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Note in pencil: T/S 524160 2 pages page 1

SSD (sig. Sect.), UK Base
APO 413, US Army
20 October 1945

Subject: Technical History of 6813th Signals Security Detachment

To : Director, SSD (Sig. Section), UK Base, APO 413

Submitted herewith is final draft of technical history of 6813th Signal Security Detachment for your consideration and emendation.

(signed)
J. K. LIVELY
Inc: Technical History (dup) Capt., Sig C

1st Ind RDJ/hjk
SIGNAL INTELLIGENCE SECTION, OFFICE OF THE SIGNAL OFFICER, HEADQUARTERS
UNITED KINGDOM BASE, APO 413, UNITED STATES ARMY. 26TH October 1945

To: Director, Signal Intelligence Division, Office of the Chief Signal Officer, Headquarters, United States Forces, European Theater, APO 757, United States Army.

1. Amended version of above report is herewith forwarded.

2. One copy of the above report is being held in this office until such time as the receipt for this copy is recieved here.

(signed)
ROY D. JOHNSON
Lt. Colnel, Signal Corps.
Signal Intelligence Officer.

Inc: Technical History
1 copy w/d

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(written: T/S 524160-2, copy 1, 29 pages)

TECHNICAL HISTORY

of the

6813TH SIGNAL SECURITY DETACHMENT

20 OCTOBER 1945

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ACKNOWLEDGMENTS

No one person could write the history of American participation in activities at the Government Code and Cypher School. this report is therefore the composite effort of members from the various blocks in Bletchley Park. The section on SIXTA was written by Captain Jack MAGILAVY and 1st Lt. Ernest H. MORRIS; HUT Six by Tec 3 Arthur N. LEWIS; BLOCK F by 2nd Lt George H. VERGINE; and HUT Three by Captain James K. LIVELY who also edited the whole report.

CLASSIFICATION ADVISORY

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INTRODUCTION

Shortly before the end of the war in Europe General Spatz of the United States Army Air Force addressed the personnel of Bletchley Park. Outstanding among his remarks was the observation that never before in any war had such a vast amount of intelligence been available, had so much been known about the enemy. Without detraction from the efforts of intelligence agents, PW interrogation, ground and air reconnaissence and the like, it seems safe to accredit Bletchley Park with the greater part of the information about German war measures. Despite complications in cryptographic and wireless telegraphy procedure which the Germans introduced to heighten the security of their communications and which perennially threatened to dry up the "ultra source", the Government Code and Cypher School continued to open up to Allied staffs the mysteries of German traffic until the end of the war.

Bletchley Park was (and is) an amazing institution even to those old hands among the Americans, now rendered less awe-struck by the hardening effect of two or more years spent within its precincts. At first exposure complete chaos seemed to reign overall but with acquaintance beneath the superficial confusion order found found itself---not that order which would have been susceptible of being rendered diagrammetically by an efficiency expert but a pragmatic system constantly changing and constantly adapting itself to a problem which refused to remain stationary.

This institution was 99.4 per cent British. The original breaks into German systems were made by Britons with pioneering assistance of Poles and French. The methods of utilising the results were developed by Britons who had had four years of experience before Americans appeared on the scene to do their part. Yet Americans were not solely bystanders and it is the pyrpose of this historical sketch to depict what was their participation and contributions consisted of.

Prior to the establishment of the 6813th Signal Security Detachment representatives of Arlington Hall had visited the

Government

Government Code and Cypher School. In early 1942 Lt. Colonel (then Captain) S. Kullback toured Bletchley Park, paving the way for the visit of Lt. Colonel (then Captain) Rof D. Johnson later in the same year. Based upon the study and reccommendations of Capt. Johnson and with the approval of the British Foreign Office which controls G. C. and C. S., the decision was made to send American Signal Corps personnel to participate in the activities at Bletchley Park. The first contingent left Washingtom in August 1943 and the last major party, departed in March 1944. At first these American personnel were regarded as directly part of Signals Intelligence Division (Signal Section) Headquarters European Theater of Operations, US Army , commanded by Colonel George A. Bicher; the varioys individuals being placed on detached service to Bletchley and billeted in private quarters. In late February 1944 the 6813th Signal Security De-tachment was organised and on 29 Marh 1944 a post opened in the Manor House at Little Brickhill (Buckinghamshire). The then Captain Bundy served as the first commanding officer and remained in that capacity thrughout the operational history of the detachment. Operations by American personnel at G. C. and C. S. continued until Victory -in Europe Day at which time the major mission of the party was completed. The detachment was subordinated to SID (Signal Section) Headquarters European Theater of Operations, uder Lt Colonel Johnson who was director of the Special Cryptanalytic Project.

The 6813th Signal Security Detachment has had abn average strength of 85 officers and men, 20 of these serving in administrative capacity to maintain the post at Little Brickhill and the remaining 65 in various assignments at G. C. and C. S. The achievement of administrative and overhead personnel in providing comfortable quarters at Little Brickhill does not constitute part of this history but merits grateful mention in passing.

The operational personnel of the Detachment comprised a body of technicians concerned with the problem of German cryptanalysis, and their assignments corresponded to the organisation of that portion of of G. C. and

C. S.

C. S. Briefly stated, these departments were as follows:

I. Sixta - Traffic Analysis

II. Hut Six - Cryptanalysis of the German Enigma machine

III. Block F - Cryptanalysis of Fish (German non-morse) Traffic

IV. Hut Three - Evaluation and Exploitation of Message Content of all German Traffic.

Each department is discussed in some detail in subsequent pages.

