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Speakers: Prescott H. CURRIER, Captain, USN (Ret.)
John H. TILTMAN, Brigadier (Ret.)

Location: National Security Agency (NSA), Fort Meade, Maryland

Topic: Presentation Given to Members of the Cryptanalysis Field

Moderator: Vera R. FILBY

Introduction: John W. MARLOW

Filby: As of last spring, when we had a few lectures, we were very fortunate to have Brigadier Tiltman talk to us about the TUNNY machine and a problem he had solved earlier in his career. And as a result of this, I had many requests from interns and others who heard it, "Let's have...Let's have a conversation. Let us talk to him. Let us get together and just have a question and answer period." So since this was intern inspired, and I thought maybe it would be a good idea to turn it over to the interns. So we've have an intern committee—John Marlow's honcho'ed this for you. And we were very, very fortunate last week in learning that Captain Currier, U.S. Navy retired, who has been a member of the cryptologic community—he'll tell you how long—was going to be here from his retire home in Maine. And it would be a marvelous opportunity to hear *two* of our most learned people at the same time. I will let John tell you more about them. But I want to introduce to you now one of your own: John Marlow.

Marlow: Little did I know that I'd get into this. ((Chuckling heard.)) Captain Currier has been retired from NSA for several years now—two or three. That's about as accurate as we're going to be through the whole thing. And I can give you a very brief sketch of his background, and it's going to be somewhat incomplete due to the number of things that he's done. It's...It would...Well, we'd spend the whole time just talking about his background if we did list everything. And so, my apologies to him. But he was commissioned in the Naval Reserve in 1935, and worked as a cryptanalyst with OP-20-G which was the forerunner of the Naval Security Group. He worked on primarily Japanese systems at that time. In December of '40, he went on active duty and was an able member of the 1st Liaison Group to the United Kingdom for cryptologic undertakings. From '41 through '45, he was responsible for all outgoing COMINT and work on major Japanese naval systems, which must have been a heck of a job. In the post war period, he worked on both the Russian and then the Korean problem; and served in a liaison capacity with the British again on two occasions. He was, I believe, senior liaison officer to the United Kingdom for a period of years, and he held several...or numerous, actually, high echelon positions in both the Naval Security Group and

NSA. And in 1965, he joined P1 and became a [sic] Agency-wide cryptologic consultant until his retirement a few years ago. And he's very graciously consented to come before us today and talk about anything that's on your mind. And I believe he's going to start off with a short summary of some of the things he's done. Captain Currier?

Currier: Thank you, John. I'm going to remain seated if it doesn't bother the people in the back row. If it does, I'll get up. The...What I thought I might do originally was to talk about World War II and the Japanese problem in the Pacific without going into any great technical detail on individual systems. It might give you an insight as to how a cryptologic war is fought. That was probably the last one that was completely this. But it occurred to me that it might be of some use if I went back before World War II and told you a little bit about what went on in OP-20-G in the period 1935 to 1940-41 principally because there were several things that happened during that period that I think are very interesting. And while I cannot remember all the details, I think I can remember enough to let you know pretty much what sort of things went on and what we did with what we got, and how important it was. As I say, this will not be a formal lecture. I haven't prepared anything. I don't have any notes, and I don't have anything that I'm going to write on the blackboard—which I usually do. But I thought possibly that if you'd like to enter into this, and want to ask questions as I proceed, I'll sort of slow down every five or ten minutes. And if anyone has a question about something that...If...By the way, if there's a question that particularly bothers you and you don't...you want to ask it, and you can't...don't think you can remember it, just raise your hand and I'll stop and I'll try to answer the question. You can ask...As far as I'm concerned, you can ask anything you want to. If I can answer it, I will; and if I can only half answer it, I'll say so. But you may get a little bit more out of me that way, and you may find some things that you'd like to know that I...that I skip over because I either have forgotten or I don't think it would be of any great interest to you. So that...As far as the format's concerned, that's, I think, roughly the way we should do it. So, ah, the period...The five-year period before the war in OP-20-G was entirely a one-target period. As a matter of fact, the U.S. Navy had only had one intelligence target from 1921 on, when they were first formed. That was Japan. Now war plans were written to cover other nations, but the intelligence collection effort and all of the communication intelligence collection effort was single target—just Japan and nothing else. It was just as well because we only had three and a half cryptanalysts for most of that period ((laughter heard)), so that it was a bit of a problem to have done much of anything else. I don't remember the...exactly the number of people that were in OP-20-G then, but the entire space occupied by the analytic groups was probably as big as this room. It may have been half, again, as large. The machine room was about the size of this stage, and it was in charge of one chief. And I think he had someone who could type, but I'm not sure. ((More laughter heard.)) The sys...The bulk of the

systems were divided into two groups: one was the pure naval and the other was the naval attaché. The naval attaché traffic was that which I was primarily responsible, and which contained most of the really very interesting information. As far as types of systems are concerned, the Japanese navy used codebooks of one sort or another—some really quite large. Two or three element codes were the...in most cases, with a transposition overlay—a transposition encipherment. Um, not all that difficult. We were able to do most of it. I won't go...As I say, I will not go into any details on things like this unless you ask me a question about it. And I'm going to just skip over most of the tedious cryptanalytic details, in any event, because I don't think they have a place in a lecture of this sort. The naval attaché systems, on the other hand, were quite different. The Japanese did have a machine. You...Most of you who've read cryptologic history probably remember the name Red machine. If you don't remember Red, you remember Purple. All machines were colored in those days. And the Red machine was a title, I believe, that the Army gave them. I'm not absolutely certain. We didn't call it that, but eventually we did when we...whenever we spoke to the Army—which was about twice a year reluctantly. ((Audience laughs.)) Um, the machine itself—in case you're interested and any of you who've done any work on any machines at all—was extremely simple. Um, (B% a) (1-2G), if you know it. A s...Really, two wheels run in tandem with a key which steps once, twice or three times. And that's all there was to it really. But the kind of information involved in that was of great interest, and I thought I might just tell you just a little bit about that and a few of the other things that we did to make life interesting in those days. The information that the naval attaché had about some of our people, that he was...that they were using as agents was probably one of the prime targets for the period '36 and '37. None of you, I'm sure, remember the trial that was held in 1938—some of your fathers maybe, but I doubt if any of you remember—concerning a naval lieutenant commander who commanded a destroyer, and who for something on the order of 18 months to two years had been delivering material, mostly classified—some of no great interest, but mostly classified—to the Japanese naval attaché for onward forwarding to Tokyo. We first ran across it in the Spring, I believe, of 1937 when in the course of reading some of the Red machine traffic, we ran across the first message which started out "Report on Agent K." Well, we didn't know who Agent K was, but as time went on, we gradually gathered together a series of possibly a dozen messages dealing with the type of material that the Japanese naval attaché was buying from Agent K, how much he paid for it, and what the retainer fee to Agent K was, and then on one occasion—and I've forgotten precisely when—a drop point and a rendezvous. Well, to make the story rather shorter than it actually is, this information was turned over to the FBI. They set up a...whatever they set up, and eventually caught the man and brought him to trial. But the problem was this: that all of the information that we got was so sensitive that the Navy

didn't believe that it was worth divulging the source in order to convict the criminal—which sometimes happens nowadays, as you probably well know. So we had to work out some sort of a dodge that the judge would buy and the FBI could do. So we let the man go for about six weeks, as I recall, in order that he be caught red-handed as it were. And eventually, a case was made and the man did...I've forgotten. He went to jail or something or other. But in the course of it, there was another man that kept cropping up in the traffic whom the Japanese called Tomimura—which is a perfectly good Japanese name by the way—until it turned out that this Tomimura had access to certain U.S. communication documents—signal books and that sort of thing; odds and ends; nothing of any great value. But he was obviously not Japanese and, too, he was obviously on a U.S. destroyer because several of the publications that were mentioned that the naval attaché bought from him could only have been obtained on a destroyer. So eventually, this turned out to be a radioman named Thompson, by the way. And the Japanese apparently chose the name “Tomimura” because if any of you know Japanese, the character “mura”, which means “village”, is also (B% “retson”). So (B% Tomison) is as close to “Thompson” as you can get, I guess. In any event, this was the same sort of thing. And this was the kind of thing that cropped up in the naval attaché traffic quite regularly—all through that period—so that it made it really very interesting. And it was worth coming in, in the morning and getting the day's traffic and laying out a cross-section sheet and seeing what was in the...There was one goodie at least every day or two ((audience chuckles)), so that it made it very interesting—which is something which perhaps some of you have not yet experienced. I hope you do at some point because it makes life worthwhile. The...There were several other attaché systems, by the way. And we...Oh, when I say “we”, I mean ONI mostly. OP-20-G was an adjunct to ONI at the time. And all of the language officers, and the interpreters, and the conveyors of information up the line were ONI people sitting with us. So we were sort of all together. But periodically, we used to...Oh, and I think we paid the trash man in New York to deliver to us all the contents of all the wastebaskets in the Naval Inspector's Office, and three or four other places. And every now and then, we'd find something in the wastebasket that was of interest. And we did, in fact, find something at one point which made it necessary that someone with a little expertise should pay a visit on the Naval Inspector in New York. So I don't know whether any of you...I'm sure you don't know Admiral Mason, Rosie Mason. He was a young, eager naval officer at the time. So he said he'd go. They got a couple of...an ex-locksmith, I think, and also an ex-convict and a couple of retired FBI agents—I've forgotten precisely. ((Chuckling heard.)) But they made up quite a crew, and they went up and visited the Naval Inspector. And not only did they get everything in his wastebasket, but they got everything in his safe. ((Audience laughs.)) And this was a help also. But this is the sort of thing, you see, that sort of

