

Albert Brown Oral History Interview

CORK MORRIS: This is Cork Morris, today is March 2nd, 2010 and I'm interviewing Mr. Albert Brown; and also with us is his wife [Margy?]. This interview is taking place in Fredericksburg, Texas in support of the Center of Pacific War Studies Archives, for the National Museum of the Pacific War, the Texas Historical Commission, for the preservation of historical information related to this site. Mr. Brown, I appreciate you taking the time to come in here and talk to us. I usually like to start with a little of your background: where you were born, where and when, and what your folks did and how you started in the military.

ALBERT BROWN: Okay, well, I was born in Scranton, Pennsylvania, and grew up in Scranton, Pennsylvania, went to Wesleyan University, and after that I went to Harvard Business School, and just before that I got a pilot's license. I saw war coming along, and I wanted to get into the Navy to fly, and I went down to the first naval district there and I couldn't pass the eye exam, so they said, "Well, you'll be called active duty soon." Went to the Naval Academy for a special class with a group of other college graduates who had either engineering or science degrees; they wanted to

make more Naval Engineering Officers, and they took the top five percent of the class and sent us to MIT to a very secret thing, the word radar was secret in those days, and we went to a special part of MIT that was hidden in Boston Harbor in an old building. And, you entered the old building and the only funny thing about it was when you went over to the elevator to go up to where we had classes, the elevator [was?] operated by our Marines.

CM: (inaudible)

AB: So, anyway, I got into the radar business, went out to Pearl Harbor, was in the amphibious forces at Guadalcanal for a year, and then they sent out a thing saying they wanted sea-experienced officers for submarines, because they were building so many new ones. And since I --

CM: What year was this?

AB: This was in 1940 -- it's going to be '42. And, since I wanted to do a three-dimensional thing in the air, I thought well, if I couldn't do it in the air I'd do it in the water. So, I put in for submarines, went back to New London to submarine school, then went out to Australia to pick up a submarine, which I did, and spent some time on the submarines. And --

CM: Now, were you a captain of the submarine, or --

AB: No, no. Oh, no, no, I was just a lieutenant (inaudible) then, and on the submarine, though, because I was the radar fellow I finally became the, sort of the specialist in [conning?] the surface attacks using the radar on the surface at night, because then instead of the two-knot submerged speed you had twenty knots on the diesel engines and you could get in any position you wanted and fire torpedoes at the closer range, because torpedoes were no good. I liked to be inside a thousand yards to fire, because we were much surer of hitting the targets. And the other thing we started doing was saying -- submarines then used to hunt, in the daytime, with a periscope, and I showed the captain that you could sweep out a much bigger territory by using standard speed on two diesels on the surface at night, about 12 knots, and if you're going 12 knots and you have the radar, you can cover a much bigger area than you do in the daytime with the periscopes that stick six feet out of the water. And so the captain agreed to do that and we did that, and when we came back to Pearl Harbor after that patrol, the captain went in and told, you know, the captain always has to go tell everybody about the patrol, and he told them about this, and said, "We changed our way of doing things," but the submarine was sent to Mare Island for a major overhaul, and so they said, "Well

then, let's get this guy, Brown, to come out here and write a new set of operating orders for submarines, submarine policy." So, I was sent back to Pearl Harbor to do that, and as a result of that -- this was a simple thing to do and I said, but, you know, you need the people who know how to operate the radar and things, and they said, "Okay, you go over to the Pacific Fleet Radar School and get that set up."

CM: Was that in Pearl Harbor?

AB: That was in Pearl Harbor, it was actually in Camp Catlin next door, a Marine camp. So, I went and this leads right into how I got into -- with Admiral Nimitz, because what I was doing was looking at tactical use of radar, which a lot of people didn't know because it was new and it had been secret, so I started -- it was easy to set up the submarine business, so I started looking at all the tactical uses of radar and going around all the different commands at Pearl Harbor, and finally people I could talk to about using radar for tactical operations. And then, one day I got a call from Admiral Nimitz's Chief of Staff, [Emmet Morris?], and I went to his office and he said to me, "The admiral has just made you the officer in charge of the Pacific Fleet Radar School -- Tactical School for Senior Officers." And I said, "There isn't any such school." He said, "There

is now, and you're it." They laughed and he said, "Yeah he would talk to the admiral" -- that was Nimitz, the admiral -- "the admiral has recognized that most of his senior officers who were commanding the fleet, when they were junior officers there was no CIC, there was no radar, no electronic stuff, and he thinks that they don't make full use of it. So, that's why we have the radar tactical school that you're now running." And I said, "Well, they aren't going to come." He said, "Oh, yes, the admiral will make sure they're there and they're on time when he tells them to come. However, they're not being sent to school to learn, they're being sent to your school so the school can take advantage of what they've learned, so you're not going to teach them, they're going to show you. Now, before they -- before any of them comes, I'm going to send you the ships they're on and I want you to go to see the CIC officer and the air officer, and find out how they're not taking advantage of their facilities. And, that's what you've got to get across." This is pretty clever. He told me that, and he said "That's it." He didn't tell me any more, so I went back and I started thinking about it, why me? You know, I thought, of all the people, I'd never met Admiral Nimitz, why should I be picked to do this job? And I thought, gee, if this is what he thinks, and I knew this

was true from all I'd been doing, because I was talking to the lower level of officers, CIC officers [and things?] so I knew that they weren't taking advantage of this stuff. And so, I thought why me? Well, one reason was that I was just wearing [dolphins?], which proved two things; one, I'd been out there doing it, and two I knew nothing about carrier operations and fleet operations because submarines always operate all by themselves. When you get assigned an operating area in the Pacific, the one thing you're guaranteed is nobody in your area is friendly, therefore anything you see, sink. So, this sort of meant that I could talk to these people, there's no intimidation that I know something about their business or anything.

CM: I guess the obvious question is did you get a lot of opposition from these diehard --

AB: No, I'll finish.

CM: Okay.

AB: So, the other reason I thought was because I had the facilities, I put a [mock up?] CIC and a thing where the guys in the room up above could put targets on the radar and move them around so we could have a whole operation. And so, when they came over I told them, you know, you're not being sent to school, we want to learn from you. Now, let me give you an example of some of the things we've

learned. See, then I would proceed into things I'd heard from their own CIC officers, pretending I'd learned them from other schools; of course, there hadn't been any school before that. And, then I said, "Now, admiral, why don't you sit down and pretend you're a radar operator and you're on the vertical plotting board," and I had enlisted men there to help him, and so we sort of showed him how a CIC worked, because that was the idea, to see what information you could get from the CIC and how it worked. And, actually, the surprising thing is they kind of got interested in it, and the final payoff was at the end of the session, one of the admirals came over and said, "You know, son, that was very interesting, my CIC officer's been telling me a lot about those things." And so I thought that was a hell of a clever thing. Now, I never spoke to Nimitz about this, just his Chief of Staff, but so whether this was his idea or Nimitz, I don't know but I think it was Nimitz's from these other things I've heard that he was concerned that those people didn't know what was going on downstairs. Lot of them never been down to the CIC, you know, which was several decks down and -- so that was one of the things. Another interesting -- at that time, we were having trouble with kamikazes, and so a lot of -- I spent a lot of time looking at what you could do about

kamikazes, and the problem was that they came in at very high altitudes and basically undetected. And, the reason they were undetected was because if you looked at the radar coverage from all the radars we had on our ships, it didn't really cover the higher altitudes because we were more concerned with things below 20 thousand feet and down on the surface. And so, I realized there was a cone up over any task force above 20 thousand feet where you wouldn't really, or were most unlikely to detect anything. And furthermore, we didn't have any CAP up there.

CM: [Hawaiian CAP?]?

AB: Combat Air Patrol. So, trying to think of how this could be done, since I looked at all the radars, I realized that on the P-61, that's the night fighter with the twin --

CM: Twin tails, yeah.

AB: -- thing, that had a radar in the nose that had a parabola that rotated 360 degrees quite fast, and then it could nod up and down.

