"... Our Navy was being defeated in the battle of radio waves. Our cards were bad, and the enemy could read our hand. No wonder we could not win in this poker game."

YOKOI, Toshiyuki - The Story of the Japanese Naval Black Chamber

EXTRACT FROM: LECTURE ON COMMUNICATION INTELLIGENCE - Given at Naval War College, 20 August 1948, New Port, Rhode Island by Captain J. N. Wenger, USN, Deputy Chief of Naval Communications for Supplementary Activities.

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EXPLOITATION

As prospective operating commanders your primary concern with communication intelligence is naturally its exploitation. A troublesome problem arose in this connection during the War. It is worth mentioning here because you may be confronted with this problem at some later date.

All knowledge and experience of war point to the necessity of exploiting every possible advantage. The temptation was, therefore, naturally very great in the heat of battle to use communication intelligence whenever it was available. This led to carelessness which quickly threatened to jeopardize the source.

In time of war the full value of communication intelligence cannot be realized unless operational use is made of it. However, when action is contemplated, as a result of this intelligence, the possibility of compromising the source must always be forne in mind and this danger weighed against the military advantage to be gained. A minor advantage is never alone sufficient ground for risking the loss of a communication intelligence source.

The point of this principle is that most codes and ciphers are necessarily used over wide areas. A change by the enemy as a result of suspected compromise may therefore have far reaching consequences. A commander in seeking a minor advantage in one locality may deprive another commander elsewhere of a much greater advantage or deny the use of

communication intelligence in a subsequent major operation.

This indicates, of course, the great importance of coordinating operations, where practicable, with the intelligence situation. An example, with an odd twist, of the consequences of one actual failure to do this will illustrate this point. Plans were made, coordinated, and approved for a certain campaign in the southwest pacific. Subsequently the Air Force commander decided that use of a certain additional airfield would be helpful, and accordingly an attack was made on it by ground forces. Unfortunately the objective was overrun and an important Naval command ashore in the area was closely approached. Twelve hours later our forces realized the mistake and withdrew, leaving the headquarters intact, but meanwhile, the Japanese in the excitement of the moment had erroneously reported all their codes and ciphers compromised. Swift and sweeping changes were made by the Japanese. As a result, one of the most important operations of the Central Pacific, scheduled to commence three weeks later, had to proceed without benefit of the unusually complete intelligence which had been available just prior to this incident.

As a corollary to this basic principle of exploitation, cover measures should always be taken in the use of communication intelligence. When the decision is made to take action based on it, studied effort must be made to ensure that such action cannot be attributed to communication intelligence alone. When possible, such action must always be preceded by suitable reconnaissance or deceptive measures.

BRIEFING

Special care must also be used in briefing aviators or other personnel engaged in missions or duties which might readily subject them to capture

by the enemy. Extreme pressure can be brought to bear upon such personnel if they fall into enemy hands, and it is both dangerous and unfair to burden them with secrets which they do not absolutely require.

Perhaps one actual incident will show the hazards involved. Communication intelligence was supplied to a task force commander, indicating the prospective movement of a certain Japanese force. The actual name of this force was included. Unfortunately, this latter information was passed on to pilots who were sent out on searches for this force. Some of these pilots fell into enemy hands, and, under severe pressure, revealed the details of their briefing. The Japanese were certain that the special name for their force could only have been obtained from their communications so they took evasive measures and thus denied us the advantage that we had held.

In this case, it was desirable that the task force commander have all available information regarding the expected enemy force, but his more careful briefing of subordinates might have resulted in a far better conclusion to this episode. The essential needs of the pilots could have been adequately met by ordering them to search a specified area, with at most a general indication of the objective.

A little ingenuity in handling such problems will go far toward saving the goose that lays the golden egg. Whenever it becomes essential for operational reasons to divulge an item of communication intelligence under circumstances involving any extra jeopardy to the source, the information must be so disguised that it cannot be traced to the communication intelligence source alone.

