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Oral History Interview

NSA-OH-14-83

CAMPAIGNE, Howard, Dr.

29 June 83

Annapolis, MD

By: Robert D. Farley (glp)

Intro: Today is 28 June 1983. Our interviewee, Dr. Howard Campaigne. Dr. Campaigne, a mathematician and cryptographer, served during WW II at OP-20-G and for a short tour at Bletchley Park. Following World War II, he joined the Navy Security Group, AFSA and NSA, in the R&D element as a mathematician researcher. Dr. Campaigne is a retired Navy Captain in the Navy Security Group Reserve. He served the bulk of his career in the Research and Development elements of NSG, AFSA and NSA. Dr. Campaigne will discuss his military and civilian careers. Interview is taking place in Annapolis, Maryland, the residence of Bill Blankenship. Interviewer, Bob Farley. Captain Campaigne desires that the classification of these tapes be Secret Handle Via Comint Channels Only.

Farley: Well, we might as well start. What I'd like to do, Cap, is just to thank you first of all for giving me this time. I apologize for not meeting you in New Mexico,

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but that's the breaks of the game. What I'd like to do, if you don't mind, is run through your career and we'll spend as much time on that as you think is necessary. Then pick up the R&D.....

Campaigne: By career, you mean cryptographic? The cryptologic part of it?

Farley: Your Navy career. Right.

Campaigne: Yeah, well, ...

Farley: Let's pick up the early days, teenager days, and then your college days, and your Navy.

Campaigne: Well, when Pearl Harbor came along, December 7th, 1941, I was teaching at the University of Minnesota; teaching mathematics. And I had already taken an interest in cryptographic things. I had tried to devise a mechanical crypt system, one that would computer-like, encipher and decipher, and I had devised what I thought was a system. And I had entered in some written communications. I think I first wrote to the Army saying I had this thing and offering them for their use. And I believe they wrote back to me and said that on these matters, the Army and Navy were coordinated and would I please communicate with the Navy. So I wrote to the Navy, which turns out I got an answer back from Commander Safford, who at that time was OP--? I don't know if they called it OP-20-G or

not, but it turned into OP-20-G later if it wasn't. And Safford essentially said, "Well, they didn't need any more crypt systems, but they did need somebody who had some ability as an analyst, and would I be interested in taking their crypt course?" They had a correspondence course that trained people in cryptanalysis. And I said, "Yes, I was." And they sent this along and I finished their course and then enrolled in the second course and was in the midst of that when things began to heat up and looked like we'd get into the war. And they wrote me and asked me if I would be interested in having a Reserve commission.

Farley: Is this in the mid-30s, Cap?

Campaigne: No, this was about 19..? This was in '41 is when I got this communication about the offer of a commission. And I acceeded to that and made the applications and I eventually got my commission and it was dated 5 December 1941. So two days later the balloon went up and we were in the war. And sometime in the next week or two I got orders to report to Washington. And I was able to complete the quarter at the University of Minnesota in December and the Christmas break happened and I took my oath and reported to Washington. So I got to Washington on 5 January of '42. I reported in to the Main Navy down on Constitution Avenue, on Monday,

the 5th of January and they said, "Come back at midnight." So they put me on the mid watch right off. And they were doing that to nearly everybody who reported in. You know, all sorts of people with all sorts of backgrounds were reporting in hourly down there. We had quite a time on that mid watch. most of us couldn't stay awake because we'd been traveling and were not accustomed to that. I was assigned to Commander Ford, who was a Reservist back on active duty, permanent active duty. He was working on the J...what did they call it? The JN-20 the Jap Navy 20 which was a code, enciphered code. A good bit of the book was known and some of the additives were known and there were some people on that watch shift who were very skillful and could recover twenty or thirty groups a day. While a beginner like me, who knew nothing about it, was lucky to get three groups in a watch.

Farley: Did they require any additional training before they set you down at the desk, or not?

Campaigne: Well, they didn't. No, they just put us right to work. On-the-job training. But, in fact, they subsequently reassigned people according to their skills and things. And since on paper I was well qualified for certain activities, you know, having a PhD in mathematics.

Farley: Oh you had that before?

Campaigne: Oh yeah, I got that in 1938.

Farley: Oh great.

Campaigne: Yeah.

Farley: They should have offered you a Commander's commission!

Campaigne: No, they didn't. The Navy paid no attention to academic qualifications. They just looked at your age. If you're old enough to be a JG, you were a JG. If you're old enough to be a lieutenant, you're a lieutenant. So, yeah, they were doing that sort of thing. Now, Bill Ray, Dr. Ray. He reported down there sometime in the next month or two and the fact that he had a Ph.D. was entirely ignored. They looked at his record. They said he has a college degree, therefore he's qualified to be a P1. And a P1 he was. Subsequently, of course, they modified that after a few months and they made more reasonable arrangements. And if he hadn't been patriotic, he never would have come for a P1. It was an incredibly frugal arrangement.

Farley: So wrong.

Campaigne: Yeah, well, they... let's see. Howard Engstrom was there and he had been asked by Wenger to form a research group. And I was, on paper, qualified for that and they assigned me within a few weeks to that. They took me off the code recovery, in which I was not very effective. There were some people that were really very good. You know, they could just run rings

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around me in recovering these additives. Well, they had months of experience and I had only a few hours. So there was a reorganization of OP-20 then at that time and which kind of went over my head because I didn't know too much about it. They took Safford, instead of being OP-20-G, Safford was changed to OP-20-S was it, or something like that. He went into preparing cryptography completely, and the cryptanalytic work was taken over by Jack Redman, no Joe Redman I guess it was. Commander Redman. For a while they put me on communications. I was running messages around. I used to have to go to Wenger and Redman frequently for releases of the messages we did. For a month or two I did some of that. As Engstrom's group got going, we begin to spend more time on [redacted] which looked like it would be used by a lot of people and was very important. It was a good one for us to work on because there were mathematical things you could see about it. We also started looking at the Enigma, which was already very important because the German submarines were using the Naval Enigma. At that time, we were not able to read any of it. But we were making some analyses of the cipher traffic and trying to do things. Somebody, probably Friedman, somehow or other made some contact with the British and we begin to cooperate with the British. There was a group that went

over to visit England, not including me but some of my colleages went over there, and then came back. And there was a group of the British came over and they were able to tell us a great deal about the Naval Enigma and we begin to exchange keys so that we were able to read some of the traffic, and thereby learn a great deal about it.

Farley: Right. Sir, could you give me some feedback, if you recall, on the trip of Sinkov and Currier and the other people? Did they feed back anything to you people after their return?

Campaigne: Yes. Not to me directly, but to Enstrom. Let's see. They brought back some information concerning the Bombes, and the way they worked. There was a critical fact which we didn't appreciate for a long time which had to do with the diagonal board, which is worth a factor of 26 in the effectiveness of the Bombe. And we couldn't see how the Bombes would be effective because we overlooked something. The fact depends on the plugging that the Germans used on their machine was reciprocal. That is, if A went to Z, then Z would go to A. And that made the diagonal board a feasible thing. And we didn't understand that. These people went over there, including Pres Currier knew about it, but apparently were unable to communicate it to us when they came back. We were still in the dark for a quite a long time after they got back.

Farley: They didn't want to, or they didn't understand?

Campaigne: No. They probably didn't understand how important it was. Possibly. And they had been, of course, cautioned and recautioned about spreading any of this information around, so they were a little coy about giving this information and talking of it. But eventually we came to an understanding of it. And we had deep respect for the British for perceiving how useful that was. We just didn't begin ....

Farley: Did Leo Rosen bring anything back of use?

Campaigne: Yes. Yes. Yes, he did. Although I myself didn't know much about because he was over in the next building or in Arlington Hall, when they moved Arlington Hall. So I didn't get to know Rosen until later. But both the Navy and the Army studied diligently methods of "may" bombing. And the Army went to the telephone department to get a relay-style Bombe which eventually got called "Madame X," that thing. And we did some studying. We had some people from MIT come down and join the Navy and were there in uniform. These had been recommended by? Let's see now. I can't remember his name. The man at MIT who eventually became President's aide on research on these things. He subsequently became a Provost at MIT, after the war. And he had already devised a thing called the differential analyzer. (Ed note: He's talking about Vannevor Bush)

He had invented the differential analyzer. He also had been proposing and talking about a library machine. This was a thing to use microfilm and search microfilm automatically. The "library machine" he called it and they had built a copy of an analytic device and we, the Navy, took that device or a copy of it and modified it some and used it for analytic purposes. [redacted] and things like that and it was able to do that. And a young man who had worked out at it up there came down and joined the Navy, and one of these was John Howard, and another was Larry Steinhart. Both of them were great assets. And with them and some of the others, there were some people from IBM too, studied the bombe thing and thought they had another way of going about it besides the Madame and more like the Polish Bombe. And they devised a configuration and we approached the National Cash Register Company in Columbus, Ohio, is it? Dayton, Ohio. Dayton, Ohio. And subsequently gave them a contract to manufacture these things. And many of our officers went out there and the Bombes were operated there. So we had a Naval installation there for the purpose of doing Bombe runs. Subsequently, all the Bombes were brought to Washington and had a whole building full of them. They had eight

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hundred people in that group and I've forgotten how many Bombes. A fairly large number. At least, 25, maybe a hundred. And these were electro-mechanical things. The wiring of the wheels was in the wheel which rotated, but spun very fast. And I was, for a while, involved in devising cribs to run. We had to crib into the text in order to run one of these things. If we knew the plugging, a six or eight letter crib would be enough to find the beginning of the message and we primed the pump with that crib and then you can get out the whole thing, and having read one message you could read everything else on the day. In order to break in without knowing the plugging, we had a much more serious problem. And for a while, the British did practically all of that. In order to do this initial breakin device which was a problem that came up every other day. They used the plugging for two days. So every other day we had this initial break problem. In order to that we devised some other machines which were founded on the thing like the Bombe, but more flexible. Also a much slower device. It would take hours and hours to do that. And in that case we had to get cribs which were sort of 26 letters long. It would have to be a long phrase. Fortunately, the Germans had a weather report scheme which they would broadcast daily in their Enigma system and it started out this ??"Viskaya Wetter??" and date and that was

up to 26 letters. And so "Viskaya Wetter"(??) was a standard crib and we could often break in on that. Toward the end of the war, we got to competing with the British pretty successfully. It got to where we could do more than they because our resources were greater. They were always a little bit more ingenious than we are. They had a head start which we never quite overcame that way.

Farley: Sir, how was the cooperation, or what was the degree of cooperation between the US Army and the US Navy in that area of research?

Campaigne: It was very close. Now, we had an agreement as to split the work so that we wouldn't duplicate too much. And so, I didn't and most of us had very little interest in the things they were doing directly there. But in what they called "reseach," that is in cryptanalytic problems that that had not been broken, either side felt they had an idea they could try it. And we used to go over and visit, and they'd come visit us. And I tried to personally get over there at least every few weeks, once a month or something like that, and got to know some of the people who were working for Kullback. Kullback was the man in charge of that. There was a list of people who were working in that and who I knew pretty well. So at least in our group, the liaison was pretty good. Now, on the people who were working on the Jap-Navy codes, there were

probably very little because they just wouldn't be working on similar lines. There was a system called...was it JN-19?

Farley: Yes.

Campaigne: And I think we took alternate days. Arlington Hall did some days and we did other days.

Farley: Odds and evens, right.

Campaigne: Yeah, odd and even type of thing. But I didn't work with it so I wasn't real close to it. Arlington Hall had made a number of lash-ups which they used the IBM device as basic things and then they put some gadgetry they hung on to it. Now, let's see, the basic device was a tabulator, I guess. And so they had what they call applique units for the tabulator which would enable them to do a variety of things. These applique units were essentially plug boards with mechanisms in it so the plugging could be changed and things like that. I wasn't too close to that. One of these things they called the "Gee Whizzer" and I believe that worked on the JN-19. And that did some things that were very difficult to do otherwise. It was very productive. Of course, "Madame X" was a very large Enigma device. When I say it was large, it about the size of this house, and you know, a kind of a big mysterious thing. It worked relay speeds, relays clicking back and forth. The

advantage of it was that they could simulate a large number of Enigma machines. It would take one of these

It still wasn't as fast as the electro-mechanical devices we had.

Farley: You made improvements over the British Bombes, didn't you?

Campaigne: Yes. Mechanically, our Bombes were better and more reliable. Yeah, they'd done it first so we could see their mistakes. But yes, our Bombes were more reliable devices than theirs.

Farley: Sir, you mentioned National Cash Register and a contract. Was that the first contract levied by the Navy?

Campaigne: No.

Farley: With some commercial organization?

Campaigne: I don't think so.

Farley: Could you give me the history of contracting.

Campaigne: Well, I wouldn't know. Wenger was the man who was most active in that. Prior to the war, prior to 1940,

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Wenger had made trips around the east to the various scientific sites to inquire about what sort of help could be achieved. He had visited IBM, he had visited MIT, and probably others that I don't know of. At MIT, he had let a contract to MIT to make a variation on this library machine. And, although they didn't deliver that until after the war started, they had begun working on it two years earlier. He had also let some contracts with IBM to furnish us with some somewhat specialized tabulators. And I guess Arlington Hall probably let another contractor or wrote this contract or something because they had followed closely what was going on there and they had a lot of these IBM devices. Oh yes, and another place he had visited was Kodak in Rochester,New York, and he had given them a contract to make some comparators. Comparators were to look at and compare texts and look for repeats, and either long repeats or high coincidence rates, and Kodak subsequently delivered to us a number of devices. One of them used movie film, which you could code these things with light spots and dark spots and run them back past each other. And another used glass slides. The glass slides could hold about six hundred letters of text and the advantage of the glass was it wouldn't shrink. If you tried to do that with film, you'd find that one film had shrunk more than another and they would't fit well.

And then after the war began we were using those devices and we, the Navy, gave some more contracts to Kodak to make some more devices. An we ended up making a very flexible and highly effective thing called "Hypo." Hypo was based on an idea which arose during the war, so it only went back to the experience we had with the others. And Hypo could do a variety of things. It was a pretty flexible thing. Unfortunately, it had all this photographic processing associated with it which meant we had to have dark rooms and things like chemical laboratories. And we had to have specially trained people to do that, and so in a way it was quite expensive. And when we got into digital. After the war we abandoned that, that kind of stuff because digital computer-like things were much cheaper. So going back before the war, there had been these contracts with Kodak, with MIT, with IBM, with National Cash Register. And all those things turned out to be very valuable and it was to do things. When the war ended, you know, we had a TICOM investigation and we went into Germany and we found the documents we could and we found people we could and we interviewed those. And we found that the Germans were well aware of the way the Enigma could be broken, but they had concluded that it would take a whole building full of

equipment to do it. And that's what we had. A building full of equipment. Which they hadn't pictured as really feasible. In about 1944, the early part of 1944, the Germans came up with a new crypt system which they called Geheimschreiber. This was an on-line teletype encipherment device. And before it, they had two different enciphering devices which was used for high-level German command, OberX-commando type of things. The British made some progress on this and from our end over here, there was a considerable interest because it looked like the thing for the future, which it was. So several of us went over there to work with it and learn about it and I was the only one delegated from the Navy Department to go, but there were a couple other people from Arlington Hall who went over. Well, I guess there were four or five. Some of them only stayed a few months, and some of them stayed for longer. Al Small was over there for a short visit, six weeks maybe. Arthur Levinson was there permanently, which turned out to be two years, I think. And George Vergine was there. Those are the only ones I remember.

Farley: Was Dale Marston there?

Campaigne: No. I don't remember his being there at that time. They lived at Little Brickhill. There was quite a group there doing other things besides this. The Navy contingent was much smaller, but we had a liaison officer

who was Al Clifford at the time, but I was over there, not as liaison but as a working member on this Geheimschreiber thing, which we called "Fish" and the two versions of it were called Tunny and what was the other one? I don't remember. ((Ed note: "Sturgeon"))

Farley: I have Tunny and Fish. Colossus is something else.

