on the note of the 6th Army was quite ironical and reads: the Spetelf station being sought “is the one we have captured!”[38].

The cryptographic analysts in the Intelligence Services of the Armies not only decrypted many intercepted dispatches but helped breaking the enemy ciphers whenever possible. By exploiting the results of radio eavesdropping, the 4th Army cryptanalysts contributed to start the breaking of the code “known as ‘German’ and eventually also of a new code, which was only a modified version

[35] We cannot exclude that the “installation” (impianto) and “uninstallation” (spianto) messages unprotected with the new ciphers may have provided the enemy operators, in some cases, with indications on the movements of the Italian Divisions.
[36] There were 18 and 14 stations, respectively.
[37] ISCAG, Coll. 249.
[38] Headquarters, 6th Army, Intelligence Office, *Riassunto di vari, op. cit.* The final piece of news is not connected with the prisoners’ statements.



14.7 Detection finding of Austro-Hungarian radiotelegraphic stations in the first decade of September 1918 (ISCAG Archive)

of the previous one"[39]. In all likelihood, this was the mentioned *Schlüsselheft*, which the Austrian Divisions telegraphists labelled as "German" because it originated, with minor modifications, from a code used in the German army. Therefore, "the modified version" may refer to the second edition of the *Schlüsselheft*, already mentioned.

Clear signs of this code breaking may be found in the decrypting activity carried out by some Italian units, concerning radiotelegraphic messages inside Austrian Divisions on the eve of the Italian attack on 24 October. The information sent to the Italian Supreme Command by the 4th Army on 21 October reads:

> For two days, the enemy has been waiting for our offensive to begin from midnight to dawn. From the intercepted radio telegrams, it seems that the Headquarters of the 40th Honved Division on 20 October ordered its units to be prepared in those hours. It also seems that the

[39] Headquarters, 4th Army, Report on the *Attività radiotelegrafica nemica sul fronte dell'Armata dal 18 settembre al 4 ottobre 1918* (Enemy Radio telegraphic activity on the Army front from 18 September until 4 October 1918), AUSSME, Series E1.

troops of the 17th Austro-Hungarian Division must maintain their "ALERT" status from 4 to 6 a.m[40].

In short, it seems that the cryptographic skills of the Italian Army were no longer concentrated in a single centre of excellence.

The Radio Communications in the Final Battle

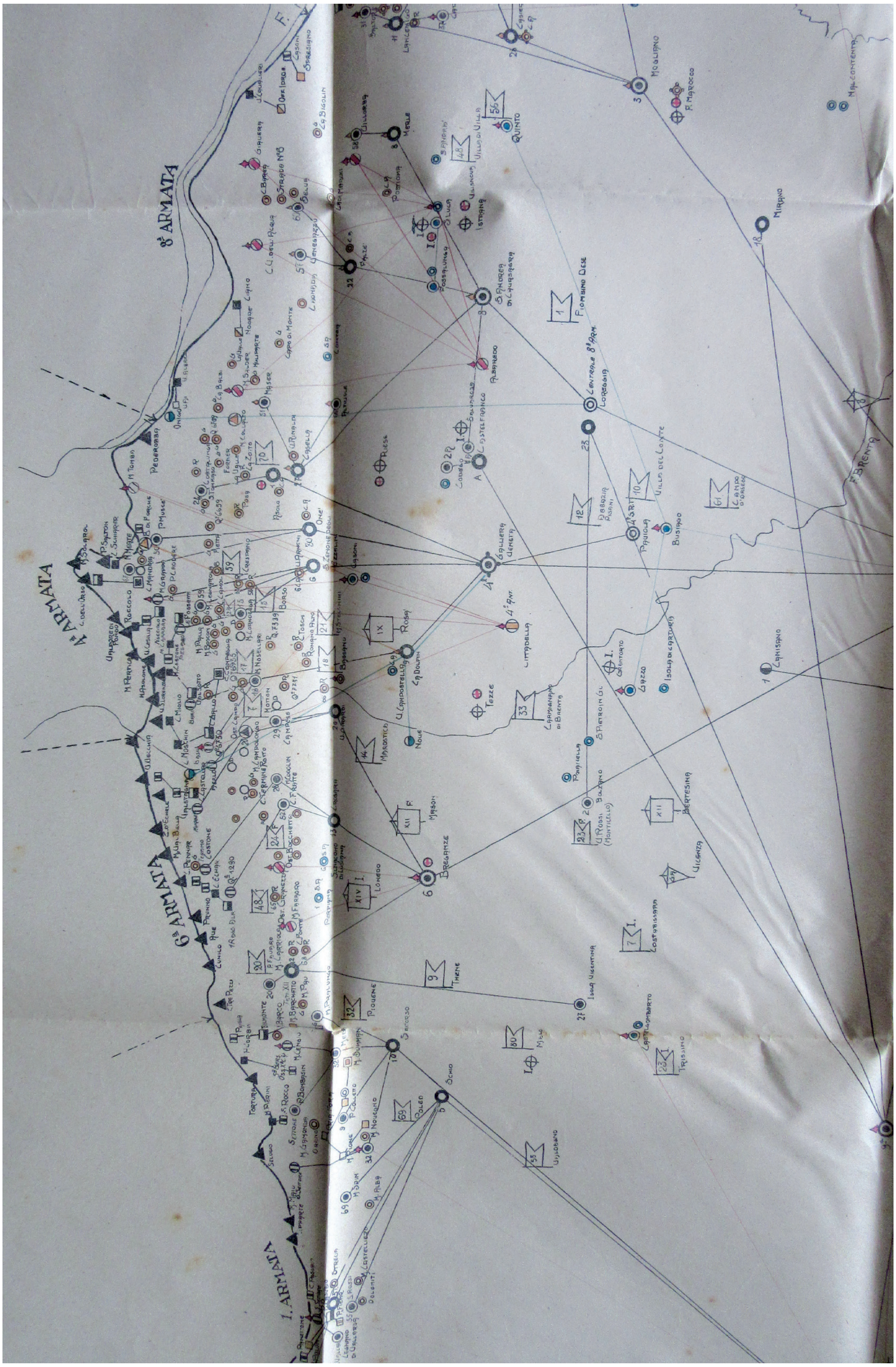
Picture 14.8 shows the deployment on the field, a few days before the final attack, of the Italian radio stations which, adding those operating in France, Albania, and Macedonia amount to a total of about 700 units[41]. Considering the number of the reserve equipment, of those being installed or distributed and of airplane radios, the total resulted close to one thousand pieces. Radiotelegraphic operators had grown from a few hundred at the beginning of the conflict to about 9,000 personnel serving in 18 Sections with 22 groups embedded in Corps.

The transition from static trench warfare to a war of quick movement after the enemy lines were broken had been long planned by the Italian Headquarters. For each unit, they had identified a limited number of routes known as *assi di collegamento* (linking routes) along which the troops could move, together with the localities where the tactical commands and intelligence gathering centres, including communication centres, could be set up. In the instructions given by the Headquarters of the Armies, priority was given to telecommunications systems over other traditional means, notably acoustic or optical, as per the latter two, it was noted that usually "in territories like ours, their range is quite short"[42].

The Headquarters of the 3rd Army planned for instance, that telephone and telegraph lines had to cross the Piave river by means of underwater cables laid away from the bridges or gangways - as these were open to enemy fire - and to be developed along the linking routes at the same speed the Headquarters advanced, thus ensuring connections among them, respecting the hierarchical order. The radiotelegraphic sections had been prepared to accommodate the sudden shift from trench warfare to war of movement. No less than 600 vehicles ensured their mobility so that they could follow the Headquarters closely in the rapid advance. It was a movement of exceptional size, with more than a hundred transceiver stations involved which preserved the integrity of the command chains, producing a volume of traffic never recorded before.

To protect radio communications, the Headquarters of the Armies ordered that, "all Headquarters up to and including divisional Headquarters communicated with each other by delivering radio telegrams already encoded with the *grey code* to radiotelegraphic stations. Only in case that one of the two correspondents should be not equipped with the *grey tables,* telegrams could be delivered to radiotelegraphic stations as plain texts. The messages would then be encoded at the radio stations using the *SA service cipher*. For radiotelegraphic communications directed to Headquarters of allied armies, the messages would instead be encrypted with the *I.A. code*". Instructions were also distributed for the protection of geophonic communication within the Brigades[43].

[40] Headquarters, 4th Army, I.T.O. Office, *Message to the Supreme Headquarters - Operations Office and HQs*, 21 October 1918, AUSSME, Series E1, env.90.
[41] Chief Inspector STM, *Relazione Tecnica sul Servizio Radiotelegrafico dell'Esercito operante, op. cit.,* p.12.
[42] Headquarters, 3rd Army, General Staff, *Collegamenti nella guerra di movimento* (Links in the war of movement), 21 October 1918, AUSSME, Series E1, env. 111.
[43] *ibidem.*



14.8 Deployment of Italian radiotelegraphic stations on the eve of the offensive of 24 October 1918 (ISCAG Archive)

This provision confirmed the previous instructions about the abolition of all the old codes and prevented Austro-Hungarian analysts from achieving relevant information from the large amount of the radio dispatches exchanged between the Italian radio stations during the Vittorio Veneto battle and the following forward movement. The final report of the Inspectorate of the STM highlighted that "the radiotelegraphic connections were secure and uninterrupted", despite the intensity of the events was unparalleled and added:

> Even the isolated Radiotelegraphic stations continued their operations under enemy fire with self-sacrifice and perseverance and repaired aerials several times a day. During the heat of the fight, ordinary telegraphists took usual care of dealing with correspondence, repairs, as well as attending to the delicate and difficult tasks of encoding and decoding dispatches[44].

14.5 THE ARMISTICE AND THE POST-WAR PERIOD

The Internationalisation of Italian Military Radio Communications

During the armistice negotiations, Italian wireless communications were required to fulfil a task that was unimaginable until a few days earlier. A connection had to be created between the Austrian Supreme Command in Baden bei Wien and a radio station of the 1st Radio goniometric section in Padua, to allow the Austrian Plenipotentiaries to exchange dispatches - some of which were exceptionally long and complex - with their Headquarters in Vienna.
An international radio telegraphic circuit was readily established throughout two Austro-Hungarian point-to-point Baden-Budapest and Budapest-Pula links, a transboundary link between the stations of Pula and Coltano - which were equipped to ensure this type of connections but certainly not between the opposing sides - and finally the link between Coltano and Padua. An excellent service was offered to the Austrian Plenipotentiaries in the dramatic days of the negotiations, delivering their telegrams always in a concise time[45].
Immediately after the armistice signature, several other international responsibilities were assigned to the existing radiotelegraphic sections and to seven new sections, often linked to the tasks of the Intelligence Service in occupied territory, in the colonies, and abroad[46].
A new radiotelegraphic Section was dispatched to Bohemia and embedded within the Headquarters of the Czechoslovakian Army Corps. Another Section deployed to Dalmatia within the Headquarters of the Italian troops installed there; others were sent to various occupied zones and to the East. A 3 kW field and a continuous wave stations installed in Vienna provided a link to Italy for the Italian Military Mission in the Austrian capital[47].
The Military Missions in Vienna, Berlin, and other capitals, as well as the main information collection centres, used the new *S.I.B.* code. For any other radio communication within the Army, including those of the units deployed in the sectors just mentioned, "the transmitting Headquarters and Authorities should use one of the authorised ciphers: the *S.I. code* with *Grey tables* and 5-digit

[44] Chief Inspector, STM, *Relazione Tecnica sul Servizio Radiotelegrafico, op. cit.,* p.13.
[45] 1st Radio goniometric Section, *Relazione sull'operato, op. cit.,* p.6.
[46] Chief Inspector, STM, *Relazione Tecnica sul Servizio Radiotelegrafico, op. cit.,* p.14.
[47] *ibidem.* This connection currently operates on the Vienna - Pula and Pula – Padua links.

groups; the inter-allied (*I.A.*) code with 3-letter or 6-letter groups; the divisional *D code* with 3-letter or 6-letter groups" and a new regimental *R code* with 5-digit groups[48].