COORDINATION WITH OPERATIONS

There is another aspect of coordination between fleet operations and communication intelligence activities which should be mentioned here. For most effective results the communication intelligence effort must be carefully oriented to give optimum coverage of operations in progress. A vast volume of communications has to be scanned each day. In order to give precedence to the material of current importance, it is essential that those controlling the production of intelligence are constantly and fully informed of the current situation. Moreover, this knowledge is essential to the proper interpretation of certain intercepted material. For example, when a sudden rise in enemy traffic is noted, it may be a reaction to some strike by our own forces or it may be the prelude to a strike by the enemy. Knowledge of our own movements permits correct interpretation accordingly.

At the beginning of the war, our communication intelligence centers had great difficulty in obtaining information concerning operations of our own forces. Operating commanders naturally had the same concern about disclosing their secret plans as we had about our secret plans as we had about our secret successes. Some of their reluctance also arose from a misunderstanding of our problems.

One actual example will illustrate the point. During the Guadalcanal campaign, Japanese observers were reporting, in a tactical code, movements of our ships in and out of local harbors. In solving the code, it was readily determined that certain code groups represented ships of certain types, but we were not sure which types they were. If we could only know the actual movements of our forces, this question could be quickly settled. When, however, a request was made for the information, it was denied on the grounds that it might influence our guessing. We received the informa-

tion only after pointing out that positive identification of these code groups for ship types, in these relatively unimportant messages about our own movements, would enable us to be certain about them in far more important messages about enemy forces which might be intercepted later.

INTEGRATION OF COMBAT AND INTELLIGENCE OPERATIONS.

A curious situation arose during the war which pointed to the necessity for close integration of combat and intelligence operations. As we captured enemy-held positions and sank enemy ships, the number of communicating stations decreased correspondingly. Since our ability to obtain communication intelligence was directly dependent upon the volume of enemy transmissions that could be intercepted, we were confronted with the paradox of having our intelligence efforts threatened with defeat by our own combat successes.

In the face of this difficulty, the aviators began to develop a great enthusiasm for knocking out radio stations, thereby aggravating the situation. We were quick, therefore, in our appeals to restrain them and fortunately succeeded in having their attention directed to other targets before too much damage was done.

Normally the disruption of enemy land-line and cable facilities is much more effective than the destruction of radio stations. The former will have three beneficial effects. First, more enemy traffic will be driven to the air where it can be intercepted; second, this traffic will then have to be encoded thus creating additional difficulties; and, third, the additional load on the radio channels will probably tax their capacity, thereby seriously delaying, if not actually preventing, the delivery of many messages.

In connection with the integration of combat and intelligence operations, it is especially important that intelligence officers understand the place of collateral information and captured documents in the production of communication intelligence. As in many other enterprises the more one puts in, the more one takes out. Much of the output, especially in the early stages of solution of cryptographic systems, is fragmentary. It is frequently possible to fill in the gaps with collateral information, i.e. information from other sources, and thereby expedite solution. A great deal of the work, particularly in the field of traffic analysis, is pure deduction. Information from other sources is of tremendous help in arriving at correct interpretations. In many respects, traffic analysis is like dead reckoning in navigation. The errors are cumulative. If, from time to time, we are able to obtain a fix of reliable information from some other source, be it a prisoner of war, a captured document, or a reconnaissance photograph, we may be contradiction or confirmation check our course and proceed accordingly.

CONCLUSION

In the discussion which we have just had, I have tried to remove from communication intelligence the aura of mystery and romance which popular writers are in the habit of attaching to this subject. My aim has been to present it to you as serious problem. It is such a complex and comprehensive one that, in the time allotted, I could give you only a glimpse of the over-all picture. But, I trust that you have seen how radio is truly a two-edged sword. Without it, command cannot function, but its improper use may bring disaster, as it did to our enemies, or at least prevent the achievement of surprise, as it sometimes did for us. As

someone aptly said, "If you use radio at sea you are very likely to attract a lot of undesirable company". Perhaps this knowledge may be helpful to you at some later date.