CM: It could not do that.

AB: Yeah, as it rotated sometimes it would be looking down, then it would gradually move and look up, so it was covering a big area in front of the aircraft and of course, if there was a target over here, when it got to this angle it would see it and it would know it was over there and not

dead ahead, and show that on the screen. So, the pilot could see immediately where any target was in reference to his aircraft. So, I thought, well, if you took this thing and you point it straight up, and you un-- oh, they un-blanked the back half, you know, as the turret swung around, you would be into the [blank, see, blank that?]. So, you un-blanked the back half so you got the whole thing, and then you nod from straight up down to, I forget what it was, 30 degrees below that, so you'd cover that area above 20,000 feet so you could detect a target and if you think of it now pointing straight up, when it picked up something you could say, you know, the target is 30 degrees to starboard and at this angle, which if you knew the range and the angle so you know how high it is. So, you could get all that information. So, I went to the Army Air Corps and I told them about this and it surprised me, they got very interested and said yeah, we'll give you one of our radars and we'll help you fix it to do this. Which they did, and then I went to [AIRPAC?] and I got a bunch of the officers I knew there -- we're going to have a demonstration, I want you to get three of you we'll come and watch this display, and I want three of you to go out and see if they can see the aircraft and then I want you to get some guy to come in at 20 thousand feet and we'll see

who detects him, the guys with binoculars or the guys looking at this radar scope. And so we did that, they got a guy; normally, you know, our planes didn't go to 20 thousand feet, in fact it was hard to do, pilots had to have oxygen.

CM: And cold.

AB: So, we did the little experiment and it was pretty clear that nobody on the ground could see the aircraft. This was done at Pearl Harbor, nobody -- and the guys looking at it could see it immediately. Says, "Okay, let's put it on an S.S.-class carrier," so we put it on the carrier; well, it's one thing to detect the thing on the radar, it's another thing to shoot it down, so then how to get the air officer, the gunnery officer, to say, okay, we've got to work this out so that -- there's a combat air control way up there and when somebody detects a target, he's got to get a fighter director to tell the CAP where the target is so they can shoot it, but then at some point it gets within the range of the gunners, you've got to break off the CAP and the gunner also has to tell them where to start shooting, where to look for the aircraft to shoot at. It was just a thing to work out on this ship, of all the people, so everybody get into the [aft?] --

CM: So nobody gets shot accidentally.

AB: And so, we got all that worked out on the carrier and this is when we had, [you know, was for once and we sure were?] were taking the task force 58 or 38, it was always the same basic group of ships out into the combat area, and so we had a group then, this carrier was in and they were going out for a few days practice before they went out to the war zone. And so, I thought, gee I better go along on this because we can try this stuff and so we went out and spent a day doing things and start something; the next day we had three carriers, so three air groups, and then they had another air group from [Barbers Point?] in the exercise, so we had the carriers, cruisers, destroyers, the whole works, oilers, because we were doing a practice, and this other air group from Barbers Point, so it was a real big mess. And, on the afternoon on the second day over the ship comes, "Now, hear this, Lieutenant A. Brown report to the flag bridge immediately." I went up to the flag bridge and [Admiral Mitches?] says, "Okay, it's all yours," and he hands me a dispatch and it says, "Sixteen hundred to nineteen hundred task force so-and-so, OTC, Lieutenant A. Brown. CW Nimitz."

CM: So, you're in charge, huh?

AB: I was in charge of the whole task force, and the OTC is in charge of, I don't know if you know this, Officer in

Tactical Command, Officer in Tactical Command means you're in charge of everything except for, you know, tactical -- you can't -- change -- you're just in charge of what it does, and I think he thought I didn't know what to do, but I knew just what to do. And I thought, here's the time to do the practice, so I went down to the CIC, got the air officer, the gunnery officer, said, you know, "I have three air groups in the air," I said, "Let's land everybody but let's do -- get a CAP and a whole thing," and so we did the whole practice thing for the kamikaze thing, and it worked. Except they didn't shoot down our own guy. But, this -- to me this was interesting that I had no idea this was going to happen, and apparently, and I didn't -- I don't know how Nimitz found out that we had done this on the carrier, but obviously he knew and he decided he wanted to see it tried, and he also knew that I was doing it, which said to me with a lot of these things, he had a really good intelligence system of what was going on in his own --

CM: His own service.

AB: -- his own service. It's an interesting thing.

CM: It's interesting how anything gets done.

AB: Pardon?

CM: It's interesting how anything gets done in huge a huge bureaucracy like [The Army?], but, you know, I guess it takes guys like Nimitz to sort it out, to find officers.

AB: Yeah, but he had obviously, because I had only -- the only people I had talked to about this were the people in AIRPAC, and of course, having seen the demonstration I'm sure they told a lot of other people and some -- but somehow this got to Nimitz, and he must have been so -- I want to see this tried out with a task force. The other thing that was strange is why didn't he tell me, or tell somebody to tell me, I don't know.

CM: [All mind to just?] throw you in and see how you do. That's how you learn to swim and stuff, you know.

AB: Then, after this, the next thing, Emmett Morris called me and said the admiral wants you to attend all of his strategic planning meetings. Now we're -- at this point, this is into '45 -- Winter, '45, and the strategic planning meetings were all about the invasion of Japan, and he said, "You have to attend all these meetings, but the only words you can say are either yes sir, or no sir, nothing else. They don't want to hear from a junior officer." Well, I was a lieutenant, I was just barely a lieutenant, but the next thing I knew, I was lieutenant commander, because apparently Nimitz had requested the President to make an

out of line appointment to lieutenant commander, and I think the only reason was he didn't -- he wanted a higher ranking officer to sit in on the meetings. At any rate, I couldn't say anything at the meeting, but I would sit there and if Nimitz or somebody else would say, "Brown, do you see anything wrong with that?" I would say, "No, sir." Or, they would say, "Brown, does that look okay?" And I would say, "Yes, sir." That was it. Then afterward, Emmett Morris would say, "Okay, what do we have to do now?" And, namely, the reason I was there was because they would often propose things that I don't think they knew what all the pieces needed to be arranged to do it. Like, we talked about using [picket?] destroyers out in advance of the fleets of a kamikaze [came it wouldn't be at the carrier?] but the picket destroyer would have to control the aircraft that the carrier had set out, and you think, you just send out a picket destroyer; well, you don't just do that because -- and I knew all these things -- different destroyers had different radars because they were different vintages and all kinds of things, and some radars were good for that and some weren't. So, you had to know which destroys you could use as pickets, furthermore if you just sent a destroyer out, a destroyer didn't have fighter directors, so you had to get guys who were qualified

fighter -- these were the guys you know, fighter director is the title of the guy who looked at the radar and controlled the fighter and vectored him toward the enemy. Well, they didn't have fighter directors, so you had to pick the right destroyer and it had to have enough -- or on it -- you had the right radar and then enough of a CIC to have a fighter director, and then you had to find fighter directors with combat experience who could do it. And, I had a record of all these things so that's -- that really was the reason I was there was because I would say, "Okay, you can use these destroyers, and you got to get -- here's a list of the people who would be on them, et cetera, and so that would --" it's things like that. Now, of course, we never did any of these things because the atom bomb came along and the thing ended. However, one of the problems that I had with it all was that I didn't think, as a submarine officer, I knew what was going on out there and I didn't think we needed to do anything.

CM: In what way, you mean --

AB: Because the Japanese could no longer -- nothing could go to Japan anymore. Their fleet didn't have enough fuel to move. We had enough submarines then that we were surrounding Japan and we could finally just shut them off from everything. And, I thought, you could just do that and

after a while they'd say, okay, we quit. However, the whole motivation, these discussions -- now, these discussions were down in the bottom of the Makalapa Heights, you know, Nimitz's headquarters there, and they were always done on a teletype with Washington. Everyone was a joint meeting with God knows who all in Washington, and they would have a fairly high-ranking officer with a tape that you could put in the teletype machine, you know, to scramble it, one tape was made just for this, he would fly out to Washington with the tape, put it in the machine, and then you'd have the conference; but, you had a television screen that showed in English what you were saying and another one that showed in English what Washington was saying, and the conference was conducted, there wasn't any voice. I mean, we talked and then we decide --

CM: This sounds pretty high-tech, coming from them.