spices things up a bit. It does happen nowadays, but you don't hear very much about it. But when there were only four or five of us working, why ah, it happened not only to us, but sometimes by us, so that it made for a change. The other material...The regular naval material was also of great interest to the Navy really. The...All during the '20s and into the '30s and by the time I got into it, there was no doubt in anyone's mind that 1), there would eventually be an "orange" war—a war against Japan. The only target that the U.S. Navy was interested in, in the slightest, was the Japanese navy in the Pacific. And we concentrated entirely on it. And I can't, for the life of me, see why anyone was surprised at Pearl Harbor because everybody—literally everybody—had been planning for it for a very long time. They simply didn't know when it was going to happen, but they knew it was going to happen because the U.S. and Japan were on a collision course politically, diplomatically and militarily in the Pacific. And it just couldn't have happened any other way. It was ordained well in advance, so that our task was cut out for us and we knew precisely what we were doing, why we were doing it. We didn't know how long we were going to do it before we had to make the change into a wartime basis, but there it was—a little...perhaps a bit more clean cut than things are now. Now, I can't speak for the Army, but they had pretty much the same sort of thing. They...The target, as far as they were concerned, was, in fact, the Japanese in the Pacific also. There were a few other things that interested them. Of course, our intelligence collection effort—the attaché business and various others 'round about the world—was very meager, and we didn't really care much about what was going on in France or Germany—or the Soviet Union, as far as that's concerned. It wasn't until...Actually, it wasn't until after World War II when the Soviet Union became a COMINT target. Sometime during the war, we did a little bit here and there: people began to think about what was going to happen when the war was over. And we did devise a few plans, but we didn't have any Russian linguists, and we didn't really know what sort of—within limits—we didn't know very much about the crypt systems the Russians used, and we weren't...didn't seem to be all that concerned about doing anything about it. Well, in any event, so much for the pre-war period as far as the Navy was concerned. Now, with Pearl Harbor—or just before; say six or eight months before Pearl Harbor when we were gradually building up—we had the...we had reserve officers come on active duty as early as a year before. I think the first bunch came in about October 1940. And this first bunch included Mr. Raven, whom you probably know, and three or four others whom you don't know and who are no longer here. But he was one of the first group...among the first of those who came to the Navy on active duty in 1940. The...I may later briefly just mention this little trip of mine to England in nine...end of 1940 and beginning of 1941. Brigadier Tiltman, of course, was there, and was one of those that greeted our group. But this I can...I think I'll just skip over for the moment. If anybody wants to know anything specific about it, why, you can ask him or

me or both of us at some point. As I say, if in the course of this, if you do in fact have a question that you think you'd like to answer and can't remember, please interrupt because I can stop at any time. As I say, this is not formal. World War II...Japan...The excitement and the furor and the confusion that resulted with Pearl Harbor, and for the first month after that, was, in retrospect, really very surprising because, I say, everybody knew it was going to happen, and we were all planning for it. But when it happened, we acted just like a bunch of school kids. The numbers of things that we didn't do that we should have, and the number of things that we did that we shouldn't have, ah, were amazing. But in any event, we somehow survived and we gradually began to increase. And from...Over a period of a year, I think probably we increased by—gee, I don't know—probably a hundred times. Oh, more than that! By the beginning...By...At the end of the first year in the war, I think there probably were a total of something on the order of 10,000—including intercept operators, traffic analysts and the like. This was really an astounding development because it was...Well, not from nothing, by the way; it was from very close to it. Before the war, there had been in the Pacific four intercept stations. And very early on in the early '30s, each one manned by anything from six to eight people. And that's...That's the lot. That's all there was. In the year before Pearl Harbor, it had probably tripled; but in the year after Pearl Harbor, it went from possibly a total of 500 in the entire security...in the entire OP-20-G activity to—oh, I don't know—two or three thousand, possibly. Maybe even more than that. And then, shortly after that, up to about 10,000. There were three so-called processing centers. One in Washington, one at Pearl Harbor, and one later on in Melbourne. And I mention this because the...there was no attempt to allocate. There was no attempt to assign tasks to any one. Everybody worked on everything, and the man who got there first got the credit. And I'm not so sure this is a good system. It certainly is not all that efficient. But in wartime, you can't afford to be inefficient. You must get things done the best and quickest possible way—and it's not always the most efficient way. The competition between the three groups, and particularly between Washington and Pearl—(B% FUPAC) as we called them—was very intense. As a matter of fact, it became so intense that some of the individuals on either side began swearing at one another in messages. ((Audience laughs.)) And it became...In fact, I think probably on two or three occasions, if all of us had been put in one room, we...it would have ended up in a real brawl. But it was worth it, nevertheless. We didn't any more trust them than they trusted us. And anything that we did had to always be checked and vice versa. But I think it all turned out...It all turned out for the best. During the war, the Japanese did not have any cipher machines. They...The military really distrusted them, although, strangely enough, not too long ago, half...maybe a half a dozen years ago, I read some documents—Japanese—that indicated that the Japanese Cipher Security Service, mostly diplomatic, was very much taken with this machine, which they

eventually provided the naval attaché; and thought that this was the absolute ultimate; that they were now secure and they could say anything they wanted to, to anyone without any further regard for safety or security. Well, they were, of course—as we all were—babes in the woods as far as cipher machines were concerned. We had something a bit better, of course, that we were using. But the gist of the...Their views never seemed really to penetrate the military mind, although the naval attachés used the machine. So as a result, the Japanese navy, not until quite some way along in the war—possibly in 1944; I've forgotten exactly; I think the end of '44 or the middle of '44, yeah—did they actually start using a cipher machine. And this was a mess as far as they were concerned because they were never able, really, to use it properly. And it was a Kana machine, which made it a little bit more difficult to operate. There were more possibilities of error. And it wasn't a very secure machine. And the objection which was most frequently heard on the part of the Japanese—and they did quite frequently voice their objections in traffic—that who can read anything when you can't see the character written? Well, some of them knew better than this, but this was the feeling that was, ah ((TR NOTE: a blip is heard in the recording here; perhaps some audio missing))...(B% had) obvious reasons for being correct. It was felt throughout Japan...This was the reason, by the way, that they never really...that *romaji* never really took hold. So as a consequence of all this, most of the traffic was handled in one sort of code or another—mostly digital, all with applied additive of one sort or another. There were probably, oh, half a dozen...say, two major and four or five minor systems; and then a flock of operational technical systems that were in for two or three days and out the same way that we used ours. But the great bulk of all the traffic between the high command of the Japanese navy and, as a matter of fact, between individual ships; division, squadron commanders; and the high command were all in one of two five-digit systems, which changed roughly every, oh, six to nine months, depending on their distribution situation. Yes?

U/I Female: Excuse me. Captain Currier, how did they convert the Chinese charac...or the Japanese characters to, um...? Did they (B% use a telegraphic spool), or did they convert to a (B% *romaji*) (2-3B)?

Currier: You mean in the machine?

U/I Female: Right.

Currier: Well, there were two cipher machines. The Red Machine was a *romaji*...an English letter machine.

U/I Female: Right, yeah.

Currier: And the...What do we call it? Jade?

Tiltman?: (B% They were the shade) Jade and Coral.

Currier: Oh, Jade and Coral, (B% wasn't it?) Japanese navy? Yeah. I've forgotten which came first. Doesn't make any difference. The Jade and

Coral were both Kana machines. The...I said I wasn't going to write anything here. ((Chuckling heard.))

Tiltman?: (B% I would draw just...)

Currier: No, it's in my head. ((Audience laughs.)) Like when I put on my glasses, I can never find it.

Tiltman?: Yes.

Currier: Um, well, suppose, for instance, the...Think of something simple. Alright. Just take...With (B% "Kancho") which is "ship's captain," see? And ((TR NOTE: Sound of a marker writing on a flip chart))...This is written in Kana this way. ((TR NOTE: More writing noise)) Now, these individual letters are part of a 52-letter syllabary—each one of which is an individual...It's a syllable, but it can be considered as a letter. So there is no problem in making a cipher machine which has...uses as an alphabet a 52-long wheel with these in some order on the wheel. Now, the Red Machine to do this same thing: this would be written in Roman letters and...Let's see. This would be in that particular system((TR NOTE: More writing noise)), like that. So that is "Kancho." And then it's very simple, of course, to ((TR NOTE: writing noise heard))...You can just treat these as individual letters, and this can be enciphered—a (2-3G) system—which includes just the 26 Roman letters. But in any event, the feeling on the part of the Japanese or...as I said, that they didn't really like this sort of thing, particularly in military communications, particularly in wartime military communications. They didn't really trust them. So they continued to use ((TR NOTE: Flips a page on a flip chart here)) ULTRA code systems almost entirely, and mostly five-digit systems with code groups...five-digit code groups with various limitations—to which was applied an additive or a subtractive, depending on your point of view. And this carried the great bulk of all of the important administrative and tactical operational traffic for the entire war in the Pacific. Now, this meant that the Japanese had really a terrific distribution problem. Can you imagine what it would...what it was like to have to distribute to 400 ships or more, 40 or 50 commands at various places on ships and ashore, garrisons and navy yards and repair facilities all around the Pacific/down the China coast/into Indonesia, the Philippines, across the south Pacific and back? I don't know what the total was, but I should...I would guess that there must have been, oh, 2000...twenty-five hundred (2500) individual recipients of all of the major codebooks and all of the ancillary equipment and additive books. So they changed as frequently as they could. But the point is—and I'm sure you can appreciate it—that it took a devil of a long time under adverse conditions to distribute all of these codebooks, and all of the additive material that went with it, to all of the recipients—or even to a major portion of them. So that, as I say, they...My recollection is—and it could be wrong—I think they changed on an average of every, say, eight or nine months. But this involved...I somehow on occasion I used to sit down and try to calculate how many barge loads of additive material would be

necessary ((audience laughs)) in order to keep the Japanese navy afloat. And it was more than they could carry! I mean, it's like the bumblebee. You can prove that a bumblebee can't fly. Aerodynamically, he just can't fly. Well, this was the case with the additive material in the Japanese navy. They couldn't work that way, but they did somehow—and I must hand it to them. Although, on occasion, some of the smaller commands and the (B% bypassed) islands would run out, and they'd work out little systems of their own, which was very nice because it was fun working on them. But in the main, we spent—the Navy and, as a matter of fact, the Army, too. But the...And they ((the Army)) had pretty much the same kind of problems and pretty much the same kind of systems that the handling of it and the actual work on it was not unlike that which the Navy did. But since I am not an expert on the Army, I'll stick to the Navy, and if (B% Calambros) ((TR NOTE: Probably referring to Lambros Callimahos)) wants to tell you about the Army sometime, he can. The organization, in thinking back on it, was really something that was...it was a wonder to behold. And how in heaven's name it ever worked, I don't know. Just...For instance, just take the communication business, for instance. The intercept operators throughout the Pacific and on the West Coast were churning out literally millions...*millions* of letters of text which had to be forwarded to Australia, Pearl Harbor and Washington. At the time, there were no on-line systems. I assume you all know what on-line systems are. All the traffic had to be enciphered in a machine system, which is by hand and transmitted by hand. So that the size of the communication setup that handled this traffic; plus the communications necessary to exchange all the work that was done in all three centers—one with the other two; all of the queries; all of the operational traffic...I don't know why the Navy just didn't submerge with...as a result of all this. But, again, I say, we somehow got by, and I give much due credit to the communicators for doing it. But we...There were two principle groups...I hope this sort of reminiscing is of interest to you. But anyway, ah, and I say I'm going to steer clear of technical subjects unless you ask me specifically about individual that have...That the organization of the Navy was such that we had—gee, I don't know—I mean, four or five thousand people working in three shifts receiving traffic; and about another four or five hundred doing something to it. And it all came into a section where there were, at the absolute maximum, there were something on the order of, ah, 50 or 60 people in three shifts working around the clock. So you see, it all just sort of funneled down to a little area, and that, by the way, into what we called the (B% GZ) watch desk where there were four of us responsible for everything that went on and everything that went out. The...We had some terrific people in those days. And the feeling among those who were working, say, in what we used to call the "Blitz Additive Room"...That was the one where, if anything had to be done in a hurry, the...and the watch officer knew he wanted to get something out, he would return to the so-called "Blitz Additive Room" where they had all of

