David Trent Leighton

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David F. Winkler, John Grady
Interviewers

WINKLER: This is Dave Winkler with the Naval Historical Foundation, with John Grady, our oral historian, and we're here with David Trent Leighton. Today is December 14, 2010. We're located at David Leighton's home here at 2612 N. Fillmore St. in Arlington, Virginia. And we want to talk a little bit—in fact we want to talk more than a little bit—we want to talk about your career in the Navy and working with the Navy as a civilian after your time in service.

To start off with, you're born in Los Angeles, California, January 21, 1925. Can you talk about your father, who was in the Navy, and a little bit about his career, for starters?

LEIGHTON: Well, of course, when I was born I didn't know much about it. I was actually born in my mother's mother's home in Los Angeles, and we moved about three weeks later.

I'm not too all prepared in this discussion to talk about my father's career. I have information on it. He was a general line officer. He had command of a destroyer when he was an ensign, with one other officer on the ship, who was a chief warrant officer. Whenever they got underway they alternated on watches for the ship as officer of the deck. They didn't have any other officers on the ship. The ship was an old four-pipe destroyer that a commander had gotten permission from the Navy to reactivate. It had been put in mothballs at the end of World War I. No, I guess before that, because this goes back. My father graduated in 1909 from the Naval Academy, and I think this all happened before World War I. I have information on that but I don't have it in my head.[1]

GRADY: Okay, we can pick that up later.

WINKLER: We certainly can, because one of the things that we like to do is, we'll show you the transcript and then you can insert material where appropriate, you know, to flesh it out.

LEIGHTON: I can mention some things. He was a radio officer for the Pacific coast and he was stationed at Mare Island, and I was probably three or four years old about that point. So all the West Coast radio stations came under him. The Navy had sent him to school in addition to the

[1] Leighton's father was Frank Thomson Leighton born on September 2, 1885 at Tunkhannock, PA. He graduated the Naval Academy in 1909 and had an initial assignment on a destroyer. He met and married Elizabeth Roby Ohler on November 6, 1912. Besides Cornell he attended Columbia University to get a Master of Science Degree in 1916, Leighton spent World War I on the submarine tender *Savannah*. Throughout the 1920s and 1930s, Leighton advanced through shore and sea billets culminating with command of the cruiser *Louisville* from October 29, 1938 to December 12, 1940, During World War II he was promoted to Rear Admiral and had command of the 8th Naval District (New Orleans). He died at the Naval Hospital in Newport, RI, on November 23, 1943 at age 58.

Naval Academy. He had a master's degree in electrical engineering and a master's degree in mechanical engineering from two different places. One was Cornell, and I'd have to look up the other one. I think it was a predecessor to MIT, but I'd have to look that up.

He had applied for submarines at one point and he was turned down because he had these two degrees and they wanted him to do other things. For example, he was a chief engineer later on, on, I think, the *Colorado*, which was an electric-drive battleship as I recall. I'd have to look up and make sure which ship, but it was an electric-drive battleship. Well, I'd really have to go refresh my memory.

It's just not all coming back to me. And, of course, I was very young while these things were going on. He did go to the Naval War College. As a matter of fact, his thesis was on the likelihood of events if the Japanese decided to attack the Philippines, and I know he wrote his thesis on that back in about 1931, somewhere along in there, the early thirties. I know myself, when I was in high school I wrote a paper on the vulnerability of Pearl Harbor to attack.

And the reason for the paper was, it was an English class and you were required to write a paper, and that's because they wanted you to learn the references and the ibids and op cits and all that kind of stuff. So I just picked that as a subject in 1940. And all my other Navy junior friends that lived in Pearl Harbor: Oh, no, that's invulnerable. And I said, yeah, that's when they thought about the Maginot Line, it was invulnerable.

GRADY: Had you ever lived in Hawaii at that stage?

LEIGHTON: No, I had never lived in Hawaii. My father, by this time, was a commander, or just making captain. He knew an awful lot of people in the Navy and they had them over for the Army-Navy game or whatever, so I got to meet a lot of very interesting folks, and I was well aware of things that were going on. Most high school students, I guess, don't pay much attention to what's going on in the world, but in 1939 and '40 things were getting pretty hot. So when visitors would come to the house the conversation—and I'd just listen in. I wasn't eavesdropping, but I'd listen to the conversation, and different people with different views on what was going on with Japan, etc. And so I had become, well, I'd become totally convinced that there was going to be another war soon. As a matter of fact, I had bets on with other students that we'd be at war by January '42. Of course, it happened sooner than that.

Most of the people, the senior Navy people, were convinced we were going to have war with Japan. And, of course, Richardson—it was all in the papers at the time, but Richardson wanted to bring the fleet back from Pearl Harbor, and Roosevelt fired him because of that and put in Kimmel. Roosevelt said, well, we want the Japanese to know we mean business, and Richardson says: You bring the fleet back to the West Coast and start getting it ready for war; they're going to know we mean business. Because, he said, we *aren't* prepared to fight.

Well, this gets into so many different things. I had the pleasure when I was teaching at Treasure Island of talking to General Chenoweth, who was captured at Corregidor and survived the march, and he told me that where they were in the Philippines they were convinced the Japanese would invade. They were convinced they would run out of ammunition; they couldn't

get more ammunition. And he had required his troops to make bows and arrows and spears and bolos, and exercise using them, because he knew they'd run out of ammunition when they were attacked and he wanted them to have something to fight with – which they did. But in terms of preparedness for war, these days if you haven't given every soldier the most modern equipment, etc., it's something terrible. We weren't prepared for war for beans, and the people that were going to have to fight it knew it. But they knew that the first thing we were going to have to do was bring the fleet in and put more generators on them.

That's where you get to Rickover. Rickover was head of the Electrical Section, and he had personally, as a commander, ordered 5,000 turbine generators to be bought and put in a warehouse, because he knew from what was going on that they were going to have to have more electricity on the ships to be able to do any good. And so fortunately he did that and they were available. It takes two or three years to make one.

WINKLER: A couple of follow-up questions. One advantage, I think, of being at Western High School, in D.C., of course, is you are going to be a little bit more aware because you are in the nation's capital. I think that would be an assumption. But that was just one of many schools you attended. What are some of the duty stations that your father were that you had to travel around the country, growing up?