Campaigne: Yeah well, Colossus was a device built for that. Let's see. To work on this Fish problem the British had devised a couple of things; a comparator, which I believe was called Heath Robinson; and then Colossus. Now Colossus was finished only month, a few months before I got there, and then they ran into a complication which scared the hell out of them. The Germans had been running keys for a month. They changed keys every month, and all of a sudden they changed every day. And the first British reaction was it was impossible. Yeah, right. Now let's see. I think the last paragraph here has something about the other system. No, I guess it doesn't

Farley: [redacted] It wasn't [redacted]

Campaigne: No, no. [redacted] was a Russian system. No. Yeah, this is out of the Journal. What was that other thing?

Farley: Arthur Levinson had talked about Tunny, but he didn't mention the second system.

Campaigne: It wasn't Stickleback ((Sturgeon)). No, that isn't right. Well, I'll think of it maybe later on. Anyway, Colossus was built for this Tunny system and they discovered by redoubling their efforts they found they were able to read

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this even though it did change every day. And, in fact, they got to where they were reading more than ever. They got very effective at it. Because of the change to a daily thing, they decided to build more of the Colossi and they decided to build twelve of them. So when I got over there, which was on the first of August 1944, they were expecting the second, the new Colssus momentarily. They didn't have it yet. It arrived shortly and I learned to use it and I was assigned to running the Colossus for a while. We could not only set messages, you see, we had to make a run for every message to find the key settings. Well, that isn't run quite right. It really wasn't a message. It was a transmission. What would happen here is that the German cryptographer would get on the circuit and they would synchronize the two ends of the circuits. And once they got in sychrony they'd keep running and then put message after message after message. And you might have a long transmission last two and a half hours which might have a hundred different messages in it. And once you're able to [redacted] you can read the whole thing. So you just got a basket full of stuff out all at once. And if you couldn't [redacted] then you didn't get anything. Besides that, we did what we called [redacted]

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[redacted] That was a much harder thing to do and we sometimes ran Colossus for thirty-six hours at a time on one day's traffic trying to recover these things. Not at all unusual to fail, not to succeed. And then oftentimes we did succeed, it would take a few hours to get [redacted] and then we'd take twenty minutes to forty minutes for each transmission setting it or giving up on it. Sometimes we'd give up on it. And we never read more than twenty percent of the traffic. We couldn't keep up with all of it. So rather than waste time on two-day-old traffic, we'd attack new traffic and try to keep up with things like that.

Farley: It was pretty high level German traffic?

Campaigne: Yes, it was high level German traffic, right. And we would often recover things of great importance, great strategic importance. It wasn't often we got tactical information out of it. But one of the things that happened was that Rommel was back from North Africa; they'd given up in Africa and he was there. He was given the assignment to visit the Western Wall and report on it. So in this system, he sent back to high command a whole series of reports on place after place along the thing. I think there were at least twelve of them. And invaluable stragetic information. And we sometimes got some tactical information. We'd find where

units were stationed and the order of battle information. Now, we cryptanalysts didn't read this stuff. Once we got something out, we sent it on to people who read German and prepared the summaries.

Farley: You got a feedback from them though, didn't you?

Campaigne: Occasionally, yeah. Mostly for cribbing purposes. "Need-to-know" was exercised to some extent. That is, they didn't tell us things they didn't think would be useful to us. And, in fact, we weren't terribly interested. A lot of it was pretty dull stuff.

Farley: Did you get a chance to get over to Bletchley Park?

Campaigne: I was there. I was there for a year.

Farley: Oh I see. I see.

Campaigne: I went there the first of August '44, then the war ended and I was on a TICOM trip for a month. Maybe it a little more than a month, about six weeks. Two TICOM trips actually. I made two trips over there. And then I got back home about the first of August '45.

Farley: Were the TICOM trips pretty successful in Germany?

Campaigne: Yes. Yes, they were. Let's see. The first trip I went over there I was ...we went to southern Germany. We went to Munich and then to Berchtesgaden, we sort of hold up at Berchtesgaden for several weeks and stayed there. And while we were there, we got word from one of the units that they had some people at ...? Where was it now? I'm sorry. I don't remember. But it had been a

German air field and they had ushered these Germans onto the field and built a fence around them. They had huts there. And we got a hold of six Germans who had been in a Russian listening post. They had been copying Russian traffic and they had a lot of it and they had a lot of things there. And they had buried all their equipment. Rosenheim was where they were. They had buried their equipment there and then had been kept as prisoners of war, and we got them out and found the equipment. So we had all these things. Also, while I was tending to that, some of the others had run down this Geheimschreiber thing which was kept in a series of buses. It was mobile. And they got that equipment and took it back to Bletchley. Arthur Levinson went back. He was with them on same trip. He went back with those vans.

Farley: Communication train I guess they called it.

Campaigne: Yes right. Yeah, it was several vans.

Farley: Mobile message center.

Campaigne: Right. It was a clumsy, big thing. And when they got it back there, they actually operated experimentally for a while, which caused some consternation because there was some German-style traffic suddenly appearing.

Farley: Do you have any idea what happened to all that equipment? Did it come back to the U.S.?

Campaigne: No. I think some of it came back to the U.S. I believe that they divided it up and gave some to us and the British kept some of it. But I don't know what happened to it in the end. I went back on the second trip and we found a lot of key books that was used for one-time pads. We had just got hundreds of them. And I don't think they were good for anything, but we shipped them all home. And then there was a train that came out of Berlin when they thought they were going to the Redoubt. They were going to go down to the Tyrol and set up a fortress-like thing. They had packed their crypt material and shipped it in the train. And we could trace that train down into southern Germany and then lost track of it. And we visited a place called Bad Schlersee. Schlersee's a lake and there was a tourist resort, a hotel-type town right on the edge called Bad Schlersee. And we visited all the public buildings to see if we thought they might have stored things in some of those buildings - hospital, and post office, and all those. No trace of it. No trace of anything. We'd done that in a couple of towns. We'd stopped and go through the public places looking for where they might have stowed it. But there were people there who said that on May the 1st or 2nd. --No, remember the surrender was on May 3rd, wasn't it? On May 1st or 2nd, there who was a train came into the town and parked on a siding on the far side of the lake, across the lake from town, and had stood there for a day or so. And

there were some soldiers around it and they thought that they had unloaded the stuff and threw it in the lake. Well, we did a littled searching. The lake's kind of deep and we couldn't do anything. But we recommended that it should be dragged. Well, while we were on our way home .....(interruption)

Farley: We were talking about going to villages and TICOM.

Campaigne: Yeah, I was talking about TICOM and the documents. What happened is that they were using Bad Schlersee for R&R for the Army vehicle. See, the war was now over a few weeks and they were going to relax. Some of the GIs were allowed to have a few days and one of them drowned. And so in dragging for his body they dragged up these boxes of documents, which had been so carefully packed that even even though they'd been under water for six weeks, they were still useable. And so they just got scads of material. And the last I heard they were still going through it. It was such voluminous things. All sorts of stuff.

Farley: Amazing.

Campaigne: Anyhow, there was a pretty good recovery there. I would say that that train, the communications train

and this Russian intercept experience that we recovered with those people and the documents they had and the material out of Bad Schlersee, that that clearly justified all the southern work. Now there some other teams in northern Germany and I never did find out what all they got, but they did get things.

Farley: Was it a combined British/American team?

Campaigne: Yes. Yes. Joint combined. In my team when we went over the second time I had a British solider, that is he was an Intelligence Corps officer, and I had a British Navy officer and six or eight enlisted men of various types.

Farley: You had quite a crew there.

Campaigne: Yeah. Yeah, we did. We carried a portable radio and we met a schedule. You know, every evening we had to stop early enough to meet that schedule, which was like four in the afternoon. And we had a British radioman with us and we'd set up an antenna and he'd get on the key and we'd communicate.

Farley: Was there a route set up that you'd hit various elements?

Campaigne: No.

Farley: Or was it spontaneous?

Campaigne: It was kind of spontaneous. We'd hit a unit and have our meals in quaters with them and talk with their G-2 as

to what we were looking for, which he usually didn't understand, and any hints he had. They gave us lots of hints and we investigated lots of things which generally didn't have much interest in the end. For example, we heard there was a research establishment up in the Tyrolean Mountains up on a lake way up there. We went up this road and way up high and there was a lake. There was an Army installation, a small one, and a guard, a U.S. guard at the door, and it was a research establishment. And so we went up to the guard and identified ourselves and said, "What went on here?" And he said, "Ah, them Krauts, they built all kinds of shit." He hadn't the slightest idea. Well, apparently, it had to do with sea planes, because they had been running experiments with pontoons. They had various shaped pontoons there and some towing equipment and they'd been trying to improve the efficiency of these, but nothing that was information directed or cryptanalytic. We visited at the headquarters of the various things. The Sixth Army. The Sixth Army Group and the Third Army Group. And we talked with the French Navy. The French Navy had a unit in there on Lake Constance and we spent three days with them, although I don't remember getting anything effective out of it.

Farley: Let me switch tapes please, sir.

Campaigne: Yeah sure.

TAPE 1 Side B

Campaigne: Do you want to keep this just to the wartime years or you want to go?

Farley: No. We want to go on afterwards. But I have some more questions about the wartime years.

Campaigne: All right, fine.

Farley: You mentioned IBM and how involved we were with the IBM.

Campaigne: Right.

Farley: Was there a great deal of cooperation between IBM and the military?

Campaigne: Yes there was.

Farley: In early days?

Campaigne: Yes there was. IBM, stemming from Mr. Watson I guess, was very cooperative and patriotic. They would do anything they could do, they would do it. And they would do it without pay if we didn't want to pay them. We made a great deal of use of their tabulators and that sort of equipment. Of course, lots of card equipment - sorters and all those things. And we had a lot of people devoting their time to running that thing. There were a number of IBM technical people of considerable quality who went into uniform and left IBM and joined us and Arlington Hall. There were a number of them. Russ Raleigh was one. He was in the Army. John Skinner was another and he was in a Navy uniform. I don't remember all of them, but there were a number of them.

Now some of those went back to IBM after the war. Russ Raleigh did, but John Skinner didn't. John Skinner stayed and became permanent Navy. Which surprised us because John seemed to have a real career in IBM. He seemed to be on his way, but he stayed in the Navy instead. So we had very good cooperation with them and they were generous.

Farley: Were the IBM people reluctant to have us modify their equipments? Or did they appreciate the engineering guidance given by the people working on the machines in the intelligence business?

Campaigne: Well, both. I think they were reluctant because they felt they knew a lot more than we did about such things and they hated to see us waste, although they were wrong about that. We had good ideas which worked. They didn't interfere with our doing that. I think we bought the equipment that we modified. I'm not sure of that. Of course their policy at the time was to rent everything. But I think those things we modified became our property. I'm vague on that. I made a trip one time to visit with with National Cash Register Company at a time when they were just getting into final phase of preparing the equipments that they sent to us, and IBM had their typewriter division up there in Rochester at the time.

They had an engineer who prepared or modified versions of typewriters for our use so that they would run mechanically from a computer-like thing. And Henry Folstroup(?) was his name. He was a civilian with IBM the whole time there. He was a menace because he was so flexible about the coding of the letters. People would ask him, "Can this coding be put in?" "Sure anything you want." And he could put it on typewriters and no two were alike. And consequently, they were incompatable one with another. He would have done better to to have stuck to some specific coding, but he was a nice guy. Easy to get along with him.

Farley: Can you recall any concepts that were developed by the military that eventually found their way into fabrication of some systems that IBM sold later on commercially?

Campaigne: No. I don't know of any. I think that there was. We had some kind of a plug board modification. That is we hung on the plug board some relay devices which could switch back and forth so that you could effectively get a whole series of plugboards and I think they maybe copied that later on. They didn't take our idea exactly, but IBM always reengineered everything they handled and they depended heavily on elaborate engineering. So they probably made it much more elaborate than we did. I think there was something like that. It may have been used in what they later called the calculating

punch. It was really their first computer. Typically they named it a punch. And that was a little bit before this 650. Six-fifty was kind of a modification of that when it came out. And this was like 1949 or several years after the war.

Farley: So you were never really involved in intelligence aspects? It was primarily R&D.

Campaigne: No. That's right. I was not. I was not, no.

Farley: So I can't ask you about the "winds messages" or others?

Campaigne: Well, to some extent, yeah. I know some of that. Now, the first year, in 1942, that I was there, I did some research or some analysis, preliminary analysis, on on Japanese systems. And much of it was old traffic. We would dig out old traffic for instance. And it was perfectly clear that in the week before December 7th, December 1st to 7, that something was happening because the externals were different. There was a new level of Top Secret. We didn't know what it was, but there was a new level of classification appearing on those in those two days. For anybody who had been observing, it was clear that the information was there and something was going to happen. I was a friend of Al Kramer, who was an intelligence officer, Navy intelligence officer, and who had been delegated to keep the White House informed. So he told

me about his visit on Saturday, December 6th, over to the White House. He and the President and somebody else he said, had been discussing this long message. They had gotten an alert message for the 12-part or the 14-part thing which came along during the next morning. That night and the next morning. They'd gotten that alert thing and there was a time mentioned in it. And Kramer said that he'd pointed out that time was daybreak at Hawaii, but that neither of the others paid much attention to that and let it go. But to somebody who was sufficiently alert, all the symptoms were there that something was going to happen. But the only clue that I ever heard of was that time. If you tied it to daybreak then that alerts you to Hawaii. And given that none of the people involved had ever been in any real war before, you can excuse them for not being as bright as they got later on.

Farley: Sir....Go ahead. I'm sorry.

Campaigne: That's all right. I was just going to say that my contacts with that were peripheral. Everything had happened before I got there. I knew Safford. I got to know Safford fairly well. But he never talked about those things, in a general conversation.

Farley: That leads me into the next question. Personalities. Do you want to expand on Safford and Kramer?

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Campaigne: Yeah, all right. Fine. Yeah. Kramer was an introverted type of person. He was a guy who'd spend hours studying something over, but when people were talking with him, he would kind of fail to express himself much. He'd keep quiet.

Farley:

Campaigne: Quite different from Safford. Who always took a stand with everybody on everything. Safford was almost belligerent in things. And the best way to get along with Safford, I found, was just not to try to make your point. Just let him think about it. And if you didn't keep him from taking a stand, he'd come around. He was real bright. And given a little relaxed thinking he'd come out with the right answer. But as long as you would argue with him, boy, he'd stick to whatever position he'd taken. He was nice, I liked him. He was an interesting character. We used to say about him, he was the only Captain in the Navy who called the Chief of Naval Operations by his first name.

Farley: A classmate probably?

Campaigne: Yeah, probably. He was close to being the most senior captain in the Navy. He had a declaration from World War I, which, in those days meant he got an automatic promotion on retirement. So he was what they called a "tombstone admiral". He would make admiral after retiring. The Congress changed that eventually. And I don't know whether he really made that or not. Maybe not.

Farley: I don't ever remember reading anything that he did make Admiral.

Campaigne: No, I don't either. But he did retire from the Navy and he got a job with MELPAR working, desiging equipment for them, sort of like he'd done for the Navy. And they were very happy to have him. They thought he was real good. And they made a whole list of patents while he was with MELPAR; twenty or thirty of them. And there was somebody recently was trying to exploit them. He had an ad in the paper saying, "Anybody who could help me with ...."

Farley: We had problems with that; him calling up and asking for a list of the Phoenix Society members.

Campaigne: Oh? Yeah, right. That's where he advertised.

Farley: Turned him down.

Campaigne: Well, I think that that was so much superseded by more recent developments that I doubt that there was any value in any of those patents.

Farley: "Long John" Lietwiler? Do you remember him?

Campaigne: I remember his name, yeah. I don't remember him very closely.

Farley: How about Aggie Driscoll?