the really crackerjacks and who probably had recovered more additives per person than anyone before or since. And they were really good at it. But the...Stu (B% McClintock) was one of the ones (B% in one of those) (3-4G), by the way, in case you...any of you know him. The traffic itself and the information that we got from it was the result of the work of, as I say, these 40 or 50 people with infinite and endless machine support. But machine support in those days was IBM machine runs; it wasn't anything other than that. Sortings and listings; and that was all that we had. In fact, that's all we really needed. We didn't need anything else. Ah, code recovery, which went on 24 hours a day. The traffic, as it began to become readable, was funneled over to the watch officer's desk. And we soon became...It soon became possible to just sort of look at a message. And if there were one or two code groups on there that were recovered and eight or ten blanks, you sometimes could translate the whole message without even waiting for the others to be filled in. This was a bit dangerous, but I know that, given the experience with similar traffic, it was not impossible to do almost. I'm exaggerating slightly. But in any event, it was possible to recognize the really important material and to sort it out, and if it needed work, to see to it that it got the work, and get it translated, and send it out. Now, this was done directly from the watch officer's desk to the operating elements of the fleet—to the commanders. And it was really a...almost a personal communication service from the (B% GZ) watch officer to CINCPAC and CINCPACFLT and COMSOWESTAIRPAC, and the rest of them. Ah, we felt that, and whenever we would translate a message that was particularly interesting and really quite hot, we would always—I did anyway—always write a note on the bottom of it, saying what I thought of it and pointing out that...I didn't suggest that somebody do something about it, but I came as close to it as I did. And it made...It made for a very close and personal relationship. And we felt that it was—if you'll forgive the expression—"our war" at the GZ watch desk, and we were really running it, you see. ((Audience laughs.)) And as a matter...Honestly, now! It sounds a bit strange, I know, but in fact, that was very close to being true. The number of times that we were able to read and translate and get out to the operational elements of the Navy in the field, or the Naval Air Force, ahead of the time that the intended recipient of the message was able to take action, was...Well, it happened many times. In other words, COMSOWESTAIRPAC would get a translation of a Japanese message from, say, Imperial Headquarters to the Japanese Carrier Division 1 in Truk to make a sortie and make some sort of an attack. Our airman in the southwest Pacific would get that order before the man who was supposed to have gotten it. And this (B% helped). ((TR NOTE: Audio problem at this point.)) And this is one of the reasons that we felt that we were running the war, you see? Ah, and the...In the submarine war, the submariners relied almost entirely on us, really, for the first two and a half years; in fact, I guess, for the entire war. Most of them were not cleared—that is, the submarine commanders.

COMSUBPAC was cleared and his staff was cleared, and some of the SUBDIV commanders and SUBRON commanders were cleared. But most of them were not, so that the orders that were issued from COMSUBPAC to the submarines, in order to make them believe that the COMSUBPAC really knew what he was talking about, would always contain some little piece—some little word—that would indicate to the submarine commanders that that information was absolutely A1, and it came from “you know where.” ((Audience chuckles.)) And they’d act on it. And they said every time this happened, if they were told to go to a particular rendezvous point and that they would...at five minutes past 10 at that particular point in mid-ocean there would be a 40-ship convoy with such-and-such escort—and it happened, and it happened every time that they were told—you can’t blame them for thinking that we were just below...got off to one side. ((Audience laughs.)) But this kind of a...of an operation was something that puts great heart into the people who are working on the systems of the enemy here or anywhere else. And I should imagine that that’s probably the last cryptologic war that will ever be fought, except maybe for the final one. I don’t know. But it was something which most cryptanalysts since World War II, or possibly the Korean War, and most people who work in our business probably hadn’t experienced. And it’s something which can, of course, happen again. It does happen that on occasion, every now and then, something crops up in the material that we’re dealing with now which is of so-called paramount importance—of considerable interest. And those who produce, feel pretty good about it. But when you do this day after day, and not only do you feel pretty good, but you reach the point where you know that without you, things wouldn’t be as they were. And it’s something which is sort of nice to have in the back of your mind. The...I remember some—oh, I don’t know—two or three...a couple years ago, a friend of mine in Damariscotta ((Maine))...I live up in New England, by the way. Admiral Fitch...Admiral Obry Fitch, who was COMAIRPAC in the Pacific, he was then a four-star admiral. He said...I...We were having a drink with him before dinner one day, and he said, “You know, during the war, a funny thing happened to me.” He said, “One day, I got a message telling me that Admiral Yamamoto was going to make an inspection tour. And I was asked—this was sort of an alert—and I was asked to sort of standby; and that in the very near future I would be given additional information and told what to do.” And he said...It seemed...”Though I didn’t know where it came from.” I can’t believe that he really didn’t, but maybe he just didn’t remember. He was an old man; he’s 88 now, (B% I guess). And so, he said...He stood by, and sure enough, along came two or three other messages, giving not only the date and time that Admiral Yamamoto was going to make an inspection tour in (B% Rabaul) and several other places in the area—I’ve forgotten them all now—and when he...precisely when he would be where, who his escort was, when he would land at each airfield, and the lot. So he said, “I didn’t question it. I just looked around, and I even got a

couple of...got the Army Air Force to help me.” ((He chuckles.)) He said, “I didn’t like it, but I had to because they were the only ones that had P38s.” So he got the Army Air Force together; the carrier planes didn’t have the range. And he said, “Sure enough, right when I was told, along came this ‘Betty’ with two”—that was a Japanese bomber—“with a couple of escorts.” And he said, “We shot it down, and that was all there was to it.” And I just...I couldn’t resist. You know, we were sitting there alone just having a drink. And I said, “Well...” Without revealing too much, I said, “I sent you most of those messages.” Well, he never forgot it. And it was a stupid thing for me to say because he’s an old man, and every time he sees any of his friends ((he chuckles)), he always tells the story! So I ((audience laughs))...It’s...Let it be a warning to you. ((More chuckling heard.)) The...Now, let me stop for a minute. Ah, is there anyone here who would like to know any more about anything other than I have told you about the Japanese systems during World War II? There wasn’t very...There isn’t really very much to tell. I mean, the fact that they’re five-digit additive systems is about really all that is of interest. But I’d be very happy to answer questions of that sort—or anything else, by the way that...((Slight pause here.)) Yeah?

U/I Female: If the (3-4G) additive, how was the key generated?

Currier: Well, just throwing cards up in the air.

U/I Female: Random?

Currier: Sort of pseudo-random. The same way...The same ((he chuckles))...I won’t tell that story. ((Audience chuckles.)) Ah, I...Should we tell them about the time we went up to Oxford and watched the old ladies generating the add by throwing the IBM cards up in the air and picking them up off the floor? ((Laughter heard.)) That’s roughly the way it was done. The additive was not one-time. It was keyed additive, and there were X thousand books distributed. Everyone had their own. And they had a...They had a...It was a keyed additive, so that it wasn’t tailing. And they would start at various places in the books, and eventually, of course, this produced depths. And when you have depth, you’re a dead duck—which is what they were. Yeah?

U/I Female: What was the message volume?

Currier: What was the message what?

U/I female: The message...Message volume for a month?

Currier: Oh, God! ((Audience laughs.))

U/I female: Unbelievable?

Currier: (B% I don’t know.) What, fifty thousand? Hundred thousand?

Tiltman: (B% Definitely)...

Currier: I don’t know.

Tiltman: (3-4G; very faint.)

Currier: A lot!

U/I Female: Because you were saying...Right! ((Audience laughs.))

Currier: A lot.

U/I Female: You were saying (4-5B)...

Currier: Yeah, a lot. Enough so that we had sufficient depth in almost every book to get right at it. And within the first two or three weeks of a code change, which involved a codebook change and an additive book change, we were into it enough so that we could just whiz right through it. And the next week saw it recovered to the point where we could read anything important that we wanted to. But we did have a help, by the way. And this is something I didn't mention. I guess I should have because I'll never forget the smell of those captured codebooks. We used to have...Right from the beginning, the...When the Marines first made their raid on Makin ((TR NOTE: now known as Butaritari)) and Tarawa from the *Argonaut*—a submarine—about 150 of them went ashore. And that Marine assault team had with it instructions to pick up anything with a red cover—*anything* with a red cover, and get back to it, and don't get killed while you're doing it! And...((Audience laughs.)) So that we were, in fact, able from the very first time to have either knowledgeable people or someone whom we could...with whom we talked before the raids took place, whose sole purpose was to go right to the communications center/station/activity—whatever it happened to be. Take everything you can get and get out in a hurry. So that in the course of the war, we accumulated tons, literally...tons of captured codebooks and all sorts of things, so that this was always an assistance. But we never captured a codebook before it was used; we always captured it after the fact. But, of course, this was a great help because we then had a complete vocabulary of every codebook. And they didn't change the vocabulary very much. It was a 50,000-group business, and they just shuffled the groups, and the vocabulary stayed the same. The system of using it stayed the same.

U/I Female1: Even after the capture of the books, they still continued using the same...?

Currier: How could they change it?

U/I Female2: (B% They just) (2-3G)...

U/I Female3: They can't change every...

Currier: How could they change it?

U/I Female1: That's true. (XG)...

Currier: See, the...This...This is the...This is what I was saying. I don't see how in heaven's name they managed to survive, but they did. They had to continue using the codebooks, even...If they weren't...If they were absolutely certain that a particular book and particular series of additive books or pages had been compromise...captured, then they would try to do something about it. But most frequently, they didn't know for weeks or

months after the fact. For instance, as we went island hopping up the South Pacific, the Japs...The favorite Japanese way of disposing of their material was not to burn it, but to bury it! So it was a simple matter of going into wherever their communications setup was—sometimes in a little (B% meka) shack under a tree, which (B% you...was) always identifiable by the antennas around. And look around for a soft spot in the ground...

Tiltman?: (B% And dig up) a latrine.