AB: Then it was high-tech. We discussed something and decide something, then Nimitz or somebody would say, "Okay, send that to Washington, you'd see it on the screen and you'd wait till the reply came back from Washington. And, the thing that got me about all this was that all the implication of two things. One was the worry about how many people or ships we'd lose in invading Japan because

everybody knew from, well, Iwo Jima and before that that they were a bunch of fanatics, they would just keep going even though they knew they were going to get killed, and people were afraid that they would just enlist the population of Japan to rush at American with big sticks, into machine guns, and that we would lose a lot of people, but also there would be a tremendous slaughter of Japanese people; I think that was true. All the discussion was how to avoid this and how you could do it so that didn't happen, see, because there was no mention of any atom bomb or anything, it was all too secret.

CM: Did Nimitz know about the bomb, or anything?

AB: I don't know. I suspect at some point he did, but I don't know when he did, because that was -- anyway, there was never any discussion that the -- so, it was this worry about people being killed on our side and the other side and how to do it with less loss, was the biggest part of discussion. What way can we do an invasion without -- the other thing you noticed was the whole emphasis was like the boss wants us to capture Japan, get the territory, you know, defeat them, [that stupid?], but you can't say -- if you can only say, "Yes sir," or, "No, sir." But, I thought, and since then I've talked to a lot of submarine officers even higher ranking submarine officers that they

all agreed that there was no way, because the last submarine patrol we did it got so there wasn't enough targets, the only thing submarines were doing were rescuing downed aviators. There were no more, so, anyway, I thought we never needed the atom bomb, we never needed to invade Japan, all we needed to do was just keep the submarines there and wait. Oh, yeah, and you keep some carriers and things around, but out where it's safe, you don't need to get into the kamikaze range; and the kamikazes couldn't get submarines very well because [you didn't detect them?] when you're submerged and they weren't very good at bombing us. For a while when we were down around southern Philippines we had, you know, broken the Japanese code and we were so good at it that sometimes we would get the Japanese convoy routing -- they got the code, deciphered it somewhere in Washington, turned it into another code, sent it to Pearl Harbor, turned it into the submarine code, broadcast it; we'd have to get it, break the code, we didn't have machines we had to do it with strips, and we would know the convoy routing before the Japanese convoy commander got it because their system was so inefficient. And, one time, when we were down there we used to go and during the day try to be spotted by -- we knew that they were patrolling with sometimes aircraft sometimes seaplanes that carried a

bomb -- and we knew their routes and so to act like a lot of submarines we would go where this one came at the right time and sometimes they wouldn't see us; I remember standing on the bridge waving, "Hey, we're over here!" And, they'd see us and head toward you; you'd dive, they'd drop their bomb would go off, you'd go over and try to get the next one. Because, if you could make them think there was a lot of submarines they'd pack the convoys closer together and since we got the convoy routings --

CM: Easy targets

AB: -- [we got targets?]. (laughter) But, you know, so that's -- anyway, that was -- now, where's the -- I wrote up some of these stories for the children and grandchildren and I (overlapping dialogue; inaudible) don't know if that helps you but it's not an audio thing.

CM: Well, actually this was -- this you have, Japanese aircraft radar, one of my questions was how was Japanese radar?

AB: Not too good. One of the stories is about -- that's what this story was about. The Japanese -- as you can see I got to be sort of an odd guy at Pearl Harbor, and when somebody came there and nobody what to do with him, they'd send him to me; and this electronics engineer came to see me one day and he said that he had a Japanese radar and he had analyzed the vacuum tubes and he knew all their

characteristics and he started going on and on and on with this. And, he said, but he couldn't find anybody at Pearl Harbor that would listen to him, and I thought, you know, when you come to very operational guys and you start telling about vacuum tubes, no, they're not interested. I said, "Well say, have you got one of these radars?" He says, "Yes --"

CM: Oh, the actual unit.

AB: -- yeah, he says, "Yes, I have," I said, "Where is it?" He said, "It came over here on a TBM," I said, "You mean the Japanese radar is installed on one of our TBMs?" He says, "Yes, yes I have it it's over here at Ford Island." I said, "Well, you know, the commands here would be interested in operational things; I'll tell you what, I'll tell you how we can get started with this." I called up SUBPAC and said I got this aircraft from this Japanese radar, can you send a submarine out into operating area and we'll see how easily the radar can detect the submarine, you know, when it's surfaced, when it's got its conning tower out, you know, and get some idea what ranges it can pick it up. They said, "Sure, that'd be great." So, we made a date and we did it, and it turned out that the radar wasn't that good; it had on the wings of the TBM [Miyagi?] antenna, you know, the Miyagi -- its antenna, a stick like

this with things across. And, they had them and they could turn them so you could get a direction from inside the cockpit; look at the screen and you could turn the antenna. So, we went out and we played with the submarine, we found the radar wasn't so good, to pick up a submarine on the surface, you could pick it up at about six miles, which, you know, the submarine could detect the plane before that, so it wasn't -- and if it had just the conning tower awash, you had to be about two miles away, so it wasn't very good radar -- for that, for submarines. So, we were coming back to Pearl Harbor and I looked at the scope and it was all full of hash, you know, obviously some other transmission was making it so you couldn't see what was on the radar screen and I said, "What's this?" He said, "I don't know, it's something they're broadcasting over at Pearl Harbor." I said, "Well, what frequency is it?" He said, "Oh, it's about so and so," I said, "Hey, that's our TBM -- a TBS frequency." And, we had a short-wave radio on all our ships that was considered to be just line of sight, so in a task force you could talk to the other ships on this TBS radio without -- in plain English, because you figured you can't go far enough --

CM: (inaudible)

AB: -- you couldn't if you were engaging the enemy, but if you were normal you could talk on this. And I said, "You know, there's a broadcast, a TBS broadcast from Barbers Point to talk to ships that are right off Pearl Harbor, right off Oahu, and if you rotate the plane on these antennas just right you can tell exactly where that is." And, we did, yeah, you could -- we did it and I knew where the station was and we could pretty much see where it was coming from. So, I'm thinking about this, we get back in the evening and I thought I needed to write a report to SUBPAC about what we found, how good the radar was, and I did that; and then I started thinking about this detecting the TBS. Gee, if there's a Japanese plane and he turns off his transmitter, and just turns on the receiver, and he starts looking around and he starts seeing this hash, he rotates the antenna until he gets the maximum, he knows exactly the direction of where the fleet is. I thought, this could be how the kamikazes find where we are; so, by this time I went to bed and I couldn't go to sleep thinking about this, and I thought, gee, I'm the only guy who knows. And, tomorrow morning, they could sink a ship just if this happened. So, I got up and I wrote up -- the only way is to tell everybody stop using the TBS, the whole Navy. That's an [all nav?]. You've got to send an all nav to the

fleet and say don't use the TBS. Gee, now who can do this? So, I wrote what the ALLNAV could be and I knew Admiral McMorris from these other things, and I knew where he lived on Makalapa Heights. So, I got in the car, drove over to his house, at three a.m., banged on the door, and it's answered by his Japanese servant -- he had a Japanese servant. And, he (inaudible) sleep, and I started yelling, "No, no, I'm one of your own," and I made enough noise; so the next thing, Admiral McMorris comes down, says "What's going on here? And I told him. He listened to the story, he picked up the phone, and he said, "Send this all nav." That was the end of using TBS. The only thing I have no idea, did the Japanese know that?

CM: That was my next question. Did they know they had this technology?

AB: I never found out, and of the lot of interesting things, in fact, in most of these stories, you know, I don't know any more what happened, and it would -- it certainly is possible, if somebody goes back and digs in all that stuff, you could find out.