Campaigne: Oh yeah. Well, Aggie Driscoll was a legend when I arrived and people talked about her and that quite a bit before I ever saw her. And you know, she had a very bad accident and was crippled, limped. She really looked like a witch. And she was very secretive. She didn't want to tell anybody anything she was doing. And I think she had developed a little bit of paranoia. For a long time she was a shining light for the Navy group back in 1930s and she was their main cryptanalyst. She had a good reputation. And most of the young officers who were assigned there were assigned to her for training; so she knew a lot of them. She knew a lot of them very well. And some of them had not stayed in the cryptanalytic business and had gone to the Regular Navy and had a lot of rank and important assignements. But she became fearful that she wouldn't be able to do things. And so there was a period there when she was

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given assignments which were very difficult assignments, and everybody else had given up on them. And they were given to her more or less to keep her busy. They figured they were hopeless anyhow and there wasn't anything bad she could do. And one of these was what they called the NAT, Japanese Naval Attache' Code. And they gave me that assignment. So she and I were working on that together -- independently, but together. And she found a pair of texts which were analogus.

And our theory of how the machine worked -- we did a lot of counting and that. We worked out a model of what we thought the machine did, how it worked, and we predicted that that sort of thing wouldn't happen from time to time. And we instituted a big IBM search for such things. We ran a lot of traffic, but we never found one as good as the one she'd found. And eventually, managed to break in on it on that very piece of text. It took us a long time. But before that happened, we had to take her off of it because she would secrete things. She would get ahold of what she thought was good and wouldn't let us see it and hide things. And they assigned her to me. As an officer, I fitted into the organization better. So I was her superior. And she wouldn't tell me what she was doing. I'd go in and talk to her and she'd give me nothing.

Farley: Double talk?

Campaigne: Yeah. She'd go round and round and not say anything. And I would sometimes look around her office to see how things were going. Every time she needed a piece of paper, she'd send somebody to get a pad of paper and she had desks full of paper pads which had nothing on. She was just greedy. And her sister worked with her. Her sister was very nice person. Can't remember her name right now. And she had another crony named Mrs. Talley, whom she said was the greatest freequency counter. And, you know, that's not very high level. And then she had some military assigned to her from time to time. And she got me in trouble one morning. We had to turn in muster list before nine o'clock and I had several different groups working for me at different places there around. So I put the finger on somebody in each group and they were supposed to tell my secretary that everybody was present or accounted for each morning. And Mrs. Driscoll, I think, had one chief petty officer there with her. Anyway, she reported as all present or accounted for and he called in from the sick bay fifteen minutes later saying the doctor was sending him home. He couldn't be in. And that went to the personnel office. Personnel officer was right on me. What did I mean reporting him accounted for when he wasn't there? And I didn't know. I had to go down and upbraid

Mrs. Driscoll who didn't take it seriously, I'm afraid. Well, we got out of that. Eventually they assigned her to Naval Attache' thing in order to get rid of her and then had to take her off that. They then assigned her to the Enigma problem and had to take her off.

Farley: How about Captain Engstrom? Was he a commander then?

Campaigne: Well, he was lieutenant commander when I came aboard. But he subsequently was the captain. Right. Well, I was assigned to him and I worked for him nearly all the time during all the wartime. And he was a very easy-going fellow who never took anything too deep to heart. He didn't worry about it. But he had a lot of ideas. He was very original. And he succeeded in organizing things very well. He'd get the best out of people by just letting them do what they knew how to do. And he never crowded

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anybody who was on the track of something. Many of his people ~~edple~~ were very effective. So I have great respect for his ability that way. Apparently, he mostly was intuitive. You know, you couldn't follow that he had logical arguments for doing what he did, but he did very well. Unfortunately, his health failed later on, about 1955, and that was too bad because he wasn't an old man.

Farley: Who was the chief of the machine operation at the Navy building?

Campaigne: By machine operation, you mean the IBM machines?

Farley: The machine support element, whatever that was.

Campaigne: Ralph Cook was part of the time.

Farley: That was another name I couldn't remember.

Campaigne: He was there during the early days. Now he got duty elsewhere in the Pacific, I guess, and wasn't there the whole time. But he's the one I remember. I don't remember who succeeded him. Bill Lawless was .....That was later. After we became AFSA, but Bill Lawless was a liaison man who attempted to get bright ideas going and so we saw a lot of him. But that was not wartime.

Farley: Are there any other names? I want to move to Station Hypo. People there like Ham Wright and Tommy Dyer and Rochefort and those. Before we go, are there any other people in

Washington that you recall who were personalities or eccentrics or people we should have on the record?

Campaigne: Well, I recall some of them. I don't remember their names too well.

Farley: Was "Tommy" Thomas there? Willis Thomas?

Campaigne: Yes. Yes, he was there. Right. On and off he would get assignments out in various places and then he'd be back and so I'd see him when he was back. I never worked closely with him. There was an officer there who was lieutenant commander when I was lieutant. Cross, John Cross, who subsequently was assigned to the State Department State Department if I remember right, and then he was eventually nominated as a commissioner on the Federal Communications Commission. And that's the last I heard of him there. He and Engstrom had desks together, one across from the other. So when I'd go to see Engstrom, I'd see Cross very often. There was an officer named Ralph Meeder. He was a reservist and he was assigned out of Dayton for the Bombe project. But as the Bombes finished up, he came back to Washington and was there. He was quite a politician. He would be "hail fellow well met" with everybody. The commanding officers and the warrant officers and everybody.

Farley: Is he still around the area?

Campaigne: No, no. He's dead.

Farley: He's dead, is he? I'm sorry.

Campaigne: I don't remember just when he died. But he went together with the ERA group at the end. As the war ended, Wenger felt that he was afraid that all this talent he had collected would be dissipated. And he came up with the idea of having them form an independent, private organization which would keep them together. And if the Navy would support them, the Navy would help them stay together and they'd be available there anytime an emergency arose. And they talked about this idea to a considerable extent and they organized what eventually they called the Engineering Research Associates. And Engstrom was one of the prime movers in that, a central figure. And Bill Norris was also a prime mover. He was quite energetic and pushing the idea. And Ralph Meeder was one with them and Larry Steinhart was another. And they got a lot of people. In fact, they signed me up. I was thinking of going back to the University of Minnesota where I still had a job, and they were going to locate it in St. Paul, and so I signed up to be a consultant with them. I was going to work part time with them. Then I changed my mind and stayed in Washington, so it fell through and I never did it. They set up business in St. Paul and for a long time, almost the only business they had was with the Navy. And Wenger was satisfied with that arrangement, but other people in the Navy looked at it askance because

you know, it looked like Wenger was just feeding his favorites and they didn't like it. So somebody came along and said it's time that ERA found some other business. So ERA went looking for other business. And it wasn't long before the Navy part of it fell off, relative number. And when it got down below forty percent, the Navy began to have less influence with them. You know, they had other contracts and deadlines to meet and they had to put the Navy to one side. And so they weren't any longer avialable in the way they had been originally. They had a project contract, so that things could be added quickly as a task. Task this and task that. In late 1947 or 1948 when we let a task to them to build a computer. It was "Task 13." And 13 binary is "One, One, Oh, One" and that's what they named it when they made a commercial version of it. They called it the "Eleven Oh One." Yeah. I worked very closely with that. In fact, I designed the arithmetic unit, and the rest of it. We gave the logical design to them. And they copied it. I only remember one change. One serious change they made. And that is, they used the quotient register to feed for an input-output register. Which was really a mistake because it meant when you imput-output nothing else could be going on. You can't fault them for that. It was in the early days. Nobody thought about concurrent operations at the time, but two or three years later we were beginning to wish it hadn't been done that way.

And the next machine was not done that way.

Farley: Sir, you mentioned Redman, Jack Redman?

Campaigne: Right.

Farley: The two brothers? Would you care to comment on either or both?

Campaigne: Well uh, let's see. Joe Redman was made Chief of Naval Communications at the time when they got rid of the man who had been there before and whom they blamed for not having a good organization. I don't know what he did. I don't remember his name now. But it was well-known then. And he put his brother in, Jack, as Op-20-G. Of course, Safford was Op-20-S or something. So that the two, Safford and Redman, were running the place. Lieutenant Commander Wenger was assigned as Redman's deputy maybe, or alternate. They shared an office there and seemed like they were alter egos. If Redman wasn't there, why Wenger always had an answer to the question. Jack became Chief of Naval Operations later on, two years later. Something like that. To me, a much more junior officer, the Redmans looked like pretty good things. They could get facilities. They got resources for us. They were and always sympathetic and that. So, they looked

all right to me. I didn't see anything wrong with them.

Farley: I've heard people say one of them was quite abrasive and was a career-wrecker of many Naval officers later on. But again, you said you saw it from the point of view of a junior officer.

Campaigne: Yeah. I didn't see that happening. Joe went on to be a vice president of Western Union, was it? Or something like that, you know. And I think he was occasionally useful to us in later days. We could find out things from him and make contacts. So. He was always sympathetic to the Op-20-G crowd. And so it was subsequent Directors of Naval Communication didn't know much about it and sort of kept fingers off and seemed kind of cool. I guess they thought it was unmanageable in a group.

Farley: In retrospect, do you think it was proper decision for the intelligence organization of the Navy to be subordinate to ONC rather than ONI?

Campaigne: Oh I couldn't tell. I don't know. No, I couldn't say.

Farley: That's an interesting controversy.

Campaigne: Yeah. No, I really don't know.

Farley: I was just curious. Let's talk about people in FRUPAC or Station Hypo. Tommy Dyer for instance.

Campaigne: Yeah, Right. I got to know Tommy only at the end of the war when he came back to Washington. I was never

out at FRUPAC until after the war was over. And of course, he's a personable fellow and is a lot of fun to be with and I got to know him fairly well. In fact, I wrote a little letter to the editor of this thing called "Cryptologia" just a few months ago. And when it was published Tommy wrote me a note and I got his address out of him that way. Yeah.

Farley: Ham Wright?

Campaigne: Well, I saw Ham Wright around. I never actually worked with him at all. We'd go to lunch sometimes, that, and there was some bridge players who played with him a lot, but I didn't play bridge, and he didn't play poker with our group. So I didn't really get to know him very well. He was one of Mrs. Driscoll's favorites. He had worked with her earlier before the war and she knew him.

Farley: Jasper Holmes. Were you...?

Campaigne: No, I don't know him.

Farley: Associated with him? How about Joe Rochefort?

Campaigne: No. I didn't know him. I knew his name because I heard it a lot. And I didn't even realize that some people didn't think much of him. He came back there after the war and was only there a short time and was gone. And so I didn't get to know him.

Farley: Red Luckenbach?

Campaigne: Yeah, Red Luckenbach I knew pretty well. He worked

with IBM equipment. He was part of the machine support group there, and then of course, subsequently went back to IBM and was a representative; used to come and visit NSA pretty frequently. So, at least I knew him to talk with in the hall. I didn't work with him very much. I guess I had discussions with him about technical organization, analysis of problems and that.

Farley: Other personalities, like E. S. L. Goodwin, Sid Goodwin.

Campaigne. Oh yeah. I got to know Sid Goodwin very well because he was a private flyer and we belonged to a flying together. And he was a good thing for the club and I got together with him a lot, quite a lot.

Farley: Does he still fly?

Campaigne: Well I wouldn't know. I haven't seen him for twenty years. I don't know. I still fly, but don't know about him.

Farley: I interviewed him in February at Pebble Beach in California.

Campaigne: Yes, you told me.

Farley: Fine fellow. Fine fellow. He was a little reluctant to talk at first, but later on he warmed up.

Campaigne: Yeah, well, he never was a great talker. I think he's a profound thinker. He thinks a lot of things, you know.

Farley: One thing surprised me about him he said he wanted to forget the past.

Campaigne: Oh really?

Farley: That's past. That's gone.

Campaigne: He just wanted to live in the present.

Farley: Right.

Campaigne: Huh. Well.

Farley: Sir, are there any other personalities we should talk about?

Campaigne: Well, Harper, I got to know pretty well. Later, after war, we had a group go over to England. I went with them and Harper the senior officer on that trip, so we knew him. His wife had just died then. But Harper was well thought of by many people. They thought he was a real sound character. Apparently, up the line in the Navy they didn't think so because he didn't get promoted, but he had just about every assignment around there from time to time. He was the Comptroller and the Adjutant and the Chief of the station and so on.

Farley: You didn't get a chance to visit Corregidor or any of those places before the war?

Campaigne: No. No. No, I visited Clarke Field out there after the war. I forget. It must have been 1963 maybe or 1964. That's the only time I was out there.

Farley: Shall we wind down World War II and then move into the subsequent area. I don't know just how this fits in, but in an article you wrote you discussed the Navy attack on [redacted] Should we discuss that?

Campaigne: All right. Fine. When the war was over, -- now let's

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see. Maybe the war wasn't over yet. Yeah I think it was. I think what happened is that as I understood it, President Roosevelt had said that we were not at war with Russia and we wouldn't study their codes. But there were people down the line who thought that was very unwise.

[redacted] So, I voiced my suspicions of that. As soon as that happened I told Rowlett that I thought, and he agreed, he thought that was a correct analysis. And I don't know who else looked into it any further or how or whether it was looked into.

Farley: What a shame. What a shame that that happened.

Campaigne: Yeah. Yeah, it sure was. In fact, it was sort of incredible. It was credible enough that we might have been penetrated but that it should be up the line and not count among us was kind of a surprise to me. It was perfectly clear. [redacted]

Farley: How early in the war did the Navy have..... Well, let me ask it again. Did the Navy have an effort against Soviet communications during World War II?

Campaigne: Yeah. Yeah, but it was extremely modest. We did a little intercept. We had great difficulty covering up for our intercept stations. And practically all we had was a few samples of traffic. But we had looked at those samples and we identified a couple of channels. Things like that. So. But when we uncovered these Germans there at Rosenheim, we got quite a lot of back traffic. They had some and they

those samples and we had identified a couple of channels. Things like that. So. But when we uncovered these Germans there at Rosenheim, we got quite a lot of back traffic. They had some and they knew how to read some of it. So then they told us what they knew. So that was a big step up right there.

Farley: Great.

Campaigne: Now what they argued was they were experienced intercept people on Russian and why couldn't we put them to work doing that?

Farley: Too bad we couldn't.

Campaigne: Well, we could have really, but we weren't willing to.

Farley: Did they eventually end up with Gehlen and his crowd?

Campaigne: I don't know. We didn't send them to Gehlen. We turned them loose. Gehlen might have recruited some of those people. I don't know.

Farley: Sir, you may or may not want to answer this one, but do you know whether the Navy had any effort against any of our Allies communications -- and you can call it communications security if you like?

Campaigne. Yeah, we did. We had some against the French. We monitored some of their things and watched it but we didn't put a lot of effort on it. But there was some against the French. Let's see. There was some against the Italians. The Italians were really fragmented. Part of the occupied part and when they broke loose at the end

there were some in the southern part of the country who were relatively independent. I guess the Italian effort really was just right at the end of the war. I never worked with any of those traffics, and Frank Raven would know a lot more about it than I. Oh yeah, he's a personality I dealt with a lot during the whole war.

Farley: I was going to ask about him later, but that's fine. Did we have an effort against the British?

Campaigne: Well, we looked a little at some of their things. It really wasn't an intelligence effort. It was more a cryptographic monitoring. There was an incident, so I heard. I didn't deal with it but with the Atlantic traffic, the convoy traffic. That is, the British were using an enciphered code for the convoy thing and we were convinced that the Germans were reading it. And we told them that and it was hard to persuade them that it was true. I think it was superseded by the combined cipher machine at the end, which Safford had cooked up. But there was a time there when we were really worried about that. I think we did some monitoring to see if we could prove our point, which we couldn't.

Farley: Do you have any comments on the ECM? Anything that you'd like to talk about?

Campaigne: Yeah well. Of course, I ran an ECM for six weeks or something.

or something. I was in the communications there. A tremendous clunker. I remember one time in England during the later part of the war, I walked down a quiet lane at night and all of a sudden I could hear one of those things going. You could recognize it.

Farley: You had to be very deliberate in poking those keys or you'd jump the rotors.

Campaigne: Yeah, that's right. But it was a pretty rugged piece of equipment. It was much too heavy and used too much electricity. It was perfectly clear that starting at that moment we could've learned much better, but the development cycle was such that nobody dared to start something then. We also got ahold of the British machine. What was it they called it? I don't remember. ((Ed note: "Typex"??)) But it was an Enigma with double wiring in the wheels, so it was not reciprocal. And of Course, we took it apart and examined it with great interest. We didn't do any extensive analysis on it. We did some. About the time when they were working on combined cipher machine, we did do some analysis of the British cipher machine without telling them. Looking for weaknesses and we didn't uncover anything. It was a pretty secure device really.