New Dangers

After the armistice was signed, the radio interception and cryptology activities had to be maintained in the Italian Army, also because new actors appeared on the geopolitical scene, whose territorial claims clashed with Italy's aspirations. The dispute over the definition of the borders with the new Kingdom of Serbs, Croats and Slovenes was only resolved in November 1920 with the signing of the Treaty of Rapallo.

It was therefore mandatory to continuously listen to the "stations of the States being formed as a result of the latest military and political events" at the north-eastern borders with Italy, as well as to check the radio channels used during the conflict by the enemy field stations, since some of them could have fallen into the hands of the new Kingdom army - similarly to what happened to a part of the Austro-Hungarian fleet - being prepared to locate them through radio-goniometers, should they resume transmissions[49].

These measures were also justified by the events of the last days of the war, when a *Penkala*, which had withdrawn quickly to escape capture by the Italians, was stopped and captured by the Slovenian armed forces in Pörtschach near Klagenfurt, in Galicia. The Slovenes escorted to Ljubljana, Major Sieger - the chief of the *Penkala* -, his Officers and all the equipment they carried on four trucks[50].

All Sieger's attempts before the Slovenian National Council to have his material returned were unsuccessful, so much so that a few months later O. Marchetti reported that all the documents related to the "Italian codes and ciphers had been handed over to the Slovenes"[51].

The huge amount of material seized and the availability of analysts of Slovenian or Croatian origin who had served as cryptologists in the Austro-Hungarian army during the war, made the potential of Italy's new neighbours frightening. In fact, in March 1919, while the Intelligence Section of the Austrian army had ceased operations, an efficient cryptographic office was already operating on behalf of the new Kingdom under "a certain Major Andreika, who had previously directed the Cryptology Branch of the Ministry of War in Vienna"[52].

For these reasons, O. Marchetti warmly supported in his already mentioned letter to the Ministry of War, the need to maintain in an efficient condition the Cryptographic Unit - finally called by its real name since 1 December 1918 - even if missing its first Chief and soul: Luigi Sacco[53].

[48] Operation Office, Confidential Letter, Subject: *Norme sul ciframento dei dispacci r.t.,* (Regulation on Radio telegraphic dispatches coding), 10 June 1919.

[49] Chief Inspector of STM, *Relazione Tecnica sul Servizio Radiotelegrafico, op. cit.,* p. 14.

[50] M. Ronge, *Der Radiohorch, op. cit.,* p. 42.

[51] O. Marchetti, *Attività dei Reparti crittografici, op. cit.* We do not know if Sieger's four trucks carried on board also RT equipment, but Marchetti himself assessed that the Slovenes had captured Udine station as well, together with Austrian ciphers and keys.

[52] *ibidem.*

[53] *Section R Logs, 17 November 1918,* AUSSME, Series B1, 101S, Vol. 329 d. The new name (CR Unit) replaced the old (RT Unit).

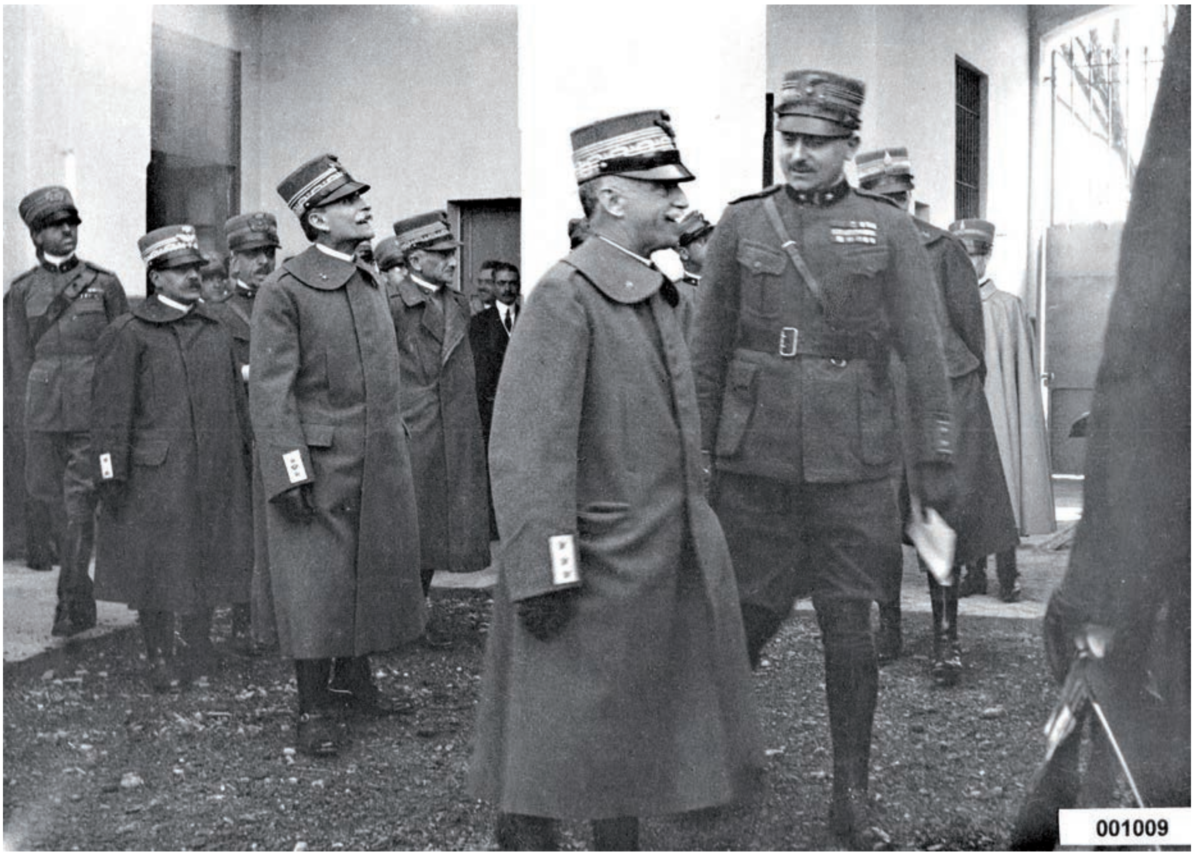
The Sacco' Leave

On 17 November, the secretariat of Section R sent a request to the Territorial Command of the General Staff Corps where it is read: "Please ensure the reassignment of Lt. Col. Luigi Sacco to the Headquarters, 3rd Group, Engineer Mobilisation Centres, Radiotelegraphic Services"[54].
Sacco's transfer order was sent only 13 days after the armistice came into force. The abrupt 'abandonent' of the Cryptographic Unit by its undisputed Commander and founder may raise some perplexities at first glance. To a closer look, however, there were some reasonable justifications as the Head of the Intelligence Service explains, in recalling the work carried out by Sacco:

> The Head of (Cryptographic N/A) Unit together with some other officers were almost exhausted, eventually. Moreover, he - who also belonged to the Corps of Engineers - had to follow his career path [...] and many times someone required this condition was fulfilled. […] He still had to manage and develop the Central decrypting office, provide for new codes, and keep them up to date, including inter-allied ones. He had to train the Officers assigned to the mobilised and mobile cryptographic units, set up the units, monitor them, direct them, and maintain contacts with similar branches within the allied forces […].
> Of course, he was exhausted from such a hard work; so, he - besides his love for cryptography and the beautiful Unit he had formed and raised as a creature of his own blood - wished to return to the arms he belonged to where, while working hard as per his nature, he would rest[55].

To meet this need, the plan to replace the Head of the Cryptographic Unit immediately after the end of war, had been prepared since some time. Sacco's possible substitute, Major Alessandro Romani, had already been assigned to the unit on an 'interim basis' on 4 October 1918.
Sacco could have started a brilliant career as cryptographer within the Ministry of Foreign Affairs, which intended to acquire the Army's capabilities in that field, to address the critical issue of peace negotiations. The General's family recalled he often mentioned his choice not to leave the Army, rejecting the Foreign Affairs 's offer, also given the position he was offered by the Army about his never-neglected interests in the development of radio technologies. In fact, for Sacco, the Headquarters, 3rd Group, Engineer Mobilisation Centres was a provisional destination before to be appointed Director of the Radio, Telegraphic and Electro-technical Workshop in Rome, in March 1919. The photo in picture 14.9 shows Sacco as the host of the visit the King of Italy and General Diaz paid to the Workshop, together with Generals Cittadini and Nicoletti Altimondi, Colonel Bardeloni, and Major Celloni[56].

[54] *Section R Logs, 28 November 1918*, AUSSME, Series B1, 101S, Vol.329d. Sacco had been promoted to Lieutenant Colonel for special merits in April 1918.
[55] O. Marchetti, *Il Servizio Informazioni, op. cit.* p. 213. After Sacco was promoted to Major and consistently with the regulations, he should have reassigned to an Engineer Unit. On 6 July 1917, however, the Secretariat of Office R sent a communication to the Personnel Office of the Supreme Headquarters about "the impossibility to release Major Luigi Sacco for the Service cannot find a replacement", Section R logs AUSSME, Series B1, 101S, Vol. 288d. However, Sacco - in addition to his regular cryptographic work - had to attend to the tasks of Director and Teacher at the Army Radiotelegraphy Operator Courses.
[56] General Armando Diaz was the Chief of the Army Staff; General Arturo Cittadini was the First Aide-de-Camp to the King; General Gustavo Nicoletti Altimondi was the Commander of the Corps of Engineers. Colonel Cesare Bardeloni was mentioned earlier as one of the Officers at the STM Inspectorate; Major Achille Celloni co-authored with Sacco the book *Manuale di Radiotecnica* (Radio technics Handbook).

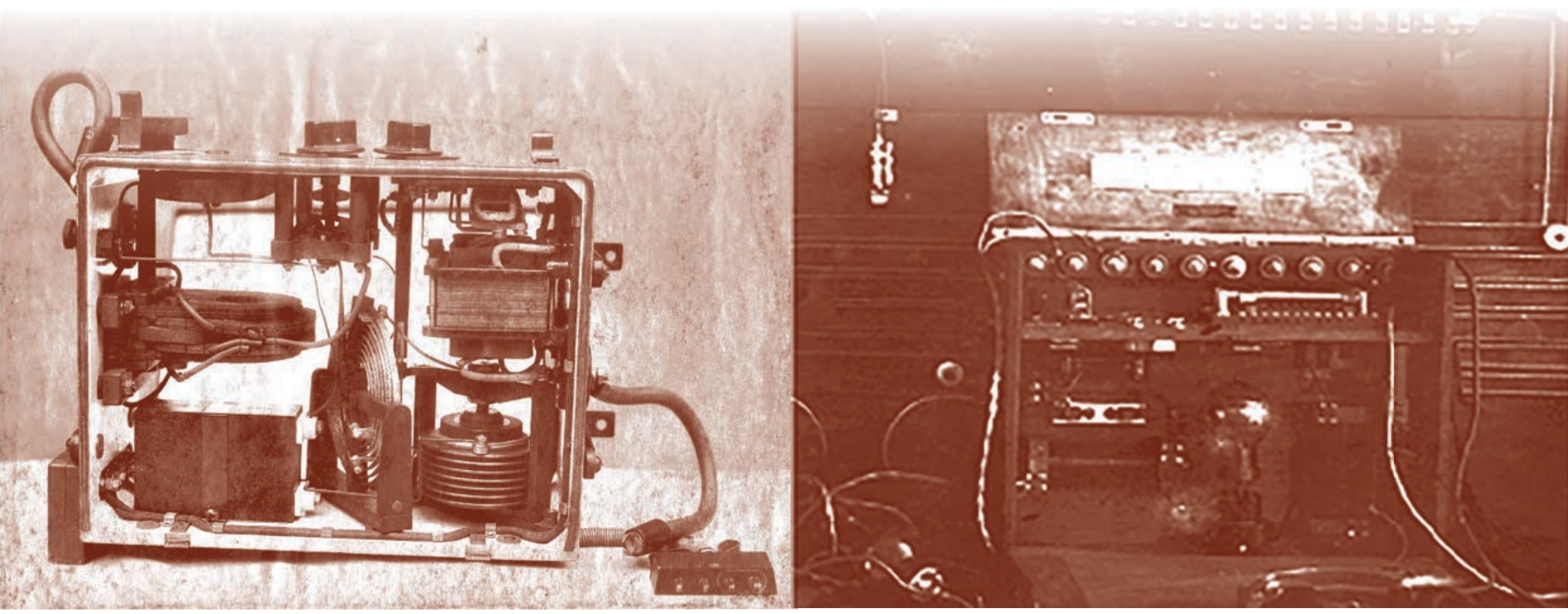


14.9 H.M. Vittorio Emanuele III visits the Army Radio-telegraphic and Electro-technical Workshop in Rome (ISCAG Archive)

Sacco, however, never parted with cryptology and continued, for most of his life, the activity in this field. In addition to writing the 'Manuale' and taking care of three editions of the book, he delivered many classes on the subject[57]. He remained committed to spreading the cryptographic culture across the Italian Armed Forces, and finally worked to improve the Army tools in this field: an encoding machine patented in 1941 and entrusted for its construction to the Nistri company in Rome, has unfortunately been lost[58].