Currier: And dig up...Yeah! It may have been a privy, and sometimes it was. Sometimes ((audience laughs))...This may be why the codebooks smelled the way they smelled! ((He and the audience laugh.)) But, I mean, we'd get...From some of the Marine raids, we used to get codebooks with bullet holes in them and blood on the first page and (2-3G). This made...brought a little realism into the crypto (B% business, you see). But anyway, it was quite a war. ((He pauses.)) Ah, any more questions?

U/ID Male: (B% A question...) You might indicate that they also had...The navy had some (B% cipher system)—transposition (1-2G).

Currier: Oh, yeah. Well, that...

U/ID Male: (B% JN-19, I think.)

Currier: Yeah. They did. They had other systems, but...the transposition system. And as I say, they eventually had a machine or two in which, by the way, most of the high-level traffic was supposed to have been sent. But they never trusted it, and they never were able to communicate. And they always had a hell of a time keeping the machines going—there were only a half a dozen. So that they would almost always send a message in the...I've forgotten which one it was now—Coral or Jade. And then they'd cover...They'd follow it up by a message in a ((he chuckles))...in a five-digit codebook just to be sure that the people who were the intended recipients got the right version. Yeah. And they were always having trouble with garbles, and they never really got things sorted out for their machine.

U/ID Male: (B% Never.)

Currier: Not all during the war. Right at the end of the war, they...The Germans talked them into—I guess the Germans talked them into it; I don't think the Japanese asked for it—with using some Enigmas. And there was a German submarine...Do you remember this, John?

Tiltman: Only vaguely.

Currier: There was a German submarine that left Bresk with a dozen or so Enigma machines specifically altered for the Japanese, and...What happened to it? They never arrived...At least the machines were never actually put into use. After the war, on the TICOM team, we did, in fact, find some of the machines in Tokyo, but they were never...As far as I know, they were never used. Did the army...Japanese army ever use any...

Tiltman: No.

Currier: Enigmas? I don't think...

Tiltman: The Green Machine came after...It was (2-3G), but no traffic was ever seen.

Currier: No. I know...

Tiltman: You...The (1-2G) you're talking about was the (1-2G)...

Currier: Yeah, that's right.

Tiltman: The (1-2G)...A (1-2G) of the Enigma.

Currier: That's right. Yeah, yeah. In any event, the Japanese navy probably was...considered itself well in the forefront of cipher security and communications security. And they didn't trust the diplomats, and I don't think they trusted the army. But in any event, they never really came up with anything that was really sophisticated and really secure at all in the course of the entire war. They were bound by tradition and by having to look at characters. So they were stuck with codebooks and additive books, and they...It just...That's probably the reason they lost the war. ((Audience chuckles.)) Yes?

U/I Female: (B% Captain), at the beginning of your talk, you stated that everybody had anticipated (B% an Eurasian) war—at least a war with Japan.

Currier: Yeah.

U/I Female: If everybody kind of anticipated this and there were war plans, why were we caught with our pants down (B% sort of)...?

Currier: I just...I don't know.

U/I Female: (B% Just somewhere) around our ankles?

Currier: I can't answer the question, but all I know is that the...We were a single target...single crypt target...single intelligence target nation—what, 15 years anyway before the war. And war plans were written for a Pacific war. Oh, there were other little things. I know we had a...

U/I Female: (B% Well), there's so many rumors that you hear that we did have actual messages (B% at the time in places and nations), but they were never decrypted. And things like that, that have been brought to light, I guess (3-4G) here...

Currier: Um...

U/I Female: Is there any truth to that, as far as you know?

Currier: There were...With the messages that were read, if the people who received the text had received them in sufficient time for them to ponder them a bit, I think would have concluded that Pearl Harbor was the only place that any sort of a strike could have taken place. There were no messages in any system sent by the Japanese indicating that the Japanese striking force—the navy, the carrier force—would attack Pearl

Harbor at a particular time. There were several dozen messages that were sent to and from the Japanese Consulate General in Honolulu that would have indicated that something was going to happen—and it had to be there. The...There were two or three young Japanese naval intelligence officers who were attached undercover to the Consulate General who spent a great deal of time roaming around the hillsides above Pearl. And in retrospect, I don't quite see why we really missed it all—and we really did. We really did. There were...The messages in the Purple Machine, for instance, that were sent right up to the time that the...while the negotiations...numerous negotiations were taking place with this country, should have, really, given it away. But they didn't. They weren't specific, but they were close enough to it so that we should have known, 1) that the 7th of December was the day. We should have been able to determine from the material that was sent from the Japanese Consulate General in Honolulu that the odds were better than even that it was to be somewhere in the Hawaiian Islands. This, we should have been able to do. We did not do it. Now, don't ask me why. I wasn't in the decision-making capacity at the time. But looking back on it, this, I think, is probably true. It's also true, by the way, that right toward the end of the war, when Truman and others had to make a decision as to whether or not to drop the first atomic bomb on Hiroshima, I thought at the time that if he had only asked me, I could have told him that there was absolutely no need to do it. There was...There were literally dozens of messages...naval messages from a lot of the shore installations, particularly the air stations—those that were running the...you know, the Kamikaze business; one just not far from Yokohama (B% in Atsui)—where the reports back to headquarters, "We have no fuel. We are out of gas completely." They always came back, "Mobilize the people in the villages. Send them up to the countryside to dig up pine roots. You will distill pine roots and produce enough fuel to get your planes off the ground." That's how bad it was. It was at this time and not long after that, that the decision was made in order to, quote, "save two million lives" that the atomic bomb was dropped on Hiroshima. That is two million American lives, see?

U/I Female: And I've seen some of the devastation that they (4-5G), and it is the same devastation, too.

Currier: Yeah. I'm...Yeah, so have I. Yeah. The...Well, all...You see in retrospect, it's easy to say this sort of thing. But it's just like Pearl Harbor. The...While the information was there for those who wanted to see, those who did see didn't construe it in the way that it should have been. And, as I say, I have no other...I have no answer to it. It's something that goes on. Yeah?

U/I Male: The Japanese that attacked Pearl Harbor: were they aware of the damage that they did do? And if they were, then went into the United States, would we have been ready for them?

Currier: They did know what they did. They had a complete report on the destruction. I think they perhaps thought they did a little bit more than actually happened, but they knew how many battleships they'd put out of action. They were disappointed that the carriers weren't there. Our carriers were out at sea, by the way. And many destroyers got out. It was the battleships that really hurt. But the point really is, at that time, they were not in a position to be able to do anything except go back to Japan. They couldn't have gone on. They'd run out of gas, too. They (B% were all out of fuel oil), you see. And they were not equipped to do anything other than make a strike. It was a hit-and-run raid. They weren't set to make a raid on the west coast of the United States and occupy San Francisco. (B% I mean, that's...) No, they wouldn't...Nothing else could have been done by them at the time. And the fact that we lost a lot of old battleships was somewhat of a blow to our "prestige", if you will. It didn't honestly turn out to be all that devastating. We didn't...We needed aircraft carriers and submarines and cruisers and destroyers much more than we needed battleships. So that while it was a blow alright—there's no doubt about it...And the Navy felt pretty downcast for the next year or so. And I know that there were prophets of doom who said, "Now, well..." (B% There...) It's a pretty touchy period. But it never really was. And if you just think back, what the Japanese had to work with, what their sources of supply were and the width of the Pacific, it should have been fairly obvious that at no time was there any danger of attack...of the Japanese attacking and occupying U.S. territory. Oh, they sent over some balloons and set fire to the forests in Washington and in Alaska and...Hot air balloons that they sent across the Pacific with a prevailing wind. And one or two of their submarines actually shelled an oil refinery in L.A., I think. But that's all. They never learned how to use submarines. And they were never able, ever, to do anything other than set a limit to their area of conquest and try to maintain it. And that was from Japan to Wake, down to the Marshalls, over to the Philippines, Indonesia and around the coast of China. They could never get us down. Does anyone...? Well, gee, it's after 11!

U/I Male 1: We should have a...

Currier: Yeah.

U/I Male 2: (B% Pardon me), (3-4G; very faint).

U/I Male 3: Could you give us a brief picture as to what was happening as far as Germany was concerned? Was there no effort against that country at all?

Currier: Oh, no! We...

U/I Male: Were (B% you) (XG)?

Currier: No, no, no. Well, I...As I say, I was not in the Atlantic war, although I did know what was going on and I did go down there. And I...But most of my war was in the Pacific. Yes, there was a great deal of effort. The point really was that the...The cooperation between the British and us in the Atlantic war was—operationally, perhaps—was closer and more

productive than it was in the Pacific. We were both working together. The British intercept service and us exchanged material and exchanged results, but it was in the submarine war in the North Atlantic where the really astounding results were produced. This was primarily in the beginning: the British GC&CS...((TR NOTE: British Government Code and Cypher School)). And John Tiltman...You can ask him about that. Ah, this was principally the...They developed the devices for reading the Enigmas. They got the few (B% pinches) that were available. They did all of the initial work. They developed what was known as the "Bombe." You know what the Bombe is? B-O-M-B-E? Anyway, it's an Enigma analog that runs as fast as we could run things in those days—to try everything, once you had a little menu that you could put into it. But, again, I think maybe John...You ask him; he'll tell you about it. We eventually...When we first went over there, there were some questions as to whether or not we should be allowed to be told all about the Enigma and the success at Bletchley. I was easy to fool because I didn't know anything about an Enigma—not very...I wouldn't say nothing, but I didn't know very much. I was interested in other things. We did spend quite a bit of time with the people who were working on it. And we...As far as I could see, everything was absolutely free and open and above board. And we sat there and chatted with the people operating the devices, and sat there when they all said, "Hurrah! We've broken it today," and so on. But we didn't really bring back everything that some of the people here thought we might have. So eventually, they sorted things out—and maybe John Tiltman can tell you about that, too. ((Audience chuckles.)) But in any event, it was a GC&CS, or a British achievement. And as the war progressed...When we built our own Bombes and ran them at Nebraska Avenue, and the results were exchanged, we eventually did have sort of an assignment of tasks. And I can't remember what they were precisely. But this was, again, the deciding factor in the submarine war in the North Atlantic. There were something on the order of—and I think I'm right; John may remember better than I—seven hundred and something...or 590 submarines that were sunk in the North Atlantic from 1942 through 1945. Nine-tenths of those were...came as a direct result of COMINT information on their positions and operational activities. Ninety percent...

Tiltman: That's from the naval Enigma.