I. SIXTA

Historical Record. The American party first arrivedin Sixta in October of 1943, four officers and eleven enlisted men strong. This number was increased during the five following months by the arrival from time to time of further shipments until the top strength was around twenty men and six officers. Not all of the original party was included in this number, however, several of the first arrivals having been trained by Sis ta and then shifted to Hut Six, Hut Three, or the Quiet Room (liaiso between Hut Six and Sixta). Other men, after working in Sixta for a while, went into Control or into the Direction-Finding Section, a specialised branch of Sixta.

Task of Sixta. "Sixta" is a name derived from a combination of Hut Six and Traffic Analysis (abbreviated to TA), the latter term being the clue to the function of the section. The combination indicates that the section was primarily established as an aid to the cryptanalysis of Hut Six. When operations got well under way, however, it was found that traffic analysis produced also much valuable information of an intelligence nature independent of Hut Six.

Sixta activities broke down into the following divisions: Log-Reading; Search Party; Fusion Room; Direction-Finding Section; Control; Wireless Telegraphy Bureau; and Technical Section. It be well to describe each of these activities briefly because members of the American party were

were scattered throughout Sixta and participated in most of its functions.

Log Reading. The bulk of Sixta and the majority of the American party were at first engaged in reading operator's logs as they were sent in from British or American intercept stations. The staff were divided into sections dealing with specific types of traffic or different geographical areas or various parts of the German Forces. Thus there was the Eastern Front air section, the Western air section, The Western Front section dealing with Army Enigma logs, and a similar section dealing with lower-grade Army traffic in the East. There were seperate sections for handling the police network and naval traffic. The armies and air groups in the Mediterranean were also studied by seperate sections. In each of these sections, at one time or another there was at least one American.

Search Party. Various operational changes in Sixta gave rise to a large "search" or log-identification section, and it was here that the greatest number of American personnel in Sixta was later employed. Except for the Officers in the Fusion Room the Americans were generally retained on short-term jobs so that they could be switched from section to section as the need for extra help developed. Thus it was that with the growing demand of personnel in the log-identification section Americans were soon shifted.

Fusion Room. The Fusion Room at the beginning was the most exalted part of Sixta because here all raw information gathered by the log-readers was evaluated and passed on to higher authority. Gradually the function of the Fusion Room Officers became more and more closely integrated with that of the log-readers until eventually the Fusion Room ceased to exist and the former Fusion Room Officer became head of his own party of log-readers. Only two Americans worked as Fusion Room Officers; Lt Robert G. Nunn and Lt Edgar S. Salsberg. Lt Nunn was in charge of the Weston Front Army at the time of the invasion and for several weeks thereafter. Lt Salsberg was the officer for the Mediterranean area. He was instrumental in perfecting a procedure for properly handling and evaluating the contents of teleprints received daily from the British group in the

mediterranean

* An interim report by Lt Robert Nunn on the scope and methods of SIXTA treats this subject in considerably greater detail.

Mediterranean area.

Direction-Finding Section. The D/F section of Sixta was an elaborate one, relying on several British stations for its information and producing highly satisfactory results. No Americans were employed in this section.

Control. Another activity of Sixta was that of maintaining constant contact with all intercept stations and advising them on cover desired from a W/T standpoint. This was essentially a part of Control which was run from Hut Six by Mr John Colman, but the sixta section under Captain Lovett was separate. In the latter section Captain Lovett found the assistance of Sgt Benjemin R. Carroll so valuable that he was made second in charge of the section and was eventually commissioned because of his good work.

Wireless Telegraphy Bureau. The W. T. Bureau under Major Morrison employed at least one American at all times in addition to Lt Fehl who served as liaison between the Bureau and Hut Three. (Vide infra.)

Technical Section. The work of the Technical Section of Sixta is fully covered in the Sixta History. Consequently only thos phases in which American participation figured directly will be touched on here.

Capt Magilavy joined this section in ugust of 1944. After a period of orientation he took over the subsection which had just been set up to deal with the reconstruction of frequency tables employed by the German Army in the West and in Italy. This project was carried on with some success until November 1944 when the German Army began using enciphered call signs. It was possible up until the time of the change to confirm and in some cases establish identities solely on the basis of frequencies. Considerable assistance was rendered the Control Section and log-reading party in maintaining continuity over the three-day frequency change then employed by the Germans.

About the middle of November 1944 Capt Magilavy was given the task of setting up a completely new section to deal with the fusion of information and intelligence on the German landline network. It was hoped that the results obtained would provide intelligence of strategic importance. An accurate picture of the enemy landline net was soon built up from decodes, MI-8 reports, Derce?? listings and from circuit

numbers

members (the last-named had been in process of compilation for several years in the Technical Section). This picture was projected onto a call diagram indicating all the main landline centres and repeater stations with their interconnecting main cables. An order of battle was then superimposed on the landline net. By following the daily reports of landline repair and construction as they appeared in the decodes and then tracing reroutings (in the case of bomb damage or line overloading) or routeing (in the case of new construction) an interesting although obvious fact emerged. It would be possible completely to disrupt the landline communication facilities throughout most of Germany by carefully bombing certain key repeater stations and exchanges, All pertrinent data down to and including street addresses were correlated and passed on through channels and in short order emerged as the "Short Circuit" project. Using the information provided by the Technical |Section, this strategic bombing-planaimed at the systematic disruption of landline facilities as allpied to the several German Army Froups in the West. Before the plan could be put into operation. however, the immenent end of the war (late April 1945) precluded the final completion of the project.