Above all, I hope you have gained some appreciation of the importance of communication intelligence to the future defense of our nation. With the advent of long range air fleets and guided missiles which can strike overwhelmingly and without warning, it has become obvious that peacetime intelligence is no longer merely a strategic protection, but a tactical one as well in the most literal sense. The devastation of the first atomic bomb crystallized this thought as nothing else could have done. It is now apparent, with a special clarity and urgency, that completely effective intelligence is imperative for the safety of our country, and effective intelligence, if the example of World War II can be accepted as a criterion, means in a large measure communication intelligence.

If our Nation is to be protected in the future, anticipation of attack alone is not enough, because attack may be too overwhelming to combat. In these times of total war, every field of national enterprise must be scrutinized for the slightest signs that may warn of hostilities. Troubles must be detected before they can gain the momentum that leads to war. This is the mission of intelligence, and especially of communication intelligence.

Intelligence is our real first line of defense. The smaller our military establishment, the greater must be our intelligence safeguards.

We are not alone in appreciating the future significance of communication intelligence. Other nations are taking increased measures for security and, in consequence, our difficulties promise to increase tremendously. In closing,

may I, therefore, emphasize again the importance of avoiding unnecessary discussion of what has been revealed to you today. The Navy Department has refused to confirm or deny any press disclosures, and it is most advisable that this policy be supported by all who know the truth.

May I thank you for your very kind attention.

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"YAMAMOTO

My next slide (4) illustrates the part played by communication intelligence in one of the most dramatic episodes of the war - the ambush of Admiral Yamamoto. The details of this event have been widely publicized, but a few notes on the intelligence aspects of it may be of interest. The essential facts are shown on this slide.

A chronology of events associated with this affair follows. All times are minus 9.

APRIL 14, 1943

1. At 1ØØ8, the Pearl Harbor C. I. Unit sent out a despatch to CINCPAC, COMSOPAC, and COM7THFLT containing a fragmentary translation of a Japanese message, dated 1755/I 13 April 1943, from CINC SOUTHEASTERN AREA FLEET to several addressees, including COMDR. BALLALE GARRISON:

> On 18 April CINC COMBINED FLEET will _____
> as follows: Ballale Island _____ _____ _____ _____ _____.
> Comment by FRUPAC: This is probably a schedule of inspection by CINC COMBINED FLEET. The message lacks additives, but work will be continued on it.

APRIL 15, 1943

2. At 15Ø41Ø/1 and 15Ø657/1, the Pearl Harbor and Washington C.I. Units sent out more complete translations of the same message. These are summarized on the slide.

At 1149/I, CINCPAC notified task force commanders in the Pacific: At 1ØØØ (Ø8ØØ/I) on 18 April, YAMAMOTO himself, via bomber escorted by six fighters, will arrive from RABAUL in the BALLALE-SHORTLAND AREA. He will leave KAHILI at 16ØØ the same day to return to RABAUL. All dates and times are "L". In case of bad weather, the trip will be postponed until 19 April.

At 1543/1, FRUMEL disseminated the translation of another Japanese message, dated 1221/1 April 14, from RABAUL BASE FORCE to an unidentified addressee, wherein reference was made to "the special visit of YAMAMOTO", and "in view of the situation regarding air attacks on the post", certain precautionary arrangements were requested, including the moving of the "post" to a new location.

APRIL 18, 1943

At Ø5Ø5 and Ø535/1 April 18th, a Jap plane was noted by FRUPAC originating encoded weather reports. FRUPAC commented (in his 181926Z (19Ø426/1)) that this was an "unusual time for Nip plane weather mission".

At almost exactly the predicted time, the enemy planes were sighted approaching BALLALE, and at 1129/1, a paraphrased message of COMAIRSOLS reported as follows:

"Major J. William Mitchel, USAFF, led P-38's into KAHILI AREA. Two bombers, escorted by six zero's flying in close formation, were shot down about Ø73Ø/1. One other bomber shot down was believed to be on test flight."