CM: Well, that's what all this is about. Now, that would be interesting to know. Did the Japanese have their own radar, or did they get it from the Germans or something?

AB: I don't know.

CM: No idea?

AB: They had radars, yes.

CM: They had their own technology?

AB: Yeah, and they had radars and -- just like this one. And, you know, one of the things people don't think about, I kept being asked how good was the Japanese radar, and I went to the JICPOA, Joint Intelligence Command Pacific Ocean Areas, it's a very secret thing at Pearl Harbor, and I went there and started looking through all the stuff they had and there's a lot of interesting stuff they had like they had a thing called, Who, Me? And Who, Me? was a little thing that you strapped on your arm and you had a thing up on your finger, and when you went like this, you could pull your finger and it would spray a liquid that smelled -- as it claimed -- smelled like [Occidental shit?], and the idea was that to get the Chinese and other locals to dislike the Japanese you would go up to where a Japanese officer was and surreptitiously go (makes flatulence sound with mouth) at him, and so he'd smell that. This was in JICPOA, this was an intelligence thing. Anyway, what I found what is interesting was they had captured a Japanese radar manual and translated it into English, and when I read the manual, what I found was that they had trained some technicians to understand the

transmitter and things that went with it, and other technicians totally separately to understand the receiver and displays; and one of the things we'd learned in radar is you can't do that if you want the radar to work, because all you got was this. And, once I saw that, and that's the way they were trained, and it was very important to us to train all our radar technicians, if you wanted to have the radar working, to understand the whole thing. It's more difficult, but usually you got a better result than trying to have --

CM: If they understood it.

AB: -- yeah, and so that was what our schools did. And so, when I saw this, one of the things I said to, you know, to put out the Japanese radars, a lot of times aren't going to be working. That'd be interesting to know how much of the time -- because, our radars were working most of the time. Because, you know, you got -- it was new stuff, there'd be failures, you'd have to fix it, but we usually kept them fixed and working.

CM: I remember on -- there was that whole big stink in the day of Pearl Harbor, that radar post that saw the Japanese but (overlapping dialogue; inaudible) --

AB: Oh yeah, at the beginning of the war, yeah. But, actually saw the Japanese, but they didn't have any way to --

CM: Nobody believed them.

AB: Yeah, this was the other side of it, to make use of it.

CM: I was kind of wondering about how did radar advance during the war? I mean --

AB: Oh, we had MIT; they collected a whole bunch of top-notch scientists, working on radar. When I was at the school there was all kinds of famous scientists, physicists, electronics engineers, everybody working on radar, and this got right into the production, this was very efficient. Our radar improved, zoomed, during the war. That was one of the reasons why, at the end, I was in the strategic planning meeting because they wanted to do something -- different ships had different equipment, because it came out at different times, and some of it was much better than others, but when you equip a ship and send them out, you can't re-do the radar. Also, it's a matter of how fast you can produce the new ones, and we were producing ships pretty rapidly.

CM: Was that actually a problem, being able to make radar equipment quickly enough that -- to keep -- so that all the ships had them, or did some ships have them, and --

AB: I don't so, most ships had a pretty good radar, always, it's just that some of them last year's model.

CM: Gotcha, but it changed that fast, I mean, was there huge --

AB: Yes, it changed very fast, the numbers on the equipment usually would go, there'd be one, two, three, four, five, six, seven, going up as they changed the [sing?] a little bit. Then, when they made a major change, like they'd go from 10 centimeters to 3 centimeter [band?], then they had a new name. And that'd start out one, two, three, you know, and so on. So, you'd get different -- and there were a lot of different -- I don't know how many, and you'd just keep seeing different ones.

CM: Well, I assume you sort of kept abreast of new radars came out with longer ranges and stuff, and you'd be right on top of that.

AB: Yeah, yeah. Yeah, that was what I started doing after I got into the radar schools things was, you know, looking at all the new radars and seeing what they were doing and what they could do and talking to people -- operating people about how they could use this new piece of stuff, and then how do you get the people trained to use it. We also had a school to train operators, all sorts of CIC people, fighter directors, and then technicians.

CM: Well, did you keep that, your little admiral school that you had, so that --

AB: Well, no, it was only needed twice, I mean it was only two task forces.

CM: Well, yeah, I guess that's true. But (inaudible).

AB: Actually, it was interesting, a couple of times some of the admirals or senior captains who went to the school wanted to have some of the people on their ship attend the school, people who hadn't been there, and so I would get people coming saying they wanted to go to the school, and of course there wasn't any.

CM: Did you have to invent a school for these people, or?

AB: No, I told them, "Well, you know, we'll let you know when we're going to hold it again."

MARGITTE BROWN: And, you never held it again?

AB: No.

MB: [Right back to the AWACS?], Al? What about your AWACS paper? Your AWACS paper, the paper that lead to AWACS? The paper you wrote about the kamikaze radar up ahead which became the beginning of AWACS.

AB: Oh, that is an interesting one. I don't know if Nimitz was involved in this or not, in the middle of all this, we had a TBM that they put a big radar on, big powerful radar, that meant you had a big -- like the TBM was pregnant, like a big bulge under it, and there was a very powerful radar in it, and the information from that radar was then sent by -- well, in those days, a pretty crude data link -- back to the carrier so it could be displayed on the radars on the

carrier so the fighter directors on the carrier could vector their aircraft.

CM: So, instantaneously?

AB: Huh?

CM: Instantaneously?

AB: Yes, instantaneously. Just, whatever came off the radar went right down to the carrier and was displayed on the radar scopes in the carrier. The only trouble with this, the TBM is a slow aircraft, this was slower still, it didn't have long range, when it had this added to it, it was even shorter, and the system -- you know, the data link wasn't the best data link to get the information down there and so when I looked at this thing, I wrote a paper which, I think, I sent to Nimitz or gave to this Chief of Staff or something, which said, "This is the wrong -- it's a great idea but it's the wrong way to do it. This kind of a radar should be put on a much bigger aircraft that had a long, long range and the fighter director should be in the aircraft looking at the radar right there and vector the aircraft right from this thing." And, I had heard that something was being done about it during the war, or at the end of the war, that they were looking for a plane to do this in, so. Whether it was from my paper or something else, I have no idea. In, I think it was 1953, I got a

call from a General [Agan?] who was -- I happened to know General Agan from other things -- he was the head of the Air Defense Command when I knew him, and now he was in the Pentagon, and he called me up and he said, "Hey, Al, I've been appointed the chairman of the AWACS committee and I want you to be the co-chairman." And I said, "Sailor, I haven't any idea what AWACS is, what do you mean?" He said, "You don't have any idea what it is? You're the guy who invented it," I said, "I never heard of it." He said, "Look, I have here the letter you write in 1945 which describes AWACS." So, I went over to the Pentagon and when you have one of those things in the Pentagon, he's sitting at the head of the table with a whole bunch of colonels who are doing on different parts of it, and when I drove up to the Pentagon, he had a colonel there to meet me with a driver to take my car and park it, and take me. And I said, "Sailor, you know, I have no knowledge about the Air Force, I don't know what's going on now, you got all kinds of missiles that didn't exist when I knew this stuff, and there's no point," he said, "No, no, I want you to be the co-chairman of the committee," and he insisted that we sat side-by-side at the head of the table with all these things. I kept objecting, but after a couple of sessions I realized that he had only one reason he wanted me there,

because he used to say to me, "Al, you know, I'm just a fighter pilot." And, he just wanted somebody with a technical background, not to really make decisions there, as I said I just didn't know enough about it and I thought the colonels he had doing things were pretty smart. He just wanted to make sure that somebody looked at the overall technical background and thought there was no problem, and to assure him that --

CM: Yes sir or no sir.