[57] Sacco started teaching cryptology in the courses for the Intelligent Service Officers in 1920s and continued for more than 20 years.
[58] Paolo Bonavoglia, *La crittografia da Atbash an RSA*, www.crittologia.eu/bio/sacco.htm.

CONCLUSIONS



Austro-Hungarian captured telecom devices: a transmission equipment of a plane shot down in 1917 (left) and a telephonic interception device (ISCAG archive)

Despite the dramatic experience of the Third War of Independence - lost by Italy mainly for lack of information and scarce clarity along the Army chain of command - a General Staff including an intelligence unit modelled after the German army's was not established until 1882[1]. However, the intelligence branch, in its early stages of development, remained concealed during non-belligerent times, whereas during the mobilisation for war, it boosted up to become an actual Intelligence Office.

Even though a stable intelligence body in the Italian army initiated its activity in 1897, its information gathering operations were hampered until 1914, not so much by organisational shortcomings as by the lack of funding, which for instance hindered the recruitment and management of an adequate number of agents working abroad. In recognising the importance of an efficient information cell within the Headquarters of the General Staff Corps, General Alberto Pollio worked to improve its efficiency irrespective of chronic financial restraints. Nevertheless, it took some time before the Italian Intelligence branch could try to match the primacy of the Austro-Hungarian *Evidenzbureau*, which had superior traditions and consolidated prestige inside the Dual Monarchy.

In the first decade of the nineteenth century, the *Evidenzbureau* had also incepted an innovative activity aimed at intercepting and interpreting the emerging Italian radio communications, especially military ones already considered as a potential source of information. The interception activities intensified when the relations between the two countries became critical, that is, after the annexation of Bosnia-Herzegovina (1908-1909) and even more during the Libyan war (1911-1912).

The Italian army, trying to provide more secure telegraphic communications, had previously adopted some codes that, for some years, made the interpretation of dispatches more difficult. To overcome this obstacle, beginning in 1911, the *Evidenzbureau* started to train specialists in cryptology and purchased the most important Italian codes on the black markets that flourished in Europe at that time. The Italian Armed Forces, also due to the insufficient cryptologic culture in the entire Country, could not emulate this behaviour, thus suffering considerable delays vis-à-vis their enemy at the beginning of the conflict.

When Italy entered the war, other organisational dysfunctions in the intelligence organisation emerged also because it was divided into two bodies - the Intelligence Office and the Situation Office - which, although part of the same Operations Division, often found it difficult to cooperate. Moreover, during Cadorna's time, the Supreme Command focused its care and confidence on the Situation Office, leaving the activity of the Intelligence Office/Service in the shade.

Moreover, some shortcomings in counterespionage left the door open to enemy networks dedicated to subversive propaganda and sabotage, especially against ammunition depots and warships, across Italian territory[2]. It took time also to organize sabotage of relevant objectives in enemy territory and to exploit the contribution in combat roles of the internal ethnic components of the Hapsburg Monarchy[3].

Nevertheless, already in 1916, the intelligence organisation of the Royal army had reached a reasonable level of expansion and efficiency, as demonstrated by the development of the Armies Intelligence structures which became capable enough as to compete, in terms of ability and professional skills, with the Intelligence Office of the Supreme Command.

[1] The 1882 reform came at the end of several reorganisation steps in 1867, 1870, and 1873.

[2] In the first years of the conflict, there were severe and numerous explosions affecting reserves and ammunition depots both in the war zone and in the rest of the territory, as well as on warships in the ports of Brindisi and Taranto.

[3] France and Russia formed legions of volunteers by Austro-Hungarian prisoners of Czechoslovakian ethnicity from 1914-1915.

This Office is also credited with the support given, following the first months of the conflict, to the creation of a telephone interception service within the Armies and with the attempts to remedy the cryptologic deficiencies undergone at the beginning of the war.

In 1915 the Italian army was, in fact, devoid of any structure devoted to interpreting the enemy radio dispatches intercepted in large numbers, and to improving the Italian codes and ciphers. Most of the Italian radio dispatches, except those encrypted with some codes distributed only to High Commands, were read by Austrian analysts led by the talented cryptologist Andreas Figl.

The success achieved by the Austro-Hungarians depended on several and interrelated reasons such as: their pre-war accurate planning, including the purchase of several Italian codes; the weakness and age of the latter, for the most part unchanged since more than a decade; the capture of some new Italian ciphers and instructions during the fighting; the 'partial encoding' adopted by the Italians in the early days of war; and last but not least, the poor preparation of operators in Italian encoding branches and radiotelegraphic sections.

However, soon Italian Headquarters became aware of the danger posed by radio interceptions and systematically avoided transmitting confidential information and specially operational orders toward subordinate units. Nevertheless, the considerable amount of dispatches available to the Austro-Hungarian analysts - even deprived of any sensitive information - helped in breaking new codes and ciphers, so that when, in lack of other means of communication, some units were forced to transmit some important orders by radio, they found Austro-Hungarians more than ready to comprehend them and to gain some cryptologic success, as during *Strafexpedition* in May 1916.

On the other side, to make up for the inability to decrypting the enemy radio dispatches, the Intelligence Office created, in the spring of 1916, a cryptographic team within the radiotelegraphic office in Codroipo (Udine), under the command of Luigi Sacco who soon began to break some enemy ciphers.

In this regard, the chances of solving enemy codes and ciphers also depended on the radio communication strategies and methods adopted by the opponents. In fact, it is proven that the Austro-Hungarian Headquarters prohibited exploiting field radio stations for communicating between units after 1915, focusing mainly on the interception of Italian dispatches. When enforced, this strategy limited the cryptographic material available to Sacco and his team, but also severely disadvantaged the Austro-Hungarian army when the conflict turned into a war of movement.

On several occasions, the Italians too were able to maintain 'radio silence' as it was possible along the Isonzo front where, thanks to the milder climate and more comfortable environmental conditions than in Trentino, wire connections were used almost continuously. For example, in August 1916, before the Sixth Battle of the Isonzo, the lack of significant interceptions together with deception operations put in place by the Italian Intelligence Office, contributed to disorienting the Austro-Hungarian Headquarters for good. The shortage of any information achieved by radio eavesdropping before the Italian attack that led to the conquest of Gorizia, spurred a lively debate within the Imperial Army on the usefulness of the interception and cryptanalysis services. Similar criticism emerged the following year after the Battle of the Bainsizza Plateau, since General Boroevic proposed to remove the entire service due to the useless operational information it had acquired.

In the other sectors of Radio Intelligence - including interception, traffic analysis, and radiogoniometry - the Italian army benefited from the in-depth knowledge acquired before the conflict and from the availability of modern equipment supplied by the Italian and British Marconi or manufactured in its plants. Thanks to the experiments in the field of radiogoniometry conducted since 1907, the Royal army adopted this technique well before the Austro-Hungarians and, after the first months of the conflict, succeeded in implementing a strict control on enemy radio communications. Even before the summer of 1916, when the decrypting of the enemy radio

messages began, the control over foe communications, in scenarios well beyond the limits of the Italian-Austrian front, provided relevant contributions to the Italian intelligence.
Given the reduction of Austrian field radio transmissions on the Italian front and following the reorganisation of the Intelligence sector effected in October 1916, Luigi Sacco, and some members of the radiotelegraphic office in Codroipo, were reassigned to manage the Cryptographic Unit of the Intelligence Service in Rome, expecting they could also fill the gaps in specialised skills of some Ministries, notably Foreign Affairs, Interior, and Navy.
After settling in Rome, the Cryptographic Unit started to break- in addition to some codes and ciphers of the Austrian, German and even Turkish armies and navies - more than a few enemy and neutral diplomatic codes, together with many systems used by actual or suspected spies.

Thanks to the abovementioned reorganization of the Intelligence sector, the intelligence tasks were split between a 'tactical' component dedicated to investigating about the Austro-Hungarian army on the Italian front entrusted to the Situation Office, and a 'strategic' element dealing with structures and political-economic issues of the Habsburg Empire assigned to the Intelligence Office, now renamed Intelligence Service.
The year between the reform of October 1916 and the Twelfth Battle of the Isonzo was a 'crucial period' for the entire Italian intelligence since it evolved into a complex organization with various resources specialised in the numerous branches of Intelligence. The information network became wider and stronger, including a larger number of important centres abroad, and the increasingly disruptive force of the ethnic components within the Austro-Hungarian army was finally exploited[4].
Telephone interceptions carried out in even more extensive and systematic way became a relevant information source, together with the development of traditional human intelligence - notably, interrogation of prisoners and deserters, theft of enemy documents, reports from agents, etc. - and of radio communications decrypting, albeit occasional.
In general, mass telephone interception carried out during WWI on all fronts yielded a significantly greater amount of information than that obtained through cryptanalysis of radiotelegraphic dispatches. On the other hand, due to the limited distances covered by eavesdropping stations - usually less than one or two kilometres - the results of telephone listening were mainly of tactical nature, even though tracking back strategic orders and instructions turned out to be feasible, in some circumstances.
Only by reviewing the documents captured during their advance after Caporetto, the Austro-Hungarian Headquarters became fully aware of the danger posed by the Italian extensive telephone interception network. Throughout 1916 and most of 1917, Austrian underestimation of their opponents' capability in this field had given the Italian a significant competitive advantage.
Before the most important Austro-Hungarian attacks, the Italian intelligence structures provided correct and timely information to their Headquarters. As a matter of fact, the reason behind some so-called 'surprise attacks' was the result of factors external to the Intelligence Service, such as the 'filtering' of data by General Staff offices which wanted to validate the personal convictions of the 'Boss', instead of offering him objective contributions. In particular, the planning for the Twelfth Battle of the Isonzo - like what happened before the *Strafexpedition* - was discovered in time, including information about the main avenues of enemy attack. However, operational presumptions prevailed which disregarded the possibility of enemy offensive operations at the time and place they occurred.

[4] The Information Centres were established in Paris, London, Bern, Lugano, Vlore, The Hague, Copenhagen, Stockholm, Freetown, Christiania, Petersburg, Bucharest, Athens, Cairo, Thessaloniki, Corfu, and Buenos Aires.

Therefore, despite the crises and uncertainties caused by persistent overlaps and contrasts between different intelligence sectors, the final comment of the Commission of enquiry on the Battle of Caporetto, stating that until October 1917, "overall, no significant debits can be attributed to the Intelligence Service, in its organisation and operations" can be justified.