LEIGHTON: Well, San Diego. Vallejo—Mare Island. Puget Sound for overhaul. At that point he had command of a cruiser, in there for overhaul in the summer of '39. Annapolis—he was in the Steam Department. You've been down to a parade down there, at the Naval Academy? You know about the quarters along—I guess it's Quarter Road. No, maybe it's not Quarter Road. Anyhow, all the Navy juniors would climb the trees up that are behind the bleachers. And then the Jimmy Legs—back in those days they didn't have Marines as guards; they had the Jimmy Legs, they were contract people, and they'd come chase us Navy juniors out of the trees before the parade started. Well, we lived in quarters directly behind that, just about to set on Worden Field, and I remember those days. I was one of the Navy juniors climbing trees. What you do is get to the top of the bleachers so the branches were low enough you could reach them and pull yourself up. But that's neither here nor there. But Annapolis was one duty station.[2]

[2] From pre-prepared notes: My entry year into service: 1942. I graduated from Western High school in Washington, D. C. In early June 1942 and entered into the Naval Academy a week later due to Presidential appointment earned in the annual competition for such appointments open to sons of naval officers. My pre Academy education was all in public schools wherever my family lived due to my father's duty assignments. The Naval Academy was my thirteenth school. The year before I entered I attended three high schools located in Long Beach, Annapolis, and Washington. I was almost the youngest member of the Class of 1946, since I was less than three month beyond the minimum age limit. The entrance exams were held before I had completed senior year. This was a particular problem for me, since some of the questions on the Chemistry exam were about subjects not yet covered in my Chemistry class; I eked out a 2.5 in that subject which qualified me to enter the Academy. Since so many of my classmates had at least one year of college before entry, I was afraid I might fail and thus studied hard. I was pleasantly surprised when I stood 118 at the end of the plebe year. I eventually worked my class standing up to 23 at graduation, between Bob Welander and Bob Wertheim.

He had two tours in Washington at ONI. And, unfortunately, on December 7 he was in the hospital, diagnosed as having a bleeding ulcer, and they treated him for that over several years. And what he really had was stomach cancer. And so the cancer got worse and worse and eventually killed him. But he went from there out to the—well, this is totally disjointed—he was in the Office of Naval Intelligence. He'd been called back from command of the *Louisville*. He was on a goodwill mission to South America as commanding officer of the *Louisville*, which was one of the 10,000-ton treaty cruisers. He got orders out of the blue that they wanted him to report to ONI Washington. And the ship meanwhile also got orders to pick up gold and take it to Cape Town, Africa. They wanted to send it on a military vessel. And I don't know the details, I've never looked it up to see what the big gold shipment was, but there was a major gold shipment that was sent from the United States to Africa and offloaded, and the *Louisville* was assigned to get it there. Commander Nelson, who was the executive officer, was then made commanding officer and my father came back to Washington. And I believe—this was just before the war; this was in 1940, I guess. Well anyhow, he was in ONI. And then he got selected for rear admiral. I have the dates and all, I just don't have it in my head.

Meanwhile, the Navy reorganized the shore establishment and they moved into New Orleans, the Eighth Naval District, the whole Southeast. And so the panhandle of Florida was in the Eighth Naval District; the lower end of Florida was in the Seventh Naval District. My father was ordered as commandant of the Eighth Naval District, and he had orders as additional duty to be task force commander on the Eighth Naval District borders, which was the largest Naval district in the country by the time they got through building the Eighth Naval District.

They told him—I know he told me that he was convinced that we would soon see German submarines in the Gulf. And he was told: Don't ask for destroyers; we're not going to give them to you. So that was a big problem because it wasn't more than a month before they showed up in the Gulf. And he used to come home and say, "Well, we sank two more whales today," because the aviators, you know, they'd see a whale. A lot of carcasses of whales in the Gulf (chuckle).

But anyhow, he died in November '43 from the stomach cancer, which they finally figured out was cancer and they went to operate on him and they got in there and it was too close to the valve to his heart and they couldn't complete the operation. So they sewed him up and gave him radiation treatment. He died on active duty in November of '43. I was a midshipman.

WINKLER: One thing. Obviously, your father must have had some influence on you and your siblings, because most of you wound up in some Navy service.

LEIGHTON: Well, my oldest brother was Class of '41. My sister was the first ensign in the Waves. But she'd gone to Wellesley and she knew the president of Wellesley quite well. And you'll remember, the president of Wellesley was the first officer in the Waves. And the next day my sister was the first ensign. The president of Wellesley came in, I think, as a lieutenant commander when they started the Waves.[34]

[3] LCDR Mildred H. McAfee, USNR. Elizebeth Roby Leighton was the first Ensign sworn into the WAVES (Women Accepted for Voluntary Emergency Service) on 4 August 1942. Her highest rank LCDR.

WINKLER: Your oldest sister, she's still around or has she passed on?

LEIGHTON: No, I'm the last member of my direct family. Both my brothers, both my sisters, and my mother and father are all gone. My mother and my two sisters all died at the age of seventy-six. I've lived longer than anybody in my line in 500 years. I don't know back before that when they died, but I do know all the people in my line, my direct ancestors, in 500 years have not lived as long as I have now.

WINKLER: Well, this is something which you shouldn't complain about.

LEIGHTON: No, no. I don't complain about getting older because there's only one alternative. But unfortunately, when you turn eighty the doctor told me—when I got to be eighty the doctor said, "The warranty is gone on the parts." And that's very true. And every year since there's been some more parts that stopped working right.

GRADY: Your father, obviously he was an influence on your going to the Naval Academy.