Farley: Right. Sir let me switch tapes.

TAPE II SIDE A

Farley: Sir, let's sort of wrap up the World War II, but before ...uh oh. That's not on. All right. That's better. The light was blinking and I thought she was "kaput." Let's, as I say, talk about the end of the war. You were primarly associated with the European War during your military career?

Campaigne: Yes. Yes. That's right.

Farley: When did you see signs that things were going badly for the Germans; and how soon before VE Day?

Campaigne: Sort of Thanksgiving in 1944. I mean, it was pretty clear that they were retreating as fast as they could. And you know, it couldn't continue that way very long. I made a bet with Harry Hensley as to when the war would end. I bet that it would go past the first of January and he bet that it wouldn't. And then he welched on it. He never paid me. So it was clear enough then that it couldn't continue an awful long time then after that. When I started off on the TICOM trip before VE Day. We went to Paris and spent a couple days in Paris getting prepared for it and then we proceeded into Germany, and on VE Day we were traveling. We learned that the war was over by a car full of what looked like GIs, but it turns out they're Frenchmen -- and this Frenchman yells, "Boom, Boom. Fini. Boom, Boom. Fini." We figured he meant we were finished. We were going the wrong way. You know, we were

getting into trouble. And then it got dark and we came into a town there where we were going to join the units for the evening and guns were going off. We thought there was a battle going off. We thought there was a battle going on there. Of course, they were celebrating by fire, but we didn't know that. Yeah, well, then I spent a month there. And then I went back to England and cleaned up a few things like that Tunny thing. I got it ready and shipped it back. And then went back to the States and took a month's leave. And when I was on leave VJ Day happened. And so I came back to my office there in Navy Communications Annex to a disrupted thing. People were getting out left and right saying good-bye, leaving as fast as they could. And I decided it was too late in the year to go back to Minnesota, so I decided to stay on a year. And they were attempting to keep as many people there as were willing to stay so as not to dissipate all their know-how. And so I stayed on.

Farley: Excuse me. Did anybody prepare a history of Tunny? Or were any of the Navy individuals assigned or delegated to a history project?

Campaigne: No. I wrote this "Cryptanalysis of Tunny," I guess is the title, which was not really a history. It's just technical description of the thing. And it turned out to be useful because someone,

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[redacted] as listed there. They're not accurate. At the time I didn't think it mattered and I didn't make them precise.

Farley: Did the people at Nebraska Avenue or the Annex, did they encourage people to stay on active duty, or were they recommending that a lot of them leave?

Campaigne: Yes. No, they were letting people go who wanted to go, but they tried to keep a force around. Well, Wenger was apprehensive about dissipating too fast. So he encouraged some people to stay around. There were even some people who left and came back. Not very many, but a couple. I can think of two of them I think. Now by the following year, it'd settled down somewhat. And they had tried to reorganize for permanance activity, and by the following spring they had made a new organization and offered me the job as the Chief of Mathematical Research. And so I transferred the first of July in 1946. The first of August, I guess it was. The 28th of July maybe. I resigned from the Navy Reserve and took a civil service job. But I still continued doing pretty much the thing I was doing before. And we shifted to a longer-range view and started

looking for improved ways of doing things. And it was was in response to that goal that we sent Jim Pendergrass off to this school at University of Pennsylvania which was run during the summer. And when Jim came back and described what he learned, we said, "Gee. That's what we need. That has the flexibility that we've been looking for." So we started studies on that and that turned into that "Task 13" at ERA and eventually became the ATLAS computer and has been growing ever since.

Farley: Pendergrass worked for you then?

Campaigne: Yeah, he was assigned to me.

Farley: Was he an engineer?

Campaigne: He was a mathematician, I think.

Farley: The question is, how come he was selected to attend that course? Somebody wanted me to ask you that precise question.

Campaigne: Yeah. Yeah. Well, he had proper background and we had evaluated him as a man who could absorb something at such a course and be useful. And he happened to be available. So we gave him that assignment. And that turned out to be a really good decision. It was Engstrom who said we should send somebody. He gave me the job of finding somebody and I picked Pendergrass. And Pendergrass was willing to go. He wasn't too reluctant.

His wife didn't like it, I guess, but it wasn't too bad. He was up there eight weeks and he came home every weekend, or nearly every weekend.

Farley: So the last days of OP-20-G, the phase out of the targeting ...

Campaigne: And the beginning of AFSA.

Farley: The targeting, the intelligence targets. Was everything dropped or did they continue to have some effort against any systems that might have been still in use?

Campaigne: Well, we enlarged on our Russian effort, which was still a deep secret as it was undercover sort of thing. We, in my group, I think [redacted] And my group didn't really have the responsibility because it was somebody over in Raven's organization which had responsibility. But we were probably to turn quicker to it than they were, and we did quite a lot. And [redacted] worked for me and he did that [redacted] thing, and he also did something on the others. I don't remember what the system was like, but I remember working one weekend and struggling with [redacted] but it took me a long time to catch on to that. And then as we got better developed, we gave it up and Raven's people took it over because it was becoming more an operational sort of thing. And eventually, the prohibition against working on Russian was relaxed and

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we could be a little more open about it. Only slightly more because we were afraid of what they might find out. There was a colorful character there in the Marine Guard who was a Russian. He had been in the White Army. He'd been an officer I believe in the White Army. And when he came to this country he joined the Marines and was eventually assigned there. And he was a warrant officer. Believe he was a permanent warrant officer. See, he had fairly elevated rank for an enlisted man. And there was a Russian night club called the "Balalaika" in town and he used to go down there every weekend. You'd find him there anytime.

Farley: Yes. Connecticut Avenue and K Street.

Campaigne: Yeah. And I guess they were all Russian refugees in this thing and they probably as they got older they dissipated I suppose. I don't know.

Farley: So in mid or late 1946 the primary emphasis had shifted from analysis to research. Is that true?

Campaigne: Yeah. I think that's right. Yeah.

Farley: Research in the machine area?

Campaigne: Certainly my emphasis because while I was given the assignment of doing mathematical research, which was generally cryptologic, although we did turn our attention to look at some mathematics which might be useful. We looked at the -- what are they called now? Permanance.

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[redacted] And we did a lot of study of that and so that was a pretty big program with us. Then we got started on this computer thing through the Pendergrass trip. And we put a lot of effort on that for the next four years. By the time the computer got there we were already...let's see..it arrived in December ...the last week in December in 1951, the ATLAS did. Now, we were still AFSA but AFSA was just about to give way to NSA. Yeah. Right. So the computer was the biggest item in there, but we were doing these mathematical studies on [redacted] Permanance, things like that. And then we were doing a lot of cryptanalytic work. As my people would go over and work with Raven's people on the problems they had, looking for things that were new style. And we did quite a lot of statistical analysis, too. We tried to work up statistical tools for the cryptanalyst to use. So although we were working shoulder to shoulder with them, often we had a different goal than they did. They wanted to read the traffic. We wanted to develop techniques.

Farley: I see. I see. In '46, '47, was there talk of the possibility of the establishment of an integrated intelligence overall agency as supervisory agency that eventually became AFSA?

Campaigne: Well, there was a lot of discussion, of course, about the Unified Military Act of 1947. You know, that was just being formed. So there was lots of talk. People at my level was just talk because nobody listened, but there was different concepts pushed around. One of the fears of the cryptologic people was that if the intelligence thing was separate, then collateral information and cribs and things wouldn't be fed back wo readily. So we kind of felt that we needed a close contact there for that reason. I don't know whether that ever carried any weight or not, but was such a feeling.

Farley: Did you know Admiral Stone then?

Campaigne: Well yes, sure. He was the commanding officer there. At the time AFSA was formed, he was the guy in charge there. But I didn't know him intimately.

Farley: Were you transferred to AFSA from the Navy?

Campaigne: Yes.

Farley: When AFSA was established then, you moved over with Sid Goodwin and some of the other people?

Campaigne: That's right. That's right.

And we merged various parts of Arlington Hall with it so that Charlie Rupp and Bill Erskine and that came into my organization from that. And for a while we had an office over there and an office at NSA and I had to run back and forth. Eventually, we all moved. Did we ever straighten that out? I don't remember now. But I certainly was surprised recently to visit Arlington Hall and find B Building still there the same as before. I thought sure it was going to burn down.

Farley: And to walk on those floors, you feel like you're going to go through.

Campaigne: Yeah. Yeah.

Farley: It's ridiculous. Ridiculous. How many new projects were undertaken with the establishment of AFSA in your field?

Campaigne: Yeah. Well.

Farley: Was there a mass of new ideas?

Campaigne: Well, we tried to. Yeah. We tried to get a fresh start and we organized the things. We merged these two programs, the one from Arlington Hall, and then fitted them to a program. We did have some new things. And one of the hardest parts of merging was to reorganize our contract program because Arlington Hall had done their Arlington Hall had done their contracting differently than we did and we spent a lot of time working up our contracting procedures and program.

Farley: All right. I don't know how to take this now, Cap, whether we should run through a series of projects, or just let you talk about what happened chronologically, or what would be easier for you?

Campaigne: Well, the easiest thing would be for me to talk about those projects I remember.

Farley: All right. Harvest, is that in sequence? I don't want to get it out of sequence if we can.

Campaigne: Well, the Harvest proposal--there were a series of proposals that came up in that. There was one called "Nomad" and Nomad was a flop. We never got anything much out of it. But Nomad was a way to treat data very much like cards treated it, electronically, but something like cards. That's where the Nomad comes in. There's no address systems in Nomad. And we let a contract--now, this was AFSA--we let a contract to Raytheon, I think it was Raytheon. Up in Boston, to do this and we had a bad experience with them. Their proposal was very imaginative. It really sounded good. The minute we signed the contract everything changed. They no longer were imaginative. They were picayune about changes. Anything that we mentioned was a change in the contract, change in scope, change in price. I suppose that's what

they did, they took the imaginative man off and put him on something else and they put some other person on it.

Farley: Some clown.

Campaigne: Well, yeah. He was a fiscal type in there. We even retracted on something. We said, "Well, you know, this thing is getting too big. We'll dispense with it we'll do without." They said, "Fine. That's a change in scope. The price goes up." I don't know why we let them get away with that. We should have said, "No, it's going to stay in and the price will stay the same." But eventually, we got so disgusted with it we cancelled the whole thing. We told them to deliver what they had and let it go at that. So. But there were other ideas of which the Harvest was part of. We called it "Plantation" to begin with. It turned out that "Plantation" was a word the White House had taken for their use. The word "plantation" was going to be a key word in the scramble for safety. And when they heard us using "plantation", they sent the word and, we had change it. And to change to "farm" or something. But the idea originated with the people in Arlington Hall, and that was to have a modular computer set up in which you'd have things which resembled barns and stables and that and the plantation, a center or central thing. And out of that, and joined on that in the end, when IBM proposed the "Stretch" advice, our people said, "Well. You could

put a escalator thing on that and we'd really have a wonderful device." And so they called it "Harvest" as part of this plantation group of things. We had a lot of things on our "Stretch" machine more than anybody else did. At one time the name Harvest covered the whole thing and another time Harvest covered just the special tape device. But the special tape device turned out to be a very good thing, very useful. And very imaginative. And one man pointed out this, that suppose that instead of using electronic tapes, you used old tried and true punch cards. The cabinets to house that many cards would cost more than the tape device. And yet they couldn't sell it. It just was more capacity than anybody needed. IBM regarded it as a bad experience because the Stretch as a whole they lost money on. They made eighteen of them, did they? Sixteen or eighteen. And they spent so much money on it that, it was not a success. And since then, they've been very careful about getting into big computers. They just let Seymor-Cray build them and they don't have a really big computer in their stable now. After the ideas of Harvest were started, we in research tried to think for other things; and one of the suggestions came up was that we ought to have a big program. We ought to attack like the Manhattan project. We ought to really go after

it. And so we dreamed up this project "Lightning". And we went outside the cryptologic community for sources claiming that it was really in the national interest; it it wasn't just cryptologic. And it went down. Final approval was by President Eisenhower himself. We gave him a briefing and asked if they could do that. And we ((shown an article authored by interviewee)) yeah, right. Okay, well. "Lightning," I guess it's described in there, better than I can describe it now, but it was very influential. There was subsequently after the Lightning proposal was over, after we'd spent three or four years at it, they had an international conference in Europe about high-speed computation. And it turned out half of the program that they had over there had originated in our Lightning contracts. So. It had a great contribution. Now, in running that program, we had contracts out to IBM, to Remington Rand, to MIT, and I think there were five all together. I don't remember the other two. And we used to go around visit them regularly to see what they had and they'd give us a rundown on all their new ideas and what they were trying here, there and the other thing. And we ended up by having them build some prototype machines that could run. And they ran at much higher speeds. I was just reading about the 701. We did our first thinking about that while 701s were still..? The 701 had 34 micro-seconds to do multiplication.

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Farley: Did anybody in the early 50s foresee the need for such high-speed computations; or anticipate that it would go to exorbitant lengths?

Campaigne: No. No. It was clear to us that one way of getting high capacity was to go fast. And it was easy to do with the early things. We even let a contract along about 1948 to some company in California to make a special vacuum tube which would switch in three nano-seconds. And then they delivered this tube and it took us three weeks to measure those three nano-seconds. We didn't have any scopes or equipment that could measure that sort of thing. We had to go to jury rigs of various kinds in order to measure. Now, of course nowadays, there are scopes that will do that. There's been a lot of development along those lines. We probably should have encouraged more of that under Lightning. We did some development of laboratory equipment to work with such high speeds. But anyway it was clear that the electrons could go

a lot faster than they were going and that was an easy way to get high capacity. There were some counter arguments. People would come up and say, "Why strain it? Why not just have two or three devices or do it in parallel?" And my answer to that was "Well, we'll do that too." And of course, it turns out that the high speed has been achievable and cheap. We spent a lot of money then because we didn't know what we were doing, but since then the techniques have gotten so that the electronics is cheap. So the Lightning program was a little bit similar to the new program I've just been reading about in the paper where Admiral Inman is president of a company that'll do reaearch. It's a little similar. I think that they're close to the limits on speed. I don't think they can speed it up an awful lot more. There are physical limits.

Farley: I see.

Campaigne: But speed's probably not what they're looking for. They're probably looking for how to do software. That's the expensive thing now. The software developments were facinating because didn't have a concept of software. We thought of everybody programming in machine language. We didn't realize how hard that would be because we didn't picture any really complex programs. And I remember Joe Eachus first telling me about a software

thing. Well, we were trying to write routines that could be reused. You know, write an output routine which you'd use and we never could do it. They'd never fit. They'd always had to be redone. And Joe said, "They don't write a routine. They write a program that writes a routine." And that's the key idea, see, in software. And that's a very important development and it's still going on. But programming is still expensive and I suspect they'll be doing a lot of thinking about programming systems. One of the other programs we did in those days was on radio propagation. We figured there was things to be known about the radio spectrum and the way its propogated around the world and we were going locate intercept stations, it's well to know which would be the best places. They were often surprises. Intercept stations were not effective when they thought they would be and vice-versa. The history of radio propogation is full of surprises. One of the surprises happened in 1901 when Marconi sent a signal across the Atlantic. Every scientist in the world was saying, "It won't work. It's going to go off tangentially and you'll never hear it." And then they did. And they had to find out about the ionosphere which they hadn't suspected before. There was a similar surprise in 1946 or '47. The Air Force had planned to go to ultra high frequencies for

air-to-ground communications. And they asked the Bureau of Standards, that had a propagation laboratory, to set up an experiment and measure the extent of interference. What would be the interference range? They were hoping that UHF would not interfere more than eighty miles. away. So the Bureau of Standards set up this experiment. They put a transmitter on Cheyenne Mountain and then they put a series of receivers out on the plain all the way out to eight hundred miles. They expected the first one, which was eighty miles, would receive it. Then one hundred and twenty miles might not get it all the time. Beyond that, they didn't think it would be heard at all. It was heard by all of them all the time. So they go back to the drawing board again and this time there was some conflicting theories. One was that the turbulence in the atmosphere absorbed these signals and reradiated them. And the other conjecture was that they were absorbed in the ionosphere by the electronic spots and reradiated. So they had to do experiments to find out which of those worked and they both worked. So there are now communications circuits based on a tropospheric scatter and on a ionospheric scatter. But it was a complete surprise. One of the things we worked at antipodal reception. When a radio station sends out waves the ionosphere keeps it in like a whispering gallery and it's concentrated at the antipodes,

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and we were able to demostrate such reception. Unfortunately, the earth is so clustered that the end of every diameter has got water in at least one half of the places. So there aren't very many places that are any good. But

Farley: So the state-of-the-art then, a lot of developments can be credited to NSA and your people?