Currier: Yeah, from the naval Enigma only. The Germans, up until very recently...Well, they know now. But up until, say—I don't know—ten years ago, would never really accept the fact that all of this was not done through DF and other things—(1-2G) and stuff. They never would...never believed, honestly, that we were able to read the bulk of their submarine Enigma traffic—or enough of it so that we were able to get the material that allowed us to be where the submarines were and do something about it. So, again, if it hadn't been for the work on the naval Enigma during the war, the North Atlantic submarine...the North Atlantic war might well have gone the other way; might well have gone the other way. So I think it was

a deciding factor beyond...almost beyond a doubt. So...Yes?

U/I Male: Do you have any information as to how vulnerable we were to cryptologic attack by...(1-2B)?

Currier: Oh, sure.

U/I Male: Which we didn't (4-5B)?

Currier: Yeah, yeah, yeah. The...In the Pacific, the Japanese were never really able to do very much except on our tactical systems, operational systems—which I don't think we really cared very much about anyway. But they were able to do a pretty fair...In the first year of the war, they were able to do a pretty fair TA job on a lot of our callsigns. But they were never able to read our major systems. They never touched the ECM. Never, all during the war. And I've talked with...since the war...In fact, right after the war, and several times since then, I've talked with both Japanese army and navy cryptanalysts who went...gave me in some detail precisely what they were doing and what successes they had and who they were working against and so on. And, no. And of course, the TICOM mission turned up all of their files. No, they never did anything against ECM at all. And the...As far as I know, the Germans didn't either. (1G)...

Tiltman: (2-3G)...

Currier: Yes, John.

Tiltman: (B% See), the Japs read 209 and the Germans probably (B% read strips), in codes.

Currier: Yeah, that's right.

Tiltman: And the Germans never touched anything above 209, (B% above)...except for speech, (B% that kind of stuff).

Currier: Right, yeah.

Tiltman: (1G)ing the telegrams.

Currier: Yeah, that's right, they (1-2G) telegram. The Japanese never had any telegraph systems of any sort. Did the army...Japanese army?

Tiltman: No, not (2-3G: very faint).

Currier: I never...I certainly...I know the navy didn't. Well, you want to rest for a bit? And stay there (2-3G) and talk with you for a bit, if you want to. ((Audience applauds.))

Marlow: ((TR NOTE: After the break.)) May I have your attention? ((He pauses.)) Your attention, please! ((Chatting heard in the background.))

Filby: I think we better get back.

Marlow: I think we're ready to start. For the second half of the presentation, rather than do what we had originally planned and put Brigadier Tiltman on the spot, we're going to have him join Captain Currier and kind of pick up the

train of thought where it was left off before the break—as Brigadier Tiltman saw many of the same things, or some of the same things, from the British side of the fence. And they both were involved in the liaison effort...the initial liaison effort between the United Kingdom and the U.S. at the beginning of the war...or previous to the war, December of '40. And we're going to let them work it out their own way. And I think the Brigadier would like to bring...ah, begin with a comment having to do with Captain Currier's statements. Okay?

Tiltman: I was very interested in Captain Currier's talk. I've known him very well indeed in and out of the office for over 30 years. And there was a lot of it I'd never heard before. So you're privileged. I wanted to say something about the first visit we had from the American services. We had very little warning and we were not consulted. Right at the end of 1940, we merely had an instruction from our Chiefs of Staff that they had arranged with the corresponding American numbers for a complete exchange of everything. Well, this was...caught us completely by surprise. We had our own quite serious security troubles of one kind or another, and we had to adapt ourselves to this thought that four completely unknown Americans were going to be shown everything. This was made very much easier for us by the fact that the four Americans—Captain Currier and...who was then a lieutenant and another Navy lieutenant named Weeks, and Dr. Sinkov and Leo Rosen from the Army side—arrived. And they brought with them a...an analog of the Japanese Purple Machine which we hadn't succeeded in breaking. This was a tremendous gesture which (B% started off)...us off on the right relationship. And we've never forgotten it. This was a...Somebody had to make the first step, and the Americans made it. We had in, I suppose, April 1940, without warning suddenly found ourselves able to read a certain amount of German air Enigma traffic during the German occupation of Norway and Denmark. And this posed a tremendous problem in security. The first solution of it was rather amusing. The information that came out of it had to be distributed to a number of people. And our great (1G) chief in London was not satisfied that they were all worthy to receive it. So he invented this spy named Boniface who was supposed to produce all this priceless information. This immediately divided the recipients into three classes. The first class were the people who knew where it came from and they were all right. The second class were the people who didn't know where it came from and assumed that this spy, Boniface, was true; assumed that everything that came from the Secret Service was absolutely without foundation; and put it straight in the wastepaper basket. But the third one, the really dangerous people: they were the people who guessed where it came from and weren't restricted in any way. So we were really in the stage of getting over this when the Americans arrived. And we did...It took us a little time, but we did eventually come clean and show them everything we had, including all the Enigma results and so on. But we put rather restrictive conditions on how far this information should be disseminated

when they come...came back to the States. And this is what caused a good deal of trouble during the next few months. We go...got over it eventually, and our cooperation was very complete. But I did want to say that it was the American gesture that started it off on the right footing. I don't want to take over the floor altogether because you won't see Captain Currier again after today.

Currier: Come now! I'm not going to disobey. ((Audience laughs.))

Tiltman: I know, unfortunately, very little about the Enigma solution. I was in the position—certainly from, I think I would say, from the beginning of the war—that I was the leading cryptanalyst diagnostician, if you like to put it so, in GCHQ. And from early in 1941, I was called chief cryptographer and I was actually personally responsible for the attack on anything we weren't reading or anything that was undiagnosed. This was, of course, a quite impossible responsibility to carry, but we did our best. I had a very small research section of about twelve. And we also thought it was our war ((audience laughs))—whether it was under the same justification, I'm not quite sure. But we didn't have anything, really, anything to do with the Enigma machine at all because this was a known machine. And although a tremendous effort...a great deal of ingenuity and enormous machine resources had to go into its solution, it wasn't really within my responsibility at all; and I didn't have anything to do with it. I didn't have anything to do with the naval Enigma either.

Currier: John, were the Enigmas that they got off the back of that truck in Holland somewhere, was that before the air solution, or was it after? Do you remember?

Tiltman: I don't know that story. I'm not...Or I've forgotten. ((Audience laughs.))

Currier: Well, no, the story...It is the British story.

Tiltman: The earlier ((audience laughs))...The earliest story is this: we had, in our office, started the commercial Enigma, which wasn't...which didn't have the security features of the service Enigmas.

Currier: Yeah.

Tiltman: But what happened to us was that from sometime in, I suppose, early 1938, we had made contact with the French. And the French had been in contact with the Poles. And young Polish mathematicians had studied the German Enigma communications, and had come up with the idea of what was called the "Bombe." This was a...an analog of the machine. They acquired the old wheel wirings through spy activities with the French. And then they developed this analog that could go through all the movements of the wheels and all combinations of the wheels in fairly rapid time to test a particular menu, as Captain Currier has called it. This is something I didn't have anything to do with at all. But we got the wirings from the French, and originally from the Poles. Three or four people went from our office in about May 1939; actually went to Warsaw and made contact with these young Poles—who afterwards were evacuated to France where I

saw them. This was really the origin of our success. We knew...I haven't got the story in my head at the moment, but we did know rotor wirings when the war broke out.

Currier: Was it the...? Of the army Enigma only?

Tiltman: Army and air.

Currier: Army and air?

Tiltman: Yes. The navy was a much bigger problem. They didn't break into the naval, I don't think, until...They hadn't broken in when you were there, not really.

Currier: Yeah, they just...They were doing...

Tiltman: Just about.

Currier: They were doing...They were doing, John, then on the basis of the weather broadcasts (B% in Brighston).

Tiltman: Yes.

Currier: And everyday they'd send the same sort of a message with about the same length, starting out the same way. And the first "X" letters—42 or 21 or something or other—were always the same. And using that and the information...I think, by the way...I may be wrong, but I think that the Enigma that they got off the back of a truck—it either fell off or somebody pinched it or something—in Holland was a naval Enigma. I may be wrong on that, but I know that the...

Tiltman: I'm afraid I don't...

Currier: Yeah. I know that they got one. And I think that they got the standard set of naval wheels. And I think they got the wiring from that. But I could have things slightly mixed since I wasn't there and I...The story is secondhand. But in any event, they were beginning to read the naval Enigma in...Began in '41...It began in February '41.

Tiltman: (2-3B), (2-3G) remember.

Currier: Yeah.

Tiltman: But, ah...

Currier: (B% There were)...Remember the (B% bam burses) they had? The...

Tiltman: Yes.

Currier: The hand machines that they had—these great, long sheets of paper with holes punched in them?

Tiltman: Yeah. Then there was a thing called a (B% fahs) sheet...

Currier: Yeah, yeah.

Tiltman: Which had punched holes. And they used to lay it on a...

Currier: Yes.

Tiltman: Transparent table with a light underneath.

Currier: Yes, right. Yeah.

Tiltman: Do various jobs. I didn't...I had absolutely nothing to do with it. ((Audience laughs.))

Currier: It wasn't yours.

Tiltman: It wasn't mine and...But they did a magnificent job.

Currier: Yeah.

Tiltman: My...I think my chief job on the German side of it during the war was the initial reconstruction of the "Tunno" machine—TUNNY; what we call the TUNNY machine, which was the German teleprinter online machine used for high-level communications. I didn't reconstruct the machine. It was done in my research section. But I produced the...I worked on the bust, which let us into the machine. And if I'm allowed, I'll talk about that another time. In fact, (B% I know I've) talked to you on it, but...But, ah, I don't want to get into that today because I hope to have an opportunity of talking to you another time.

Currier: John, do you remember...? Do you remember when the U.S. Navy first set up its Bombe operation in Nebraska Avenue? Was it as much as a year? See, we didn't have it when we were down on Constitution Avenue. We didn't have anything until we got out to Nebraska Avenue. We didn't move out there 'til February of '43...

Tiltman: No.

Currier: And we set up about that time. But I...

Tiltman: I remember...

Currier: Because I didn't have anything to do with it. I (2-3B)...

Tiltman: I remember seeing...Surely I saw some Bombes in ((he pauses))...No, I think right until you got into ((he pauses)) Arlington Hall, I don't think you had any Bombes set up. Would you remember? ((TR NOTE: Said to someone other than Captain Currier.))

U/I Male: Before the Hall? No, at the Hall.

Currier: No. You didn't have any...?

Tiltman: Quite earlier at the Hall. Before the (B% move)...

U/I Male: At the Hall? (2-3B)...

Tiltman: Oh, yes!

U/I Male: My gosh! Well, there's a little service, sir—the Army!