LEIGHTON: Yeah, there's no question that my going to the Naval Academy—I'd wanted as a young boy to go to the Naval Academy when I grew up, and Bert Decker's father was in the Class of '22, and I knew him very well, and he wanted to go to the Naval Academy. We said, if we get to the Naval Academy, let's ask to be roommates. And that in fact happened; he was my roommate all three years at the Naval Academy. Of course, he's gone now, as is his mother and father. But it's kind of interesting that I didn't know until very late in the game, working for Rickover—it wasn't until Frank Duncan's book came out on Rickover that I realized, that I put together, that he and Admiral Decker were in the same class. And in fact, Duncan points out that one of the naval officers who liked Rickover and helped him.... You know, everybody's got the idea that nobody liked Rickover, that they all hated him, and that's not true. So I mentioned that to Rickover. I said, "You know, my roommate at the Naval Academy was the son of Admiral Decker." He said, "Well, I remember bouncing him on my knee when they were little kids." And I talked to Bert about that and he said, yeah, he remembered that too.

One day much later Rickover brought Admiral Decker down to my office. He said, "Here's a friend of yours who just stopped by to see me." The Deckers had been very nice to me over the years, and they seemed to alternate East Coast, West Coast, more or less on the same cycle. So Admiral Decker and my father both had duty in San Diego or Annapolis or whatever at the same time. So they were good friends.

WINKLER: Was your father the first Leighton to be in—or was there a history before that?

LEIGHTON: No, my grandfather—which I'm trying to put together here—one of the things I have is a letter in which he says, "I'm thinking about Annapolis for Frank." And that's the first thing of anything I've found in looking at the thing, is that statement in my grandfather's writing, thinking about Annapolis for Frank.

And I don't know—see, Admiral Stark was a good friend. In fact, we have a very nice wedding present from him when we got married. And his father was a druggist in Tunkhannock. Tunkhannock's a small town in Pennsylvania. If you take Wilkes-Barre and Scranton and then make a triangle, Tunkhannock would be there. In other words, Scranton's up here, and you go over there is Tunkhannock, and back over here is Wilkes-Barre. So it would be an equilateral triangle.

Well, Stark, of course, ended up as Chief of Naval Operations at the time when the war broke. And I think, I've always surmised, but I have no knowledge of it, I've always surmised that he's the one that wanted to get my dad back in ONI, and had him jerked off the *Louisville*. Because this was just before the war. But I don't know that he had anything to do with it, although I do know they were good friends. And, of course, they grew up together, although he was older. Stark was class of '03.

So he was older than my dad. But I'm sure they knew each other, because in my grandfather's diary there are several mentions of members of the Stark family. And, of course, Stark was a hometown hero when he ended up as Chief of Naval Operations.

But my dad's father was born, lived, and died in Tunkhannock. He was a farmer as well as a merchant. He ran a store. And wanted desperately to go to college, but there was no money in the family. And my grandfather wanted to get his youngsters out of Tunkhannock. I mean, if he'd been selfish he would have tried to keep them home on the farm to help him on the farm, but he wanted to get them out. He wanted them to get an education. So my father was the first Leighton in my line to go to college, to a four-year school, the Naval Academy. Have you done much genealogy?

WINKLER: No, not personally.

LEIGHTON: You go back before the industrial revolution, most everybody was a farmer. And people would try and grow enough to feed their families, and then maybe extend it and sell something that's left over. Well, my ancestor came over from Scotland about 1800. We've never been able to pin down the exact date. Some people say 1795, some say 1800, but we haven't been able to find a specific point of arrival. The earliest documentation I have other than people saying things is when he bought land in Tunkhannock. Well, my ancestor, just north of Tunkhannock. My ancestor that came over from Scotland bought land near Montrose, which is only about twenty-five miles or something.

He opened the first store in the whole area. He apparently had been working, had come over several years before, but we don't know how many years. And apparently the Scottish peddler was a well known function, and apparently a lot of Scots that came over became peddlers. I didn't realize how important peddlers were until I saw a sign up at Plymouth, and it was about the Scottish peddlers. It was a write-up about how they were and how important they were. And when you go back and think about it, there were no stores. And in the villages, the small places, you didn't have a hardware store, you didn't have a clothing store, you didn't have it. And so a lot of the Scots became peddlers. They would go to a place where they could buy

goods and they would pack them up on a horse, and then they'd go around where they lived, and the peddler came by.

Even I can remember the days when we had fruit and vegetable peddlers, and knife sharpeners. They'd come by and, well, by the time I would see them they were in cars, or a truck, or whatever. They'd have all this stuff and you'd buy stuff that way. But back in the days when my ancestor came over, he opened the first store in a place near Montrose that they had a store. And he brought with him everything that he had left over from where he was in Westchester County in New York. He apparently was there for several years.

But he didn't marry until he got to Montrose, and then he married a girl who was several generations English immigrants to.... And they had twelve children.

GRADY: My mother was the twelfth of thirteen, so when you say that I always sort of think about what I remember as a kid. What was the Naval Academy like in '42 when you came into it?

LEIGHTON: What was the Naval Academy like in '42? Well, of course, the war had already started.

WINKLER: Just to back up—you mentioned your father was ill on December 7. What were you doing?

LEIGHTON: On December 7 my uncle, my father's brother, who was in the Class of '13—and at this point he had resigned as a lieutenant commander in '28, I think; Class of '13, resigned in '28, and he was the fortieth Naval aviator—he was visiting us in Washington. I think he came up to see my father while he was in the hospital. And so he invited me to go to the only professional football game I've ever been to. This was back in the old stadium.[5]

WINKLER: Griffith.

LEIGHTON: And the team—I forget the name of the team then. Was it—well, anyhow. So during the game you'd hear on the loudspeaker: General So-and-so, call your office; Admiral So-and-so, call your office at so-and-so; Ambassador So-and-so, would you please come to the.... So at the end of the game my uncle and I came out to the street. And in those days you still had "extra" newspapers. All the newspaper boys had stacks of these things, "Extra! Extra! Pearl Harbor Attacked!"[67]

[5] Bruce Gardner Leighton earned his wings as Naval Aviator #40 on April 20, 1917 and saw duty in England during World War I. He left active duty in 1928 and became an LCDR in the USNR. Employed by Curtiss-Wright, he eventually wound up in China at the Central Aircraft Mfg. Corporation training Chinese engineers and factory personnel. He actively recruited pilots for the Flying Tigers prior to World War II. In October 1943, he was recalled to active duty to supervise Navy aircraft production in the western US. He would pas away on Decemeber 7, 1965.
[6] That day the Redskin's hosted the Eagles. Future Navy Secretary John Warner was at the game and recounts the same story.