Campaigne: Yes. That's right. That's right. Yes.

Farley: So that you did it first here.

Campaigne: Oh yeah. That's right. There were a number of things on that. And it's pretty well known in the industry that we'd been active in that.

Farley: Sir, let me ask a question bouncing back to Harvest. Why was there so much difficulty in getting Harvest finally functioning?

Campaigne: Well, one of the troubles was mechanical trouble with

that tape handler. Apparently, the thing could be distorted or jammed or something and they kept having mechanical problems with it. And it went on for a long time. They weren't such that they ruined it, but they were troublesome for a very long time.

Farley: I heard so many derogatory remarks early in the game about Harvest. It was a "white elephant."

Campaigne: Yeah. It was frustrating, I guess, to deal with. But it did a journeyman's job and it was there a long time. People got so they could get around its quirks, I guess.

Farley: It was a beginning, I guess.

Campaigne: Yeah, sure. Yeah. You never can expect any first effort to bear fruit.

Farley: Sir, there's some research I've read where you were involved in a project or an effort called "Blue Jay" and you prepared a memo with Frank Raven in which you mentioned that there were [redacted] in Blue Jay, and you also compared the [redacted] with Red and Blue Jay.

Campaigne: Yeah, well, Red was the Japanese. Red was the Japanese.

Farley: Does that go back to World War II? Okay.

Campaigne: Well, I don't know what Blue Jay is. I don't remember.

Farley: That was project Blue Jay and you had turned out an MR for that.

Campaigne: Yeah, right. No, I don't remember that. No. I don't know what it was.

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Farley: Okay. It doesn't matter.

Campaigne: [redacted]

Farley: Sir, before we continue on projects, could you, as of a certain date, year, describe the organization of R&D at a specific time. Who was in charge? The various organizations? And specifically, your responsibility.

Campaigne: Yeah. Okay. In 1947, there was OP-20-GM. M, I guess, stood for machines. And that was the research organization and Engstrom was the head of it. And it was divided into, I think, five branches of which one was mathematics, that was me, and one was radio propagation, and I think that was Mensal or else Mensal had left and his successor was in there, who might have been Bill Norris. I don't remember for sure. There was a section devoted to aids for the mechanical devices for the intercept station. And there was at one time there was a Commander White who was the head of that. He was probably a little later. I don't remember who was there then. There was a group on analytic machines and let's see. Who was the head of that? I must have been close to them, but I can't remember who was the head of it now. Have I named five?

Farley: I think so, yes.

Campaigne: Yeah. Okay. Does that describe it for you?

Farley: Yes. Fine.

Campaigne: So it was part of OP-20-G, and OP-20-G was part of Naval communications.

Farley: Well, I was going to say, should we skip AFSA and go into NSA or was there an engineering, an R&D organization, in AFSA that's worthy of note.

Campaigne: There was an R&D organization in AFSA, and I think that Kullback was the head of it. I was in the mathematics branch then, but they transferred me up and I became assistant to Kullback. I was Kullback's assistant for Research, and he appointed another assistant for Development. That was Joe Eachus. And Leibler came back. He'd been with us prior and he came to be the head of the matematics branch. Then, let's see. When we formed NSA, I guess it continued that way. It continued that way until I went off to the Army War College. And then when I came back, Engstrom had come in and taken the job as Assistant Director for Research and Development. And so I was in Engstrom's element again, and he put me in charge of the mathematics thing again. That's when we started the Project Lightning. And at that time, let's see, that's 1957. At that time, the organization wasn't too different. We had a mathematics group. It was an office. It was called an office. And it had graduated from a branch to an office. And then there was one for analytic equipment. Then there was one for a shop. That was Schierlmann. He was

responsible for construction. And there was one for the intercept stations still. We were called, I guess, R1, R2, R3 and so forth. There's one missing in there. Analytic equipments. Oh, there was a cryptographic one. That was Bruce Erikson for a while. Yes. That was the one we didn't have before. In the AFSA, when the cryptographic was a completly separate organization. Yes. Someplace in there they organized a research group for cryptographic equipments.

Farley: I see. Would that be to provide support to the cryptanalyst?

Campaigne: Cryptographers.

Farley: Cryptographers. Oh. Okay. The development of our own codes. I see. I see. This is a good time to ask this question. What determines what R&D will develop? Would it be the operational needs or the desires of the engineers? I know that's a peculiar question.

Campaigne: Well, it a compromise between the two which fluctuates from time to time. Certainly, when an engineer sees a technique which he thinks has possibilities, he looks for ways to apply it. I mean, that's what

happened with the computer. We saw an opportunity to apply it to cryptography and we were off after computers. But we had had in our minds for a long time that we needed some flexible analytic equipment. We had in the past, before that time, we had built a special device for every problem. And we'd gotten some very effective devices. But it always took a long time to build it. We had to formulate the problem and design the equipment, and get it constructed, and debugged, and all that had to take place when we ought to be operating. And we saw that we thought with the flexible computer you can put a program on and get going right away. Of course we didn't realize how hard programming was. We overlooked that completely. But we had a need which we'd known for a long time. We needed flexibility in our analytic equipment and here was an opportunity. We saw a chance and so we became computer specialists.

Farley: What sort of marching orders did you get from the Directors, either Admiral Stone or General Canine, later on insofar as go ahead on R&D as fast you can, and as far as you can? Did they give you any guidance at all?

Campaigne: They gave us encouragement. Yeah. And of course, in a way, that's guidance. We were always surprised. We had an idea which looked expensive and we'd go ahead and they'd

always be encouraging. Do it. That wasn't true in the late '60s. In the late '60s we weren't getting encouragements. We were being told the budget had to be cut. We had to do without. But during most of my career, we always had encouragement from above to do things. If you can see something to do, do it. We made some mistakes, but by and large, most of the things we attacked were at least partially successful.

Farley: What impact did DoD R&D, and I'm thinking of a Dr. Fubini and his predecessor and his successor. What influence did they have on your operations?

Campaigne: Well, they had some. Fubini used to come out there and he was always fun when he came. He was interested more in the intercept thing - intercept devices and that. He gave his attention to that more than anything else, and consequently, we didn't see too much of him. We described to him our propagation experiments and that, and he was encouraging, always interested in that. The other analytic devices, the computer line, he wasn't interested so much. He wasn't a computer man. He was a radio man.

Farley: Oh, I see. Let me ask this one to you. In retrospect, and during your tenure, what technological advances in fundamental engineering capabilities can NSA take credit for? Or did they help to achieve? (In its own laboratory or through contracting) Can you think of any?

Campaigne: Well, we did a lot with digital electronics. See, when we tried to make an analytic device, with vacuum tubes, the vacuum tubes had been designed to be good amplifiers and they weren't specifically good for an on-off signal. And I think a lot of things our people did with those - Eckles-Jordon circuits, and cathode ray followers and that sort of thing - would spread through the industry. I don't just how much of it we did, but the industry developed and we worked right along with them. We had the biggest collection of vacuum tube circuitry anyplace in the world there at one time. And we knew more about the life of vacuum tubes and the kinds of vacuum tubes that were used and how they should be maintained, than just about anybody else.

Farley: Let me switch please sir.

TAPE II SIDE B

How about solid-state, the field of solid-state?

Campaigne: Right. Well, one of the things we did was to have the first solid-state computer built. We gave a contract to Philco, who had some solid-state devices, transistors. And we asked them to construct a computer using solid-state electronics. Now, what they did was to substitute the transistor on a fundamental level, that is they'd

take out a vacuum tube circuit and put in a transistor circuit, which did the same thing. Rather than using the characteristics of the transistor to design the whole computer. But you can't fault them for that because it was new. New. So the first solid-state computer was built by them for us. Now, let's see now. There was was another solid-state computer built for us using magnetic cores, not transistors, but magnetic cores. So technically, that's solid state too. That was the one we called "Bogart." We had a couple of copies of Bogart and that was a good reliable machine, but it was magnetic circuits, not transistor circuits. Those two things came along about the same time. They were contemporary. And then of course, later on, the industry just took off in that same direction.

Farley: Electron microscope, you were involved in that one too, weren't you?

Campaigne: Yeah, we had a project where we used an electron microscope backwards to construct little electronic devices. That was at Stanford Research Institute. And let's see, I'm trying to remember the name of the man who did it, but I guess I can't recall it. Shadower? No. I can't recall it. He was very ingenious. And essentially they're doing that same sort of thing now in mass. They're making these very large integrated circuits along the lines that he was working on then.

Now I don't know to what extent his things influenced them, or whether it was independent. I couldn't tell for sure, but he was doing that before they were.

Farley: Sir, is there any way to compare the technological advances in our NSA laboratory as compared with those that were eventually passed to contractors? Who did more? Can we say?

Campaigne: Well, of course, our contracting program was large compared with our own laboratory program. And so I think that the contractors did more. But we were able to to give them guidance in many respects. We had some good people. We had some good equipment.

Farley: I'm going to save that one until later. That's a good one. You were involved in a speech research project I remember when we were in the reserves together and you took us around.

Campaigne: Yes. Right. Yeah.

Farley: Could you discuss in detail that one? That's a very interesting project.

Campaigne: Yeah, well, it's still going on. Since a lot of things we listen to are spoken words, we would like to have automated reception of that. Not only the reception, but the analysis, search for repeated and for new words and things like that. The subject is extremely

tricky. It turns out to be real easy to make a demonstration of such a thing, but it's darned hard to make a useful functioning quantity thing. IBM produced a thing they called a "shoebox" because it was in a box like shoebox - which could recognize five or six words. And you could hook a little toy train to it and say, "stop," "go" and it would go back and forth to that. But when you tell it, well now what we want is an automatic recognizer for the word "Mayday" in text which is not necessarily separated into words very clearly. Continuous text and that. Well, it turns out that that's a horse with a completely different color. So we set up some projects in different laboratories to do speech recognition. That was the principal thing. And in order to do the speech recognition we also did some things in speech generating. There was a laboratory in New York City with a man named Cooper who was quite advanced on that sort of thing. It turned out that the speech research thing caused us a lot of trouble in our budget process because when you start talking to a congressman about speech, he thinks he knows more about it than anybody. And he couldn't picture what we meant by speech. He was thinking of public addresses; and they'd make wise-cracks. I don't know whether they ever understand. It's a good thing the program wasn't terribly big or we

would've had a real problem. Now there's been a lot of progress. Gradually, they've gotten to the point that where you can do speech recognition. Part of the difficulty is having is to adjust to the speaker. There's There's still remains things to be done about that. When you listen to somebody talk, say with a radio, the first few words you can't distinguish, but you get his tone and the way he forms phonemes and that and within a second or two you're hooked on. You can understand him. We don't know how to have a machine to do that yet. There are speech recognition devices which work very well with a given speaker, but they don't work well with other speakers. And of course, what would be desirable is to have them understand any speaker, no matter what. [redacted]

Farley: Uh huh. This one is out of sequence again, Cap, I'm sorry. On Harvest again, did you have difficulties with IBM and how were these problems resolved?

Campaigne: Oh yeah. We did have difficulties with IBM. Budgeting problems. It was always getting more expensive than it should have been and than we had agreed to and I guess

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we went around refinancing it two or three times. We had a fuss with them about programming language for it. Joe Blum invented a language and we had them implement it. We had some sort of a program to prepare an operating system for Harvest. And we went round and round with them on the technical details on that. It seemed like some of them had fixed ideas about hos to do things and we didn't always agree with it, but we eventually worked something out. Let's see, what did he call that language? I don't remember now. Language B? Language A? That doesn't sound right. But [redacted] would know. He.....

Farley: We've talked to him, but I don't remember. Sam Snyder sat in on that interview. Did you work closely with Sam, also?

Campaigne: Yeah. Yeah. When we first started a computer project, Arlington Hall started one of them. We were independent then, and AFSA had not yet been formed. And we worked together pretty well. We went in different directions to achieve a computer, but we compared notes and discussed things all the time. And Sam was one of the central figures there. Bill May was another one.

Farley: Dumey? Arnold Dumey, was he...?

Campaigne: Yeah. I think Arnold left before these were completed, but yes, he was involved. But on technical detail it was more Snyder, and let's see now. On mechanical things who was it? This ...gee, I can't think of his name. He's

the guy who retired only just recently. And he was president of the Phoenix Society just before he retired I believe.

Farley: Oh boy.

Campaigne: I saw him a year or two ago. I talked with him.

Farley: Is he in this area, or did he go to California?

Campaigne: I don't know what he did. I think he's still in the area. Yeah. I think he's still in the area. Oh, I can't think of him. But we worked real close together. And of course, Abner was what they were building and we were building "Atlas."

Farley: What was the name of yours?

Campaigne: Atlas.

Farley: Atlas, okay.

Campaigne: It got to be called that before it arrived.

Farley: You remember the sequence, the first up to the most recent, of the computers? You talked about Abner

Campaigne: Oh. Yeah, all right. Well, the first one that we planned was Atlas, which we had built for us by ERA. But then we built a relay version, the same kind which we called Abel, A-B-E-L. And the relays were too slow to get any useful work out of it. But it did help people train for programming and it helped some of the engineers find out just what sort of thing it would do. We gave Abel to the logistics research project at George Washington University and they

subsequently gave it to the Albert Einstein High School. So it lasted a long, long time. Before Atlas was available, before it was delivered, we began to plan a second machine. By this time there was some new memory devices coming along. Williams tube was coming along, and so we planned what we called Atlas II. It was a completely different machine. It had different size words and everything else. We gave that to ERA as a project also. Then the 701 came along. IBM made them available and we we bought some of those. And I guess the 704. Then we got this Bogart computer. Then we began to buy some others. We bought a Burroughs computer and began to get them in large quanties. When the 704 came in we bought a number of those.

Farley: Security problems, communication security problems, were they considered at all in those days?

Campaigne: Oh yeah.

Farley: Tempest and this type thing?

Campaigne: Yes. Yes. We worked with a group, Maylon Doyle. He was the theorist in this crytographic department in R&D. And we attempted to have ideas from time to time. But, in fact, there was a time when we designed what we thought was going to be a highly successful cryptographic machine. It didn't turn out. It wasn't adopted, but we did some thinking along those lines. I think it petered out toward the end. We quit. The development cycle got longer and longer and the ideas that were being used were pretty fertile over there. They didn't really need any successes from us. And we did less and less on that.

Farley: I don't know if this is a fair question, Cap, or not. What is the precentage in the R&D from concept to fruition, for instance? You plan so many that fail and you plan many more that are successful. What is the average?

Campaigne: Well theoretically, what the research and development people are doing is just trying things out. They're doing experiments. And so you'd expect them to have a lot of failures and a few successes. Historically, as a matter of fact, they have many more successes than they should have. And the reason is they're so damned cautious. See, they're more cautious than we were. At least more cautious than we should have been. We

should've been doing but we didn't undertake to try something unless we had a pretty good idea that it would work. And most often it did work.

Farley: Why is that? Government money rather than corporation's money?

Campaigne: Well.

Farley: Does that enter into it?

Campaigne: I don't know. I don't know. I guess it's because the researchers like to look good. They don't like to have a failure, even though they're there just to experiment. They like to succeed. But, in fact, somebody who was administering a research and development activity ought to say, "You know, you guys are too damn cautious. Get out there and do some experimenting."