MAY 21, 1943

At 15ØØ/1 May 21st, the Japanese Navy Department originated an ALNAV, in plain text, reading in part as follows:

"The Commander-in-Chief of the COMBINED FLEET, ADMIRAL ISOROKU YAMAMOTO, died an heroic death in April of this year in air combat with the enemy while directing operations from a forward position."

I might say in comment that this is an excellent example of highly effective teamwork between the Army and Navy in the war. In this case, the Navy obtained the intelligence and set the trap; the Army sprang it.

TRAFFIC ANALYSIS

My final example in the Pacific War illustrates the value of traffic analysis. This slide (5) contains headings of a series of messages actually transmitted by the Japanese and received by us. By means of these headings, and without knowledge of the contents of the texts, we were able to determine very accurately the movements of two major units of the Japanese Navy, at a time when the information was not obtainable otherwise.

All call signs in the headings are in their enciphered form and the identification of each, as obtained by reduction of the cipher, is shown immediately above it.

On 21 April 1944 a Naval dispatch was intercepted from KURE radio station. This is represented on the slide as heading "A".

COLL CALL KURE RADIO
SO RU RI DE YASIKO ITO191 TIKA W81

SAEKI AIR STA SUB CHASER 55 SAEKI DEF FOR COMMINDIV 3
TI MA MI 6 TOHISU NIHOKO

COMMINDIV 54 BB YAMATO CA MAYA//
NISUE TUHO NURU2 KU I 9//

GRAND SURESCO IMP HQ NAV SEC BUNGO CHAN DEF KURE DEF COMDR
KO NI 5 KA TI 2 I SU O HA KA NI 1

211410 (TEXT)

From the association of the addresses it appears that this is a dispatch from the commander of the KURE DEFENSE FORCES notifying the defenses and patrols of KURE HARBOR and BUNGO CHANNEL that friendly ships are to pass through the defense area. The question as to which ships they are is answered by the inclusion of the call signs for the battleship YAMATO and the heavy cruiser MAYA. That the ships were leaving port rather than entering is determined by two circumstances. First, previous information had definitely placed both ships at KURE, and, second, the dispatch was transmitted on the KURE local circuit. Previous experience indicated that this dispatch would have been delivered via the TOKYO high frequency broadcast if these ships had been approaching KURE.

Accordingly, it was reported to the commander-in-chief that the battleship YAMATO and the heavy cruiser MAYA were about to sortie through the BUNGO channel. No prediction as to destination was then possible.

On 22 April 1944, another dispatch pertaining to these ships was intercepted from KURE radio stations. This is heading "B" on the slide. As the call signs for mobile units were changed daily you will note that they differ from those appearing in heading "A".

(See YAMATO and MAYA)

COLL CALL KURE RADIO ITO 411 - ONA W78
SO RU RI DE YA SI KO

MANILA TPN DEPT BB YAMATO CA MAYA

TI // NI RU NA TUHO MU KI 3 YO RE 1 //

CINC 3RD SO EX FLT KURE TPN DEPT
RE MU 8 HA KI TI WA BT

221644 (TEXT)

This is a dispatch from the KURE transportation office to the corresponding office in MANILA and evidently concerns a shipment from KURE to MANILA which is apparently on board the two ships. But now we have information as to their destination. There is additional evidence that they have left KURE (delivery to the two being accomplished by KURE radio) but are still in the immediate vicinity of KURE because the delivery was by a frequency used for local communications.

Accordingly it was reported to the commander-in-chief that the YAMATO and MAYA which had left KURE on the day before were headed toward MANILA.

23 April another dispatch was intercepted, this time from TAKAO (on FORMOSA) radio station. This is shown on the slide as heading "C".