AB: Yeah, it was yes sir-no sir kind of thing. So, that's how I got into AWACS. But, what's interesting is I don't -- and that's what'd be interesting to see what happened, because I don't know if I wrote that to Nimitz or I wrote that to his Chief of Staff, or somebody, but I remember writing the paper and giving it to somebody and it was -- you know, it was right near the end of the war and I did hear that they were doing something about it once, and I have no idea what happened. It would just be interesting to know.

CM: Yeah, it really would.

AB: But, at least it finally got to the guy they put in charge of it.

CM: No, that's -- sometimes those bureaucracies do work. I'm always fascinated, technology and World War II really

fascinates me, but I'm not very technical. Is radar a microwave-type wave?

AB: Yeah, microwaves, it's all the same thing. Light, which you see, infrared, ultraviolet, x-rays, cosmic rays, it's all the same stuff.

CM: All a frequency of something.

AB: It's just the frequency is different.

CM: So, was there every any problem with cooking electronic equipment, you know, when you're swinging your radar away through them, did that ever become an issue? They talk about a -- how can I put this without sounding like an idiot?

AB: Yeah, I'm not getting the question.

CM: You hear about, a lot of times, that some of these microwaves pulses that radar puts out, if you sweep through some other kind of electronic equipment, you'll cook that equipment, it's because of the frequencies, the way the frequencies, does that ever happen?

AB: No, it wouldn't be that, it would be -- it depends how delicate the device is and how much power there is.

CM: Okay, I guess that's --

AB: Yeah, it's not that they -- the frequencies don't interact and things, it's just -- it's just a --

CM: I know a bunch of Vietnam-era pilots, fighter pilots, and they talk about the targeting radar they had on their planes, these are F-105s and F-100s and stuff, and they said you had to be sort of careful about not turning that on when you're on the ground.

AB: Well, yeah, if you have a powerful radar and there are other things using that frequency or related frequencies, yes you could -- it's no different than if you're sitting here reading this paper, you're using light just like this. If you get a terribly bright light in your eyes, you can't see the paper, it's that --

CM: That is an excellent definition. I'm going to try to remember that (inaudible).

AB: It's the same stuff, and if you have more of the same stuff, you can block out the thing you're using.

CM: It's like, the big thing now is people accidentally shining lasers into commercial pilots' eyes from the ground with the new powerful laser [pens?]. (inaudible) the concept of this.

MB: Al's background is a physicist.

CM: (inaudible)

AB: Yeah, I went to graduate school after the war.

CM: Oh, really? Same field, radar and stuff?

AB: No, no, actually, physics in general, but the work I did was in low temperatures, cryogenics.

CM: What sort of application?

AB: Well, now there's a lot of applications; when I did it (overlapping dialogue; inaudible) there weren't many. In fact, the wildest thing we did, this was in 1958, '48, yeah '48, '49, we were making liquid helium, because the work we needed to do was a helium temperatures like down to about four degrees absolute, like, that's 300 and -- 200 and some degrees.

CM: Absolute zero.

AB: Yeah, it's right near absolute zero, and a guy came to us and said that he would pay us \$100 a day to immerse this thing he had in liquid helium, and we said, "What thing is it?" He said it was just a metal thing, about like this, he said, "You know, I'm from the Atomic Energy Commission, and it's my job to find somebody who could just immerse this thing in liquid helium. "Well, what is it?" "Well, I can't say what it is, it's classified."

CM: Don't you hate that?

AB: So, this was in the summer, this Columbia University, out in New York City, and we said, "Okay, for \$100 a day, we'll do it." Now, we figured that a thing like this, we had to get a Dewar, that is like a thermos bottle thing, about

this big, and we figured we needed so many gallons of liquid helium. As far as we knew it, that day, nobody had ever made that much, and the only way that we could make the helium was to cool what -- we had to make liquid hydrogen and use liquid hydrogen to cool the helium and expand it so it would liquefy, and it would take us about something like 28 hours to make that much with the equipment we had, so we had a -- and we weren't allowed to make -- to use liquid hydrogen -- no, he wouldn't -- no, that's right, he wanted it in liquid hydrogen, so it was just making hydrogen with that, not using it to make helium, just the hydrogen, but if we're going to make that much hydrogen, Columbia University wouldn't allow us to be in any building. So, we had to have a little shack out on the campus, and apparently it got around that we were going to make that much liquid hydrogen, and the next thing we knew the campus police were clearing everything out of the building around there; and then on Broadway, just outside, here's an ambulance pulls up and policeman. So, we were working over 24 hours, we have to sleep there, the four of us were doing this, so we got all ready to put the thing in, where's the guy who wanted to see it? He's on the fourth floor of an adjacent building watching it with binoculars.

CM: Did he ever tell you what was in that thing?

AB: No, we finally got ready and we carefully lowered the thing into the liquid hydrogen, and of course it's like putting a red-hot lump of steel in cold water, you know. Suddenly, all the hydrogen evaporating because it was so hot, and that's all it was, I mean, it did that and finally gets cooled off and quiet, and finally it's just this metal thing, sitting down in the thing still covered with liquid hydrogen, which is what he wanted. At the end there was just -- so we know it's a liquid hydrogen temperature and that's all he wanted, and he just kept watching this with binoculars, there's nobody else around. And then, when he saw it was all quiet he came down and we took it out and gave it to him, or put it on the ground, still too cold to touch, and he said, "Thank you," and when it got cooled off he took it away. I have no idea what was in it. So, it'll be a hot day, it was one of the hottest days in New York that day, and a Good Humor man was somewhere out there and somebody went out and got us some Good Humors, and came in and we still had liquid hydrogen, and I thought, I'm going to see what a real cold Good Humor is. So, I tied a string on it and lowered a Good Humor down into the liquid hydrogen, which boiled a lot more away, then I have a Good Humor cooled to liquid hydrogen temperature, and I was

standing there holding the thing like this, you know, because it was too cold to eat, and it exploded. I say exploded, it just cracked apart, so that was our big explosion of the day. But, none of us ever found out what we tested and why we tested it.

CM: What university were you at?

AB: Columbia.

CM: Columbia, okay.

AB: In New York City. So, anyway, that's -- you've got most of the story.

CM: I actually had an uncle who worked in the Philadelphia Navy Yard, he was in the MIT draft, working on degaussing ships, and of course he never talked about that, apparently that was all big top secret back then.

AB: Yeah, we had a degaussing cable on our submarine and every time it came in to the submarine -- it has to come in to get power, and it came through the -- because it was on the outside of the hull, the cable has to be outside the hull to degauss --

CM: Did you just, like, wrap, just around --

AB: Yeah, it's wrapped around the submarine and you find what current you have left to put through it to nullify the submarine's magnetic field, that's the idea, so if you got near a magnetic mine you wouldn't set it off. So, we

noticed that every time we went very deep there was another six inches of the cable inside the submarine. Well, because it's higher pressure out there, lower pressure inside and it was pushing the cable in, so the next time we went to a navy yard, we said, we didn't like this, remove it. Because we don't think we have a problem with mines, we think we might have more a problem with the cable. So, we had the degaussing cable removed. I don't know if that was smart or not but that's what we decided.

CM: Well, there's a penalty, at least from what I understand it was -- I'm not really sure it worked all that well, anyway.

AB: Yeah, well, apparently it did work, and lots of ships went near magnetic mines and things. We were unlikely to be because we were going around Japanese harbors and things and they weren't going to have magnetic mines there.

CM: Right, I guess his deal was mostly with convoy duty and all that stuff, and they were just [laying?] these mines out and wait for somebody to drive by.

AB: One time on one patrol, actually it wasn't on a patrol I was on, but our ship once laid mines in a Japanese area, it's actually Japanese area on the -- sort of southeast of Japan where there was the right depth of water where a lot of other ships went through and it took a load of mines and laid them there so the submarine could do this secretly.

And, they wouldn't know there were mines there. They were magnetic mines, I think.

CM: How do you carry mines on a sub, strap them to the deck or?