So I knew that my uncle would have business to take care of, so I said "You go on and do whatever you've got to do. I'll get a bus home." Well, he said that would be all right. I was sixteen, I guess. So I got the bus home.

I came up Massachusetts Avenue. We living up near the cathedral, rented a house there. And coming up there was this huge traffic jam. And when you finally edged up past the Japanese embassy, people—a whole mob had gone there and broken through the gate, and the police were trying to turn them back, etc., but there was a big flap going on at the embassy. The embassy was burning papers like mad. But you saw this huge mob that was fairly backed into the traffic. And finally got past the embassy and, of course, got home and turned on a radio. Didn't have television in those days. And, of course, we knew. My family, myself, or others in the family were all listening to the radio, because we knew so many people that were on ships at Pearl Harbor. And this ship was sunk and so-and-so, and we worried, of course, that friends had lost their lives. It took a long time to find out what happened to the people we knew. But December 7, 1941, is a day I'll remember all my life. But I was just a kid; I mean, a high-school kid.

I had taken the exams for the Naval Academy a year before. I was in the Class of '46, graduated in '45. Well, I took the examinations for the Class of '45, graduating in '44, but two of the subjects I hadn't had: physics and chemistry. And so I failed those two subjects. I got a 1.2, I think, in each of them. I took the exam not because I was trying to get in the Class of '45; I wanted the practice of the exam.

Those were back in the days when the Bureau of Personnel was the Bureau of Navigation, and my father had gotten me copies. If you wrote in to the Bureau of Navigation they would send you the last five years of examinations, and so you could study that, which was very useful. I realized about every third year they had a question that required you to draw a map of the United States and then identify things, where they are. So I said, well, this is the third year. You know, that was two years ago that they asked that question the last time. So I said I think I'll look at a map of the United States, and I memorized it. I figured how big the sheet of paper was, and then figured, if I put zero at the north end of Maine and then the north end of Washington, and then the end of Florida and the tip of Texas, and the top of the panhandle in Texas, I just memorized about six numbers, relatively. So I saw that question so I took my sheet of paper and a ruler and I just put six dots on there, and I knew that I had to now draw something that connected those things.

It was very helpful, because a lot of guys—the guys from Texas, they'd draw a big thing of Texas and a few appendages that were the other states. I mean, they thought Texas was most of the United States. Well, it was a big chunk.

But anyhow, I failed two of those tests and so I didn't get into Class.... Well, meanwhile they changed the age limit between the Class of '45 and the Class of '46. I would have been eligible at sixteen to get into the Class of '45. They raised it to seventeen with the Class of '46, and I was seventeen and three months when I got in, because the exams are in April. And so I got into the Academy then.

But I wanted to go to the Naval Academy and had for years, and I just made the assumption that's what I was going to do if I could. I took the Presidential exam.

WINKLER: Okay. So what sort of appointment that gives you for the Naval Academy?

LEIGHTON: Well, it's the President. The President had, back in those days, the number that sticks in my head is fifteen appointments, but they may have raised it. Over the years they've juggled those figures, and I don't know what it is today for the Presidential appointments. But the President and the Vice-President I think each had fifteen, but I could be wrong on those numbers.

WINKLER: How do you get a Presidential appointment?

LEIGHTON: You take a civil service examination. To get in the Naval Academy a lot of the congressmen make their appointments open to competition. Some of them, I'd say probably most of them, the competition has to be from their own state, their own district. If they're in the House then it would be just their district, and then the Senate it would be their home state. And they're allowed so many—well, they were; I don't know how it is anymore, but in those days each senator was allowed so many midshipmen that he had appointed. So when one graduated or failed or whatever, then you had another slot available. And then they could make an appointment, and then they'd have alternates—first alternate, second alternate. And so let's say that a guy has an appointment for Annapolis and West Point and takes both sets of exams and passes both. Then he picks one or the other. Well, in the process of all these things maybe the kid went to MIT instead, and so therefore he didn't use the appointment. So then the first alternate would get it if he passed, etc.

The President and the Vice-President historically—as far as I know, still do—make their appointments available, well, when I took it, sons of Naval officers could compete. I don't know whether it was open to enlisted men's sons or not. I mean, there were some appointments—different people do different things with their appointments. Some senators saved it and used it for political purposes, friends or whatever, and gave the appointment to them. And some of the senators just put it in the pool along with the President and the Vice-President and everything and there's competition and then according to where you stood. Like my brother was first in the Presidential his year. He had graduated from high school and then gone to prep school for a year. I graduated from high school and a week later went to the Naval Academy.

Back when we had it, the Presidential appointments went in on the first day; they were ordered to report the first day they would take people in. You know, they scheduled them throughout the summer, so Bert and I were in the first group that year, as were all the other Presidential appointments.

GRADY: Obviously, you knew when you went into the Naval Academy you were going to be commissioned and going into a war. What was the spirit or the morale like among the midshipmen?

LEIGHTON: Well, they wanted to get out of the canoe club and go in the war. Now, there are a lot of guys—I think a lot of guys applied to go to the Naval Academy who otherwise were worried about getting drafted. Generally, nobody wanted to be drafted. You had volunteers. You had guys that would go up to Canada and sign up for the RAF. They would take them at a younger age, and you had a lot of guys that wanted to get in the war right away, and enlisted. Or, well, they would have to go to college to become an officer, unless they were already enlisted and, through that route, got commissioned. And there were certainly guys in my class, I'm sure, who were worried that if they didn't go—they applied to the Naval Academy because then they wouldn't be drafted. You probably couldn't ever find anybody that would admit to that, but we got an awful lot of good football players that were made available because the colleges couldn't get them; they all got drafted, whereas at the Naval Academy they were already in the service.