Currier: Oh, so it is! ((Audience laughs.)) Ah, did...?

U/I Male: Your Bombes are different from ours.

Currier: Yeah. Yeah, right. Anyway, if anybody wants to hear about...Howie Campaigne can tell you all about it.

Tiltman: Oh, yeah—(B% about) the Navy Bombes.

Currier: About the Navy, (B% yeah).

Tiltman: I had another comment on the (B% chapter)...on what Captain Currier said. He was talking about the distribution of cryptographic material by the Japanese in the Pacific. And I know very well what the problem was with us because we had a fleet general naval cipher—general fleet cipher. And there had to be 1700 holders of that, and we found this was being...our cipher there was being extensively read by the Germans. And I had to solve the problem; took me a long time to do it. But I reckon that I did provide them with a cipher which was reasonably safe. Now, you can see what some of these distribution problems were. Again, I'll leave that to another time. Has nobody got any questions they'd like to ask?

U/I Female: Captain Currier?

Tiltman?: Yes, go on.

U/I Female: On the taking of the cryptographic materials (3-4G)...

Currier: Yeah.

U/I Female: (3-4G) Cheltenham (B% is)...

Currier: Yeah.

U/I Female: Was a great gift. Was that, from our point of view, a very big carrot?

Currier: Yeah. It...

U/I Female: Or...(XG)?

Currier: See, actually I don't think the...I don't think they act...The people in either one of the two crypt sections were, in fact, consulted about this. I know that...And I didn't know until after the fact. All of the infighting and squabbling about this proposed visit...It was cancelled once, and I never knew why and I never asked, and I wasn't in a position to ask. I had a job to do and I continued to do it until somebody said, "Well, you're leaving tomorrow." Ah, and the...Yeah, it was. We...The Army and the Navy put together everything that they had of any importance—and this included the Purple analog, which, of course, was really the biggest. But we also had a lot of Japanese naval material. We had write-ups on all the systems with an enormous number of books in one sort or another. The total, by the way...The total weight of the material that we brought with us was something over a ton. And we...This presented a real problem when we got...We went to the (B% Orkneys) on the British battleship *King George V* right after...He brought...They brought Hal...Lord Halifax over here as the first...as the first wartime ambassador. And we left from Annapolis, and went south and picked up a beef convey coming up from Argentina, and then went up to the Orkneys. And when we arrived at Scapa, the...It had been proposed that we fly down in the (B% short) flying boat so that they...They sent one up. And come to find out, the hatch was so small, we couldn't get any of the gear into the flying boat. So we were

left...actually just left stranded up in the middle of Scapa Flow. It wasn't an un...Well, it was raining, but...It was kind of unpleasant, but it wasn't...It wasn't dangerous or anything of that sort. So we just sat there. And finally...And I can't quite remember how this happened. Somebody got in touch with the cruiser *Neptune* that came in from the Med, and she was rather a mess. She hadn't been home for four years, and rather badly scarred and knocked about and...Although it was still afloat. ((Audience laughs.)) And we talked a trawler captain into taking us and all our gear from the KGV ((TR NOTE: *King George V*)) over to the *Neptune*. And I...For the life of me, I can't figure out how we did it or who did it. But anyway, we did it. And we loaded all our gear on deck on the *Neptune*. She was on her way down to Sheerness for a refit. And the...We left the following day, and as we pr...We were alone, and we were proceeding down the (1G) channel along the east coast of the British Islands—from Scapa down to Sheerness which is at the mouth of the Thames (3-4G). And about halfway down, we passed a convoy. And as we passed the convoy, there was a German reconnaissance...naval reconnaissance plane sort of flying along, counting the ships and so on. And, of course, we were one of the ones that they counted. And they thought, "Well, there's...Here's an important convoy because it has a cruiser as one of its escorts." So they buzzed off a message. And the first thing...You know, we were down eating and the bow just (B% lifted over) and went over here this way. And the bomb landed here and another one on this side. And, God! I thought, "All that gear is stacked on deck unprotected...absolutely unprotected." ((Audience chuckles.)) And I was so scared I couldn't go up and do anything about it anyway. ((Audience laughs.)) But...And then, they made a half a dozen strafing runs up and down the ship. And I said, "Well, that's...The Purple analog is gone. This is (B% quite) useless." After the attack, we went up on deck, and contrary to the Geneva Conventions, the Germans had been using copper-jacketed explosive bullets in their machine guns. So that rather than penetrate our crates...It was all crated in fairly heavy, wooden crates. Rather than penetrate the crates, they hit the wood and exploded. And all they did was blow little pieces of wood out of the crate, and not one single bullet ever penetrated any of the crates. And the deck was just strewn with spent bullets all over the deck like so much sand. In fact, when I first heard it, I thought it was someone dragging a chain across the deck.

Tiltman: Believe it or not, this is a new story. ((Audience laughs.))

Currier: Yeah, and the...The officers of the *Neptune* were not all that happy about having us, although they seemed to be. They were good enough. But then...And I say the *Neptune* had been knocked about a bit. And their ward room facilities were limited. She'd taken a couple of hits somewhere nearby in the galley and there wasn't much food and...The officers were all...I've never seen anyone who looked as if they needed a rest more than those people. She was commanded by (B% Rory O'Connor). Do you remember Rory O'Connor?

Tiltman: (2-3B)...

Currier: He was a very famous Royal Navy captain.

Tiltman: Yes.

Currier: And he had...He wore sea boots above his knees like this, flared out; and an enormous cape with a brilliant red lining. And he wrote poetry. ((Audience laughs.)) He was terrific.

U/I Male: May I ask, where was the Purple Machine solved?

Currier: Ah, it was solved jointly, oddly enough. Ah, yeah. In spite of the fact that I think that in one story that I read, Larry Clark got credit for it. Do you remember that story? It was solved mainly over on your side.

U/I Male: In (2-G), yes. I just want to get in a reference (B% to the Army).

Tiltman?: That's alright. ((Audience laughs.))

Currier: You had...You're going to have to get Lambros up here to talk to you.

Tiltman: Yeah.

Currier: He...For rebuttal, because I don't consciously avoid talking about the Army. I just don't know anything about it. ((Audience chuckles.)) But in any event, the...we got to Sheerness all right and got the gear unloaded. And were met...I've forgotten who met us, by the way. Can't remember now. Some Navy type...((Audience laughs.))

U/I Female: He (4-5B).

Tiltman: (XG)?

Currier: He...No, we met him in London.

Tiltman: Oh!

Currier: We got all our gear loaded on a something or other. I've forgotten now. Well, anyway, we went to London. And Humphrey Sanders, who was the equivalent of COMNAVSEC or whatever they are...I've forgotten. He was NI...NIS-9, hmm?

Tiltman?: (1-2G).

Currier: And (B% Joe Longis) was his deputy.

Tiltman: Yes.

Currier: Who is one of the recently retired directors of GCHQ. The problem that was presented to us was that we were driven from Sheerness to London briefly and then on out to Bletchley. And we didn't return to London for three days. Now, Bob Weeks and I were classified as naval observers. And as such, theoretically, we should have reported in to our naval attaché, who was Admiral Kirk in London. Ah, we did not do this—obvious reasons that he wasn't supposed to know where we were going or anything about us. We were just naval observers because that was...The Navy just thought that was a good idea, I guess. We went to Bletchley. We stayed there three days or four. Came back to London to pay our

respects to the ambassador and to the naval attaché. Well, the introduction to the naval attaché was terrific. He was so mad that we hadn't actually touched base with him first, that he almost on the spot ordered us court-martialed. And it took a lot of talking to get out of it. But eventually, he came around and agreed that we could do what we were told to do. And we didn't have to tell him anything, but he'd like to know if he could. So we fed him ridiculous ((audience laughs))...But we spent...Gee, we were there, oh, two and a half months, wasn't it? Yeah, we came back on the 15th of April. But the trip in itself was of considerable interest and sort of fun, except for occasions here and there. But when we arrived in Bletchley, my first introduction to Brigadier Tiltman was...We arrived, I think, sometime in the evening, as I recall. It was dark, I know, and everything was blacked out. And we walked in the front door, and then through some blackout curtains. And there was Brigadier Tiltman standing in his full regimental with his legs spread apart and his hands behind his back, sort of standing like this. And that's my first view of John. ((Audience chuckles.)) Um, we were given...At that time, we were given a room and three pencils and a pad of paper and said, "This is where you sit." And from thereon we were treated royally. We had...I know I'm...This isn't really cryptanalytic, is it? ((Chuckling heard.)) But we had two cars, two...a driver a piece; the army had their car and Bob Weeks and I had our car, and never the twain should meet. We always had two cars. ((Laughter heard.)) We weren't really operating together that much. And we had a young Scots driver who was very much impressed with his assignment. He thought that driving us around England, being free to come and go, was just absolutely the top ((audience laughs)). So he took it upon himself whenever we had to go through a roadblock, or deal with the local police or the MPs, I can not introdu...I can not imitate his Scots brogue. But he never failed, when the opportunity presented itself, from saying that these were two American officers on a secret mission and you're not to stop them! ((Audience laughs.))

Tiltman: Were those the two drivers that took us up in the...?

Currier: Took us up to Sterling.

Tiltman: Two cars when we went up to...

Currier: Yeah, that's right. To Carlisle Sterling. Carlisle.

Tiltman: And to Greenock.