AB: No, no, you -- these were special mines that fitted in the torpedo tube, and from submerged you would shoot them out the torpedo tube with just -- of air, blow them out, and they were rigged so they would, when they got out there into the water they would sink and then something would release -- so, to the bottom, then something would release the mine so it would go to the depth that was set, so you had to go to a specific place where you knew -- check the depth, and it would go up and if the mine was supposed to be at, I don't know, 10 feet below the surface, if you dropped it in the right place it would go up to there.

CM: Wow.

MB: Al, you were thinking of your stories really just related to Nimitz.

AB: Hmm?

MB: You were thinking, I think --

AB: Yeah, this had nothing to do with him, he asked me about the monument --

MB: I know --

CM: This is all just so fascinating.

MB: No, no, I know, but that's what I'm saying, the museum is the whole South Pacific, so then you have a lot of other stories that are not --

CM: But, you just happen to be sitting in his daddy's hotel right now.

MB: Yeah.

AB: Yeah, his grandpa's hotel.

MB: And, I was thinking of the story that you had talked about the, what, the transport that had been, that you had torpedoed and nobody had -- it wasn't supposed to be known in Japan, and then the reporters had come back --

AB: Oh yeah, that story's here.

CM: Oh, in one of these things?

AB: Yeah, it's in one of these paper -- that was where we went into this, there's the Inland Sea, there's the Island of [Shikoku?] is out into the Pacific, and then behind is the Inland Sea, and there's southern entrance and then the northern entrance to the Inland Sea, and actually we went in the southern entrance, we went all the way inside, got inside the Inland Sea, and there is nobody around. Finally, a transport cargo ship came out and it just happened to be at what we figured was about our maximum torpedo range; our captain figured, let's fire one torpedo at it, and we did, and of course we were watching and we

saw the torpedoes at the end of their run would surface and then sink to the bottom. And we saw our torpedoes surface not too far from the ship, but it never made it there, and we thought, oh, God, now they're going to be after us. And, we saw no change on the ship, so we figured nobody on the ship saw it, because they were in their own Inland Sea and they probably didn't have any lookouts, they were just the guys on the bridge just steering the ship. So, we said, gee, what can we do? Because we were submerged, we can't go very fast and it wasn't going too fast, and so we're sitting in the war room, and I said, "Look, let's suppose one of us is crossing Golden Gate Bridge, and he looks down and he sees a submarine and he said, hey, that's a Japanese submarine, now how many of you guys with all the different submarines and allies we have, could say that one's a Japanese submarine? I don't think any of us could necessarily say we knew exactly. But, let's say somehow you knew, what would you do?" Well, you'd go to the nearest phone and you'd call a port director and you say, hey, there's a Japanese submarine just went under the Golden Gate Bridge, and what do you think he's going to say? I said, "So, why don't we just surface and just like we were a Japanese submarine proceeding out to sea, there's no [enemy?] submarine vessels in here, once we get out

there, there's going to be all kinds of guys looking for us so we can't be on the surface out there, but in here we could follow this guy out. Now, it's getting to be late in the afternoon and by the time we get there it can be night and then we can go after them on the surface. So, the captain said, "Okay Al, do it." So, I got the lookouts and I said, "Now, we're going to surface," and we're only about a quarter of a mile from the Japanese coast, said, "You're going to see Japanese people, they're going to see us, and look at us, and they may wave or do something. Now, you get up there and just do your regular jobs and if you are looking at somebody and he does something, you do the same thing, if you he bows you bow, if he waves you wave, if he holds his hand up, you hold your hand up. Whatever he does, you do the same thing, and then go back to whatever you're doing." So, we proceeded out of the Inland Sea on the surface, which I think was absolutely probably the safest place we could be.

CM: Hiding in plain sight.

AB: In plain sight, fully surfaced, and with lots of Japanese people stopped and looked and pointed and some waved, or some did different things, we just kept on going and finally, it got to be dark and then we were -- and as we started to get out where the anti-submarine vessels were we

dove so -- but, when we get outside and surfaced either he was going to go north or south, and since we were supposed to go north, that was our patrol plan, we turned north, but apparently that was the wrong way, because we didn't see him. But, what we did do was we go through the whole Japanese fishing fleet; and you go right through them, they're there -- they don't know, on the surface, and sometimes you pass 50 feet away, they don't know one submarine from another, haven't got any radios, there's just fishermen, you pay no attention to them, they pay no attention to you.

CM: You see these things in the movies and you wouldn't believe them. There it is.

AB: But, you know, you realize the same thing, we have a lot of odd submarines we'd see that were some other nation's that was friendly, but inside of our ports.

MB: Al, the other torp-- the transport you took torpedoed, and then there was no --

AB: Oh yeah, that's what we were talking about, yeah, we went on that -- one time we went north and we went into the northern entrance which is [Kiseido?] and we got inside, that's written up in one of these papers, but the interesting thing about it is we sunk a transport and when you're right, almost inside the Inland Sea, they really

pasted us to the point where they had first planes and then they had five destroyers or anti-submarine vessels dropping depth charge. And these guys knew what they were doing because one of them off to the side would ping, so he'd keep track of where you were, but the one who made the depth charge run wouldn't, and he would get information from the one who was pinging as to where you were and that's very smart. Most of them didn't know how to do that, or mostly you didn't have enough of them, and this kept going on till I thought, it's written in there, I thought we were finished, because with five destroyers, finally we were running out of air, you know, it gets really bad on a submarine, you can't breathe, you walk 10 feet and you're (panting), and it gets terribly hot, and --

CM: I couldn't even imagine it.

AB: -- it's not good, and we had a -- because I was the sonar officer too, we had new, special sonar equipment that was in the forward torpedo room, and I could tell from the sounds who was making another depth charge run, and as he made the depth char-- and I would be on the -- had a phone to the captain in the conning tower telling him, and he would do anything he thought he could do to avoid it, which wasn't much because by that time we were getting heavy and we had to keep an up angle like this so the screws were

partly holding us up. And, you know, we were down below our designed depth anyway, and water was coming in; it was not a good situation. And, you know that you've got to surface, because you've got to get air, and if you do and destroyers are there they're going to shoot at you first, but what they're mainly going to do is try to run in to you, that's a standard thing to do. You know, just run right into a submarine, that's the end of it. So, we figured that was the end and --

MB: Well, you said you were starting to sink.

AB: -- we decided -- hmm?

MB: You were -- you could hear when they were going to drop a depth bomb.

AB: Oh, yeah --

MB: You were starting that story.

AB: We could hear when -- I could tell when they were going to get close enough to drop and so I would lift the headphones off my head so I didn't get a big bang, because then (mimics noise) you know, and one of the torpedomen in the fore room -- by this time nobody was wearing anything but underwear shorts because it's so hot, you're dripping wet, and one of them was standing there watching me. And when he saw me take my headphones off, he knew what was coming,

and I saw a big pile of shit drop out of his underwear, so I knew you could be scared shitless.

CM: Oh yeah, I'm sure.