In the field of communications security, being aware of the weakness of most Italian codes and ciphers, in September 1916, Luigi Sacco had drafted a report about the flaws of the Italian systems and set out the principles to be followed to increase dispatches security. On that occasion, he created - and not just as an example - an innovative 'trench code', adopting cryptographic criteria later applied to divisional and regimental codes that, due to their 'temporary' nature, represented an insurmountable obstacle to a systematic cryptanalysis.

In addition to the divisional code, during the spring-summer of 1917 the Cryptographic Unit produced a code for the Intelligence Service as well as encoding and decoding tables for protecting the codebook most widely used by the Army Headquarters. The Austrian analysts succeeded in breaking them only at the end of November, proving the groundless nature of the negative judgement of the Commission on the Battle of Caporetto about the Italian Army cryptography. In fact, at the beginning of the Twelfth Battle of the Isonzo, during the later shifting of the front, and for much of the First Battle of the Piave river, some of the most important Italian coding systems had not been forced by the Austro-Hungarians.

On the other side, since radio silence was not always observed, the Italians carefully monitored the sparse field communications on their front and the most frequent Austro-Hungarian dispatches on other fronts or originated by the Navy, managing to interpret their contents. The Unit's decrypting activity increased in October - November 1917 when, as the Austro-German offensive and war of movement began, the German army, but also very sparingly the Austro-Hungarian army and navy, were forced to employ radio communications.

However, the German generals of the 14th Army - which prevailed in breaking the front in Caporetto - recalled in their memoirs the significant delays in transmitting orders along the Austro-Hungarian army chains of command, as the front shifted from the Isonzo to the Piave river. The Austro-Hungarian strategy of using radio - even through their advance - for intercepting enemy communication more than for orders transmission, could have caused those drawbacks, leading to significant operational consequences.

In the early months of 1918, probably because of the insistence of German allies who were conducting the war, the Austro-Hungarian Headquarters authorised a wider usage of radio transmission firstly for 'Divisions and above', and then for 'Divisions and below'. From this moment on, the Italian analysts could rely on more abundant cryptographic material and obtained significant success in forcing some Austrian field coding systems. One of these had been introduced in service just at the beginning of the Second Battle of the Piave river, while others entered service during the following events on the Italian front.

The favourable results came, partially, from the deployment on the front of some Italian cryptanalysis resources, started during the First Battle of the Piave river and continued in the spring of 1918, as cryptologic capabilities were set within the Armies in coincidence with the increase of Austro-Hungarian radio stations and traffic.

At the beginning of 1918, significant reform was enacted also within the Italian Intelligence organization that put an end to the dualism between the Intelligence Service and the Situation Office, by the suppression of the latter and the transfer of its main functions to the Operations Division. A more rational tasks allocation ended the duplication of the intelligence architecture - in fact, a

distinctive trait of the Italian top military organisation since the 19th century - which had not withstood the test of WWI, proving to be anachronistic and inefficient.
The Service relocated near the Supreme Command in the area around Padua, focused its activity no longer on political issues but rather on the best systems to break down the enemy combat potential, exploiting the achieved greater autonomy also for planning unconventional warfare. At the same time, the cooperation between the different central and detached elements of the Intelligence organisation became closer, with a more effective filtering and timely exploitation of information[5].
The communication security too experienced relevant improvements since the Cryptographic Unit was ultimately assigned the full responsibility of producing and checking all the Army's ciphers and codes. The number of the main Italian cryptographic systems unknown to or unbroken by the enemy increased during the year, reaching a figure of at least ten at the end of the war.
Undoubtedly, the timely replacement of all major codes and ciphers, implemented during the planning for the last Italian offensive that led to the Battle of Vittorio Veneto, was the most outstanding measure adopted by the Cryptographic Unit. The new systems introduced in October 1918 were not at risk of being broken, also because the enemy lacked the time necessary to collect the material required for their analysis, keeping the skillfull Austro-Hungarian cryptanalysts in check during the decisive final phase of the war.
The above brief overview depicted the evolution of the cryptologic war won by the Austro-Hungarians in the early stages of the conflict, in terms of number of breached ciphers and decrypted dispatches, also by employing partially mechanised systems. Later, the quantitatively limited and yet highly efficient team led by Sacco regained terrain. It fought more effectively after November 1917 when, following a more frequent use of radio communications by the Austrians, the cryptanalysis work could be managed on nearly equal footing on both sides of the front, with a growing Italian incidence that peaked in October 1918 thanks to new, unbroken codes and ciphers.
Based on the research done to write this book, we can, therefore, confirm the statements of Marchetti and Sacco about the gradual results the Cryptographic Unit obtained through firm commitment and spirit of sacrifice. Contrary to the Gylden assumptions in 1930, carelessly taken up by some later scholars, those results had been achieved starting from the summer of 1916 and, to a greater extent, from the last months of 1917, without any help from the French or British Allies.
It is astonishing that Sacco and his team - initially 9 units, who became a few dozen at the end of the conflict - were able to reach a capability comparable with those of much larger enemy and allied organisations having consolidated traditions and experience.

Despite the undoubted interest aroused by the secret war conducted around cryptology and, more generally, about Communication Intelligence, one cannot but recognise the general prevalence, during WWI, of human intelligence sources over COMINT, especially in terms of the influence these information sources had on the events of the war. The interrogations of prisoners and deserters perfected using hidden microphones[6], the capture of enemy documents and the information provided by various types of agents have played a crucial role, not only on the Italian-Austrian front.
The results of telephone interception, although largely increasing during the conflict, was indeed significant but not comparable to those achieved by traditional sources. On the other hand, radio intelligence - which owes its fame to profound technical and scientific interest, to the emphasis

[5] Despite difficulties and misunderstandings, the relationship between the Chief of the Intelligence Office/Service of the Supreme Command and the officials in charge of Intelligence operations inside the Army Headquarters were generally cooperative and intense, since 1915.
[6] The Italians and Austrians used these microphones to intercept conversations between prisoners occurred spontaneously or induced by undercover agents.

given by some cryptologists in their accounts, and to its later developments, originated significant and exploitable information only sporadically.
The interaction among the different forms of intelligence also influenced the cryptologic sector, especially with reference to the impact exerted by human intelligence on the breaking processes of large and complex codes[7]. In the previous pages we have mentioned, for instance, the statements of Luigi Sacco concerning advantages obtained from the availability of Austrian *Rotbuch* for breaking the Austrian diplomatic code. On the opposite side, the pre-war purchases of Italian codes and ciphers made by the *Evidenzbureau* and the several documents captured in combat have certainly helped the work of the Austro-Hungarian analysts. However, the achieved support does not deserve any comment in the memoirs of Andreas Figl and was only mentioned by Maximilian Ronge, member and then head of the Intelligence Service.

The present interest in the cryptologic struggle during WWI is also due to the significant evolution of the sector during the conflict, which contributed to its development in the successive years and wars.
In the frantic search for new encoding systems to eventually impose on the enemy additional effort and time for their breaking, the code designers pursued the not so hidden intention to extend the time required for their penetration so long as they could be considered practically unbreakable. In fact, some of the ciphers introduced during the conflict were not broken due to time constraints and/or cryptographic material scarcity, even though they should be theoretically breakable.
Nevertheless, the fierce competition aimed at achieving such results generated some significant innovations.
At the end of 1917, Gilbert S. Vernam, an engineer at the A.T.T. laboratories in New York, conceived a cipher that bears his name, and that Claude Shannon will later prove as theoretically unbreakable. Vernam's cipher was tested during WWI by the American Signal Corps for wired and radio communications, using Baudot telegraphic machines that Vernam himself had modified. At the time, however, the method lacked an important feature, namely the practical availability of random keys, long at least as the dispatches to be transmitted and completely different for each dispatch: in fact, a prerequisite to meet the conditions assumed by Shannon in full[8].
The mechanisation of encoding and decoding operations, combined with a higher degree of security, was another dream of cryptologists in WWI. It turned into reality between 1917 and 1918 with the 'almost contemporary' invention of 'rotors' that David Kahn ascribed to at least four or five different people. This component was the core of the new encoding/decoding electro-mechanical machines, such as the Enigma, which - since the mid-twenties - began to replace the traditional tools of cryptology, namely paper and pencil[9].

[7] The prevalence of cryptology skills or Human Intelligence in such processes is still generating debates, not only with reference to WWI. Alberto Santoni claimed, for example, that the British were able to decrypt German dispatches encoded with HVB and SKM codes before receiving the codebooks obtained through Human Intelligence operations. To mask the capabilities of the legendary "Room 40" of the English Admiralty, Winston Churchill attributed the successes achieved in the battle against the German fleet to radiogoniometry. (A. Santoni, *op. cit*., p. 47 - 61).
[8] Françoise Cartier, *Le secret en Radiotélégraphie, Système G.S. Vernam*, Radio Electricité, 25 December 1925 and 10 January 1926. This system was used during World War II and Cold War, including the 'typewriter hotline' between Washington and the Kremlin. The greatest difficulty lies in the need for an ultra-safe channel to transmit a variable random key.
[9] D. Kahn, *op. cit.,* p. 411 - 425. The invention of the rotor is attributed by Kahn not only to the German Arthur Scherbius, who was also the maker of the Enigma machine, but also to the American Edward H. Hebern, the Dutch Hugo Alexander Koch, and the Swedish Arvid Gerhard Damm. The German navy in 1926 and the American Signal Corps in 1927 were the first to buy the Enigma machines-

These new devices appeared to be the ultimate solution because a 'brute force' cryptanalysis did not seem an effective option for breaking the coding mechanism, thanks to the extremely high number of combinations the rotors were capable of. The myth of unbreakable rotor machines lasted for many years!
Furthermore, the need to protect wire and wireless telephone communications clearly emerged during the war, also because the progress in two-way radiotelephony allowed, at the western front, voice communications among mobile platforms - such as planes and tanks - and between them and their commands, preparing the ground for an epochal change in conducting field operations[10].
Telephone security requirements began to be met in the twenties by means of 'scrambling' equipment. However, even the most complex versions of those devices implemented in the following years did not guarantee adequate security until they were replaced with advanced encrypting systems applied to wireless phones during World War II[11].
In short, WWI cryptology laid the foundations for following innovations, just as it happened in other science and technology fields, including radio communications which, after overcoming some of the limitations suffered at the beginning of the conflict, experienced exceptional diffusion and technical progress that served as the basis of many new 'civil' applications in the subsequent years, such as radio broadcasting, intercontinental telephone communications and airborne radio navigation[12].
The parallelism between the development of telecommunications and that of cryptology is not accidental at all, not only because the innovation in both sectors will be largely due to the developments in electromechanical and then in electronic technologies, but mainly for the close correlation between the evolution of the two technologies: from telegraphy to telephony, from radio communications to the Internet, until both disciplines merged into the broader digital environment of the present times.

In the years after the end of the war, the role of the COMINT, and more generally of Signal Intelligence (SIGINT), grew thanks to the potential demonstrated on the battlefields of WWI.
In addition to preserving, despite some downsizing, the structures dedicated to the Intelligence and Security of Telecommunications - implemented at the cost of enormous efforts during the war - the Armed Forces disseminated the cryptologic culture in their ranks to avoid, among other things, the mistakes made in drafting and encoding dispatches during the conflict. To this end, learning 'Signal Intelligence' became part of the curriculum of the young Officers[13].
In the Italian army, Luigi Sacco continued the diffusion of that culture carried out during the conflict, as demonstrated by the subtitle of his book *Nozioni di Crittografia* (Notions of Cryptography) printed in 1925, which reveals its use as a text for the *Primo Corso per Ufficiali informatori* (First Course for Intelligence Officials). The Sacco teaching activity in the Army schools pursued at least until the 1940s[14].