Currier: And Greenock, yeah—when we...on our way back, when we came back on the *Revenge*. Yeah, the return trip was something, too, because about two weeks before we left, after we had finished up at Bletchley, we went to Chelmsford to the Marconi place to pick up one of the newest DF sets—the navy did; Bob Weeks and I did. And we spent a day at...out at Chelmsford. And got a complete set all crated up and ready to go, including antennas and masts—everything. And we didn't know precisely what was going to happen to it, but we were told that it would be shipped

up. And we had then arranged to leave from Greenock on the *Revenge*, a very old battleship. But this was an enormous convoy going back across the North Atlantic. So we...When we got up to Greenock, we asked whether or not all our material was there, and there wasn't any of it there! None of it! ((Audience laughs.)) So Bob Weeks and I walked...or drove up and down the Clyde side, checking every warehouse until we eventually found it. And if we hadn't done that, it would probably still have been there—because the people who got it didn't know what to do with it. It wasn't addressed particularly to anybody. I've forgotten what it said on the crate. But I can't blame them; they didn't know where it went. So then we had to get a lighter to haul...This was about two tons' worth of gear. We had to get a lighter and some authorization to get a truck to go up and get the gear, bring it down to the dock, load it on a lighter; and carry it out to the *Revenge*. But when we got it to the *Revenge*, they didn't want to take it because it took up too much room. They didn't...They weren't told that there was going to be anything like this. But eventually we saw the captain and got it squared away; and we eventually got all our gear on the *Revenge*. But coming back with us, well, we had a very interesting crew. We had the three French...two or three...three French people; the entire Polish Government in exile ((audience laughs)); the new Governor General to Canada, Malcolm McDonald; a Major Somebody-or-other who was a concert pianist. And he was going along as sort of an aide to the Polish premier. What the heck was his name? And a couple of spare chaplains, both of whom were (B% proselytizing) (2-3G) ((audience laughs)). It was quite a crew. So...And we had a long trip back. And in the course of it, one morning about three or four days after we left Greenock, the skipper said that he had just gotten word that the *Hipper* was lo. *Hipper* was a German cruiser, (B% Komesreder). That she was up around Iceland. So we detached ourselves and went up to Iceland to look for the *Hipper*. Well, it was a stupid thing to do because the *Revenge* was a 1909 battleship, and the *Hipper* was a brand new battle cruiser with twice the range of the *Revenge*. But at any rate, we didn't find it, thank God! ((Audience laughs.)) We rejoined this enor...the biggest troop convoy up to that time that had ever left the Greenock area. There were 40 ships all over 20,000 tons, an escort of the *Revenge*, five cruisers of the Edinburgh class, and 20 destroyers. This was some fleet! These were all big liners carrying troops. The troops were all bound for North Africa, by the way. We didn't know it at the time, but that's where they were going. And the *Queen Elizabeth* and *George*—all the big liners—all converted to troop carriers. And we left them at mid-Atlantic, and we went on to Halifax with one ship, the *George V* ((the 5th)) and one other destroyer. The rest of them all went down and they (B% delivered) them safely. I've forgotten exactly when. This was in about April '41. They were bound for the Med. But the...We still had all this gear on the *Revenge*, of course. And he was more concerned about it; but they didn't worry, so we didn't worry. We got to Halifax and we didn't...Nobody met

us, and we didn't know how we were going to get from Halifax back to Washington with all this gear. We couldn't put it on a train, and we had no transport or anything. And while we were tied up there, we...Just by chance, a U.S. destroyer, the (B% Overton), came in. And lo and behold, old (B% Stefanick) was commanding officer, and I had known before. So I asked him if we could hook a ride back to...Where was he going? He said, well, it just so happened that he was going back to the Washington Navy Yard. So I said, "Well, can you take four of us and about two tons of gear, all classified?" He said, "Sure." So we stored it all in the ward room. Got rid of everybody, all the bunks and everything. And stored all the gear in the wardroom. Locked it. And nobody could eat all the way down. ((Audience laughs.)) I don't know whether any of you have ever read...What's it...? ((Ladislas)) Farago's...

U/I Male: *The Tenth Fleet.*

Currier: No, *Broken S...*

Severall: *Broken Seal. Broken Seal, yeah.*

Currier: *Broken Seal.* In it, he makes a comment about this particular mission of ours and the fact that when we returned, we...What was his expression? "Looked like whipped dogs." We didn't...Yeah. While we just...We may have, but it was just because we were tired. It was a rough trip from Halifax. It was rough all the way, and we...They...An old (1G) 4-piper with...in rough seas with...trying to keep the gear from smashing everything in the ward room. It was a rough trip. But that was the only reason we looked tired. Anyway, that was the be...That was the beginning of our, quote, "special relationship," which has existed from that time to this—and probably the most valuable one ever in the intelligence field between any two countries in the world. And it continues; it's still on a friendly, personal basis without regard to what the politics of the moment may be. It doesn't seem to make any difference at all. We've never faltered and we've never lost out, and we've never become very disenchanted with one another. And it's something which will probably continue indefinitely, as something you can remember. You can probably tell *your* children about it. Anybody hungry? It's 12 o'clock. ((Audience laughs.))

U/I Male: Can I...? I'd like to ask you (B% just) one more question?

Currier: Yeah, sure.

U/I Male: I wonder if you could each tell us how you first became involved in the field.

Currier: ((He laughs.)) (B% Oh, boy!) ((Audience laughs.)) You do it first, John. ((He laughs.))

Tiltman: How far back do you want to go? ((Audience laughs.))

U/I Female: Yes, the very first...

U/I Male: All the way.

U/I Female: All the way.

U/I Female2:All the way.

Tiltman: Well, ah...

U/I Male: It'll be in the *NSA Technical Journal* in a couple of weeks! ((Audience laughs.))

Tiltman: (B% Alright, yes I'll try.) Yes, I won't go back any further than that. During World War I, like everybody in my generation, I just went and joined the army. And as it happens, I was in the infantry. I knew nothing whatever about this work. I never came into contact with it. During the process of the war, I got a regular commission in my regiment. And after the war...I was wounded...badly wounded and at the end of the war, I was teaching in a War Office in an officer's cadet battalion. And just about the time of the Armistice in November '18, there was a request for volunteers to go to various parts of Russia where we were supposed to support the White Russian resistance against the Bolsheviks. And I was accepted and sent to Siberia. ((Audience laughs.)) I didn't...We didn't actually know when we left Liverpool what part of Russia we were going to. We did go to Siberia; I was there for a very short time. I had known...I had learnt a little Russian before I went there. I had learnt it a little before the war—taught myself. And I was only in Siberia two and a half months. I was in Irkutsk for a bit, and I was in hospital in Vladivostok before being shipped home. When I got back eventually, when I was past...fit enough, I joined a regular battalion. And I don't think I realized 'til then how unsuited I was to peacetime army service. I survived about six months of it and...But then, I took the opportunity offered and went on a Russian course to London. At the end of that course...This was a fairly elementary course, and none of the other army officers who went on the course knew any Russian to start with. And they passed the preliminary examination, and I just scraped through the inte...second-class interpreter degree. And I was in the—quite by chance—in the War Office when they were looking for interpreters. I was borrowed for two weeks before going back to my regiment and was taken over to the Government Code and Cypher School in London. This was the 1st of August 1920. I didn't even know what the office did until I went into the director's office. As I say, I was borrowed for two weeks, August the 1st, 1940, and I've never gone back to my regiment. ((Audience laughs.))

Currier: Not August the 1st, 1940. It was earlier than that.

Tiltman: When? Ah, 1920. Sorry!

Currier: '20. 1920, yeah.

Tiltman: (2-3G) muddled. And now, I was a year there then, and then I went to India for nine years. We had a small unit in Simla. I may tell you about that another time. And then, they formed a military section of the

Government Code and Cypher School and I came back in charge of it. And that was in March 1930. (1-2G)...((Chuckling heard.))

Currier: Well, mine isn't anything like (B% yours) or as good as that. And the only reason I got in it was because nobody else wanted me. ((Audience laughs.)) No, I...Serious. Yeah, I (B% dozed) out of the Naval Academy—the Naval Academy Preparatory Class. I was...I always like to say that it was because I was underweight, but that wasn't the real reason. Actually, I was under...I was 15 pounds underweight. I weighed something like 105 pounds. The...This was one of the reasons that they gave for refusing me admission. But I was in the preparatory class for about a year. I had enlisted in order to go to the Naval Academy, which my cousin did, and I thought it would be wonderful—easy way of getting in—and I wouldn't have to fuss with a Congressional appointment. So I went to the Academy preparatory class, which they held in Norfolk. It was sort of a cram course for those entering the Academy, and something like boys' school, by the way. And after I finished there, I took the examination, which I did pass. But then, I took a physical examination after that, and they turned me down. There may have been a...It may have been an excuse. I like to accept that (B% statement). And then, I had a couple of years to do...I had to do something. And eventually, I ended up by being an intercept operator for a year, and then I quit and went to Dartmouth. And then, I got a letter from Joe Wenger saying how about coming to work for the Navy? Oh, I had picked up Japanese, and I had done some cryptanalysis, and I wrote some reports. The...Then I got in serious trouble by doing it because about, oh, a year after I got out and started working seriously—I (B% hadn't) on my own—I was ordered to be placed under surveillance. Said I couldn't possibly...“Nobody can learn Japanese in less than a year and be a cryptanalyst in less than six months, and break and read and translate and write reports all on his own. This is impossible! It can't be done! Nobody does this.” So they placed me under surveillance and tried to find out where I was getting all my information. ((Audience laughs.)) Ah, and eventually, it all came out; and they had to rescind. I've still got a copy of...I think I've got it around, a copy of a letter telling...from ONI who had been the recipient of all of this work that I was doing. And they wouldn't...they just didn't believe it. “It's impossible.” So in any event, as a result of that, I...When I got out, I went to Dartmouth, and then I got a letter from Joe Wenger saying, “How about coming to work for us” And I did. And so...But it all started because I dozed out of the Academy preparatory class. So they didn't want me. ((He pauses.)) Yes?

U/I Female: Um, yeah, I have a question. You know, something that's always bugs me is: when did they ever start using (B% signals in reoccurring squares)?

Currier: Oh, I never heard the word...Let me see. I think I...The Army was way ahead of us on that. They ((audience laughs and applauds))...They...

U/I Female: (XG)? (4-5G) (B% involve)?

Tiltman: Kullback was (B% right in that)...

Currier: Yeah, Kullback and Sinkov, the two mathematicians, see, in the Army...We didn't have any mathematicians. As a matter of fact, we didn't care about mathematics. We just went ahead and solved the systems (XB). ((Audience laughs.))

U/I Female: Oh! (2-3G)!

Currier: Ah, that's right. Yeah. I said, seriously...Yeah. It didn't...

U/I Female: Well, how about the British? Did you use anything...any...Well, you said you were (B% an intercept operator).

U/I Male: Well, (1G) (B% square at the top)...

Tiltman: I have one horrible confession to make. Back in, I think, about 1932 or 1933, I was taken and given a demonstration of (B% Horace) machinery—Horace sorting machinery. And I didn't think it would help us. And, of course, we had to take to it as soon as the war broke out. But the...Ah, we didn't have any at all before the war. We worked entirely without any...We didn't have any mathematicians either.

Currier: Yeah.

Tiltman: But, of course, the U.S. Army—Mr. Friedman and Rowlett and Sinkov and Kullback were all brought up working sorting machinery from years before the war. We just let it pass by; and I was the culprit, I think, then.

Currier: Yeah, I can remember a time when...When was it? Yeah, I guess when Raven first...when Raven first arrived sometime in about October 1940. Or maybe it was one of his earlier trips when he came down on (B% active duty), and we were working on the Red Machine. And as I told you, it was an extremely simple machine. There was actually nothing to it. It was...Um, I mean, it was one wheel of 20 letters and one wheel of 6 letters on the same axis turning together with a interruptive stepping device and a...(B% Possible) to set up a sequence on both wheels. That's all it was. So the...