AB: It's the first time I saw a demonstration of being scared shitless. But, we got to the point where we decided that was the end, that we might as well surface and see if we could shoot at them before they ran us down. So, we got a gun crew together, we got all ready to, you know, because you've got to carry the shells and things up and out into the gun, you've got a four-inch gun. And we surfaced and we were in the midst of a heavy rain squall, so of course nobody could see us, because the rain, you know, blocks the radar, too, the radars we had then. And we surfaced and just headed out to sea. And when we sunk this ship, you know, I was right there by the periscope and the captain was watching, you know, and the quartermaster counts down the torpedo run and then you hear the boom and the captain said yeah, "We got him," and he said, "Al, take a look," because he wanted to have somebody else to see it too. I took a look and I saw the thing was going to break in half, and it went down and then we had all this problem. When was that -- when did [Steve?] call me, 195-- maybe it was in the '60s -- I got a phone call from our captain, when we were good friends. We met each other socially and things,

and he finally retired from the Navy and often visited us and things, and he called me and said, "Hey, Al, I got a phone call from a Japanese press guy and he asked if we were the -- we sunk this ship off [Moroto Saki?] and it's the one we sunk and he wants to come talk to me," then he called again and he said, "Hey it's really interesting and I think he's going to come to see you because he wants to hear about it," and the thing is that apparently he's been doing a lot of research about what the Japanese Naval Command was doing and they're very unhappy with the things they were doing, and what he found out was the ship we sunk was a transport that was bringing troops back from somewhere down south and the captain had said he wanted to go up all on the west side of Japan and into the Inland Sea, and he was told to go around in the Atlantic side which, I mean, Pacific side, which was where we were and he protested that there was too many US submarines there, and they told him, "No, you go where you were told," and so he got sunk, and yet he -- there was no reason he couldn't have gone the other way where there weren't any submarines, you know, in the China Sea, and apparently a lot of the people on that ship died and there wasn't a big effort to rescue them and in addition the government put out things that you can't mention this incident, it's to be kept

secret. So, he's now writing all this up and the net result of all this was that as they got into it the people from the town put up a memorial to that ship we sunk, and so there's a memorial to the ship we sunk there in [Moroto Saki?]; so this guy, he came with a television crew, interviewed the captain, he called me up and for some reason he couldn't come to see me but he asked me some questions, and I said, "Yeah, I saw it," and he apparently, I thought he was implying that a lot of people could be saved, but when I saw the ship it was breaking in half and going down, and I think it would be hard to get a lot of people off it, you know, that's a bad thing. It broke; it goes down fast, anyway. But, that's -- there's a paper on that here. Moroto Saki.

CM: Are you writing a book, by any chance?

AB: No.

CM: Aw, come on.

AB: I just wrote -- these are very brief things.

MB: He should write a book, his family keeps wanting him to, but he's not interested.

CM: Just like I say, I find I have a bunch of books about German technology in World War II, which is just -- maybe you have a theory, how come the same scientists in

different places get the same idea at the same time? Do you understand my --

AB: Yeah, I think that's because so many -- there was so much exchange of scientific information --

CM: Pre-World War II.

AB: Yeah, pre-World War II, there is all the time, and I think that people get led to the same ideas without, you don't need to tell anybody --

CM: That's the [best words?] --

AB: If a guy who really discovered radar, you never hear about this, I only heard about it because when I got sent to the special radar school by the Navy, one of the guys that talked to us was a Professor [Mimno?] at Harvard, and Professor Mimno was very interested in measuring the exact distance to the Moon. He just did all -- spend a lot of his career trying to do this and he got the idea that if he could send a high-frequency signal to the Moon in just one pulse, and it would be reflected back and he could measure the time it took to come back, he could tell exactly how far the Moon was. Well, that's radar.

CM: That's right that is radar.

AB: Now, he didn't know he'd invented radar; actually, other people had been -- invented radar, but he had invented radar sort of before they did all by himself because he had

been doing this back in the '30s. Well, at some point he published this, so another guy is going to look at it and say hey, wait a minute, we can use this not -- we don't need it for the Moon, how about something just out there? So, I think that's how ideas spread very fast.

CM: Can I mention a story I heard about stealth technology, that some Russian guy in like the '50s or '60s had written a paper about how light reflects off surfaces, ignored -- everyone ignored the paper until somebody picked it up and said, you know if you did that to an airplane, I see what you're saying.

AB: Yeah, I think that goes on a lot and there's -- in the scientific world there's a tremendous amount of communications. When I was in graduate school everybody belonged to the American Physical Society, and there was a monthly publication of the *Physical Review*, and at that time they just started another publication called *Letter to the Editor*; where the *Physical Review* only published full, finished research papers that had been reviewed by a board to makes sure they were all -- if there was any question about anything in it, you'd go back to the author and get him to fix it, and so forth, so they were all reviewed papers in the *Physical Review*. In the *Letters to the Editor* was just coming out was all kinds of ideas and

little things that weren't quite finished and that kind of thing, and there was only one meeting a year of the American Physical Society, one for everybody, one year -- one meeting a year, and it was -- I think it was four or maybe five days, you know, papers and things were presented, and that was it. Today, the American Physical Society is divided into I don't know how many parts any more, must be 10 or 15 parts, the [fire?] frequency part, the cosmos kinds of things, all different things, metallurgy, and there's no longer just a *Physical Review*, there's a whole bunch of them, and I don't do this stuff anymore, but it was a common thing, when I was a graduate student, you got the *Physical Review*, you read the whole thing, because you know what's going on in physics. I don't think it would be possible now. Furthermore, it's so sophisticated in some fields that even though you were a good physicist in one field, I'm not sure you could pick up the journal of another field and understand it without a lot of work. But, you know, it's all out there, hard to keep up with it.

CM: It is, it is.

MB: I think one of the interesting things in your career, Al, is that as you were talking to Cork about all this, you were really doing what you call operations research, how

each piece goes together and connects and -- for instance on the aircraft --

AB: Yeah, I went to study physics not because I was interested in physics but because at the end of the war when I was going around doing all these different things, there were a bunch of civilians hired by the military to do all sort of operations, research, sometimes it was called that sometimes it wasn't, analysis of things, and these guys when they talked to the military often they talked in very technical, non-operational terms, although they were looking at operational things. And a lot of the military people didn't pay too much attention to them and I found a lot of things they were doing was for -- I went to see them frequently that I could go and tell to the operational people who would listen, but it was what, because I could put it in terms they could understand versus these guys couldn't. And so, I decided this is the kind of thing I like to do, so I went around to all these guys that I worked with, you know this may be a dozen or more of them in Pearl Harbor; and the ones I thought were best for physicists, their background was physics, so I decided to study physics, mainly because I wanted to do operations research. And, these were the people who did operational things like they would analyze how accurate it was to drop

bombs anywhere and what were the factors affecting whether they were effective or non-effective and things like that, there were very operational things, but it was all full of mathematics and other things; it was hard to tell people exactly what you do about it.

MB: I think another thing that you did in the war where you first used radar, what was what, in the landing craft, helping them find a way to land on the islands? You talked to [Bryce?] about that.

AB: Yeah, this was, you know, I told you I got out to Pearl Harbor and I didn't want to be in a Navy yard installing radar and said I wanted to go to sea and this commander came to me and said he'd been assigned to do these landings at night behind Japanese lines with marine radar battalions. And, what we had to do it with were the old four-stack destroyers that had two boiler rooms removed and bunks put in for Marines and he thought if he didn't know anything about it, but he said if you're going to do it, from what I understand, you need radar to do this. And so, he said, "Come with me, we got to figure out how to do it." The first thing we had to do was figure out how to do it, and from this, when I read about the Normandy landings, I think boy, if I'd been in charge of that I wouldn't have done it that way at all, that was terrible. But, what I

found out was that in one case, when they tried to land Marines they went in in their landing craft, and the reefs in the South Pacific are such that you can -- a landing craft could go aground on a reef a half a mile from shore, and in some cases they did. And here was a bunch of Marines, loaded down with equipment, a half a mile from shore, and sometimes the water was often over their heads before they could get to the shore, and a lot of them were lost just that way, they never got there. Or, if they got there, it was because they got rid of all their equipment, and to arrive on the Japanese shore naked wasn't very helpful. So, the first thing we had to do was find a way. And then the charts we had weren't very good. So, you had to find a way to get to the shore that wouldn't get you on a reef; well, if you photographed it in the right kind of light you could see pretty much what a path was. So, first of all you had to get some flier to go up and take pictures of the place you wanted to invade so that you could find out where a path was. Then, you had to get that path on a chart that we had even though some weren't good and kind of investigate that a little bit, then you had to make sure that you knew where you had to be at night so that you could send the ships down that path. Now, with the radar you see the island and it depends on -- exactly where you

see the island depends on where -- you don't see the beach, you see anything that sticks up enough to reflect the radar [pack?] so you have to see what you're going to see so you know where you are, and then the radar will actually see the landing boat because there's enough metal helm that's on the Marines and things that you can spot the boat, and so with a radio you can watch on the radar and guide the boat to follow the path to get to the beach. But, when you get to the beach you have to know what they're going to need to do there, so you have to spend a lot of time figuring out how to load the boats, so making an amphibious operation is not just going ashore, it's a whole lot of things you got to work out first. And, we did this, so you could do this. And, this is what this commander that I was on his staff, that's what we worked on; that's how I got to be [see?] such an expert in --

CM: In radar studies.