[10] Peter J. Hugill, *Le comunicazioni mondiali dal 1944*, Feltrinelli, 1999, p. 195 - 222. The Author of the book considers these communications as the first example of tactical C^3 (Command, Control, and Communications).
[11] The scramblers produced by the American company Western Electric and known as A3 were replaced with a system called SIGSALY in 1943, to protect political and military wireless telephone communications between UK and USA. Alan Turing - who is recognised as the person who broke Enigma - contributed to SIGSALY implementation.
[12] The large availability of high vacuum valves, low-cost remnants of the war, favoured the construction of cheap receivers, a prerequisite for the rapid spread of radio broadcasting. Guglielmo Marconi's experiments using 'very short directional waves' carried out in 1916, were the turning point that led to high-frequency international voice communications in the 1920s. The radio beacons introduced in WWI will be perfected to allow air navigation at greater and greater distances.
[13] For example, courses on 'Military Codes and Ciphers' started in 1917 at Riverbank Laboratories for U.S. Army officers, continued after the war at the Signal Corp school in New Jersey, as shown by publications containing classes delivered by W. F. Friedman in 1923, such as 'Elements of Cryptanalysis'.
[14] L. Sacco, *Appunti di Crittografia, ottavo Corso tecnico integrativo sulle Trasmissioni*, Istituto Militare Superiore delle Trasmissioni, Rome, 1940 - 41.

Radio telegraphic field station in operation (ISCAG archive)

ANNEXES

ANNEX A

Italian Service Ciphers

SERVICE SIPHER WITH GROUPS OF DIGITS

The table in figure 8.2 of the text is presented here with the addition of a sub-row.

MAIN TABLE WITH A SUBROW CONTAINING TERMS COMMONLY USED IN THE ARMY										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	a	b	c	d	e	f	g	h	i	j
	aiutante	battaglione	cavalleria	corpo	esercito	//	magazzino	//	servizio	telegrafista
1	ch	l	m	n	o	p	q	r	s	t
	alpini	batteria	cavallo	Corpo d'Armata	fanteria	gruppo	maggiore	//	sezione	tenente
2	u	v	w	x	y	z	qua	que	qui	quo
	amministratore	bersaglieri	centrale	//	//	infermeria	militare	pontone	sergente	treno
3	ba	na	be	ne	bi	ni	bo	no	bu	nu
	//	brigata	ciclisti	deposito	//	intendenza	minatoti	pontieri	sotto	//
4	ca	pa	ce	pe	ci	pi	co	po	cu	pu
	armata	compagnia	colonna	direttore	finanza	istruttore	mitragliatrice	presidio	squadrone	ufficiale
5	da	ra	de	re	di	ri	do	ro	du	ru
	//	campo	colonnello	direzione	fortezza	ispettore	muta	//	//	ufficio
6	fa	sa	fe	se	fi	si	fo	so	fu	su
	artiglieria capitano	Comando	distaccamento	frontiera	ispettorato	//	reali	carabinieri	//	//
7	ga	ta	ge	te	gi	ti	go	to	gu	tu
	automobilista	capo	comandante	distretto	generale	//	munizioni	reggimento	Stato Maggiore	//
8	la	va	le	ve	li	vi	lo	vo	lu	vu
	//	//	Commissario	divisione	genio	//	//	reparto	supremo	volante
9	ma	za	me	ze	mi	zi	mo	zo	mu	zu
	aviatore	cavalleggeri	compagnia	drappello	//	lancieri	ospedale	sanitario	sussistenza	zappatore

As shown in the text, the auxiliary table usage produces the addition of a digit before the group of two digit resulting from the main table. The initial digit '0' indicates the shift in the main table to the first 'sub-row' containing one hundred terms commonly used in the military field and placed in the cells below the letters. The word 'Major' for example, is encrypted as '061' and the words 'telegraphic operators' as '090'.
Since the table was rebuilt from the terms interpreted by Austrian cryptanalysts as of 21 December 1915, some of the words in the cells are missing.
One hundred telegraphic words, numbers, and other syllables indicated by the prefix '1' of the auxiliary table are included in a third sub-row not shown in the table above.

Coming back to the interpretation of the functions of the auxiliary table, reproduced here on the right side, adding the digit '2' at the beginning of a group of two digits meant the letters in the main table must be swapped. For example, '228' meant 'el'. Adding the digit '3' at the beginning of the group means 'i' had to be inserted in the middle of a group of two letters, so that '374' stand for 'pio', and so on[1]. As said before, the adopted keys were always regular, as the following tables show. The key for the auxiliary table was the same as the key chosen for the first horizontal line.

AUXILIARY TABLE	
0	Common terms used in the Army
1	Telegraphic terms, figures, syllables
2	Inverted syllables
3	Insertion of 'i' in the middle
4	Insertion of 'm' at the beginning
5	Insertion of 'n' at the beginning
6	Insertion of 'n' at the end
7	Insertion of 'r' at the beginning
8	Insertion of 'r' in the middle
9	Insertion of 's' at the beginning

Numbering of rows in the table										
October 1915	9	8	7	6	5	4	3	2	1	0
December 1915	5	6	7	8	9	0	1	2	3	4
February 1915	9	8	7	6	5	4	3	2	1	0

Numbering of columns in the table										
October 1915	0	1	2	3	4	5	6	7	8	9
December 1915	2	1	0	9	8	7	6	5	4	3
February 1915	3	4	5	6	7	8	9	0	1	2

Service Ciphers With Groups of Letters

A characteristic feature of the C series ciphers are the three-letter code words chosen from an Italian reduced alphabet of just 17 letters (A, B, C, D, F, G, H, I, L, N, O, P, Q, R, S, V, Z) that generates the main table with a maximum of 17 x 17 = 289 cells. Considering that for each of these cells, 17 variables could be used in conjunction with the auxiliary table, then a cipher containing 4.913 terms can be formed. In practice, the number of combinations used in the different versions of the group C was usually lower.

Due to the difficulty of finding this kind of ciphers in Italian archives, the tables of the *C1* shown below have been rebuilt in part using the data found in Ronge's report[2].

The first horizontal row of the main *C1* table and the first vertical column of the two tables contain the letters of the code words chosen among 17 letters of the reduced alphabet that have been sorted according to the keyword chosen.

The main table includes 14 x 12 = 168 positions that, together with the auxiliary table, become 168 x 12 = 2.016. The table can encode individual or pairs of letters into two-letter groups (for example, the letter 'r' is encrypted as 'CN').

[1] Operations on the auxiliary table are not always possible for individual letters. In other cases, they generate syllables that already appear in the table in Picture 8.2 a, and in this case the encoding operator can choose between two different possibilities.

[2] M. Ronge, *op. cit.,* Beilage 18.

MAIN TABLE														
	F	L	I	C	A	Z	O	N	B	D	G	H	P	Q
I	a	b	c	d	e	f	g	h	i	j	ch	l	m	n
N	o	p	q	r	s	t	u	v	w	x	y	z	chi	che
O	ba	ca	da	fa	ga	la	ma	na	pa	ra	sa	ta	va	za
Z	ab	ac	ad	af	ag	al	am	an	ap	ar	as	at	av	az
A	be	ce	de	fe	ge	le	me	ne	pe	re	se	te	ve	ze
C	eb	ec	ed	ef	eg	el	em	en	ep	er	es	et	ev	ez
L	bi	ci	di	fi	gi	li	mi	ni	pi	ri	si	ti	vi	zi
F	ib	ic	id	if	ig	il	im	in	ip	ir	is	it	iv	iz
V	bo	co	do	fo	go	lo	mo	no	po	ro	so	to	vo	zo
S	ob	oc	od	of	og	ol	om	on	op	or	os	ot	ov	oz
R	bu	cu	du	fu	gu	lu	mu	nu	pu	ru	su	tu	vu	zu
Q	ub	uc	ud	uf	ug	ul	um	un	up	ur	us	ut	uv	uz

AUX. TABLE	
I	2^{nd} row
N	a - -
O	n - -
Z	s - -
A	- i -
C	-r-
L	- - i
F	- - l
V	- - m
S	- - n
R	- - r
Q	- - s

A third initial letter in the code groups refers to a row of the auxiliary table. For example, 'ta' is encoded into 'HO', while 'tra' become 'CHO' as per the sixth line of the auxiliary table. The letter 'I' at the beginning of a three-letter encoding group indicates the use of a second position within each cell (sub-row) where the terms currently used in the Army, Arabic and Roman numerals, and some recurrent terms without endings, such as 'inform', are found.

In table rebuilt by the Austrians analysts, the number of sub-row positions was initially less than 38%. Among these, the terms commonly used in the Army were limited in number, but the knowledge of the rest of the cipher could still allow to interpret the meaning of the Italian cryptograms.

The first key used and shown in the table was the word 'FLICAZONI, which appear in the first row without repetition. The letters of the reduced alphabet not included in the keyword until the 14th positions are filled in the row positions following the end of the key. In the first vertical column of the two tables, the inverted key is inserted while the remaining positions are occupied by the letters of the reduced alphabet, from top to bottom. The Austrians did not identifie this first keyword used by the Italians, which we have rebuilt and shown it here.

When the Austrians discovered the way to reconstruct the keyword starting from commonly used Italian words, the result was quite ironic. The keyword was 'CAPITÓMBOLANO' (Italian for 'they tumble down').

Ronge recalled the similarity of the *C1* cipher to that described by Andreas Figl in his book and called *Zweispaltige einfahtable*, i.e., a cipher with 3-letter groups other than those within the Italian reduced alphabet, a main table, and an auxiliary table with 13 x 9 x 12 combinations in total[3].

As shown in the text, some C series ciphers adopted after *C1* can be described in the same way as *C1*, but with a greater number of positions in the main table, as in the case of *C2,* or using a "dictionary", as in the case of *CF*.

All tables are equivalent to codes that include, for example, a number of pages equal to the number of columns of the equivalent table i.e., in the C series, a maximum of 17 pages identified by one of the letters of the reduced alphabet. Each page contains as many rows as those in the table, which were identified by a second letter of the alphabet, and as many columns as there are rows in the auxiliary table.

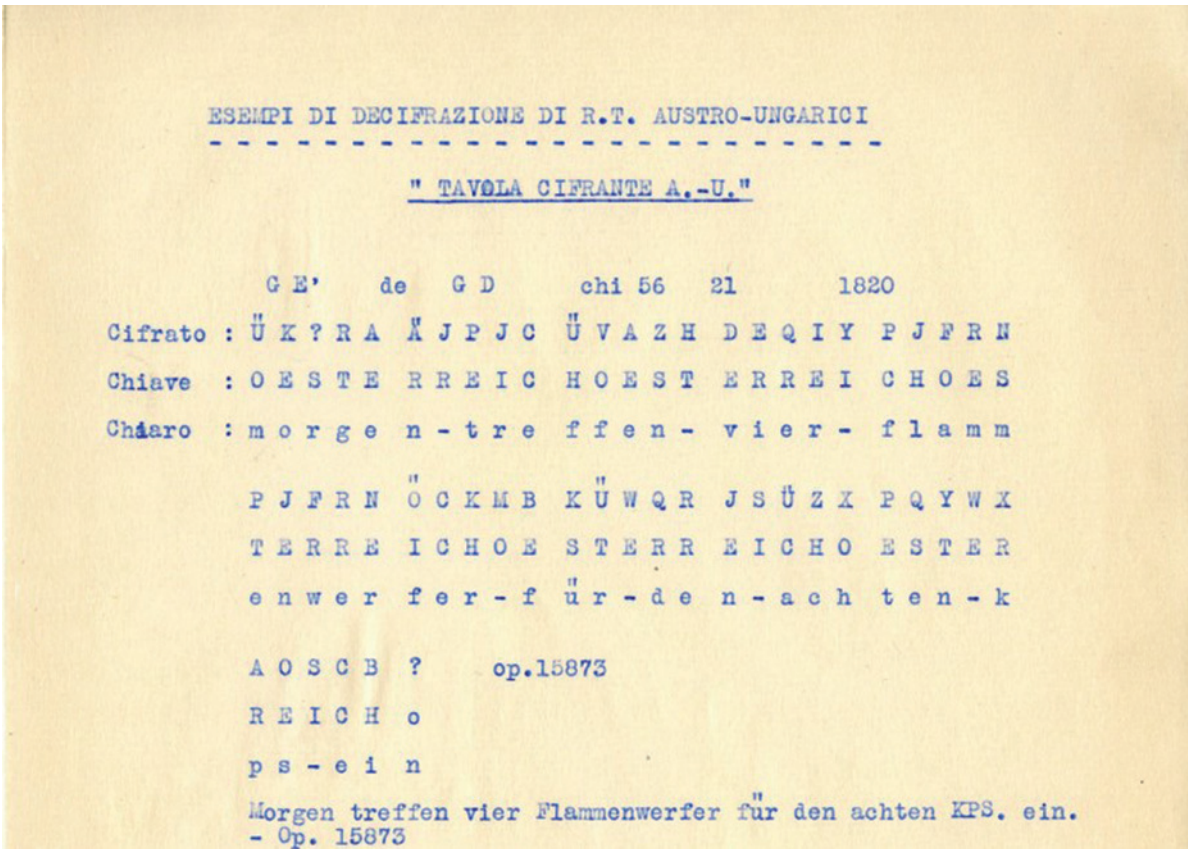
[3] M. Ronge, *op cit.*, p.52. The reference is on page 173, Annex 32 to the book written by Captain Figl.