Roster of American Personnel in Sixta.

Log-reading

Lt Ernest H. Morris
T/Sgt Cecil R. Porter
T/3 Earl W. Swanson
T/4 Ralph W. Carl
T/4 Robert W. Kidder
T/4 John N. English

Search Party

T/3 Laurence C. Hoydstun
T/4 Bail H. Possan
T/4 Norman Singer
T/5 Ross Martindale
T/5 Frederick S. Reckert

Fusion Room

Fusion Room
Lt Robert G. Nunn
Lt Edgar H. Salsberg

D/F Section
none

Control
Sgt (later 2/Lt) Benjamin R. Carroll

W/T Bureau
Lt Alfred P. Fehl
Pfc David A. Black

Technical Section
Captain Jack Magilavy

Critique. There is no question of a seperate history of American activities as distinct from British. All were amalgamated as one party with no operational division. Sections within Sixta were headed variously by British or American personnel and were staffed by both. In some cases American officers and non-coms worked under the supervision of British sergeants; in other instances American officers were in charge of groups of mixed personnel. The arrangement, placing emphasis on operational experience rather than rank, was entirely harmonious and successful.

The general impression gained by most of the American party in Sixta was that the organisation, methods of operation and actual results obtained left nothing to be desired. The flow of work seemed always to be efficiently handled with a minimum of administrative interferance.

Of particular interest was the manner in which British colleagues found their diligence rewarded. Promotions were frequent for the deserving and a continuous flow of qualified NCO's to Officers' Candidate School was always maintained.

II. Hut Six.

This brief report does not attempt to duplicate even in condensed form the official Hut Six history now nearing completion. Our only concern here is with the part played by the American pasrty in the two final years of the Hut's history.

It must be emphasised at the outset that Hut Six remained basically a British accomplishment. American personnel never constituted even a tenth of the total strength of the Hut. Nevertheless our contribution was far from negligible. Americans participated in every activity of the organisation and contributed valuable work in each.

Historical Summary. The first contingent of Americans arrived at Bletchley Park on 30 August 1943 at a critical moment in the life of Hut Six. Before this time Lt Col (then Capt) Johnson had spent six months in the Hut and even earlier Col (then Capt) Kullback had toured the organisation, but this date marked the first penetration in force. Two days later, on 1 September, German Army keys stopped the general use of discriminants and the problems of traffic identification were vastly complicated.

The group assigned to Hut Six consisted of four officers and two enlisted men: 1/Lts Alex T. Frengel and John J. Libers, 2/Lts William Bijur and Arthur J. Levenson, T/3's George B Walker and Arthur N. Lewis. In an intensive two-week course conducted by Mr John Herival, one of the senior British cryptanalysts, the group was initiated into the mysteries of Enigma and was then considered ready to begin an active apprentisceship.Lt Bijur was assigned to the Air Research Section, Sgt Walker to Control, Lts Frengel and Libers left the Hut temporarily for Sixta, the former being eventually assigned to Hut Three, the latter returning later to the Control Section in Hut Six.

Lt Levenson soon had to drop out of operations temporarily to assume the role of teacher, guiding the second wave of American arrivals who were destined for cryptanalytic sections through the course of instruction the first group had so recently completed. His class consisted of

1/Lt

1/Lt William P. Bundy, T/Sgts John E. Hyman, Gwynne B. Evans, Irving E. Wossorsky and T/3 George Hurley. Lt Bundy distinguished himselfat this stage by setting a new Hut Six record for speed in the solution of the dottery exercise. Meanwhile another group was being given a familiarisation course by Miss Helene Taylor. Lt Bundy and Sgt Hurley joined the Watch, Sgt Hyman Air Research, Sgts Wossorsky and evans the traffic identification section where they were reinforced by T/3 Oliver F. Egleston and T/4 Howard N. Porter. M/Sgt Stuart R. Frazier and T/3 Benjamin R. Carroll and Frank T. Mucck were assigned to Control. T/Sgt George H. Vergine also joined Army Research upon his release from hospital.

When these men had been absorbed into the Hut organisation, the third and largest group arrived in January, were trained, and were distributed throughout the Hut.

Distribution of American Personnel. At this time the distribution of Americans in the subsections of Hut Six was as follows:

Watch
- Capt Bundy
- Lt Louis Enzdbeck
- Lt Oliver R Kirby
- Pfc Francis H Stanton
- Pfc Henry F. Thielbar

Machine Room
- Pfc LeRoy H. Fischer
- Pfc Mathew Simon
- Pfc Walter P. Sharp

Army Research
- Lt Levenson (transferred to Block F, 5 April 1944)
- T/3 Lewis
- Pfc Maurice Yochelson
- M/Sgt James J. Leehy
- T/Sgt Vergine (transfererred to Block F, March 1944)

Air Research

Air Research
- Lt Bijur
- Sgt Hyman

Control
- Lt Libern
- M/Sgt Frazier
- T/3 B. Carroll
- T/3 Mueck
- T/4 Walker (transferred to 6811 SSD beginning April 1944)
- Pfc Alfred P. Bruce
- Pfc Maxwell N. Frank
- Pfc James D. Carroll

Identification Section
- T/Sgt Evans
- T/Sgt Massarsky
- T/3 Egleston
- T/4 H. Porter
- Pfc Herbert Auerbach (transferred to 6812 SSD)
    - Charles R. Biorman
    - Kenneth A. Fuller
    - Theodore Goldstein
    - Grant Mc Donald
    - George W. Morris
    - James R. Nielson

Detached Service at Beaumanor
- T/3 Fred J. Allred
- T/4 John A. McGeachy
- T/4 Forbes S. Sibley.