I made up my mind I wanted to be a naval officer. I admired my father. I mean, my father was God to me, basically. I looked upon him as an absolutely wonderful man and I wanted to follow that route. And, of course, we didn't have any money so going to college would have been hard. My sisters both went to Wellesley and my older brother went to the Naval Academy, [89]so that was taken care of, and my other brother was going to college and he got some scholarship money and my family paid the rest. But he went in the Navy too. He had an eye problem, and so he wasn't qualified to become a line officer. He had a problem with one eye. So he went in the Supply Corps. He graduated from Georgetown. Well, he went to Georgetown, and then when we were on the West Coast he went to UCLA, and then when we came back to Washington he went back to Georgetown and finished off and got a degree from the Georgetown foreign service school, which is non-sectarian. Of course, Georgetown is a Catholic school, but the foreign service school is non-sectarian. And so he got a degree there, but then he went in the Supply Corps and worked on targeting, actually, during the war, selecting targets for our bomb raids.

Well, he had other things he went to. He was in India for quite a while during the war at the Naval air station there. The guys were bombing up north.

GRADY: You were in an accelerated program, correct?

LEIGHTON: Yeah. Of course, all the colleges went to three years, or just about every college. Every college I know of went to three years. And '41 was the first Naval Academy class that graduated early. Instead of graduating in June, '41, they graduated in February, '41. Then the Class of '42 graduated—I guess they graduated a year early, and from then on. And then '48, at the end of plebe year they took the first half of the class and graduated them in three years. The second half—strictly by where they stood in the class, and boy, that got some people upset. Some of these guys that hadn't been working all that hard suddenly found that they were in '48B instead of '48A so then they got to spend an extra year at the Naval Academy. Subsequently, a few years ago they put them all back as the one class, but for a long time they were listed as '48A and '48B. Now they're just '48. Some guys were pretty—you know, they came just below the middle.

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[9] Frank Ohler Leighton of the Class of 1941 would be killed in car accident at age 38 in 1958.

WINKLER: During the war, for your midshipman cruises, what did you do? Gunnery exercises on the Chesapeake?

LEIGHTON: We had one where we were confined to the Chesapeake Bay, I think. And then we had one where we went to, oh, you know, Tobago? Well, it's in the Caribbean.

GRADY: Yeah. Tobago and, Tobago and, oh, what the heck's that other island?

LEIGHTON: Trinidad, yeah.

GRADY: Yeah, Trinidad and Tobago.

LEIGHTON: Yeah, we went to Trinidad. It's the only time I've ever been to Trinidad. And then what did we do the third year? I don't know. I managed to get on a four-piper destroyer. Well, I can look it up in the *Lucky Bag*.

WINKLER: Well, let's see, have to think about that. You were only there for three years, so you would have two summer cruises, right?

LEIGHTON: Yes. Did we only have two or did we have three? We had three. Well, the first year you don't have a cruise, so that's right. The first summer you're in is Plebe Summer, so then you only have two more summers. So yeah, I guess we only had two cruises.

Now, at the Army-Navy game we played.... I'd always wanted to go to an Army-Navy game, and the first year I'm a plebe and they decided to have the game at Annapolis, in that old, small stadium, because they didn't have enough transportation available. It was all being used by the war effort. So they took the brigade of midshipmen—we had one regiment and one brigade; well, we didn't even call it a brigade, we had one regiment of midshipmen—and divided it in half. Half were assigned to cheer for Navy and half to cheer for Army. And so here, all these years I'd wanted to go to an Army-Navy game, never made an Army-Navy game, and so now I'm in the half to cheer for Army. I think John Paul Jones was rotating in his grave there under the chapel, because.... In those days you marched to class and you weren't allowed to talk or anything else. But the half that was to cheer for Army, we were allowed to give Army cheers and sing Army songs on the way to class, because they wanted us to learn them. So you can imagine, you've got this group of midshipmen in marching formation going off to class singing Army fight songs.

GRADY: "On, Brave Old Army Team."

LEIGHTON: Right. So anyhow, that was an interesting thing.

Well, there were other interesting things. Shortly after, it was only a month or two after I entered the Naval Academy as a midshipman, I saw this big truck outside the marine—what's the name of the hall? Isherwood? Maybe. They had from some of the old World War I four-pipers, they had a turbine rotor that had blades stripped, and they had it mounted for everybody

to see. Well, about a couple months after we got in as midshipmen there was this big truck outside the seamanship hall. And what's it doing? It's coming in and taking this rotor out. Why? Well, one of the four-pipe destroyers had a turbine failure, and it would take a couple of years to get a new rotor. This thing had already lost some blades but they stripped the blades and re-bladed it, but they had the rotor.

You go to parade and you had rifles, Springfield rifles from World War I. They were all taken out and sent to our troops. A 1903 rifle (chuckle). And then they substituted wooden replicas of rifles. For parades they took out all the old Springfields. So anything that could be used, that could fire a bullet, they swept them up and took them out. So that was kind of interesting.

One of you asked about what it was like back at the Naval Academy then. They set up an obstacle course and you had to pass that. I had a hell of a time. I'm not good at being upside down. I become totally disorganized if I'm upside down. I never would have made a good pilot anyhow. You had this one you had to spin around, and I didn't do well at that, so I was on the relief squad for a while to be able to do the obstacle course in the time limit that you had. Every time I came to that thing and you had to do it where you were upside down it didn't work.

Of course, now they've got tremendous strength requirements. We had to pull up on a rope and I was never good at that. I passed. And then you had to pass the swimming. But I think today they're much more energetic than they were when I was a midshipman. We had some interesting games. They introduced pushball. They don't have it there anymore. But I remember "Swede" Overesch—he was Class of '12, I think—when he was commandant. He was a big one for being tough, and he came down with a big smile on his face. We had more midshipmen who were injured playing pushball than we did playing football.

Pushball, it started out as a big six-foot-diameter ball, and that didn't work too well because what would happen, you'd line up these guys and these guys, blow the whistle, and trying to push the ball, it would be dead; the ball couldn't go anywhere. You've got all these guys, ten guys on each side, trying to push the other way. So then they went to a smaller ball that was about, I guess four feet or something high. I was second-tallest guy in my company. There was another guy who wanted to go in the Marines, and when we'd go down and get measured every year the guy would stand—this was a short corpsman—he's stand on a stool to measure me. When this other guy would get measured the stick would come out of the thing and they always put him down as an inch and a half shorter than I was. Well, he was six-six at least. By the time they hunched him down and everything—they knew he wanted to go in the Marines, and they put him down as six-two. I was almost six-four.