Farley: That's what I was just going to ask. Wouldn't such concern inhibit people, engineering people, becoming a little more reckless and to reach a little farther?

Campaigne: Yeah. Yeah, well, it might. Yeah. There are personalities entering into that. When we were working with computers there was some people who the idea just thudded, you know. They just didn't see it or didn't buy it or didn't think it was attractive. And as soon as you had something working and could show it to them, then they caught on fire. So there are different forms of myopic

apparently. You know, a different thing. They don't see how it's possible. And one of the people who didn't, who never really had any enthusiasm for the computers until they began to do things, was Kullback. He didn't interfere with us. You know, he didn't try to stop us or anything like that, but he just had no personal enthusiasm for it at all. And later on he was willing to spend plenty of money on them. And there were a lot of people like that. The same thing goes with other things. You remember when the Wright brothers flew, there was such scepticism. Even if it could fly what good would it be? That sort of attitude.

Farley: Who needs it?

Campaigne: Yeah, who needs it? Yeah.

Farley: Sir, I have one question that somebody gave me. A contract was let in 1960 with the American System to prepare a handbook on cryptologic and statistical data. Contract was cancelled. And the prime representative was Reed Dawson.

Campaigne: Oh yeah.

Farley: Who resigned from IBM and eventually came to NSA. Do you remember that story?

Campaigne: No, he didn't resign from IBM. I know the American System thing. It was in California. And there were several people from our area who went there to the

American System. And you're asking me why the contract was cancelled?

Farley: Yes.

Campaigne: I think maybe Dawson didn't get around to working at it. It was stretching out. And they didn't need it any more. Other more profitable things for the company to do and so we just said, "Let's cancel it out."

Farley: Was the booklet ever published? Do you know?

Campaigne: No. I don't think so.

Farley: It dropped right there.

Campaigne: I don't think so. No. There were some things that might have been in it that were published. There was a guy at West Virginia University who had some material on binomial formulas and we got all that from him and I think we published it. And he subsequently published it himself. It's not classified. And I think that was intended to go along with Dawson's work on this. Dawson left out there and came back to the Agency. And since then he's retired. Yeah. But you're mistaken about him associating with IBM.

Farley: Oh, okay.

Campaigne: I think.

Farley: He was primarily American Systems?

Campaigne: Okay. He was with the Agency before American Systems.

Farley: Okay.

Campaigne: In fact, he was with the Agency twice before that, if I'm not wrong.

Farley: That clarifies it right there.

Campaigne: Yeah, he was a young Navy officer during the war, latter part of the war. And when he got out he went to Harvard and got his degree in statistics - mathematical statistics. And then I guess he came back to the Agency as a civilian employee. And then he left to go with this American Systems. And then he came back to the Agency again. So he's been there three times all together. Now he's retired and last I heard he was teaching in Hawaii. No, no. Since then he's left Hawaii. He's in San Jose I believe. In California.

Farley: Working for some cooperation out there?

Campaigne: He's teaching. No, he's teaching at the University I believe. Yeah. University of California at San Jose maybe. Something like that.

Farley: Sir, how do we stand chronologically now on the projects? Have we covered most of them up to the '60s?

Campaigne: Yeah, yeah. I think so. Those that stand out in my mind. Yeah, well, in the '60s, the atmosphere began to change. One of the things that happened in '57 to '59 is that we gave some money to a joint program on satellites, program on satellite, I think. And somehow or other when this got down to the Pentagon, they said what in the hell is NSA doing with satellites? And they wouldn't leave it alone,

so we cancelled out after a while. We dropped it. But you know, nowadays they're doing some work which leads right along that line. Because there's electronic intercept and satellites and we were right on track. It was a good thing to do, but somehow or other they wouldn't buy that. I suppose they were fighting budgets for NASA and arguing that NASA had so much money that nobody else neede any.

Farley: I wonder why the change of heart?

Campaigne: Well, I don't know. We were running project Lightning at the time. There wasn't any difficulty with money that way. And then subsequently, there got to be more and more of that. We were jeered at for a speech research and then somehow or other the budget process got tighter and tighter as each went along. During the Lightning program, my budget had been as high as $9 million a year. And when I left in '69, that was my last full fiscal year, our budget was $3 million. It had been cut to a third.

Farley: Cut that much?

Campaigne: Yeah. And we had been pretty much cut down cut down in the contract work. All the contracts were much smaller than they had been. So when I became eligible to retire, I figured, well gee. No point in staying around here to cut budgets. So I went out.

Farley: Would you remember in part of the R&D period, what was the prime difficulty or problem, in accomplishing your mission?

Campaigne: We had brains, ideas. Ideas is always a prime difficulty.

Farley: A dearth of ideas or too many ideas?

Campaigne: No, no. Death. A death of ideas. You know lots of things work out very nicely when you can't see how to can't see how to work them out at all to begin with. For instance on those early computers we built, you know, they were incredible things. Every unit with a vacuum tube was as big as a light bulb. And we didn't know how to get around that, except to have more lightbulbs. And then you get a lot of lightbulbs together you have to have air conditioning to cool them off. And so, we were having fifteen tons of air conditioning per machine. And nowadays you can get a that you can hold in your lap and it'll do a lot more than those would.

Farley: Excuse me sir.

Campaigne: I was going to say it wouldn't spread the heat that way either.

Farley: How early and how deeply were you involved in transistors? Was that during World War II?

Campaigne: No. No, it was later.

Farley: But subsequent to that.

Campaigne: About 1957 at Bell Labs announced that they had a component. Well, we didn't do anything along those lines. We visited Bell Labs. We had a good relationship with Bell Labs. We

used to visit from time to time and they would show us some of the things they were doing, but they didn't say when we were visiting, they didn't say they had a component that they were about ready to announce. They just announced it. And then of course, the scientific community was very dubious. They say, "Well, it doesn't work. It reallly doesn't work." And then all of a sudden they shifted and say, "We knew it all the time. You know, people had cat's whiskers back in 1910. What's new about that?" We tried to use transistors in our laboratories a lot. And of course, we did what everybody did. We tried to substitute transisitors for a vacuum tube, and that's not a good way of doing it. And they didn't work well. The voltages were too high for them. They're not suited to it. And shorts and things would happen. When we began to design circuits which were built around transistors, and not built on our knowledge of vacuum tubes, why we began to get lower voltages and more accurate and more reliable functioning. But that took a while. It took a couple years to get that sort of thing going. And then it was a while after that before integrated circuits came along. You began to put the transistors together in hundreds, instead of just one at a time.

Farley: Is there any limit to miniaturization?

Campaigne: Well, we're not close to the limit. There is a limit, yes, but it's...we're not real close to it. So it can go smaller still.

Farley: Amazing. Amazing.

Campaigne: The limit has to do, of course, with the size of the molecules that the electrons jump around in. You have to have at least a few molecules in each component.

Farley: Right. Sir, when was REMP established, Research, Engineering, Math and Physics?

Campaigne: Yeah. In 1957, Engstrom was reorganizing the R&D thing. He became Assistant Director and as Assistant Director he reorganized it. And he created that thing. Before that, we had had a branch for mathematics and we had a branch engineering and a branch for physics. He put them all in one unit, one office. So that was 1957.

Farley: And you were the chief of the mathematics element?

Campaigne: Yeah, I was the first chief of REMP. And that was just before we moved out to Fort Meade. We had a little meeting at Christmas-time. I don't know whether you heard about it. I was in the area and they found out about it so the old REMP organization got together. It is now called R5(?). And everybody was there except Roger. Everybody who'd been head of it was there, except [redacted] who wasn't.

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Farley: Oh yeah?

Campaigne: But I had been head of it for 13 years, and the succeeding 12 years it'd been occupied by five different people, I think.

Farley: My gosh.

Campaigne: The current one is [redacted] I don't remember them in order, but [redacted] and Leibler were two others. And I guess Ned Newberg. They don't keep me informed on who's running it so I don't know what doing.

Farley: Sir, I don't want to put you on the spot, but this one is in line here. Since you were in charge for 13 years - again this is an unfair question - what do you feel is the most outstanding accomplishment during your tenure as chief of REMP? And again, there may be fourteen dozen. But better still, some, let's say some, and that way you can pick and choose.

Campaign: I would claim credit for the unit up in Princeton. The idea for that arose in my REMP organization and, of course, it was a political football. A lot of people got got in the act. But when it was formed, they called it FOCUS after they got up there, Leibler quits. Leibler was the guy who suggested it. He quit my organization and went with that. Did we sent him on loan at first? I think we sent him on loan, yeah. And then he quit. But he quit with the promise that he could come back if he wanted to, and he decided to come back once later on,

once later on, much later. That was a pretty productive thing. Now let's see. What would be second?

Farley: Was IDA at all?

Campaigne: Well, maybe Lightning, maybe Lightning would be the thing. Yeah, IDA is what I was just talking about.

Farley: Yes, that's IDA, right.

Campaigne: Yeah, and Lightning might also be another outstanding success.

Farley: You mentioned in one of your articles "Compact" - Improvement of Package of Radio Instruments ." Do you remember anything about that?

Campaigne: I don't remember much about it, no.

Farley: I'm sure there are so many of these that you involved in that it's impossible to keep them all in mind.

Campaigne: Yeah.

Farley: "Aristocrat" is another one. You call it an "intelligent test for computers."

Campaigne: Right. I don't think it looks so good now as it did then. [redacted] And it was a computer program and it demonstrated a number of things there. And we started to redo that, and we got this guy in from Stanford University, to participate. But his interest flagged and it didn't go any further. Can't think of his name now. Begins with "A". His last name begins with "A".

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Farley: Let me ask another one here. What is the future of R&D in the SIGINT field? Are there any limitations at all do you think? I know that's a broad question and very broad answer.

Campaigne: Well, yeah, it's awful hard to answer. I'm convinced there is a future in it. I'm convinced that you're always better off to know more about it. But which direction I would take, I don't know. You may know about these public key crypto systems that have been talked about in the literature. I'm inclined to think that there's some sort of a trap in that, and they're not as useable as the proponents think. One of the traps is that they are going to be invested in them in long-range things. See, one thing they offered to use it for is authentication. You can encipher an authentication and that would do for electronic funds transfer or that sort of thing. But somebody might find a way of breaking that twenty years later and he can show up with an authentication that he owns the Empire State Building or something. So I think that those things are interesting concepts, but I don't think they're practical concepts. There may be more things suggested along those lines by people who are not in the business. Things that would not be of practical use, but would still be interesting. Interesting developments.

Farley: It's certainly a challenge with the trend toward high-speed communications and machine encipherment to the nth degree.

Campaigne: Yes. Right. Right.

Farley: Sir, is there ever a chance that R&D will drive the Agency and the computer take-over of almost every phase of cryptanalysis and communications?

Campaigne: Well, I think it would be improper for the R&D to drive the Agency, but it's certainly possible that the things that R&D are developing now might be the mainstay of the business twenty years from now. That's certainly a possibility. But you know, if that happened, the R&D people would be long gone and it wouldn't be R&D any more.

Farley: Well, I don't know what the percentage of the budget is for R&D versus all other elements of the Agency, but I would guess it's quite high.

Campaigne: Well, I used to argue that it should be more than 5%. It ought to be up in the 7th and 8th percent is what I said. That was my opinion. And I think that if it's less than that, that the people are not using all their resources. It doesn't make good sense to be 25% or something unless there's something very special going. But certainly a significant part of it ought to be devoted to investigating new things.

Farley: Do you think the age of the cryptanalyst, the fellow with the pencil and the pad, is gone, long gone?

Campaigne: Well, I think maybe the pencil and pad are gone, but not the cryptanalyst. He uses more effective means now to try things.

Farley: Our problem is sometimes the computers go down at the most inopportune times.

Campaigne: Yeah.

Farley: Do you think that difficulty will ever be overcome?

Campaigne: Sure. Sure. There are a number of ways of attacking it. It's still there because nobody's really tried hard to stop it. But there's a lot known about how to make reliable machines out of unreliable components. And they can be done. It isn't even terribly expensive. So it can be done. NASA has been kind of a leader in that because they want these things to work unattended. But they've developed some things that we could use. Sure. We could do it. We could lick that. It would probably mean redesigning the computers. Have to start and it'd be a two or three year cycle before we could get something on it. But we can do it.

Farley: Are you involved at all in teaching anyplace?

Campaigne: Not now.

Farley: Or advising?

Campaigne: Last year I was. I was teaching computer science at Eastern New Mexico University. But I'm not this year. I'm doing some programming on microcomputers. And I teach a little flying once in a while.

Farley: Do you? My gosh.

Campaigne: I'm pretty much retired - thoroughly retired.

Farley: Can you push that out of your mind or do you always keep the little finger in? I'm sure you get all the magazines and all the papers.

Campaigne: Yeah sure. I keep that.

Farley: Attend some of the conferences?

Campaigne: Yeah. I can't afford to go to any of the real conferences anymore. Some of them have a $60 registration fee and that sort of thing.

Farley: That's ridiculous. That's ridiculous.

Campaigne: Long as they can get it in large numbers, and they can, I suppose I can't blame them. Well, one of the things they do is they have rather elaborate proceedings at many of these, and that's expensive. But those proceedings aren't worth what they cost, mostly.

Farley: Sir, why don't I switch this tape and we'll take a break.

TAPE 3 SIDE A

Farley: Before we get into some of these philosophical questions, I want to tell you that I went over to the dedication ceremonies of the On-the-Roof Gang at Nebraska Avenue and met a lot of people there. And a couple of Marine operators. And did you ever come across any of the intercept operators that you worked with?

Campaigne: Oh yes, a number of them. Pearly Phillips is one. He was with me in England when I was over there. Another one who was there was Milton Gash. And Milton said that when he was a radio operator in the fleet, that he came on duty one morning and the man he was relieving says Amelia Earhart's plane is calling and wants a position. So Milt said he got on and said send ""H's," send "H's"" or some such thing, but he never got an answer. And he thinks they were trying to find their position at the time. And he never heard anymore about it. Except from him, I never heard that story before.

Farley: Do you remember where he was when he heard that? Was he sailing in the Pacific someplace?

Campaigne: He was in the Pacific on board ship, but I don't know just where. He wasn't too far from Hawaii I think was where his ship was.

Farley: Because I had asked some Naval officer in previous interviews whether the Navy was ever tasked with following Amelia Earhart's plane; whether they were ever told where it would be, and when it would be, and to listen for any communication. And they said, no. They never had any instructions at all. So this is the first time I've ever heard this.

Campaigne: Yeah. Well, he wasn't tasked with it either. He just happened to be there when they thought they heard it.

Pearly Phillips and Gash and I went into the Officers' Club on Grosvenor Square one time in London. Now I was lieutenant commander and Pearly was an ensign and Gash was a JG. They had temporary appointments as officers at the time. And there were a couple of Air Corps officers there who asked if they could sit at our table, because if the place was crowded see, and they sat down and they said to Milton Gash, " How long you been in the Navy?" See, and he said, "Seventeen years." And they were completely taken aback. So they turned to Pearly Phillips with his single ensign and said, "How long you been in?" And he said, " Ah, not very long. eleven years." And so they never asked me. I was the shortest termer of the lot.

Farley: They were amazed that people could stay in the service that long, I guess.

Campaigne: Yeah right. They didn't know there was a service that long.

Farley: Wet behind the ears, huh?

Sir, let me wrap up some of these questions.

Campaigne: Yes, sure. Let's go.

Farley: Would you be so kind as to contrast the R&D of days gone by, that is immediate post World War II, to the days of your association with R&D in NSA as relates to the percentage of involvement with contractors?

Campaigne: Well, let's see. When we started after the war, we had virtually no contracting program. We built one up. We started with this contract with ERA. And we made up a few other contracts. And we were trying to build a contracting program. In the 1960s at NSA we had a big contracting program with a lot of inertia. We had contracts with people who'd gone for year after year. And there were budget cuts in the air and by and large we tried to take the budget cuts out of the contract program and not affect anybody who worked in the laboratory. So that our laboratory program was beginning to a bigger and bigger proportion of it; simply because we were cutting back the contracts. It is true sometimes when these things get up inertia it gets so it looks like it's going to go on forever. And it shouldn't, but the atmosphere was certainly different. In one case we were growing and in the other we were cutting back.