Changes in these assignments occurred continuously, reflecting both changes in the pressure of work in various sections and organisational changes in the Hut, such as the formation of the Duddery, consolidation of

dition of the Watch and Air research Section and formation of the Army Watch immediately preceeding D-day.

Critique. During the entire period of operations Americams worked alongside British personnel, carrying out the same tasks under the same direction. There were no purely American sections. Major Bundy was a head of shift in the Watch and, as such, directed the work of both British and Americans within the section. Sgt H. Porter was in charge of the Western Front Army division of the traffic identification section, and similarly directed the work of both American and British personnel. Other sections containing Americans were headed by British. There was not merely inter-allied cooperation here but complete fusion of effort.

The existence of American bombes, both Navy and Army, in Washington helped immesurably to ease the tight situation in Bletchley Park. Throughout the early stages of the war many potential breaking attempts had to be abandoned because B.P. bombe-time did not permit expense on any but operational keys. As American bombes were made available it was possible to allot bombe-time for these hither-to-sacrficed keys and to take longer and profitable risks in the breaking of current keys. Moreover, the contribution of the American technitians in cooperation with the British experts was to considerable extent responsible for the successful experimentation with E-breaking methods which put the Allies in such a strong position when the Germans finally resorted to an almost universal use of this additional security device.

To an American the most striking feature of Hut Six organisation was the handling of the personnel problem, both the initial selection and the subsequent treatment of employees. Instead of a small group of expert cryptanalysts, supplemented by a large number of low-grade clerical workers, the recruitment policy seemed designed to bring into the Hut highly intelligent personnel selected from universities and schools for all jobs. This was not an unmixed blessing. It caused more dissatisfaction than was neccessary with the unavoidable routine jobs such as message registration, and it resulted perhaps in a needless waste of intelligent manpower, but it did mean that there were reserves of capable personnel to meet emergencies and that a considearble

siderable number of difficult tasks could be delegated to them with confidence in the result.

Civilian and service personnel--Army, Navy and Air force-- worked side by side under-section heads selected from any of these groups. With-in the office rank was disregarded and all worked together on a basis of Christian name familiarity.

Leave was granted liberally (a nine-day leave every three months plus weekly days off) and, except in the tense days immediately preceding and following D-Day all personnel were expected to take leave to which they were entitled. The result was an almost complete absence of the apathy and stress which follow from working continuously under pressure and tremendous reserves of strength to meet exceptional demands.

As a matter of policy the British cryptanalytic personnel were either civilian or, if militarey, commissioned as at least first lieutenants. It is noteworthy that the lack of equivalent rank on the part of most American cryptanalysts in Hut Six caused no difficulties in the relations between the two groups; nor did the slowness or absence of promotions-- particularly for enlisted grades-- diminish the real quality of their work.

An American Hut Six would doubtless have made greater use of International Business Machinery for routine tasks and low-grade clerical assistance for other jobs which were here performed by cryptanalysts proper. For example, the recording en passent (E.P.'ing) of message beginnings to uncover new cribs and keep track of the form of old ones continuously occupied one member of both Army and Air Watches. It was not until a few months before V-E Day that the semi-skilled and time-consuming task of making up "menus" for the bombes was partially delegated to full-time menu-makers. Previously every member of the Watches and research had spent a considerable portion of his time in making up his own. This reluctance to use machinery and to divide skilled and unskilled labour stems partly from the absence of suitable machinery and personnel, partly from the belief that it was desirable for the cryptanalyst to keep in constant touch with the routine aspects of his job.

In conclusion

In conclusion is quoted the assessment of the value of American perticipation in Hut Six, an assessment made by Mr P. S. Milner-Barry, head of the Hut, in a letter to the detachment commanders:

Hut6, Block D
10th May, 1945

"My dear Bill,

I cannot let the American contingent pass from Hut 6 without trying to express, however inadequately, my sense of the debt which I myself and my colleagues owe to you.

At this stage it will probably do no harm to confess that when. shortly after taking over the leadership of Hut 6, I was informed by the Director at short notice that a large body of Americans was bearing down on me, I viewed the prospect with some consternation; not for any insular prejudice, but because at that time it did not appear that we were in immediate need of reinforcements, while we were faced with technical problems which would make it difficult to find the time for training.

I can now say with sincerity that it was one of the luckiest things that happened to Hut 6 and one of the nicest things that has happened to me personally. That is because every one of you laid himself out from the word go to cooperate in every way possible and whatever we asked you to, went three quarters of the way to do it. I do not know if that is a charateristic of your nation generally, but I should be very proud of my countrymen if I could feel confident that in a similar situation a collection of Englishmen would behave as well. You settled down immediately to learn the job and to give us your best. There is a silly prejudice in this country that Americans are anxious to show the world how much better they do the job than other countries. That is another preconceived notion which I hope has received a nasty knock. The best of your men were quite first rate, as is shown by the number of key positions which they occupied, but I never met any men less anxious to claim the credit to which they were entitled.