BB YAMATO TAKAO RADIO
RU KU NA DE TA HI O - RO NA W58

	SINGAPORE			DD	DD
	TPN DEP		YAMATO	YUKIKAZE	SHIMAKAZE
TI //	NO A 1	TUHO	KI A 4	HE TA 6	0 0 2

CINC 1ST	CINC	CINC	KURE
MOBILE FLEET	2ND FLEET	3RD FLEET	TPN
// RO O 1	SU NA 4	SE MA 2 HA	KI TI WA

231423 (TEXT)

This second dispatch from the KURE transportation department now indicates that at least part of the shipment on board the YAMATO is destined for SINGAPORE; hence the YAMATO is only stopping at MANILA but till continue on to SINGAPORE. Also the direct delivery by TAKAO radio indicates that the ship has now arrived in the FORMOSA area. As the ship departed on the 21st, this was a logical conclusion. We also pick up the fact that she is being escorted by at least two destroyers (YUKIKAZE and SHIMAKAZE). Other dispatches from the KURE transportation department

carried similar headings which confirmed the facts drawn from this area.

Incidentally, it is worth noting that this movement was probably conducted in great secrecy by the Operational Commander Afloat only to have it given away completely by a shore administrative office.

Time does not permit us to pursue this analysis, but the ships movements were predicted and followed to MANILA and SINGAPORE in this manner. The strategic situation was such that immediate advantage could not be taken of it but at least the whereabouts of two important enemy units was accurately known, as was later fully confirmed.

THE ATLANTIC WAR

We shall now turn to the Atlantic. There our problem was of a different nature. We had to rely upon means other than cryptanalysis to determine the location and movement of enemy forces. Radar and sonar had demonstrated tremendous potentialities as aids in the U-boat hunt, but these aids had to be brought within their effective range before they could be useful. It was here that communication intelligence supplied the necessary link.

By means of direction finders the problem of search was vastly simplified, and aircraft and surface vessels were enabled to confine their operations to profitable areas. Conversely it was possible to divert the convoys from those areas where the probability of attack was high. Success against the German submarines was thus in the end primarily the result of the highly efficient coordination of communication intelligence, radar, sonar, aircraft and surface escorts. From the time this coordination became effective, the enemy's submarine losses began to mount sharply and our losses in the Atlantic showed a marked and steady decline.

In order for direction finder bearings to be useful they had to be collected at operational centers in Washington, London, and Ottawa in a matter of minutes. This required the establishment of a flash communication system covering the entire Atlantic area, by means of which controlling stations covering the radio spectrum could alert the D/F stations to the desired transmission. The submarines were alive to the effectiveness of our direction finders and resorted to all sorts of measures to defeat them, including extremely short transmissions which had to be identified and intercepted in a matter of seconds. Despite these difficulties, it was possible in the latter months of the war to obtain and plot bearings from practically all of the stations in the Atlantic within a matter of 15 or 20 minutes. About the middle of the war shipboard direction finders had become sufficiently workable to permit their use by forces afloat. These shipboard equipments were then coordinated with the shore direction finder system and the general effectiveness of the network was somewhat improved.

The next three slides (6), (7) and (8) are actual examples of three daily situation plots forty-eight hours apart. The black dots represent direction finder fixes on U-boat radio transmissions. As you can see, the dots show clearly the active submarine operating areas. These situation plots are of particular interest because they show the developments of two wolf-pack attacks. These are clearly indicated by the concentrations of dots in the latter two plots.

D/F PROBLEMS

As important as the direction finder proved to be, its practical application presented a number of formidable technical problems. Fixing a position was more an art than a science. The vagaries of wave propaga-

tion and the presence of instrumental and personal errors made it impossible to rely on merely a few bearings. For example, here is an actual and typical plot of bearings in the Atlantic (9). Note the area covered by the intersections as compared to nearby land masses, such as Cuba.

To overcome such difficulties, a very large and extensive direction finder net was established. At its peak the Atlantic net contained 51 stations, of which 17 were American, 23 British, and 11 Canadian. My next slide (10) shows their locations.

Special systems of evaluating the bearings from these stations were evolved so that the results could be brought within practical limits.