Farley: Okay. Good. How much brainstorming by NSA engineers is accomplished before tasking was passed to contractors?

Campaigne: A lot. A lot. You know, one really never knows where ideas come from. You may find a new way of doing something and you realize that it will accomplish what you should have been accomplishing for years, but you never realized it. You know, it didn't seem to be a requirement before. Because you didn't know it was possible. So the formulation of a problem, formulation

of a need, takes a while to do. But once you've got it properly formulated, usually a solution follows in fairly short order. Now, there are a lot of famous problems that aren't solved, like the three-body problem and that, and it's probably because the question isn't asked right. If you get the right question, the answers usually follow. The formulation of the needs and requirements is a very important aspect of the whole thing; and it's hard sometimes - someone will turn up with an urgent requirement. And you looked and you know he's been at it fifteen years and it wasn't urgent before. Why is it now? But somehow or other it's changed. So asking the questions in the right way is a big part of the whole problem.

Farley: Sir, were there occasions where the NSA engineers developed a complete prototype before passing it to a fabricator?

Campaigne: Yes. Yes. Yes. Yes, I think there were.....We generally called those things "brass boards" or "bread board" - bread board miles or brass board miles. A brass board is a little bit more advanced than a bread board. Yeah. Now, let's see. The ones I think of are mostly cryptographic devices, where the bread boards and the brass boards were made. Sometimes there'd be two or three of those before it'd be passed to a contractor.

Farley: Okay. Good. I don't know what this question means myself. The degree of phasing from concept to model - was there any particular time period devoted to each one or the only consideration was from beginning to end?

Campaigne: Well, uh, you really have to have a concept before you can even set up a project, don't you. So, somehow or other you have to have some ideas before you start anything at all. Now, sometimes we set up a program in which there's a thinking mode, and in Lightning we did that. We allowed eighteen months and each of these people was to think as wildly as they could and come up with a program. And of course, they tried real hard to think of things they could do. And then we devoted another eighteen months to proof the concept. As they would do things in the laboratory and do some bread boarding and that. And then we cancelled some of them out and we didn't continue with them, but the two best ones we finished up by having them construct a model. But you see, we had some ideas before we ever started that. We had an idea that going fast was a way to get capacity. And if we hadn't had that idea, we wouldn't have a program at all.

Farley: Were there many false starts where you started a project and then midway or a quarter of the way you would say "That's the wrong way."

Campaigne: Well, there really weren't many, but there were some.

Certainly. Nomad was one, where we went quite a ways before we quit. And I guess there were probably a lot of them we've forgotten now that died aborning and didn't carry it too far.

Farley: I was reading through some of your literature. Project Redman was another. Do you remember Project Redman?

Campaigne: I don't recall.

Farley: How about Project Tractor?

Campaigne: Tractor I remember. Yeah. That was part of that Plantation series. The name came out of that. In fact, Tractor got built. Tractor was the tape unit on Harvest. I don't whether they called it that very often.

Farley: I was trying to find where Tractor was. This is the article you did on "Research in NSA." Redman. It says, "Basic research on the project and talked about measuring out the first [redacted] The results of the program have been widely incorporated in ....

Campaigne: Oh yes, yes. That was one I mentioned to you. We had a special tube built, which - vacuum tube - which would react in [redacted] Right. I'd forgotten the name though.

Farley: I don't see how you can remember as much as you do - so many of those. In one of your articles you talked about an unbreakable cipher.

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Campaigne: Oh yeah.

Farley: Remember that?

Campaigne: Yeah.

Farley: Would you comment on that? I think that's a great article.

Campaigne: Well, uh, of course there is no such thing as an unbreakable cipher, and it irritates me when people talk about such things without realizing it's nonsense. And this particular thing that I referred to Liliwood's (?) off-hand statement that it would be easy to make one, which was silly. But the people keep thinking there might be a such a thing as an unbreakable cipher.

Farley: That's an unclassified copy if you want it. Do you keep these? Do you collect them?

Campaigne: No, I don't have a copy of this.

Farley: You may want to have it if you like.

Campaigne: Yeah, I'd like very much to keep it. We'll have to cut off the edge here. There's something labeled SECRET on the next following it.

Farley: Alright.

Campaigne: I'll slice that off.

Farley: Okay. Do you have a lot of papers - a lot of memoirs? Do you have a collection of files?

Campaigne: Oh I've got some things, yeah. I don't hardly ever look at them.

Farley: Anything you want to dedicate or any to give us for the archives or museum? If you do, if you ever think of it, just remember we'd be delighted to get anything

that you have.

Campaigne: I see. Yeah. Well, I wrote a letter to the editor of Cryptologia a few months ago about one-time tapes, one-time keys. Did you ever see that?

Farley: No sir.

Campaigne: Uh well. It doesn't say anything that isn't widely known.

Farley: Is it in the current issue? I can look it up.

Campaigne: No, it's not in the current issue. It's probably the one before that.

Farley: All right. I'll dig it up. Oh, a name pops up here now. Somebody said, "Who is Dudley Buck?"

Campaigne: Oh yeah. Yeah. It'd be nice to talk about Dudley Buck. Dudley Buck was a real young engineer with a tremendous amount of enthusiasm. And he got in the Navy and was assigned to NSA. Then he did his two years. I guess it was during the Korean thing. And he got out of the Navy and typically he asked Admiral Stone to take over his Boy Scout troup. The Admiral begged off. But he just bubbled over with enthusiasm. He was smart, but real enthusiastic. For instance, he said when we started this ABEL, I told you that he said, "We've got to start it. Would you like to see it?" I said, "Yeah sure." So he took me over to the lab and here was this bare frame. (laughing)

Farley: He started it anyway.

Campaigne: He had it. But he went to MIT and was working on his Ph.D. and he got pneumonia and died. And he'd invented an idea called which got the name "Cryotron." Cryotron was a thing, a substitute for a vacuum tube or a transistor whose on-off electronic device it worked in liquid helium at near-zero temperatures, near absolute zero temperature.

Farley: Huh. That's would be interesting, thank you, and I'll carry this information back to the person who was asking.

Campaigne: Here, I guess this is labeled CONFIDENTIAL up here, too. I wonder who wrote it. It refers to Jacobs, Walter Jacobs, [redacted] who was not around our place. Something on statistics.

Farley: That's part of references. Is it references?

Campaigne: Yeah. It's just some references.

Farley: No, that's no problem. No problem at all. You worked with Brigadier Tiltman for a while, didn't you?

Campaigne: Yes. Yes, I did. Uh huh.

Farley: Could you comment on his abilities, his talents?

Campaigne: Well, he apparently is a very successful cryptanalyst. He did some things, including breaking into that other Fish device, which was a real piece of acccomplishment. He also had administrative duties, in which he apparently carried off pretty well, there at Bletchley Park. And of course, he was a human being who was very pleasant

to deal with. He was very nice. What's he doing now?

Farley: He died last year.

Campaige: Oh he did die last year. I didn't think I knew that.

Farley: Maybe this year. Recently. He went out to Hawaii with his son or daughter, whoever was living there, and died.

Campaigne: I see. I didn't know that. Yeah. He must have been about ninety-five, wasn't he?

Farley: Close to it I guess. Yeah.

Campaigne: He told me some interesting anecdotes. One was about their attempts to get this real smart physicist at Cambridge. I can't think of his name now. But he's the guy who suggested something concerning the way atoms moved from energy state to energy state. Durock. P-A...P-A..P period, A period, M period Durock. And that they got him over there plus the part to interview him and he said he was impossible. He's just fuzzy-minded or anyway they didn't get him. They did get Turing, which turned out to be very fortunate. And I knew Turing. He was a smart man.

Farley: Was he an eccentric?

Campaigne: Well, yeah, in a way. He would be quiet and reserved. He was an introvert, I guess, so he didn't mind talking to himself. But he was also a great runner, jogger. His arms were just as hard, you know. He was

really an athlete. He did some odd things around there. One of the things is he came to Bletchley Park as a civilian. And the first thing they did to civilians was give them this home guard form. It was a questionnaire. It asked the name, address, age, you know, all the things they needed to know. And right in the middle of it there was a statement saying you're responsible to appear at home guard drills every week. Well, he didn't go. And so after about a month or two, somebody got onto him and got hold of him. He said, "Didn't you know you had to go to the home guard drills?" And he said, "No." And they said, "Well, you know now." And he said, "No. I said "'No.'" They got out this form and where he said you're responsible to go to drills he's written "No" beside it. This was a questionnaire. He was answering the question.

Farley: He thought that relieved him of the responsibility.

Campaigne: They made him go.

Farley: What a character.

Campaigne: Yeah well, Tiltman. Tiltman was a real gentleman. I was proud to have known him.

Farley: Are there any other English or any Brits you'd like to talk about too, during that year that you were there.

Campaigne: Well, there's was Alexander. Yeah. C.H. of D. Alexander who was quite a character. He was a very brilliant

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man. And I got to know him pretty well.

Farley: There was another name. It's an Italian name. I don't want to say Carlucci or Carlessi, ((Calvoressi)) who wrote TOP SECRET ULTRA -- very small.

Campaigne: Oh! The book. Published the book.

Farley: Yes.

Campaigne: Yeah. I don't think I've read that.

Farley: It's pretty much the treatment that's been done by other writers, but I guess he wanted to get in on the act, too.

Campaigne: Maybe I did read it. I remember discussing it with somebody. Yeah.

Farley: Why don't we talk about authors? You know there's a rash of books for the last fifteen years of exposes telling everything about intelligence. What are your thoughts on what harm, if any, these people have done to the intelligence profession?

Campaigne: Well, I don't know whether they've really harmed it or not. You can imagine that there might be some country like [redacted] who gets alerted by these, but on the other hand, I kind of doubt it. They're not alert and they don't catch on. So it's hard to say. It's hard to say. I remember reading something here. It isn't those that are worrisome. The ones that get me excited is Anderson, the newspaper reporter here

who occasionally just goes ahead and tells everything he learns without any regard to how it influences a foreign country. And there I think they do read the current newspapers and watch such things. So I think he does a lot more harm than any of these others.

Farley: Right. Have any of these authors ever contacted you to ask for an interview?

Campaigne: Brian Randall has, yeah. And he wanted to know about "Colossus." See, he's got a thesis that Colossus was the first computer and if he can just show that Britain was the leader in the computer field. That's what he'd like to show.

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Farley: I see.

Campaigne: And he asked us if we would let him use our names in connection with it. Well, I was willing to, but [redacted] and [redacted] were not, so I decided to do the same as they had. And I said, no he couldn't use it. Since then, he's gotten some more material, from Flowers, and Coombs and a third man. These are British engineers who worked on Colossus. They each wrote an account of what they did on the Colossus machine. Now this is highly technical. It doesn't say anything much but what the machine was to do. It just describes it. And of course, Randall, the editor, puts it forward as a computer. And they asked me to write an introduction to it. And I wrote one and I submitted it to the Agency who found a lot of

fault with it, but I revised the faults out of it. And it should appear in the Annals of the History of Computing, or is it Computers? Anyway, it should appear in sort of like the next issue. It comes out quarterly, and so in the next few months that should appear. Actually, I'm not sure people would be much interested in Flowers' and Coomb's account of the machine. Maybe they will. They make it clear that they did it in a very short schedule. They hadn't even put a housing on the Colossus. It just stood out there in a bare frame. The vacuum tubes and all I used to try to get warm by standing next to it.

Farley: Did you read the Puzzle Palace?

Campaigne: Yes I did.

Farley: What did you think of that?

Campaigne: Well, he doesn't have everything right. But by and large it's right. I thought he did a pretty good job of making an account of it.

Farley: There's supposed to be a paperback edition out with the prefaces from the Bletchley Park people commenting on that.

Campaigne: Oh really?

Farley: It's supposed to be out on the street within a month or so.

Campaigne: Is that right?

Farley: Did you read Ronald Lewin's book?

Campaigne: I don't know it, no.

Farley: The one on Bletchley Park and then later he did one on the Japanese.

Campaigne: I haven't read it. No. I haven't read it.

Farley: David Kahn never contacted you?

Campaigne: Yeah, I met David Kahn. I was up at Cornell and he was there and I met him. He didn't try to get any information out of me to use. I gave a talk up there and I mentioned something that's in his book, which I understood was wrong. It's a minor detail, but R.D. Parker, who used to live here and R.D. Parker used to work for Western Electric when they were on West Street and there was a young guy that worked for him. Parker was given the resonsibility to try to exploit the teletype machine, which had just been invented and they did things like transmitting pictures on the teletype and a lot of experiments. And this young guy who worked for him devised an enciphering procedure whereby he used two tape readers. They had developed tape punches. Two tape readers and added them together. And they invited the guy who was then in the Signal Corps. Showed him the enciphering materials anyhow. They invited him up there. All I can think of right now is Rochefort. Not Rochefort. Anyhow, he was appalled at the way Parker told it. He was appalled at the idea of having all the

key that would be required, see? You'd have to have one-time key. They didn't know, but the concept of key and they just said well, you have a key and he said that won't do. We can't distribute the key in that quantities. See if you can think of something else. Well, what he thought of was putting in a third tape reader and then reading two tape and two keys and then you could repeat the keys at different off-sets. So they did that and submitted a sample to the Signal Corps and they sent it to Friedman, who was then in the Chicago area, and Friedman broke it. And so then, they said, "No, you can't do that. You have to go back to using a single key." So now this man from the Signal Corps told a different story. He said that they first proposed the two tapes and he suggested the single tape. Well, he could be right for all I know, but the Parker story sounds a little more plausible. Anyway, I told this story and Kahn didn't pay any attention to it. So.

Farley: Not exciting enough, I guess, huh?

Campaigne: Well, I don't know. It's water over the dam, I guess. He's published it.

Farley: You mentioned Friedman. Did you know Bill Friedman quite well?

Campaigne: Oh yeah. I knew him reasonably well, yeah. He was an

easy man to get along with. He was not a snob at all.

Farley: Do you think his accomplishments are blown out of proportion?

Campaigne: No, I don't. No. His accomplishments are terrific. Now, of course, when he started, he didn't have much competition. And Agnes Driscoll just to show off. No, he accomplished a great deal and he was a very academic-type of person, very careful about everything he did, and had the utmost respect.

Farley: Was he a good manager? I mean, did he get the most out of his people?

Campaigne: Oh. Well, he dealt with technical, skillful people very well. How he dealt with others I don't really know. He never had much of a chance when I was around to be a manager. People who are studious are inclined to be regarded as poor managers without testing them out to see. And so that may have happened to him.

Farley: That's right. One thing that brings to mind - when I was in the Army I had twenty electronic engineers working for me. And my biggest problem was trying to make the reports that they wrote intelligible to the average person.

Campaigne: Yes. Yeah, right.

Farley: And this is a prime problem. Is it because the engineers are more inclined to work with thoughts and ideas, and equipments and machines, and concept, and it's difficult

for them to put it in a layman's language?

Campaigne: Well, they copy each other's mistakes. That's part of their problem. And they tend not to put much effort into expressing their thoughts. The technical thing is hard enough, see? If they've mastered that, then they think the rest of it ought to follow. And they don't try much. A group that seems worse in it's years are the computer people. They are terrible. They pervert the English language and are absolutely intolerant of any criticism on it. I was Editor of the I triple E (I.E.E.E) proceeding on computers for a while. I was an editor on it. And we got a paper from a man at the University of Arizona, and he used "inputted" as a past tense of the verb input. And I wrote back to him and said that wasn't the right past tense. Well, he gave me an argument. (laughs) And it's gone so far now that I don't know. It'll never get straightened out.

Farley: Talking about the engineers of today compared with the engineers when you were in charge, do you have any qualms about the future of NSA for instance, or the future of the state of the art, or the entire industry? Are they as talented as you were, for instance? Or that you are?