I It has been a real pleasure to me, and I know I speak for the Hut as a whole, to work with so friendly and likeable a group of men, and our connection with you is one of the many things that has made Hut 6 a unique experience for me. I like to think too, that it is a good omen for the future, for it seems to me quite obvious that, unless we do pull together, the outlook for the world is about as dark as it could be.

The breaking up of Hut 6, even for so joyful a cause, is a melancholy business. In the general sadness of parting with so many good friends there is the particular regret of losing you, whom in the future we cannot expect to meet as we shall our own country-men. But I hope most sincerely that our ways will bring us together again. The very best of luck to you all, and me heartfelt thanks."

III. Block F

III. Block F

This paper adds nothing to the technical and organisational history of the Fish problem but is concerned with the experience and opinions of those Americans who worked on that problem. Although the American Contingent was very few in number, the training and the efforts were of great value in what may well be termed the future trend of cryptanalysis. The use of rapid electronic counting, the development of new statistical applications to the solution of cipher traffic and the research in abstract mathematics itself all reached a peak in the operational work on the Fish problem. The records speak for themselves in their contributions to the science of cryptanalysis.

Organisation and Task of Block F. To give any description of Block F, a brief picture of the organisation and its problem is necessary. The scope of Fish was greatly enlarged and intensified because of its high value in intelligence; and the diversified nature of the various approaches to solution have already filled the pages of books without any general concept of how the section actually worked to obtain results.

Essentially the Fish people were divided into two camps, the "Newmanry" and the "Testery", between whom rivalry reigned. The first handled the statistical work, usually consisting of the solution of the patterns of five wheels and also setting those wheels on each message. The Testery was concerned with the final stage of solution by linguistic efforts, that is, the solution and setting of the seven other wheels used by the cipher machine, and also the deciphering of the plaintext which was sent to Hut Three. The division of the work was never as clearly detailed as above stated because in many cases there were several means for arriving at a solution. All twelve wheels of the cipher machine could be set statistically in the Newmanry, the keys obtained from cribs could be solved by either group, and the solution of new daily patterns could be obtained independently by either group from depths or entirely from statistical work.

tical work. The distribution of the tasks therefore depended for practical purposes on the labor, machines, techniques and time available. The fact that there were sometimes several means for arriving at a desired result immediately burdened the workers with the necessity of having a broad knowledge of all the techniques in both camps as well as an evaluation and often facility for each of the techniques as applied to a particular case.

Much praise is definitely deserving to both personnels. The Testery was headed by Major Tester and consisted mainly of British Army linguists and ATS. The linguists were divided into breakers, or those (who) broke and set the second five wheels on a partially deciphered message that had come from the Newmanry, and the setters who took the break and worked out the initial settings of the wheels, including the last two. The ATS did the deciphering, or decoding as it was called, on the special machines devised with a typewriter keyboard.

The Newmanry was headed by Dr Newman who now has a chair of mathematics at Manchester University. The staff consisted of Wrens and civilian mathematicians. The section was always blessed with the top mathematical students from Cambridge and Oxford whenever it needed men. The selections of such high-grade and specialised personnel was one of the main reasons for the success of the section and should be noted. The logbooks kept by each shift were mostly mathematical shorthand which would have meant little to anyone who did not bring with him a full knowledge of the subject. As a second point to be noted, these men remained in civvies, independent of the demands of army life, thus having freedom for conscientious research and overtime, a deciding factor in favor of original thought and good work.

Besides the two camps there was also a large staff of enineers who kept all the machinery in working condition. Most of the statistical work was done by electronic counters which reqired maintainance and new gadgets as techniques developed. The construction of the large units was done at

done at Dollis Hill under the Government Post Office and they were installed by Post Office men when ready. The Colossi, or the large units, grew from one when the American party entered the section to the final twelve with a especially built Block H for their housing.

American Personnel in Block F. T/Sgt (later 2/Lt) George H. Vergine was the pioneering American in Block F. Follow his comments:

I shall never forget the maze of abstractions that confronted me the day I started in the section. That was on 9 March 1944. I was ushered into what was called the research room and given the log books to read. Log book number one could not be found; I had difficulty in reading the scribbling; and many of the terms used such as deciban and bulge were never seen in any book on probability. Any hope of finding out what the underlying theory of solution might be depended entirely on jumping into the middle of endless daily notes and a mass of unidentified symbols.

There was the Black Book, as it was called. It was supposed to give a coherent summary, but truthfully half of it was obsolete. Dr Newman claimed that the best perhaps the best summary of Fish theory could be found in Major Seaman's special Fish note-book. He had been our American liaison offocer who unfortunatel had just returned the week before to Washington --with his notebook.

I still remember the shyness that possessed me. The people spoke the same language but definitely did not speak it as we did. The members of the section were too polite in my estimation, staying completely out of my way and looking too busy to give me a few informative words. I sat in the room trying to follow the development of one particular phase of the mathematics, paging through the log to find those days on which the topic came into discussion, and saying a few extra words under my breath when I eventually found a final contradiction to the hopes of the idea.

Later Dr Newman gave me an hour's lecture on how the cipher machine worked and from then on I was on my own. The jigsaw pieced itself together very slowly. Theory, procedures, and machine operations required time to fuse. The disorganisation that first appeared to be I later realised was not the fault of the men nor organisation but was due to the concentration on the rapid growth of the problem. There had never been any need for a summary of the work because every one simply read the daily entries in the log-books and kept himself up to date. Once in a while a screed had been attempted but it seemed useless since several had become out of date before they were finished.