A substantial security improvement was achieved by the Italians, during the following months of the war, messing up the distribution of plaintext items within the tables or vocabulary. This required much more effort and time than to solve an ordered cipher.

ANNEX B

Some Austrian Codes and Decrypted Dispatches

All the images in this Annex are courtesy of “Flavia Reed Owen Special Collection & Archives, McGraw-Page Library, Randolph-Macon College, Ashland, Virginia”.



ESEMPI DI DECIFRAZIONE DI R.T. AUSTRO-UNGARICI

" TAVOLA CIFRANTE A.-U."

G E' de G D chi 56 21 1820

Cifrato : Ü K ? R A Ä J P J C Ü V A Z H D E Q I Y P J F R N

Chiave : O E S T E R R E I C H O E S T E R R E I C H O E S

Chiaro : m o r g e n - t r e f f e n - v i e r - f l a m m

P J F R N Ö C K M B K Ü W Q R J S Ü Z X P Q Y W X

T E R R E I C H O E S T E R R E I C H O E S T E R

e n w e r f e r - f ü r - d e n - a c h t e n - k

A O S C B ? op.15873

R E I C H o

p s - e i n

Morgen treffen vier Flammenwerfer für den achten KPS. ein.
- Op. 15873

B1 An Austro-Hungarian Radio telegram encoded with the table of picture 10.4 of the text and decrypted by the Italians, as shown in the lower part of the picture. The traslation from German is: "find four flamethrowers for the Eighth KPS tromorrow"

"S H"

GRUPPO	VOCE	GRUPPO	VOCE	GRUPPO	VOCE
AE	v	IH	ge	QU	-
ÄH	u	JA	n	RY	o
BK	4	JB	e	SB	m
BM	ver	JP	er	SH	-
BV	?	KJ	a	SV	l
CT	aufpunter	KP	(stop)	SW	l
DO	we	LX	ä	SZ	m
DP	1.2	LI	g	TY	ü
DT	b	LL	w	ÜA	k
DW	vor	MÄ	ge	UU	n
EI	ung	MQ	z	VU	-
EJ	i	OQ	d	WN	s
EO	8	OU	I	XC	st
FK	be	PA	ei	XD	cht
FI	j	PF	e	YF	t
GG	h	PR	ch	YK	r
GO	7	PS	ei	ZD	sch
GW	p	QN	r	ZE	er
HD	f	QS	c	ZG	te

B2 Decoding table for SH code

"-S T E R N "

F L de R T A Nr 597 gr 32 24 12.55

Cifrato:	etuis	iltis	loyal	stern	pasta	oeler	pedal	nancy	nancy
Chiaro :	ei	ge	ne	-	t	r	u	p	p
	fluid	stern	jassy	adieu	fluid	stern	277	264	
	on	-	h	ab	en	-	v	o	
	268	oeler	pilot	brehm	257	075	061	247	stern	bijou
	r	r	ue	c	k	u	n	g	-	be
	idyll	menge	loibl	061	040				
	g	o	n	n	en				

Eigene Truppen haben Vorrueckung begonnen.

B3 Example of Radio telegram encoded by the code STERN and decrypted by Italians. The tranlation from German is: "Our troops have begun to advance"

" S T E R N "

------o------

No.	CIFRATO	VOCI	No.	CIFRATO	VOCI	No.	CIFRATO	VOCI	No.	CIFRATO	VOCI
15	adele	a	36	etuis	ei	57	large	k	78	prags	w
16	adieu	ab	37	exakt	ein	58	lazur	l	79	rabbi	we
17	alaun	ad	38		el	59	legat	m	80	raoul	x
18	alpha	am	39	films	em	60	logik	me	81		y
19	alpin	an	40	fluid	en	61	loibl	n	82	ruzzt	z
20	argus	au	41	georg	er	62		nd	83		zu
21	armee	ae	42	gicht	es	63	loyal	ne	84	shawl	?
22	astma	b	43	guano	eu	64	mengo	o	85	sioux	.
23	beton	ba	44	gusti	f	65	myrto	oe	86	skalp	,
24	bijou	be	45	hansa	fe	66	nancy	p	87	stern	-
25	brand	bi	46		fr	67		q	88		
26	brehm	c	47	idyll	g	68	oeler	r	89		
27	bronz	ch	48	iltis	ge	69	oheim	re	90	stolz	1
28	clubs	d	49	jassy	h	70	okuli	s	91	tenor	2
29	cyane	de	50	johor	i	71	orlof	sch	92	teufel	3
30	czech	der	51	joppe	ich	72	oxide	st	93	thaja	4
31		des	52	kemie	ie	73	pasta	t	94	treue	5
32		di	53		ig	74	pauke	te	95	troja	6
33		die	54		im	75	pedal	u	96	tulln	7
34	egypt	e	55	kirch	in	76	pilot	ue	97	verdi	8
35		ch	56	kurve	j	77	point	v	98	wezir	9
									99	wirth	0

B4 Coding table of "Stern" code

"C A R N I A"

GRUPPO	VOCE	GRUPPO	VOCE	GRUPPO	VOCE	GRUPPO	VOCE
004	ach (?)	154	en	419	lt	740	stre
007	ack	155	er	432	m	812	teil
013	al	179	ff	433	ma	815	tel
024	armee	217	ge (?)	438	mel	819	ter
035	auto	224	gel	454	mit	820	tes
037	ba	226	gen (?)	460	mo	843	tre
040	bar	259	gt (?)	473	nd	855	tten
043	bau	284	hm (?)	480	ne	856	tter
047	befehl(?)	286	ho	492	ng	865	ü (?)
072	bre	294	i	493	ni	867	über(?)
086	chef	302	ig(?)	599	punkt	872	uhr
092	chiffre	308	in	617	re	878	und(?)
103	di	313	ir	632	rg	879	ung
106	dass opp.das	315	ist(?)	658	s	882	unter
113	den (?)	324	je	659	sa	887	v
114	der	345	ki	668	sch	892	ver
124	die (?)	382	l	678	se	921	wei
128	dort (?)	383	la	684	sieben	930	wie
140	e	411	lk	721	st	932	wird
149	ein	416	lo	732	sten	935	worden
						954	zu (?)

B5 Partial table of "Carnia" code

"C A R N I A"

U Q de U N 24 gr 27 1900

Cifrato :	892	383	492	820	433	819	294	013	932
Chiaro :	ver	la	ng	tes	ma	ter	i	al	wird
	460	632	154	684	872	887	432	454	
	mo	rg	en	sieben	uhr	v	m	mit	
	383	721	035	149	843	179	154		
	la	st	auto	ein	tre	ff	en		

Verlangtes Material wird morgen sieben Uhr v.m. mit Lastauto eintreffen.

B6 Example of Radio telegream coded by "Carnia" and decrypted by Italians. The tranlation is: "The required material will arrive tomorrow at seven by truck"

ANNEX C

Luigi Sacco's Report and the "Small telephone code", September 1916

3° REGGIMENTO GENIO
Ufficio Radio Telegrafico
DI CODROIPO

NOTIZIE SUI SISTEMI DI DECIFRAZIONE
E
NORME PEL CIFRAMENTO DEI TELEGRAMMI

------oooOooo------

La cifratura dei telegrammi,e specialmente dei radiotelegrammi, quando non sia fatta razionalmente, può essere per il nemico un'ottima sorgente di notizie autentiche, dedotte dalla decifrazione dei telegrammi cifrati. Si ritiene quindi utile di diffondere alcuni cenni sommati sui procedimenti di decifrazione, affinchè nell'impiego dei nostri sistemi di cifratura sia razionalmente evitato tutto ciò che può facilitare al nemico la decifrazione dei nostri dispacci.

1°)-Per ogni lingua, e per ogni tipo speciale di corrispondenza, esistono delle leggi, abbastanza sicure, relative alla frequenza percentuale delle varie lettere dell'alfabeto (monogrammi) e delle loro combinazioni (parole, sillabe, bigrammi, trigrammi, ecc.).

Queste leggi, dedotte dallo studio statistico, sia generale delle lingue, sia particolare delle corrispondenze affini a quelle che interessano, costituiscono la base fondamentale della decifrazione.

2°)-Sistemi monoalfabetici - In qualsiasi lingua, ad esempio, la frequenza relativa delle lettere dell'alfabeto e delle loro principali combinazioni si può rappresentare mediante appositi diagrammi; ne segue che se un testo viene cifrato semplicemente con la sostituzione di segni qualsiasi alle lettere dell'alfabeto (sistema monoalfabetico) i diagrammi analoghi costruiti con questi segni, paragonati a quelli normali della lingua, mettono immediatamente in evidenza le lettere più frequenti.

Ciò fatto, qualche vaga notizia dell'argomento e la conoscenza strutturale della lingua, permettono di completare rapidamente la decifrazione.

-(2)-

Un aiuto grandissimo si avrebbe, in tale caso, quando l'alfabeto usato fosse dedotto da quello normale secondo una regola qualsiasi. La determinazione di due o tre lettere porterebbe immediatamente alla scoperta della regola di formazione dell'alfabeto, e quindi di tutto l'alfabeto.

3°)-Sistemi polialfabetici - Una complicazione, molto usata, del sistema monoalfabetico è l'uso di vari alfabeti, che si susseguono secondo una chiave. Ogni lettera della chiave individua un alfabeto diverso (esempio il nostro cifrario tascabile).

Quando si possegga un certo numero di dispacci cifrati in tale sistema e con la stessa chiave, od anche un solo dispaccio un pò lungo, questo metodo si riduce facilmente al precedente dall'esame degli intervalli tra le ripetizioni. Sta il fatto che, notati tutti gli intervalli esistenti fra le cifre uguali che si ripetono, ne emergerà un numero (massimo comune divisore di una gran parte di questi intervalli), che è precisamente il numero di lettere della chiave. Questo trovato, si divide il crittogramma in tanti tratti ognuno contenente tale numero di segni. Essendo allora evidente che i segni che occupano lo stesso posto in ciascun tratto sono cifrati con lo stesso alfabeto, il sistema si riduce al complesso di tanti sistemi monoalfabetici, e si decifra in modo analogo, naturalmente anche senza la conoscenza della chiave.

Se gli alfabeti sono ordinati in modo regolare, la scoperta di due o tre alfabeti trascinerebbe facilmente quella di tutti gli altri.