AB: -- in, in -- well, in amphibious operations, figuring out how to -- because we worked on these things together and, you know, you get into some things; one place we practiced was in the Fijis, which was a real friendly place, and we were going to practice someplace and before we practiced we'd go to shore and find out if it's okay and so forth. And, there was a little village there; we went to the

village and it was kind of a neat little, very native, thing with little grass huts and things, and a priest came out and it turned out we didn't know it but it was Sunday, and we always brought a bunch of candy bars and cigarettes to give to the natives because they liked that. And, we start doing that, he says, "No, you can't do that today, it's Sunday." And, so we said, "Okay," and we thought we'd just (inaudible), and he didn't mind us practicing, but he said, "Don't go too far inland because there's a lot of headhunters here. I've lost a couple of people in my village by going back too far." This isn't a friendly [place?], and this priest went around, spent his time going around to different villages in his motorboat; he had an outboard motorboat, and he would go to the village. And, in his villages, they really observed the Sabbath, and they had nice little paths laid out in the village and he really had control of all the people, he did all kinds of things. They observed Sunday; I kept wondering, what these people thought it was they were doing.

CM: It's like all the [all circuit-riders?] around here. Go from town to town, everyone's about 30 miles apart, whatever day you get there is the Sabbath, because that's when he's there.

AB: But, it just was odd to think of how he could explain, and I'm sure he couldn't explain the whole concept of what he was talking about, Jerusalem, the Crucifix, you know, (inaudible), how do you explain that to these people? I mean, they have no way to even imagine anything like that

MB: Just a quick question, could the radar pick up coral under the water?

AB: No, no.

MB: So, you had to just know where that was?

AB: Yeah, the other way -- one of the things we did, though, the sonar would, we had on a destroyer had -- sonar, under the water it sends out a pulse, it's like radar except it's sound, higher frequency sound, and we could find reefs that weren't on the chart that way, by using the sonar equipment. And that was the other thing we did; if you were going to think of an invasion somewhere, you wanted to try and get up there some night, well ahead of it, to get a look at what it was like, not only on the radar but with the sonar to see where reefs were. Because, it was possible and happened in the South Pacific, for a ship to run aground where there was supposed to be water, and one of the charts we had was made up by a sailing captain, I don't know, in 18 something or other, and what was on the chart was where he anchored and where he sent a longboat

with a lead line to find the depth, because he was looking for where he could get into (inaudible) [the shore?]. And, he had a line here and then he ran into where it wasn't deep enough, but he [saw?] that was on the chart, and then he had another one where he found where he could get in closer, so that was okay. And, that's all there was on the chart, because that's all he needed, he found where he couldn't go and the hell with the rest of it.

CM: Well, the D-Day invasion they used -- once they got on the shore, they used a Michelin highway map, the most accurate, efficient map of Europe that --

AB: Michelin made good maps.

CM: Yeah, it has contours and everything you wanted to know. [Same deal?]. I actually have a copy of it.

AB: Well, I don't really have a lot more, if you've heard enough --

CM: Never. But, this is good this is all very good. Any summing up you'd like to do?

AB: Oh, I don't think so.

CM: Okay, well, once again --

MB: Let me make a comment --

CM: Sure.

MB: -- in that when Al got out of the Service he felt like there was nothing he couldn't do, that you said that, at one point.

AB: Yeah, that's sort of true, yeah. Well, it was an unusual set of opportunities that came without my doing anything, you know. I wanted to fly but I didn't -- I got sent to radar school, I got into the amphibious things, and then I got to submarine school and it was because by changing submarine operations a bit that got me into that part of it, which got me to the radar stuff at Pearl Harbor and the radar school. But since I was looking for tactical things to do, instead of just sitting at the school, the school sort of ran itself. Actually, I was the officer in charge of about four different schools there, but I didn't do anything to -- just see that somebody was doing it, I was going around and talking to everybody about what they were doing tactically, and so we keep finding things that way. And that's why I felt I could do all kinds of things, because I got all kinds of things started, like the things we were talking about. But, it wasn't like it was terribly -- it was like it was all an accident, you run into it, the guy with the Japanese radar in the plane came to me and nobody really -- he only talked about the [tactical?] side

of it, nobody really asked him about what he had, what it could do. Nobody ever tried.

MB: Well, you were qualified in what, four different areas where you ended up, were you not? I mean --

AB: Oh, the Navy in those days had letters you put after the name, you can be a Qualified Deck Officer, Qualified Engineering Officer, Qualified Radar Officer, a Qualified Fighter Director, a Qualified CIC Officer, they all had different names, and they put things after your letters, you know, they say, A. Brown, Lieutenant, EVCX, or something, to say what you were qualified in, which was just useful at the time. And, I think I was qualified in all kinds of things, because I got into them, because I was a deck officer and an engineering officer at the start -- well, deck officer because I was at sea, and qualified as a deck officer -- I was qualified as an engineering officer, and a radar officer because I was at sea. Then I got into the fighter direction, so I was a fighter director officer. I worked on establishing CIC so I was a qualified CIC officer, not that I qualified, it's that I started some of these things in it, so --

MB: Well, and they wanted you to stay in and make you a captain.

AB: Yeah, then they -- at the end, the Navy wanted me to stay in the Navy, and I said, "No, I want to go to graduate school." And they said, "We'll send you to graduate school at your present rank with all your pay and allowances and a housing allowance and all your expenses for graduate school until you get your degree, and then you need to spend five years in the Navy." And I thought about this, and I thought, you know, this is going to be the peacetime Navy, and I didn't think I wanted to do that, so I thought I'd just not do that.

CM: Thanks but no thanks.

AB: Yeah. And, I often wondered if -- it was very tempting, because it's hard to go to graduate school; one of the things, as soon as I walked in to Columbia and they looked at what I had been doing and immediately said, you're going to teach, you know, because graduate students, I was in charge of one of the graduate physics courses. Why? Because the professors don't want to bother with that, there's a full professor who will give the lectures, but you're in charge of the course, decide what the course is, the textbooks, organize the classes, you know, get all the grades together, all the stuff and run the laboratory. And so they're very happy to have -- so, they look at a graduate student who has the kind of background I had at

running a school, doing things, this is no question. So, that gave me an office in the university and a salary and everything else. Not a very big salary, but -- you know, totally free tuition.

CM: That was a good deal.

AB: Yeah, so I look at that now, because I'm in this place where, [Indianapolis?], where ex-admirals and things, formal admirals and I keep thinking, gee, you know, if I had taken that up I'd probably would end up staying in the Navy in the peacetime Navy and being an admiral. I don't think --

CM: Well, yeah, I mean there's a lot of stuff you got to do that's probably no fun at all.

AB: No, I mean, a lot of them just, I mean, they have to go to sea and spend time on a ship, just to ride around on the ship is -- and then they have a shore job which is usually not a lot of fun. Some could be very interesting, I mean, you could be assigned to some project which is very good, but you'd also be assigned to seeing the cooks and bakers school runs [right?]. Anyway, I'm not unhappy that I didn't do that. And, it's interesting, I often thought about it, now I can talk to these guys and find out what they did and you can see that; and the other thing, it's interesting, you talk to some of the admirals, you can see

that there's basically blanks in their careers that they don't want to talk about. I mean, not that they -- I think, just, wasn't very interesting to them.

CM: Well, I'm sure when you get up to be that sort of officer, there's a lot of stuff you do you just rather not do.

AB: Yeah, you just --

CM: Well, it's the old yes sir no sir part.

END OF AUDIO FILE