Anyhow, he and I were on the pushball team, and we decided we ought to make up some plays in this thing. So we came up with a scheme where you had ten guys on the other side here, and ten guys here, and they'd blow the whistle; off you'd go. Instead of our guys rushing in to hit the ball in that direction, we had two guys that would go down on the ground and put their hands on the back of their head and get under the ball. Well, these other ten guys come rushing this way to hit that ball, these two guys would be under the ball like that, okay? With their rear ends sticking up and their heads down low. That would make the ball, with no opposition, would roll

against us. It would roll up their back. Well, John Weber—that's the other guy—and I would charge forward, anticipating that this was going to happen, and so by the time we got there it would be up to our shoulder height. Each of us would ram a shoulder up against that ball, the ball would go up in the air, fly over the other people, and we had all our other guys run around and off we go. And the other team never figured that out. (Laughter) And so that was good for our getting the score. They didn't know what happened to them.

Also, the other thing that we did is, we insisted, we made a rule—this was our first-class year when this game just started—so we made a rule that we required that on all sports, that everybody had to sign up for one team or another, and we would have a full team. For example, in pushball you were allowed twenty-five members and you had fifteen playing. Okay? So that gave you ten substitutes. We made it a rule, (a) that we would always have twenty-five guys there, and a lot of teams, they couldn't get twenty-five guys to play pushball. If they didn't have fifteen they had to forfeit. But if they had fifteen they could play but now you've got a team with fifteen guys there and we had twenty-five, and every time the whistle blew, because it went out of bounds or something else—you could make substitutions whenever the whistle blew—we'd have ten guys charge out and take ten positions. So by the time you got to the end of the game one of these companies that only had fifteen guys show up, they were exhausted. And our guys, every time that you could make substitutions had ten guys change over, so there wasn't anybody that had been in too long, that was just worn out.

Well, on these things when the ball came to a stop and you had these guys fighting, it turned out that a high percentage of the varsity football players—this was a winter sport, and a large percentage of the players from the varsity football team played on pushball. So they were used to fighting with each other all the time. And the kind of stuff that went on under that ball, they'd just kick. They didn't know who they were kicking. They didn't know whether they were kicking them in the head, or where they were kicking, or who they were kicking. The football guys had been trained, when you get a pile of people, just start kicking. And so we ended up with more guys in the hospital than any other cause. So it was pretty interesting. Well, that's neither here nor there.

GRADY: Was the curriculum all the same? Did every midshipman have the same curriculum?

LEIGHTON: Basically, yes. You didn't have all—well, you could take French or Spanish, and I guess maybe Chinese or Russian or whatever. But basically you end up with a B.S. degree, and you say "In what?" Well, it's not <u>in</u> anything. There's one up there; you can see what it says. You end up with a bachelor of science degree, but it's not in engineering or whatever. Just B.S. What some people call B.S. has another meaning.

They did push the athletic programs for conditioning people. And in my company the first year the youngsters, the Class of '45, and my class, '46, as plebes, we tried hard to get the colors. But the first-class let us down. The guys in the first class, the color company thing, it didn't mean a thing to them, etc., so we didn't come close to getting the colors. The second year the same thing happened there.

So when we became first-classmen several other guys and myself said, you know, do you want to get the colors? Do you want to fight and try and get the colors? So several of us said yes, we do. So we called a meeting of the whole first class and said, okay guys, you know, we tried the last two years to get the colors but our first-classmen let us down. And if you don't have the first-class really wanting to compete on it and leading the other ones to do it too, you're just not going to get there from here. So we put it up to the whole first-class members of our company and said we want to take a vote. Do you want to go for the colors or not? If you want to go for the colors you are going to try and help make it happen, and not do things that will screw it all up.

So we took a vote, and the great majority wanted to go for the colors. So then we said okay. So now what we're going to do, we're going to try and get the colors, we're going to encourage the other two classes to help us get the colors. And all the first class, the ones that don't care about it, you at least agree that you won't do anything to screw it up. The other guys all agreed to that. So we had already made a decision where every first-classman had a chance to put his two cents in, that we wanted to try and get the colors.

And so we worked hard at it, and we got the colors. Of course, you don't get them. You go one day and just before you graduate get the colors transferred to your company, but then you're not in it anymore. For the next year the guys that take over that company get it. But we worked at it. We thought it was a good competition and so we tried. And that's why we were successful. Sometimes we'd win a game because the other people couldn't get enough people to show up to make a team. Well, we had the full bunch of them for every sport.

I went out cross country, not because I was going to contribute to winning, but I contributed to whatever the number was—for cross country you had to have twenty or twenty-five guys—that I made the difference for making that happen. I never finished a race in the cross country. I'd have still been out there trying to get to the end. But we had our number of guys there, so that's what it took.

And then we had some guys, like Joe Stoutenburgh, who was a very good friend of mine, he set a world record in the 100-meter dash, and qualified, so he had the world's record in the 100-meter dash. For two minutes. And Jim Feddit (phonetic), who was also in our company and later on bilged out, about two minutes later he beat Joe. It was a world record and counted as a world record. So we had some pretty fast runners. And good guys on the varsity football team too.

GRADY: How were selections made as to where you were going to serve after you had been commissioned?[10]

[10] From his pre-prepared notes: Just before graduation in June 1945 each member of our Class was asked whether he intended to apply for the Naval aviation program. I said that I wanted to go to sea on graduation, but might apply for aviation duty sometime in the future. After a month's leave the Navy sent me—and all those classmates who had not yet decided to ask for aviation duty—to Jacksonville for a month of flight indoctrination. Those who had already expressed intent to apply for aviation training were sent directly to sea after their month's leave. Actually this may have saved my life, as I had orders to the heavy cruiser **Indianapolis** that was sunk while I was waiting for a transport out of San Francisco. The

LEIGHTON: Well, the first thing I mentioned, they asked you, were you going to apply for naval aviation? Then they divided the class in two parts on that one alone, all by itself. I said no, I want to go to sea. I've been in this canoe club for three years; I want to go to sea and get some experience. And I may decide I want to be an aviator later on, but—matter of fact, I thought I probably would, but I didn't want to start out going to aviation.