4°)-Dizionarii - Nei sistemi a dizionario (tipo cifrario Rosso, Mengarini, ecc.), il punto debole sta nell'ordine alfabetico delle voci chiare, al quale corrisponde l'ordine numerico progressivo dei gruppi di cifre equivalenti. Questa regola di formazione è tra le principali risorse del decifratore. Quando i dizionarii vengono usati senza chiavi(I) la decifrazione si fa (anche senza possedere il cifrario), con diagrammi, analogamente a quanto si è detto per gli alfabetici. Si pos-

(I)-Oppure con un semplice spostamento nella paginazione.

siederà un diagramma delle frequenze normali delle parole più usate, in relazione alla loro posizione relativa nel dizionario della lingua. Facendo un diagramma analogo coi gruppi cifrati (quando si possieda una certa quantità di materiale cifrato), dal suo paragone col diagramma normale emergono immediatamente i significati dei gruppi più frequenti. La conoscenza completa degli altri gruppi (sempre ammettendo di non possedere il cifrario), dipende esclusivamente dalla quantità di testi cifrati che si possiedono. Il principale aiuto, in questa seconda parte del lavoro, è dato precisamente dalla sopra accennata regola di corrispondenza uniforme tra l'ordine alfabetico del chiaro e l'ordine progressivo del cifrato.

Quando i gruppi subiscono delle alterazioni prodotte da chiavi speciali, se queste si limitano ad alterare in modo fisso ciascun gruppo, cosicchè non ne venga variata la frequenza relativa, la scoperta della chiave non è, in genere, difficile; specie quando si possegga il cifrario, ad almeno un ~~gruppo~~ certo numero di gruppi sicuri.

Più difficile, ma non impossibile, è la scoperta delle chiavi che alterano in modo variabile i gruppi, in modo che ne resta modificata anche la loro frequenza relativa.

5°)-Una enorme facilitazione, nel lavoro di decifrazione, si ottiene dalle parole chiare inframmezzate nel testo cifrato. Basti osservare che da esse risulta immediatamente la lingua ed il tipo del cifrario del usato (a lettere, a parole, a sillabe, ecc.), dati che sono di importanza capitale per la decifrazione. Dalle parole chiare è poi facile, inoltre, intuire l'argomento trattato, nonchè il significato, od almeno il valore grammaticale di molti gruppi (cioè se sono nomi proprii verbi, aggettivi, ecc.). Si viene con ciò a dare al decifratore delle conferme sicure, che in molti casi non potrebbe avere altrimenti.

6°)-In conclusione si può, anche da questi brevi cenni sull'argomento, ritenere come assodato che il lavoro di decifrazione è reso possibile soltanto:

-(4)-

I°)-Dal possesso di una certa quantità di testi cifrati con lo stesso sistema e con la stessa chiave.

2°)-Dalla presenza, nei testi cifrati, delle ripetizioni dei più frequenti gruppi crittografici.

Lo stesso lavoro è molto facilitato:

I°)-Dalla presenza di parole chiare nel testo cifrato.

2°)-Dalla esistenza di regole che legano la successione dei gruppi cifrati con quella delle voci chiare.

7°)---Ne conseguono le norme per un razionale ciframento, intese a rendere, più che sia possibile, difficile il lavoro del decifratore estraneo. Si deve cioè :

I°)-Evitare l'accumularsi di molto materiale crittografico cifrato con lo stesso sistema e con la stessa chiave. Quindi frequenti cambiamenti di chiave e di sistema.

Usando dizionarii che si ha ragione di credere che siano in tutto o in parte in possesso del nemico, le chiavi dovrebbero essere numerosissime, almeno qualche centinaio, ed essere usate ciascuna per non più di 20-30 gruppi. Le chiavi dovrebbero avere per indicativi dei gruppi che non differiscano visibilmente dagli altri gruppi, cosicchè non sia facile distinguerle. I gruppi vuoti che si trovano nei cifrari, possono essere adibiti a questo uso.

2°)-Adottare chiavi e dispositivi che evitino, più che sia possibile, le ripetizioni dei gruppi più frequenti. Ciò si può ottenere sia assegnando numerosi gruppi cifranti a tutte le voci più usate, con la prescrizione di usarli alternativamente; sia adottando chiavi che alterino i vari gruppi sempre in modo diverso ed arbitrario.(I) Chiavi di tale tipo si possono facilmente costruire con lunghe serie di gruppi arbitrari, da sommare, cifra con cifra, coi gruppi originari.

3°)-Evitare in modo assoluto di frammezzare parole chiare nei testi cifrati. La regola, che talvolta viene adottata, di cifrare interamente solo i telegrammi importanti, è evidentemente irrazionale,

---

(I)-L'ideale consisterebbe nell'ottenere che ciascuna voce venisse cifrata ogni volta che si presenta, sempre in modo diverso.

-(5)-

poichè una volta fornito al nemico la conoscenza dei principali gruppi per mezzo dei telegrammi poco importanti, esso se ne varrà per quelli importanti, anche se completamente cifrati.

Per analogia si deve evitare di cifrare tutto ciò che può facilmente essere indovinato. Così non si devono cifrare le brevi frasi isolate quali "niente di nuovo", "situazione invariata", ecc.-

Quando il telegramma sia poco importante, è preferibile farlo tutto chiaro; il farlo mezzo cifrato e mezzo chiaro equivale, data la facile decifrazione, al fornire al nemico, oltre alla notizia che si vorrebbe nascondere, anche la conoscenza di alcuni gruppi del cifrario.

Anche l'indirizzo, quando si preveda che sia facilmente indovinabile, è preferibile metterlo tutto in chiaro, oppure farlo con parole convenzionali estranee al cifrario: si eviterà così di fornire al nemico il significato di gruppi importanti.

4°)-Quando si tratti di compilare cifrari a lettere, a sillabe, ecc., evitare qualsiasi regola simmetrica ed uniforme di formazione. Tali regole facilitano grandemente, poichè con esse, la conoscenza di pochi gruppi rende possibile di dedurre tutto il resto. Si deve affidare all'arbitrio più completo qualsiasi corrispondenza tra parte chiara e parte cifrante, e qualsiasi formazione di cifrario.

Il tipo di cifrario telefonico, compilato da questo Ufficio, è un esempio di cifrario di tale genere, il quale, se impiegato razionalmente e con frequenti cambiamenti di chiave, offre pochissimi appigli al decifratore.-

Codroipo, 2 Settembre 1916

IL CAPITANO CAPO UFFICIO

Cartingrano

3° REGGIMENTO GENIO
Ufficio Radio Telegrafico
DI CODROIPO

PICCOLO DIZIONARIO CIFRANTE TELEFONICO

------ooo0ooo------

AVVERTENZE

I°)-Completare il dizionario con nomi di località, di comandanti, di reparti, di materiali, ecc., di uso locale. Alle parole più usate assegnare due o più numeri corrispondenti.

2°)-Non framezzare parole chiare con parole cifrate. Ogni fonogramma (od almeno ogni periodo completo), deve essere <u>completamente chiaro</u> o <u>completamente cifrato</u>.

3°)-Per le voci che hanno due o più cifre equivalenti queste si devono usare alternativamente.

4°)-Le parole più frequenti che si devono scomporre in sillabe e lettere vanno ogni volta scomposte in modo diverso.

5°)-Nella trasmissione telefonica i gruppi vanno dettati coi numeri uno per uno: esempio 37I va dettato tre - sette - uno.

6°)-Ogni settore deve avere una chiave diversa. Ogni mese almeno la chiave deve essere cambiata. Per chiave si intende la successione (<u>esclusivamente affidata alla sorte</u>) dei numeri della parte cifrante.

N.B.-Per ridurre gli errori di trasmissione è consigliabile usare parole di facile comprensione invece dei gruppi di cifre. La annessa lista di nomi geografici può servire a tale scopo.-

---

P A R T E   C I F R A N T E

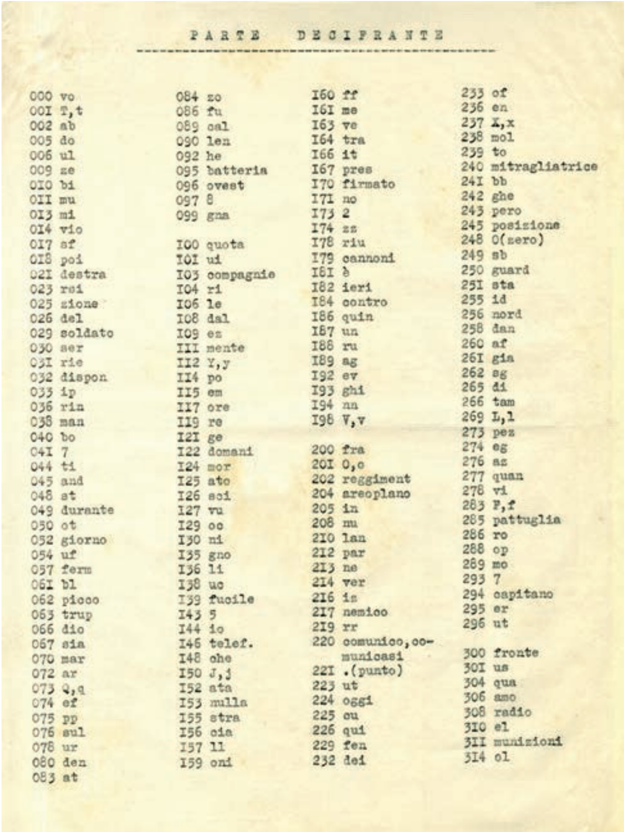
0	248
0	799
I	4I2
I	868
2	I73
2	605
3	336
3	748
4	542
4	596
5	I43
5	366
6	65I
6	944
7	04I
7	293
8	097
8	50I
9	489
9	84I
.punto(nel testo)	I2I
.punto(nel testo)	685
.punto(in fine fonogramma)	802
:	889
;	548
,	39I
accento	433
fine di parola (°)	395

A,a	483
A,a	809
ab	002
ac	456
ad	857
af	260
ag	I89
ai	363
al	405
al	566
alpini	9I2
am	629
amo	306
an	492
and	045
ano	557
ante	999
anti	854
ar	072
are	680
areoplano	204
areoplani	773
ari	688
artiglieria	449
artiglierie	5I9
as	720
assal	574
assegna	962
at	083
ata	I52
ate	349
ati	943
ato	I25
atten	7I3
attacc	729
attacco	53I
au	533
austria	389
av	64I
avan	66I
avver	45I
az	276
B,b	374
ba	937
ban	699
bat	982
batteria	095
batterie	924
bb	24I
be	325

bersaglieri	824
bi	0I0
bil	445
bl	06I
bo	040
bom	477
bombard	8II
bre	635
bu	887
C,c	726
ca	95I
cal	089
cam	475
can	427
cannone	877
cannoni	I79
car	739
capitano	294
cavallo-i	34I
cc	5I3
ce	8I8
cen	570
ci	849
cia	I56
cin	624
cio	594
cir	365
ch	474
che	I48
chi	897
cl	940
co	403
col	904
colonna	825
com	330
come	990
compagnia	647
compagnie	I03
comunico,comunicasi	220
con	44I
contro	I84
cor	498
cr	785
cu	225
D,d	424
da	906
dal	I08
dan	258
davanti	753

dd	379
de	956
dei	232
del	026
del	7I6
den	080
destra	02I
di	265
di	964
di	43I
dietro	3I7
dio	066
dir	694
dispon	032
do	005
domani	I22
dr	978
du	342
durante	049
E,e	795
E,e	88I
è	I8I
ea	704
eb	36I
ec	763
ecc.	505
eco	668
ed	55I
ee	406
ef	074
eg	274
ei	440
el	3I0
em	II5
emo	867
en	236
ena	737
ene	8I7
eni	948
eno	644
ep	608
er	295
era	770
ere	4I3
eri	648
ero	640
es	337
esi	654
esplo	540
espugn	457
est	874

(°)Da usarsi soltanto nei casi indispensabili per evitare equivoci.-



P A R T E   D E C I F R A N T E

000 vo
00I T,t
002 ab
005 do
006 ul
009 ze
0I0 bi
0II mu
0I3 mi
0I4 vio
0I7 sf
0I8 poi
02I destra
023 rsi
025 zione
026 del
029 soldato
030 ser
03I rie
032 dispon
033 ip
036 rin
038 man
040 bo
04I 7
044 ti
045 and
048 st
049 durante
050 ot
052 giorno
054 uf
057 ferm
06I bl
062 picco
063 trup
066 dio
067 sia
070 mar
072 ar
073 Q,q
074 ef
075 pp
076 sul
078 ur
080 den
083 at