Another civilian had entered the section when I had, and I was relieved when Dr Newman confessed that they had not realised just how specialised the problem had become. The new men in the future were given more consideration. But to me, of all the jobs I have ever started the Fish job will always remain as the toughest.

Lt Elmer van der Veal entered the Testery at about the same time. The Testery never expected much from a recruit during the first three months since he had to be able spontaneously to perform the mental gymnastics of adding together two Baudot letters, each containing five pluses or minuses . After spending some time with the breakers, Lt van der Veal later ???? as

Control

Control Officer, a position that was created when the allocation of wireless pickups became a problem due to the varying inteeligence value of the different links. The job also entailed the regulation of the traffic teleprinted from the intercept station, the filing of that traffic and the supervision of the ATS in the deciphering section.

Lt Arthur J. Levenson, a professional mathematician, came to the Testery about a month later. His talents in both linguistics and mathematics made him a very apt person for any phase of Fish work. He also worked part-time in the Newmanry and gained the best overall picture of the problem. Being quite affable by nature and respected for his work, he was soon labelled the American Commander of troops in Block F.

Tec 3 Tilmar Moilien entered the Nemanry the following July. Being an actuary in civilian life, he found himself very much at home in the work. He worked several months rotating through the various jobs in the Newmanry, and later when the cribbing department (a special means of obtaining wheel patterns) needed a permenant and personal touch to bring it out of its ills took over the management and made a success of it. Whencribbing eventually became obsolete in the last days of Fish, Moilien spent his time on the special mathematics and machine work which was done for Fish purposes.

These four Americans were with the problem until the end. During that time other Americans came on short visits. Tec Thomas Collins brought the dragon Machine with him, which Arlington Hall had concocted to be a godsend to the Testery Department. It dragged cribs through the partial decipherments of the Newmanry, testing the crib electrically at any position of the message. Sgt Collins stayed a few months to install and operate it at B.P. It proved to be helpful on messages which had low dottage (i.e., in which the smallest wheel pattern had few dots), but ordinary hand method with mental gymnastics still proved quicker for the larger portion of the traffic. Several more machines of the same type were later built at Dollis Hill.

Tec 4 Walter

Tec 4 Walter Jacob, a statistician in civilian life, spent about six months in the Newmanry on a special mission from Washington to study the Fish problem. His contributions in the application of statistical theory to the work speak for themselves in the research logs.

Capt Herbert Maas spent about two months in the Newmanry and the Testery as an observer from Arlington Hall Tec 5 Walter Sharp, a math instructor at Ohio University, also spent two months in the Newmanry.

The 5202 machine, another Arlington Hall invention which did electronic counting on film instead of paper tapes, brought Lt George Dixon and Tec 3 William O'Donnell to the Newmanry. The walls had first to be knocked down before the machine could be moved into its room and when it was almost in operating order, victory came. They stayed on however to test out the machine on a mock operational basis and have since returned to the States.

There are two other Americans who should be mentioned since they were closely connected with the problem although they did not belong to the Army. They are Mr Albert Small, a civilian cryptanalyst, who spent some time writing a Fish report for Washington and Lt Comdr Howard Campaigne of the US Navy who worked in the Newmanry during its last year.

Critique.

Critique. No mention of Fish would be complete without some words about the weekly Newmanry teaparties. They were the nucleus of the organisation. The notice would appear on the blackboard of the research room, announcing a date and time. Any male member had the privilege of writing at any time an item on the blackboard for the weeek's agenda and when the time came each item was discussed between sips of tea. The items consisted of anything from mathematical questions to the definition of procedures, and the thoroughness with which every job was assigned and specified, ever technique weighed for its value in time, labour and machines accounts in large part for the success of the section. Some of the most minute detail of directing types of traffic, the ordering of traffic, the adjustment of faults received conscientious consideration. every policy and procedure was thoroughly thought out and defined before it was put into action; and if put into action, the minutes of the tea-party designated the person or persons to affect the conclusion. The same forthought prevailed in the establishment of new techniques. They had to be first proven theoretically in the research log or to an extent that for all practical purposes they were theoretically valid. The premium which was attached to time, machines, labour prevented sacrifices on wild schemes.

One must have great respect for those teaparties. Not only were they democratic with the opportunity for any member to present his grievance but the personal interest was a great stimulus for work, planning and thought. Differences of opinion were ironed out and everyone knew what was going on in the section.

In the Newmanry ther were usually four jobs through which amember rotated, spending a week on each. There was the job of being Duty Officer, the boss of the shift, the arbitrator on all machines and traffic priorities, supervision of seventy Wrens and civilians. Then there was the Wheel men who managed the tewnty-one Wrens in the statistical solution of wheel-patterns and was the overseer of the Wheelbreakers, a more specific job of completing the wheel-pattern by machine analysis. Lastly, one took his turn

his turn on a week of research thinking up new ideas.

The idea of rotating jobs although it required a high class of personnel has many points ib its favour. Everyone had an oportunity of experiencing the workings of the section. The culmination of various views on the work led to greater progress, and the complete understanding of the entire problem by everyone concerned made it possible to keep work going from shift to shift without delays. If anything should be attributed to the organisation, it is the unusual measure of proximity that was found between theory and practice.