Well, so there were a lot of guys on either side of that fence, and that made a big difference on your orders because, if you were going to apply for aviation then they would take you but you would start out going to sea. And then if you were not going to apply for aviation they'd send you down to flight training for a month. Well, they argued that the ones that are going to be aviators would get some experience at sea before they go up and become aviators, but the ones that are not going to be aviators, we want them to have some idea about Naval aviation. Frankly, I don't trust people that much. I think they probably wanted to get more to apply for aviation than they were going to get, and therefore they thought if you went down there for a month of flight training that would be....

GRADY: You'd be interested.

LEIGHTON: Now, the only flight experience we had at the Academy was, what—the Yellow Perils or something they're called?

WINKLER: Oh, yeah.

LEIGHTON: Small propeller airplanes.

WINKLER: Stearman?

LEIGHTON: I forget the name. But anyhow, so we'd all been up in an airplane. Well, my uncle took me up in an airplane when I was six years old, in a little Ford Trimotor. We all, while we were midshipmen, had a few hours at least of training on—I forget what those planes are. I guess they were two-seaters; one was the instructor and the other was the midshipman. And I enjoyed that, and I thought I'd probably apply for aviation sometime. But when I graduated....

Oh, and then that's another thing. Then they put down your physical, if you didn't apply for aviation they put you down as psychologically—not damaged, but unfit for aviation, because if you didn't want to apply for aviation you must be psychologically unfit to be an aviator. And I didn't like that. They put that on my medical record, and I said, well hell, I'm not telling you I don't want to be an aviator; I just want to go to sea first. And: Oh well, if you apply for it, then automatically they'll change that. So I don't know what they did for people that changed their mind and applied for it, but I thought that was a pretty shoddy thing, to put that in your physical record, that you were psychologically unsuited to be an aviator. Although I don't know. Maybe I was psychologically unsuited to be an aviator. I didn't like being upside down.

Navy sent telegrams to my family saying I was "missing in action" as I celebrated VJ Day in my favorite city. Of the four members of '45 originally ordered to the **Indianapolis**, Harlan Twible, whose story is well known by every member of '46, was the only one who suffered through that terrible disaster.

Anyhow, that's the first thing. Then beyond that you asked what kind of ship you wanted. I asked for destroyers and they sent me to the cruiser. And fortunately for me it worked out that the *Indianapolis* was sunk while I was waiting for transportation to get there. There were four of us supposed to go. Two wanted to be aviators, so they were ordered to sea. One of those had his orders changed because another guy got killed on a cruiser and they vectored him to that ship. And Red Twible's the only one that made it to the ship before they left with the atomic bomb. And, of course, they got sunk on the way out.

BuPers sent my mother a telegram saying I was missing in action, and my aunt, who lived with my mother at the time—my father had died—got a similar telegram. I was down in Diablo visiting an old friend that weekend, and I came back to Twelfth Naval District headquarters to "Ensign Leighton, call home as soon as possible." I thought, oh my God, my mother or my aunt has had a heart attack, so I called home. My mother said, "Oh, I'm sure glad to hear from you." "Why is that?" "Well, I got this telegram here, and your aunt has also, same telegram, saying you're missing in action."

Well, they knew that I was waiting for transportation in San Francisco. So my mother had called General Porter, who was a classmate of my father's who got seasick and so he transferred to the Army. And he was now the chief of Chemical Warfare Service. And as I recall in World War II five of my father's classmates were heads of departments in the Army, which is kind of interesting, all having transferred. In those days if you got terribly seasick you could ask for transfer to the Army. And I think five or more—I think there were like seven or nine that transferred to the Army, and I think five of them were heads of departments.

Well, anyhow, General Porter and his wife, and my father and his wife, when they were ensigns, had shared an apartment and were very close friends. So when my mother called General Porter he said, "Well, what ship was he ordered to?" And she said, "The *Indianapolis*." "When did you last hear from him?" And then she knew that that was wrong in the message because they were saying I was missing in action as of a certain date, and she'd talked to me after that. But then she thought, well, they made one mistake, they made two. But anyhow, when he found out that she had talked to me on the date that she had—he was one of the few people that knew about the atomic bomb and the *Indianapolis*. And by then the Navy knew that it had been lost. So he says, "Don't worry. There's just a mistake."

So I thought, well, I could take a month off and put some seaweed in my head and say it's a long swim to the Philippine Sea, but I decided not to do that, and I went in to Twelfth Naval District headquarters and said, "I'm here, and they seem to think I'm missing in action." So then I got new orders eventually. I think that's covering that.

WINKLER: This whole thing on the *Indianapolis*, this occurred at the end of July.

LEIGHTON: Oh, yeah. Well, that was a terrible thing. Yeah, Red [Harlan] Twible has given lectures on that, and there's a video. The Class of '46 has a video of Twible's lecture on that. He resigned not long after, though, after he recovered, but he lived through the whole damned thing.

You know, the people on the ship were very upset that [Captain Charles] McVay was court-martialed. And actually McVay took over as commandant of the naval district. Then he committed suicide. But McVay was considered a very outstanding officer and his service reputation was high.

But Twible told me that the problem was that another guy was an ensign—was it Byrd? It wasn't Naval Academy—and that his family was very opposed to Truman, and they kept raising holy hell with the Navy: Why haven't they court-martialed McVay? And Twible's comments about this ensign, that he didn't identify himself as an officer when he was in the water. And, of course, to hear Twible—Twible, he and a bunch of guys had one raft. And so he tells the story of what happened to them in this whole thing. When the seaplane saw them in the water, then he sent off a message and the plane landed. I guess Twible took command in his raft, although he was a brand new ensign, but nobody else identified themselves as officers. The name that sticks in my head of this guy is Byrd, but I don't know for sure. But anyhow, he told: Don't anybody try and swim over to the thing, because he's too far away; you'll never make it. He ordered them not to. And this guy, well, he wasn't going to take orders, and so he swam, tried to get there, didn't, and drowned. So Twible has nothing but contempt for that guy.

They had another officer that was senior to him there but he was badly wounded and they put him in the raft. They put as many of the wounded as they could in the raft, and then the others were hanging on outside. Day after day after day, of course, and they'd lose orientation. Then they'd die, and then the sharks would get them. It was a terrible thing. But he covers that all. He wrote a book on it and he has a video on it.