084 zo
086 fu
089 cal
090 len
092 he
095 batteria
096 ovest
097 8
099 gna

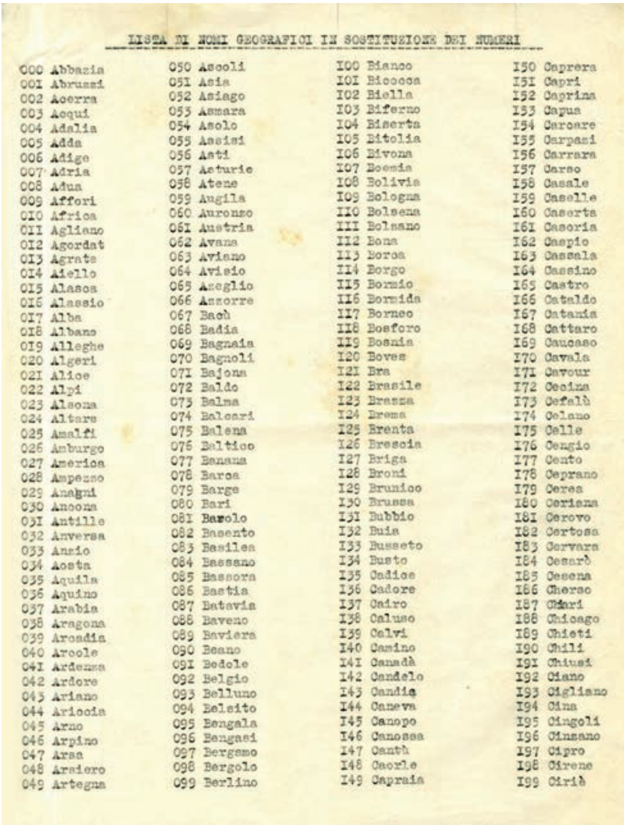
I00 quota
I0I ui
I03 compagnie
I04 ri
I06 le
I08 dal
I09 ez
III mente
II2 Y,y
II4 po
II5 em
II7 ore
II9 re
I2I ge
I22 domani
I24 mor
I25 ato
I26 aci
I27 vu
I29 oc
I30 ni
I35 gno
I36 li
I38 uc
I39 fucile
I43 5
I44 io
I46 telef.
I48 che
I50 J,j
I52 ata
I53 mulla
I55 stra
I56 cia
I57 ll
I59 oni

I60 ff
I6I me
I63 ve
I64 tra
I66 it
I67 pres
I70 firmato
I7I no
I73 2
I74 zz
I78 riu
I79 cannoni
I8I è
I82 ieri
I84 contro
I86 quin
I87 un
I88 ru
I89 ag
I92 ev
I93 ghi
I94 nn
I98 V,v

200 fra
20I O,o
202 reggiment
204 areoplano
205 in
208 mu
2I0 lan
2I2 par
2I3 ne
2I4 ver
2I6 iz
2I7 nemico
2I9 rr
220 comunico,co-
municasi
22I .(punto)
223 ut
224 oggi
225 cu
226 qui
229 fen
232 dei

233 of
236 en
237 X,x
238 mol
239 to
240 mitragliatrice
24I bb
242 ghe
243 pero
245 posizione
248 O(zero)
249 sb
250 guard
25I sta
255 id
256 nord
258 dan
260 af
26I gia
262 sg
265 di
266 tam
269 L,l
273 pez
274 eg
276 az
277 quan
278 vi
283 F,f
285 pattuglia
286 ro
288 op
289 mo
293 7
294 capitano
295 er
296 ut

300 fronte
30I us
304 qua
306 amo
308 radio
3I0 el
3II munizioni
3I4 ol



LISTA DI NOMI GEOGRAFICI IN SOSTITUZIONE DEI NUMERI

000 Abbazia
00I Abruzzi
002 Acerra
003 Acqui
004 Adalia
005 Adda
006 Adige
007 Adria
008 Adua
009 Affori
0I0 Africa
0II Agliano
0I2 Agordat
0I3 Agrate
0I4 Aiello
0I5 Alasca
0I6 Alassio
0I7 Alba
0I8 Albano
0I9 Alleghe
020 Algeri
02I Alice
022 Alpi
023 Alsona
024 Altare
025 Amalfi
026 Amburgo
027 America
028 Ampezzo
029 Anagni
030 Ancona
03I Antille
032 Anversa
033 Anzio
034 Aosta
035 Aquila
036 Aquino
037 Arabia
038 Aragona
039 Arcadia
040 Arcole
04I Ardenza
042 Ardore
043 Ariano
044 Ariccia
045 Arno
046 Arpino
047 Arsa
048 Arsiero
049 Artegna

050 Ascoli
05I Asia
052 Asiago
053 Asmara
054 Asolo
055 Assisi
056 Asti
057 Asturie
058 Atene
059 Augila
060 Auronzo
06I Austria
062 Avana
063 Aviano
064 Avisio
065 Azeglio
066 Azzorre
067 Bacù
068 Badia
069 Bagnaia
070 Bagnoli
07I Bajona
072 Baldo
073 Balma
074 Baleari
075 Balena
076 Baltico
077 Banana
078 Barca
079 Barge
080 Bari
08I Barolo
082 Basento
083 Basilea
084 Bassano
085 Bassora
086 Bastia
087 Batavia
088 Baveno
089 Baviera
090 Beano
09I Bedole
092 Belgio
093 Belluno
094 Belsito
095 Bengala
096 Bengasi
097 Bergamo
098 Bergolo
099 Berlino

I00 Bianco
I0I Bicocca
I02 Biella
I03 Biferno
I04 Biserta
I05 Bitolia
I06 Bivona
I07 Boemia
I08 Bolivia
I09 Bologna
II0 Bolsena
III Bolzano
II2 Bona
II3 Borca
II4 Borgo
II5 Bormio
II6 Bormida
II7 Borneo
II8 Bosforo
II9 Bosnia
I20 Boves
I2I Bra
I22 Brasile
I23 Brazza
I24 Brema
I25 Brenta
I26 Brescia
I27 Briga
I28 Broni
I29 Brunico
I30 Brussa
I3I Bubbio
I32 Buia
I33 Busseto
I34 Busto
I35 Cadice
I36 Cadore
I37 Cairo
I38 Caluso
I39 Calvi
I40 Camino
I4I Canadà
I42 Candelo
I43 Candia
I44 Caneva
I45 Canopo
I46 Canossa
I47 Cantù
I48 Caorle
I49 Capraia

I50 Caprera
I5I Capri
I52 Caprina
I53 Capua
I54 Carcare
I55 Carpazi
I56 Carrara
I57 Carso
I58 Casale
I59 Caselle
I60 Caserta
I6I Casoria
I62 Caspio
I63 Cassala
I64 Cassino
I65 Castro
I66 Cataldo
I67 Catania
I68 Cattaro
I69 Caucaso
I70 Cavala
I7I Cavour
I72 Cecina
I73 Cefalù
I74 Celano
I75 Celle
I76 Cengio
I77 Cento
I78 Ceprano
I79 Cerea
I80 Ceriana
I8I Cerovo
I82 Certosa
I83 Cervara
I84 Cesarò
I85 Cesena
I86 Cherso
I87 Chiari
I88 Chicago
I89 Chieti
I90 Chili
I9I Chiusi
I92 Ciano
I93 Cigliano
I94 Cina
I95 Cingoli
I96 Cinzano
I97 Cipro
I98 Cirene
I99 Ciriè

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LIST OF ABBREVIATIONS

A. E. F.	American Expeditionary Force
AOK	ArmeeOberKommandos
AUSSMA	Archivio Storico dello Stato maggiore dell'Aeronautica (Historical Archive of the Airforce General Staff)
AUSSME	Archivio Storico dello Stato maggiore dell'Esercito (Historical Archive of Army General Staff)
AUSSMM	Archivio Storico dello Stato maggiore della Marina (Historical Archive of Navy General Staff)
Coll.	Number of the case in the WWI ISCAG Archive
COMINT	Communication Intelligence
CRITO	Centro Raccoglitore Informazioni Truppe Operanti (Deployed Troops' Information Collection Centres)
CRSI	Centro Raccoglitore Stazioni Intercettatrici (Collector Centre for Telephone Interception Stations)
CS	Comando Supremo (Supreme Headquarters)
CW	Continuous Wave
"D"	Divisional Code
ELINT	Electronic Intelligence
env.	envelope in the AUSSME
G.Q.G.	Grand Quartier Général (General Headquarters of the French army)
HUMINT	Human Intelligence
I.A.	Inter-Allied Code
ISCAG	Istituto di Storia e Cultura dell'Arma del Genio (Institute of History and Culture of the Corps of Engineers)
I.T.	Intercettazioni Telefoniche (Italian Telephone Interception Service)
I. T. O.	Informazioni Truppe Operanti (Deployed Ttroops' Intelligence Service)
M13	Mengarini Cipher, 1913 edition
A/N	Author's note
O.A.F.N.	Occupazione Avanzata Frontiera Nord (Northern Front Forward Occupation Command)

“R”	Regimental Code
RDF	Radio Detection Finding
RT	Radio Telegraphy
SA, SB, SC	Cifrari di Servizio A, B, C (Service ciphers for the Italian Headquarters radio stations, 1918)
RTG	Radio Telegram
SME	Stato Maggiore dell’Esercito (General Headquarters Staff of the Army)
S.F.R.	Société Française Radio eléctrique (French Radioelectric Company)
S.I.	Cifrario del Servizio Informazioni (Code for the Italian Intelligence Service)
S.I.B.	Nuovo cifrario del Servizio Informazioni (New Code for the Italian Intelligence Service,1918)
SIFAR	Servizio Informazioni Forze Armate (Italian Armed Forces Intelligence Service)
SIGINT	Signal Intelligence
STM	Servizio Telegrafico Militare (Telegraph Military Service)
Spetelf	Spezial Telefonische (Austrian Telephone Interception Service)
T1, T2	Ciphers for Italian small radio stations
TPS	Télégraphie Par le Sol (Geotelegraphy)

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The history of the Italian Army Intelligence Service and its role during the Great War especially on the eve of relevant Austro-Hungarian offensives, is still debated.

Many topics also remain to be clarified around the new source of intelligence implemented by interception of enemy communications and about the protection efficiency of own communications' secrecy, which were developed on the Italian-Austrian front as well as on the other theatres of war.

Among the questions worthy of a convincing answer, the following may be included:

What was the actual contribution made to the Amy Intelligence by Communication Intelligence compared to traditional information sources, namely espionage, interrogations of prisoners and deserters, etc.?

On what ground the Commission of Inquiry on Caporetto denounced *"the great state of inferiority of our (Italian) military and diplomatic moves" due to the "improvements achieved by the enemy in its Intelligence Service", especially thanks to the "development of the radiotelegraphic interception supported by a wonderful cryptographic service*"?

And furthermore, could the decisive improvement of Italian cryptologic performance in the last year of the war be really attributed to the collaboration with the French and English allies who arrived in Italy after the Battle of Caporetto, as claimed by some historical sources?

An in-depth and careful research performed in the Italian archives unveiled the structures and performance of the entire intelligence sector of the Italian Army and, moreover, allowed investigate into the exploitation of the abovementioned new source of Intelligence. The analysis of memories written by the protagonists of the cryptologic struggle operating on both fronts were also very useful for this last purpose.

Several documents, many of which hitherto unpublished, helped to create a picture of the events occurred during the silent, implacable war with no holds barred that the Italian Army Intelligence Service fought also in the field of Communication Intelligence. New evidence was gathered on the work of Luigi Sacco and his "Cryptographic Units", whose skills reached levels comparable to those of the more distinguished opponents and allies at the end of the conflict.

Ciphers and telecommunication equipment
used by the Italian Army during the Great War

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