Tiltman: (B% What was) the other wheel? Forty-seven, wasn't it?

Currier: The stepping wheel was 47.

Tiltman: Yes, yeah.

Currier: And...I mean, that's all there was. And so, I couldn't—nor could anybody else—see any sense in using mathematics on anything of this sort.

Tiltman: (3-4B.)

Currier: So all actually that we had to do, really, was...I mean, for instance, you ((TR NOTE: Captain Currier using marker to write))...We just, say, ah...So you wrote the text out something like that on a cross-section sheet. And we did it this way to take up...It always stepped at least once—that is once, twice, or three times. So if you did this, you could make your stepping diagram much easier by counting on at least one step

all the time. This is a piece of cross-section paper. And then, since we knew that the key started a particular distance from the first letter, and it proceeded in a fairly orderly fashion, say, roughly like that. The slope was easy to calculate because of the 47 positions; and it was something on the order of, maybe, half steps. So it would be about...something on that order. So it would proceed more or less like that. And we also knew that there were two alphabets involved. And if it happened that one...the smaller alphabet contained most of the frequent letters, then they would stand out immediately. ((TR NOTE: More writing sounds heard.)) So then, it was simply a matter of determining, say, which were the letters on the sixth wheel; which could be done if they were high or low; ringing those in blue or red or something; making (B% the counts) this way; and you'd get a rough order of the sixth wheel. Then eventually, as you proceeded you could adjust it so that you did, in fact, produce the exact order of the letters on the sixth wheel. Then go back and rearrange all the places where the sixth wheel hit, and you could get exact key stepping. And since it was 47 long, you'd put this one here and then you went on 47, and counted the number of steps, put it in again with the exact distance between the letter involved and that particular step. Then go back and make counts on the other letters, and you could then produce a sequence that would, say 75 percent, correct. Lay it out; run the plaintext up here, giving yourself a little range like this of letters on either side; and then just read off the text. And you could just pick it out, and it was very simple. That's all there was to it. And nobody could ever see any sense in being mathematical to do anything that simple. So, as I say, ((he laughs)), there wasn't any need for mathematics. Let's not go into it. ((Audience chuckles.)) Comes pretty close (B% to it).

Tiltman: Two or three other people here know how much mathematics I know. (2-3B)...

Currier: Well, it's...And they don't know how little I know either.

Tiltman: (3-4B)...((He chuckles.))

Currier: I can fool some people, but not a mathematician. Oh, I believe in statistics. I think it's a good thing. I don't...I do, seriously—particularly nowadays. It's absolutely necessary. But it wasn't (1-2G) (B% then).

U/I Male: You still do (B% tie) squares about as fast as I can do them on the machine.

Tiltman: And that's another story. ((Audience laughs.))

Currier: Well, is anybody hungry now?

Tiltman: Yes...

Filby: (B% Are we running out of time?) (XG; very faint.) ((Long pause here.)) Well, I guess we were slated to give up the room 15 minutes ago...

Currier: Yeah.

Filby: And there doesn't seem...Is there anything that we can think of or you'd like to go on with for a few minutes? I know everybody's starving, but I don't think they're that hungry. ((Audience chuckles.)) Nobody looks (B% starved).

Currier: Well, without...No, there's nothing else special that I (2-3G) or (B% worth) hearing about and spending just a few minutes on.

Filby: Mm hmm.

Currier: We...You know...Yes, John, what do you think?

Marlow: Well, you both were asked why you...or how you entered the field.

Currier: Hmm.

Marlow: Perhaps why...

Currier: Gee, I haven't the foggiest notion why. ((Audience chuckles.))

Marlow: (B% No one asked why...)

U/I Female: (2-3G) stop (2-3G)...

Currier: Ah...

Marlow: I mean, why did you...?

Currier: So I think probably...I...As I say, I went to Dartmouth, and I hadn't been there very long when I got an offer to come down. And I just remembered how much fun it was, and I said, "Sure!" That's...Honestly, that's about it.

Marlow: Well, let me...To be (3-4G), why did both of you stay? Brigadier Tiltman has stayed for 52 years.

Currier: Right. And I've been in it for 37 or something or other like that. Ah, because for the first...Up until well after the war, it continued to be intriguing and extremely interesting—and in many cases a lot of fun. Now, there were many other things which...about which I have not talked, and which I probably shouldn't and wouldn't. But there were many other things that happened in the course of these last 25 or 30 years that have really made it worthwhile. And there were many other things that involved cooperation with our friends across the river and with various organizations about the world, which makes it even more interesting. But I think there's probably one thing, honestly now, that you should remember. And it's something that is periodically denied, I think, by a lot of people around here. But you must remember that in spite of what you are told, and in spite of the way you're treated, and in spite of what happens, that the prime reason for NSA is to read other people's traffic. And the only people that are going to cause this to happen are you and your successors and your predecessors. And everyone else is simply an adjunct to the (B% CAF). And I don't care what anybody says; that's absolute truth.

U/I Female: Yes, but we all have such a small chance to be as great as you all are. I mean, like you say, there will never be another cryptologic war. And so...

Currier: Well, you know, strangely enough, people have been saying that for a very long time, and I wouldn't place too much faith in it. I think that you'll find that while the problems are much more difficult and much more complex, there are things which *are* being done. My son, for instance, is a mathematician and he's working in G41, and he thinks it's fun.

U/I Female: Well, I'm not doubting that. I'm only saying that the adrenaline doesn't seem to be flowing (B% as free and as extensive)...

Currier: I...Yeah. Yeah, I...Then you have a point. You have a point. This, I think, is probably true. I have no panacea for this, but the things that need doing are more difficult, and it takes a...probably a different type of dedication nowadays than it did then. And more of it. I think this is true. But it is worth it. Mind you, it's worth it. ((He pauses.)) Yeah.

U/I Male: Perhaps...I think you mis...misunderstood when you said, "There will never be another cryptologic war." You mean one in which we have the fortune, the miracles, the (B% hit leads).

Currier: That's right.

U/I Male: Yeah. We'll still have cryptologic wars, but...

Currier: Oh, yeah!

Tiltman: Oh, yes.

U/I Male: Yeah, but...

Currier: But this war was a war which was controlled by the cryptologists, not by the Army and the Navy. That's exaggeration. But the point really is that there was so much dependent on the results that were produced on both sides of the Atlantic and in the Pacific and Indian Ocean and everywhere else that the war was being fought, that was not appreciated by those that were actually running the war until, perhaps, sometime afterwards—or only by a very small percentage. That, in spite of all this, that it was obvious if you were on the inside and (B% didn't) know what was going on, that the outcome of the war in all areas would have been different had there not been the type of cryptologic effort that was (1-2G). ((TR NOTE: Audio fades here.)) This was very obvious. (B% John), yeah?

Marlow?: A quick question. Ah, at this very early stage of cooperation through the British and the Americans, did you at that time start exchanging people for training purposes?

Currier: Right away! Not for train...Well, not for training, no. We exchanged liaison officers and technical liaison officers right away within months—and Brigadier Tiltman came over as one of the first visitors. I've forgotten who was...Was (B% Wadsworth) the first liaison officer with the Navy? I guess he was, wasn't he? Waddy?

Tiltman: Waddy, yes.

Currier: Yeah.

Tiltman: (B% Was your...)

Currier: And in the course of the war, there were many visits, and there were liaison officers attached to both sides; and large working parties, actually, at Bletchley—U.S. So that...Yeah, that was the beginning of the...an active technical exchange, yeah. And it's continued ever since.

Filby?: Yes. Isn't, ah...Wasn't Mr. Levinson in a group that...

Currier: Oh, yeah.

Filby?: They were at Bletchley...

Tiltman: There were about a hundred of them.

Filby?: (B% Bob)...?

Currier: Levinson, Oliver Kirby, and George (B% Lugane).

Tiltman: They worked...They worked right in the...

U/I Male: Bill Bundy (2-3G).

Tiltman: As part of the Enigma (2-3B).

Currier: Yeah.

Tiltman: Yes, some of them filtered into other jobs eventually. But they were a wonderful collection of people.

Currier: Joe Eachus, I guess.

Tiltman: Well, he...Yes, your naval people were really a separate category.

Currier: That's right, yeah.

Tiltman: And, ah...He was around (1-2G). ((Audience laughs.)) You didn't have so many then.

Currier: No, no, (B% we didn't.) ((He pauses.)) Yes?

U/I Female: How did the cooperation go between the French and the English in comparison with (4-5G)?

Tiltman: Do you want to forego your lunch? I can tell you more about this ((laughter heard)). I'll tell you another time. I've got a long story about the French. I think I will say one thing, though. We...A lot of...There have been times since the war when people have been very critical of French security and one thing or another. But I was in French GHQ in "La Ferté-sous-Jouarre" about the 15th of May, 1940 after the Germans were well into France. And we had a small party there under a major of mine, Jeffrey (B% Evans). And I had a conversation with my sort of opposite number on the French—Major (B% Beltrand). And he said to me, "We would like to keep your party, but we realize we can't. We're finished here." They realized that. France was going to capitulate altogether even as early as that. And he said, "You'd better...We'd better get them out for you as soon as we can." And then, he said, "I want to give you..." I all had to do this through an interpreter because my French is school French, and he didn't have any at all. "I want to assure you of one thing. None of

your secrets will get into enemy hands," and they never did. But there must have been something like a hundred French officers who knew virtually everything we were doing. They had introduced us to the solution of the Enigma. So we, ah...they had to have that. Some of them were in occupied France. Beltrand, himself, I believe, was under Gestapo arrest at one time during the war. And to the best of my knowledge, the Germans never got the slightest information about (B% what had occurred). This, I like to say, in defense of the French. But the rest of the story is rather a long one. I don't think we'll do it now. (2-3G)...

Filby: Brigadier Tiltman has...had planned this...(B% part of this) (2-3G). But this morning's just not long enough (XG). Now, we will schedule another talk for him and...Then we can get to go (1-2G) when he is free to come and talk to us at another time. And I'm sure you can get all of this information and some other things (XG) as well—(2-3G) and he's ready to answer questions on a lot of things. And I know (XG). Thank you very, very much.

Marlow?: Very much.

Filby: I think maybe we better let everybody out. I expect there are 1 o'clock classes and (3-4G) things to meet.

Currier: (B% Really?) It's lunch!

Filby: And there is lunch. ((Audience laughs and applauds. Miscellaneous chatting heard in background.))

//////////////////////////////////////End of transcript//////////////////////////////////////