Campaigne: Yeah, sure they are. Sure they are. No, I don't have any qualms about it. I don't think that they are getting any worse. I do think that the educational

system is failing to keep up with them. It's really extraordinary how much progress they're making without the educational system. In these integrated circuits, they learn nearly everything to know about integrated circuits on the job after they get a job, not in school. And yet progress continues very nicely without it.

Farley: So practical experience contributes.

Campaigne: Yeah well, the employers set up schools and they're likely to hire a graduate engineer and put him for six months in school just learning the way his company does things, which means learning what he needs to work in that company. And it seems to work pretty good. It's probably expensive. That is, the employer really ought to be able get somebody who knows those things from school rather than having to teach him, but that's the way it happens. I hope the schools can catch up on that.

Farley: You think there's an overabundance of engineers now?

Campaigne: No. No, I don't think so. I don't think so. It's probably the other way around. Probably not enough.

Farley: It seems to go in peaks and valleys.

Campaigne: Yeah, sure it does. Yeah, the schools find that they don't have enough engineers and then they tell students that and so they go into engineering and four years later there are a lot more engineers and

they can't find jobs that easy, and they tell the boys at home and then they don't go into it. And it keeps oscillating.

Farley: Sir, I've taken up a lot of your time. I do appreciate it. Is there anything that we have missed, anything that you'd like to put on tape?

Campaigne: I don't know about putting on a tape, but I had a very exciting couple of weeks there one time. I was President of the Flying Club at Fort Meade and one of the students ran into a steamroller or something like that on the runway and one person got badly hurt and smashed up the airplane. The same week Martin and Mitchell showed up missing. They didn't work for me directly, worked for one echelon down. I came back from leave; I'd been down in North Carolina and Walter Jacobs was my deputy and he said, "Two of our people are missing." And I said, "What do you mean they're missing?" He said, "Well, they went on vacation and they drove to California and the didn't know just when they'd be back, but they should be back by now. They're really a week overdue the way we figured it." And so I got [redacted] to telephone their home in California, which really was a mistake. We shouldn't have done that. But he called and asked about them. And they said, "What do you mean? We haven't seen them in two years." And so he said, "Oh yeah, we just been

trying to check up on them and they called right back. They were quite upset. And they immediately jumped to conclusion that we had done something with them, sent them to Russia or something.

Farley: You mean the parents called or the individual?

Campaigne: This was the parents. This was the parents. This was the parent of Martin. And then, let's see. What else did we do? By this time, twenty-four hours had gone by. It was Tuesday. And so I called people in Personnel and in Security and told them about it. The concept I had was that they'd had an accident. Maybe got killed and not identified bodies. Or injured so they couldn't talk and that we were out of contact. Because I had known of an incident or two before where somebody had had a bad accident and was untraced. But once security started on it, which was probably Thursday, a couple days later, they immediately found their car. It was parked over in front of their rooming house. They had never driven anywhere, you see. And once their car was found why we were beginning to get on the right track. They went over to Friendship Airport and went through all the ticket stubs and found stubs that they had gone to Mexico City.

Farley: Did they use the right names?

Campaigne: Yes. Apparently they had to because they had to have a visa or a passport or something to get into Mexico

City. Anyway, they didn't have any way around that and they used the right names. And by this time, of course, everybody was excited. Newspapers heard about it. Family was claiming that we had done away with them and were trying to conceal it. And all that. The day after I told Security and Personnel I met Tordella in the hall and I told him too personally. And so nobody ever blamed me for it. I was fortunate. I might not have done anything. And the people in security had a turn, and then Congress got involved. And then the two boys had a press conference over there in Russia and made a lot of trouble.

Farley: How much work was there in the investigation of what they had been exposed to?

Campaigne: Oh God. It must have been a lot. Not by me, but I think Security just sort of doubled their work load there for two months.

Farley: How soon after that did we become A and B and C groups? Was that within weeks?

Campaigne: No, it wasn't that soon. But it was within months. Yeah.

Farley: This was in?

Campaigne: No, it was '64, I guess. '63 or '64.

Farley: Okay.

Campaigne: Yeah. From things I heard since I think that what

they did, they talked to somebody in the Foreign Office who didn't even appreciate what he might have in the way of intelligence. And who looked at it only as a publicity stunt. And I wouldn't be surprised that the first that the crypto people in Russia heard about Martin and Mitchell when they had that press conference. They were probably saying, "What are you doing? We're in this too?"

Farley: Grab them. Bring them over here.

Campaigne: I don't know what the hell happend thereafter.

Farley: That shattered us, didn't it, in the Soviet area?

Campaigne: Yeah, it was very trying. Very trying indeed. I'm sure they've had a fate that they deserved. They've regretted it many, many times.

Farley: I hope so. I hope so.

Campaigne: Yeah.

Farley: That's an interesting story. Do you have any others?

Campaigne: No, that's the outstanding one. I don't have any others.

Farley: Can you think of anything we've overlooked? As I say, I'm sort of at a loss because all these projects, I could recite them all, but I think you hit the more important ones. And you could probably talk for days on some of them.

Campaigne: Well, one of the things that I'm not is emphasized much as it should be is the extent to which Wenger was a leader in automating. See, he had started four or five

years before the war to try to look up people like IBM and National Cash Register and Kodak and places like that and ask them what they could do for us. And made contacts and had started some contracts and things like that. So that by the time the war came along, we had a program which could be expanded. Otherwise, we would have had, probably had nothing. He also was influential in encouraging them to get IBM equipment and do it by cards, and that stuff. Prior to that, prior to 1932, I guess they had nothing but pencil and paper there.

Farley: So he's really the father of the machine programs?

Campaigne: Well, he is certainly as far as the Navy is concerned. Yeah. And he continued to strive in that direction as long as he lived. Wherever he was, whatever he was doing, he always tried to get more. He helped to set up ERA because just to keep this talent together.

Farley: Was there difficulty with the Navy attitude when it was a fait accompli that there was an AFSA, and would eventually would become an NSA? Was there a change of heart when the Navy troopers realized that they had to think unification rather than Navy in the R&D areas?

Campaigne: Well, I don't know. It seemed to me that in the discussions that went around, the main concern of many of the people there was relocation. If we were going to move someplace, you know. Otherwise,

I don't know. Some of them didn't think it was a good concept. They thought that the independent operations was a better thing. But some of the others thought it was good concept. And I think I was one of those who thought it would be an improvement and offered possibilities, and there were others who thought the same way. So they had mixed feelings. Some of them thought one way, some the other. Now, the people who counted didn't tell me what they thought, so I didn't know. I don't remember hearing much discussion about it. In those days, Wenger used to have a group he called the "Research Council," I think. He was the chairman and mostly we would meet as a discussion group. We'd meet once a week and have discussions. And he would give us a little guidance. We never voted. He always decided what the program would be.

Farley: He was a brain-picker, huh?

Campaigne: Yeah, yeah. He was a brain-picker. That's right. And the fact that we didn't vote or anything didn't seem to bother anybody. He nearly always came to the same conclusion we did. It wasn't controversial, ever.

Farley: Personalities come to mind again. Did you know Joe Ream, who was the Deputy Director?

Campaigne: Yeah. The one thing I remember about Joe Ream was this.

When he came here, I was at the Army War College. And then Canine had a going away party and he had a big party. So I came down for the party. And we came in, it was a great big party, lots of people there. And one of the first people I met was Ream. Somebody introduced me to him. And then we wandered around. There was a flow of traffic circulating around, people talking to people, and I went around and said hello to a lot of people, and I ran into Ream again. And I didn't remember him and he remembered me. (Laughs) I was so glad to hear he left.

Farley: Why did he serve such a short term?

Campaigne: Oh he got interested in some other things I guess, and never did get really interested in what we're doing here.

Farley: Was there a deliberate effort to keep him uninformed?

Campaigne: Not that I know of. Not that I know of. Of course, it could happen and I wouldn't know. I never had a technical conversation with him, and he didn't seem to show much technical curiousity about it. Now, he knew a lot about radio. But mostly about the commercial radio facilities and not about technical radio.

Farley: What was his claim to fame? Why did they, whoever chose him, select him to become Deputy Director?

Campaigne: Well, that I don't know. He had made kind of a splash in the radio industry. He'd gotten quick promotions

and things.

Farley: He's primarily a producer of radio programs I think.

Campaigne: Possibly, yeah. Yeah. I never did know. They had a good memory for faces.

Farley: Let me switch this tape, sir.

Campaigne: Yeah.

TAPE 3 SIDE B

Farley: All right. Another personality that comes to mind is Uncle Luigi, as they say, Lou Tordella.

Campaigne: Oh yeah.

Farley: His rise to the second position in the Agency. That was interesting.

Campaigne: Yeah it was.

Farley: You know enough about that to talk about it?

Campaigne: No, I don't. I knew Lou when he first came here in '42. I knew him. And then he went out to intercept station, so I didn't see much of him to the rest of the war. He came back at the end of the war. And he and I were kind of friendly. We got together quite a lot. But he was more concerned about operations than research. He was in research for a short while. And no, I never heard of any particular reason why he was selected. He did a good job as deputy director.

Farley: But somebody up there must have liked him. Who was his mentor?

Campaigne: I don't know. He had a tough time there with

one of the directors. I've forgotten who it was now. He didn't always get along with him too well, and for some reason he found it trying. And you could tell he found it trying. You know, he looked a little haggard and worn down. But he always seemed to avoid getting into any troubles. His job was a political one, of course, and he was adroit at it.

Farley: How much did he do for the R&D effort at NSA?

Campaigne: Well, he helped us get resources from time to time. I don't remember any details now, but there was one time we were having a fight about space - as to who would have what space -- and he came to our rescue and helped us keep it.

Farley: You have any comments about the various directors from Canine on? Any who you think are worthy of discussing?

Campaigne: Well, Canine of course stands out as the guy who everybody respected in the Agency. I was surprised to learn later that the people above him didn't think nearly think as much as we did. He made a tremendous impression. Some of the directors came here just to have their last tour and that was kind of a bad thing. I guess the Agency's gotten over that now. It's not that way anymore. Most of the directors have been pretty good. I thought Frost was one of the least effective ones. I went to one of his staff meetings one time and it soon became apparent that he was

upset about something. But I couldn't figure out what it was. He didn't talk to me. I just sat there listening. But after a while it became clear that the thing that was upsetting was the one thing he hadn't mentioned. As everything else.

Farley: Wasn't it peculiar that he was such a, I don't know what word to use, "lesser efficient director" since he had been in the business so long? He was almost born in the business and he should have known the "ins" and "outs." Why wasn't he more effective as a director, I wonder?

Campaigne: Well, I think his problems was communication problems like the one I just mentioned, see? Because he was emotional about it, he kept away from the subject instead of talking about.

Farley: I saw him chew out Frank Raven, Bill Ray, and some Air Force Brigadier General in a briefing. Just the finger on the chest bit.

Campaigne: Yeah. Yeah. And if he was going to say things like that he should have said them in private. Yeah, right. So he was violating elementary basic things there.

Farley: Who was the director when you left?

Campaigne: I think Allen came there just after I left.

Farley: Okay. I see.

Campaigne: And Noel Gayler was director when I left.

Farley: Do you have any comments on him?

Campaigne: Well, he was a colorful character. I was certainly

glad to see him go in to another assignment which was even bigger afterwards, so that NSA would get over that reputation of being a graveyard.

Farley: I have a quick question on active duty when you were in the Navy Reserves. Did you take any interesting two-week tours of active duty?

Campaigne: Oh yeah. Yeah. One of my tours was in St. Paul. I went up there and spent my whole time devising the arithmetic unit for the Atlas. But I took two tours aboard carriers, which was really nice to look back on.

Farley: As an intelligence officer?

Campaigne: No, as communications officer, not intelligence. Yeah, I was down in the Communications and only got to look out when I was off duty.

Farley: I didn't realize the Navy had tours like that for intelligence types.

Campaigne: I wish that I had taken more advantage of it now. People kept telling me "Take your training duty. Take your training duty." And sometimes I would and sometimes I wouldn't, but now I wish I had.

Farley: You would've picked up more points, too, more retirement points.

Campaigne: Yeah, that's right. I would.

Farley: Sir, I think I've exhausted you. But it's been wonderful, wonderful.

Campaigne: Well, thank you. I appreciate anybody listening.

Farley: And they will. And this will be transcribed eventually and made available for researchers and legitimate historians. I have a form here and I'll leave it with you that will designate, according to your desires who you want to hear it from nobody to everybody.

Campaigne: I'm supposed to fill this out?

Farley: Not now. Not now. I'll send you copies, but mail them to you so you don't have to worry about those things now. But what sort of a classification should we put on these tapes, Cap? Should be Top Secret?

Campaigne: Well, no I don't think so. Uh, of course, it was Top Secret at the time. Most of it, but I don't know what it would be now.

Farley: Secret Comint Channels, is that high enough?

Campaigne: Oh yeah, it's plenty high enough for me. I don't think there's anything that I said which would be of any value to any foreign country or any danger to the United States.

Farley: Most of your articles here, I think, are Secret, Secret, Confidential, Secret...yes. Top Secret. The one on "Tunny" was Top Secret Codeword.

Campaigne: Yeah yeah. Well. I don't know whether anything about declassifying that. The word "Fish" has been mentioned in the open literature. But when I suggested pointing out

that Fish consisted of two different things, Tunny and and the Agency thought I ought not do that.

Farley: Well, why don't we make it Secret Codeword?

Campaigne: All right. All right.

Farley: Comint Channels, I should say. Secret Comint Channels.

Campaigne: Yeah. All right.

Farley: That will control it a little more. What we don't want to do is to make it unclassified which makes it available to every author in the world and we don't want to have trouble with somebody finding out about an oral history and demanding it under a Freedom of Information request. We want to control it as much as we can, and this way we can. If we classify it high enough we can control it.

Campaigne: Right.

Farley: Sir, can you think of anything else that we should've talked about and we didn't?

Campaigne: No, no. We talked just about everything, didn't we?

Farley: I'm sure I'll get back and think of something. And the people who are going to hear this will say, "Well, why didn't you ask Dr. Campaigne this?" I say, "Well, gee. I didn't think of it either."

Campaigne: I can think of a little antecdote. There was a priest who died and went to Heaven and at the Pearly Gates there were two people ahead of him. One was the Pope and the

other was a cryptographer. And St. Peter was saying to this one, "Well, everything's in order. I just have to find quarters for you." And then he assigned the Pope to an apartment in a big building over on one side of area. And then he turned to the cryptographer and he said, "Now let's see if this will do for you. I've got a villa over here and it's got a lake, around a lake. And there's a mountain right behind it; and I think you ought to like that." And he sent him off and then he turned to the priest and said, "Well now, let's see about you." And the priest said, "Can I ask a question?" "Sure, ask a question." He said, "How come you sent the Pope to this nondescript little apartment over there and you sent this cryptographer to a beautiful villa with a lake and the mountain?" And St. Peter said, "Oh. Counting me, we've got 288 Popes up here, but this is first cryptographer. The only one."

Farley: Beautiful story. Beautiful. It proves what type they are, right? Great. That's great. I'll use that one. What else can we think about? People, we talked about people. We talked about places and things. So unless you say go ahead, we'll quit.

Campaigne: No, no. I don't have anything more to say, I guess. Oh yeah. I can throw a little comment here. When I went into the analytic equipment, which I did almost the first week I was there and stayed in there, I had

visions. These would be labor-saving devices, and we wouldn't need a lot of people around. And it's been a continual disappointment that we had so damn many people around. Of course, what we've done is to use these devices to do more rather than to do what we were doing before more economically. But I still feel we ought to be able to do it with fewer people. More machines and fewer people.

Farley: It's coming to that, isn't it?

Campaigne: Well, I hope so. I think it should.

Farley: What happens to the people who are displaced?

Campaigne: Well, they join the "buggy whip" manufacturers. Retire.

Farley: Spoken like a true engineer, mathematician. Sir, I've taken up four hours of your time. I appreciate it. I'm grateful that you gave me this time. This information will be invaluable.

Campaigne: It's a pleasure. It's very flattering to have somebody listen.

Farley: You have a safe flight back home.

Campaigne: All right.