The structure of the organisation was built on the concept that the male members should carry the responsibility for any decisions and the work should be reduced to a routine so that the Wrens were able to do it. Every responsibility was defined as well as the person who was to carry that responsibility. It was understood that a man was expected to do his job and he was left alone to do what he thought best.

Perhaps the main fault of the organisation was that the primary principle of the difference between a man's work and that of a Wren was overdone. It was true that the selection of personnel did make it possible to draw such a distinction, but later when the section grew to such an extent that ther was a shortage of males some of the Wrens did wheelbreaking jobs and other tasks requiring technical knowledge which were previously thought possible only by a man. A programme of training Wrens in theory and the work began in ernest but if this change in policy had started earlier greater dividends would have been noticed in the results.

Remarks. In conclusion some words should be said about decibans, a word which was pronounced in the section more often than any other. Although the term had been used in other sections of Bletchley Park, it became such a necessity in Fish statistics that the theoretical unit was the main building block of the section. The word simply means ten times the log of the odds, but its application to the calculation of the probability of two or more independent events substitues the process of addtition instead of the normal multiplication and therefire becomes a handy unit for speedy

statistics

statistics.

Then too the theory of bulge algebra should be mentioned to future mathematicians if they read the archive. It is a modern algebraic definition of the finite field of the Baudot code as applied to the Fish machine and took over a year to develop. It finally gave proof why so many of the motor runs for M3 had never given successful results despite the fact that calculations were thought to be correct.

IV. HUT THREE

Nothing in signal intelligence quite corresponds to the layman's vision of cloak-and-dagger skulduggery or brain-cudgelling lucubrations over coffee and aspirin, but perhaps the nearest approach was Hut Three into which poured the output of Hut Six, Block F and Sixta. Here a collection of people, viewing the war always from the enemy standpoint, read all the available German wireless correspondence and from it extracted that information calculated to be useful for allied purposes in planning and prosecuting the war.

Task of Hut Three. Upon receipt of decryptographed messages from Hut Six and Block F the task of Hut Three consisted of sorting traffic into various catagories of urgency to ensure that messages were processed with requisite speed; emendation of cipher or code text to yield comprehensible German text; translation of text into English; in collaboration with specialist consultants, making the necessary interpolation and annotations; preparations by military, naval or air advisers of signals to commands in the field and/or to the ministry concerned containing the intelligence derived from the processed decode. Less urgent signals did not receive this treatment but were passed to commands or ministries by pouch after publication.

Throughout the war the Hut maintained the fiction that the information forwarded to commands or ministries was derived from a "source" other than signal intelligence. "Coimmunications" (never "messages" or "signals") were "found or seen by source". W/T evidence was never presented as such

as such but converted into an opinion held by "source". Thus such and such a document was believed by source to have originated with Army Group G and so forth. At times the maintenance of this allegory seemed infantile, but it served the purpose nevertheless of preventing any save a very few from knowing that the signal intelligence was the basis of a large body of intelligence. Doubtless some shrewd recipients speculated on the omniscience of source and probably concluded that he had some connexion with codes and ciphers but speculation could go no further. It was a simple and effective device for avoiding security breaks of the type recently noted in the press.

There were of course officials who were in on the secret. The Prime Minister knew the origin of the teleprints presented to him daily and he was an avid reader and critic of B.P.'s output. The literary style of Hut Three was never exempt from Mr Churchill's objections which he was not hesitant in expressing. The transmission of information to Washington was accomplished as an additional task by the American air and military advisers.

Hut Three Personnel. The task of Hut Three neccessitated the employment of large numbers of administrative personnel but the operational personnel consisted of watchkeepers, specialist consultants and military, naval or air advisers.

Watchkeepers. In addition to the main watch which handled traffic of high priority, there were backroom watches which concerened themselves with specialist keys or traffic of lesser urgency (albeit of high importance) coming to them after sorting in the main watch. Most of the American party were members of the main watch. The senior member of the watch, designated the Number 1, had the responsibility of passing on the accuracy and correctness of all translations. All incoming traffic was sorted into catagories of urgency either by Number 1 himself or by his deputy, designated the Number 2. After sorting had been carried out, urgent traffic was dealt with by associate watch keepers of whom there were from three to five on each watch. Less urgent traffic was passed to backroom or specialist watches. The main watch was on duty twenty-four hours a day, each separate watch working a shift of eight hours. A programme of rotation was set up so that each watch did its share of day, afternoon or midnight duty.

It would

It would be difficult to state precisely the requirements demanded of a watchkeeper. It goes without saying that he had to be thoroughly familiar with the German and English labgiages, but apart from that he was required to be something of a Jack-of-all-trades--to have a recognition knowledge of variagated subject-matters although obviously he could be master of none. He had, for example, to be able to identify a communication as pertaining to army, air force or navy so that proper interpretation could be made; to realise that an apparent jumble of letters and figures was a perfectly good supply return or report of airfield serviceability and so forth and so on. Fortunately he was not left to struggle alone.

Specialis consultants. In order to make the neccessary interpretation, interpolation or annotation the watchkeeper referred his questions to specialis consultants who were experts in a multitude of departments, illustrated below:

Traffic analysis through which traffic could often be identified by call sign or wireless evidence. (The American representative in this field was 1/Lt Alfred P. Fehl.)

Language specialists who not only consulted personally with watchkeepers on translation difficulties but compiled copiuos technical vocabulary indexes;

Interpretation of proformas and periodic returns;

Interpreation of covernames and camouflage numbers;

Interpretation of railway consignment numbers and field post numbers. (The American representative in this field was Captain Edward J. Vogel.)

Interpretation of radar and rocket messages;

Problems relative to the Waffen SS;

Messages dealing with propoganda and morale in the German Armed Forces;

Interpretation of German grid references.

The filing

The filing of all information derived from Enigma and Fish sources for future reference was carried out by the military, air, naval and flak ?? indexes. The various indexes contained a wealth of information built up over a period of years, forming the veritable foundation of the intelligence-exploiting branch.

Advisers. The advisers, --military, naval and air-- through their study of order of battle and other specialised training, were in the position to inform watchkeepers regarding the urgency of messages and to assist in the interpretation of ambiguous or recondite references. Upon receipt of a complete translation, the pertinent adviser drafted the necessary signal to the command or ministry concerned.

Americans in Hut Three. The first American Signal Corps personnel to assume duties in Hut Three were 1/Lt (then 2/Lt Paul W. Whitaker and 1/Lt (then 2/Lt) selmar S. Norland who arrived in late August 1943. After a short period of apprenticeship they were assigned to the main watch where Dr Whitaker distinguished himself for thorough-going knowledge of the German language and Lt Norland not only for his command of military order of battle but for his sorting ability. In January 1944 they were joined by Major (then Capt) Charles J. Donahue, Capt (then 1/Lt) James K. Lively and 1/Lt (then 2/Lt) Louis Laptook. Major Donahue, being a philalogist in real life, readily converted his talent to Hut Three use. Lt Laptook, at first associate watchkeeper in the main watch, later withdrew from the operational watch and made a name for himself in a specialist watch (Luftgau XI - the "Daffodil" watch). At about the same time Capt (then 1/Lt) Alex T. Prengel transferred from Sixta to Hut Three where he was able to make more intensive use of his fluent native German. In May 1944 1/Lt (then 2/Lt) Alfred P. Fehl entered upon duties in the Hut as traffic analyst adviser. He was the only American to serve in this caoacity and ably maintained the high standards of Sixta. In August 1944 the American party was reinforced by Major William F. Edgerton (for a long time watchkeeper, subsequently a specialist consultant on airfield covernumbers with Mr Lucas), 1/Lt Sidney Jaffe

(operational

(operational watchkeeper) and Capt Barnard J. Vogel (specialist consultant on railway consignment numbers and field post numbers).

There were never more than ten Americans from 6813th Signal Security Detachment in Hut Three. All were officers since it was the policy of the Hut not to employ enlisted men. All except Major Edgerton, Capt Vogel and Lt served throughout as watchkeepers. Although there were American military and air advisers, these were not Signal Corps personnel but were members of Special Branch M. I. S. and came under the Embassy at London. They were commanded by Col Telford Taylor.

Critique. It should be remarked that close and cordial relations, both official and personal, obtained at all times between the British and American personnel in Hut Three. Differences in vocabulary and literary style between the American languages hampered the neophyte watch-keeper but in due course the transatlantic translator was able to produce copy intelligible not only to his compatriots but to his British cousins.

It was at one time contemplated to set up an American organisation duplicating Hut Three. It must be considered fortunate that this project was eventually dropped and a programme of cooperation maintained. At no time did the American party represent more than a tiny fraction of the British personnel working in Hut Three. The long period required to train watchkeepers, consultants or advisers would have rendered it exceedingly difficult if not impossible to increase the number of Americans within the periof when they would have been useful. Further, B. P. had since 1939 accumulated vast resources by way of indexes and documents without which emendation, translation and interpretation could not have been carried out. Finally, the atmosphere of close cooperation between Britons and Americans might have given way to unpleasant competition and resultant diminution in the output of intelligence, had separate organisations been established.

The newcomer to B. P. was always struck by the efficiency with which messages were treated throughout the Hut. In view of the tactical character of the traffic no time could be lost in locating the communications of urgency and exploiting the intelligence contained in them. All

the services

The services--Navy, Army and Royal Air Force--were represented in the Hut in order to facilitate exploitation. Further, all collateral intelligence which might be of aid to operational personnel--PW interogations, daily and weekly intelligence reports, situation reports from commands in the field etc.-- were made freely available. To the aluminus of Arlington Hall, accustomed to the slower procedure which traffic of mainly strategic or diplomatic character permits and used to the organisation which seperated the cryptanalytic agency from the intelligence-exploiting agency, this naked view of signal intelligence was exhilarating.

G. C. and C. S. had the highest priority in the recruitment of personnel, not only for Hut Three but for the other departments as well. B. P. was thus able to draw upon universities in the Unite King-dom and upon all the services for the best-qualified people. The American party considered themselves fortunate to be associated with colleagues of unvarying high calibre. The high standard of qualification was maintained not only for operational but also administrative personnel.

In view of the exacting nature of the work, B. P. considered it necessary that members of Hut Three take a week's leave every three months in order to retain their efficiency. The American party were not always able to take advantage of this rest period since American policy of leaves and furloughs did not coincide with the British.

In the watches all British personnel were as a matter of policy captains except the senior member (Number 1) who was a major. The majority of the American party were of lesser rank than their British colleagues fulfilling the same duties and their American colleagues from the Embassy serving as military or air advisers. This state of affairs was never quite comprehensible to the British, but it is believed that the morale of the American party did not suffer materially despite the slowness or lack of promotion since the importance of the task being performed was apparent ans afforded compensation in itself.