Of course McVay eventually, I think he's the last one to leave the ship, but he got on a boat so he survived, but not too many did. I guess it was the largest number lost of any of our ships during the war, wasn't it? I think it was.

WINKLER: Yeah, I think.

LEIGHTON: Mostly in the water.

WINKLER: Yeah, it was in the water.

LEIGHTON: Although, of course, explosions killed people. I guess the torpedo hit a magazine and that really did them in. They went down awfully fast.

GRADY: That was probably the reason why, and the fact that there was no accompanying vessel reasonably close to them to make any type of rescue attempt.

LEIGHTON: Well, they didn't have time to report anything and, of course, they screwed up in the investigation afterward. They'd sent a message checking out of one fleet and into the other, and the one they checked out of checked them out, and so that figured that the other guys were supposed to pick them up and expect them to arrive. And they got all disconnected so nobody recognized that they hadn't shown up. So they spent so much time in the water.

I'm just glad I wasn't there. I wanted to get into the war, like all young men, you know, wanted to go and do our bit. But I sure didn't to be on that ship under the circumstances.

WINKLER: You mentioned that while you were out in San Francisco you had a bunch of courses that you were taking. Was this at Treasure Island?

LEIGHTON: Well, the way it worked, you checked into Twelfth Naval District headquarters, and then they had a list of things you could do in your spare time if you wanted to, until they were going to have a transport ready. Of course, the transports kept breaking down. The whole Magic Carpet, you know, they were trying to bring this whole Navy back to get discharged, and so those ships were working like hell and then they'd break down, and so you had extra time. So they knew when the next transport was going to be scheduled to go. You had a chance of getting air transportation, but very unlikely because the number of planes versus the number of people involved. Really, the bulk had to be on transport ships. So they had a list there of things you could do if you wanted to. And, of course, I wanted to make use of my time. Now I'm out of the Naval Academy, I want to be an ensign and learn something. And time was ticking off.

Loran was new in those days. We'd not had anything on Loran at the Naval Academy. We still used the sextants. I don't think they even teach them sextants anymore. I don't know if they do or not.

WINKLER: No, I don't.

GRADY: I have no idea.

LEIGHTON: I'm suspicious that they don't. But Loran was brand new. I guess they had it in service in the war, at the very end of the war. And they had this five-day course or something, so I signed up for that. I think they ran that over at Mare Island, in Vallejo. So you'd sign out, and if they needed you they could get hold of you.[11]

The firefighting school, I mean, that was a good one to take, I'll tell you. Maybe they all do, I don't know if they're all firefighting school or not. That was a short course but, boy, I learned a hell of a lot. And also how to keep students awake. You'd go to lunch, you'd come back and be drowsy, and this guy had one of these big cans, a foam thing, empty can. And he'd be talking along, he'd see these people drifting off, and so he'd pick that up and, Wham! on this concrete floor. And boy, that woke them all up. That was a good technique for keeping the students awake.

[11] From his pre-prepared notes: While I was waiting in San Francisco for new orders I completed a one week course in the then new LORAN navigation system. I also completed a course in Fire Fighting which included a realistic exercise in putting out a fuel fire in a full size section of a ship's hull. In that exercise I was assigned as lead man holding the foam nozzle when suddenly the fire restarted behind us and we had to fight the fire ahead of us as well as behind. No one was seriously burned, but we all learned valuable lessons from the experience.

But you had to go in a real fire. They had this section of hull there and you went in that thing. You gotta have some guy with the hose with the nozzle, and that was me in our group. They'd divide you up in groups, teams, and so off we'd go and they'd start the fire and everything. I've got the nozzle and other guys are carrying the hose, etc. Put out the fire in front and move forward. But then suddenly hear somebody yell and you look back, and the fire's re-ignited behind you. That's a nervous moment, because now you've got a fire there and I've got this fire behind me, and we've got to get the hell out of here. We've got to get the one out in front in order to succeed in putting out the fire, but we've got to get that in order to get out alive. I lost my eyebrows on that, but my skin wasn't badly burned. And nobody in our group had any permanent damage, but it was pretty nervous, and that was a hell of a good experience. So I'm all for it. I think now everybody has to go through firefighting school.

WINKLER: Yes.

LEIGHTON: But when we were doing it this was pretty new and they'd just built this facility up there. I think that was at Mare Island, too. I can't remember for sure where it physically was located. It could have been over at Treasure Island, I don't know.. They sent me home twice on leave. But the Navy was in turmoil. I mean, you've got all this huge Navy and you have these ships loaded up with personnel, and poor old BuPers, they're trying to match bodies to commands.

Captain Rickover came to Mare Island, and it was advertised that he would give a lecture at a certain time and certain date on progress on the nuclear submarine. So I signed up to go to the lecture. Even before that—no, well, anyhow I remember that I first had personal witness that he could be rather gruff with people, and people that were there, well, they all wanted to sit in the back of the auditorium. The first thing Rickover did when he came out he saw all these people sitting in the back and the front empty, he said, "I'm not going to talk till you all move down as far as you can go." And so he insisted that they get out of the back of the thing and sit down front where he could see them and they could see him. So it was obvious that he was in charge of the situation. And then he gave a description of where he stood on the first nuclear submarine, which interested me very much. So I think that's the first time I ever saw then-Captain Rickover, and I was aware that he was in charge of the program.

January 18, 2011

John Grady
Interviewer

LEIGHTON: I guess I'm getting interviewed for this Naval Historical Foundation, that's trying to put together a background on me and what I've done or not done.

GRADY: And I'm John Grady. The interview is taking place in Admiral Leighton's home in Arlington. It's January 18, 2011. And where we left off was after the Bureau of

Personnel was notified that you were alive and never bothered to contact the heavy cruiser *Pittsburgh.* Tell me what went on after that.

LEIGHTON: By the way, I have some pictures of the *Pittsburgh* with its—no, the one that was sunk was the *Indianapolis*.

GRADY: Correct.

LEIGHTON: Yeah. I thought you said *Pittsburgh.*

GRADY: You were ordered to the heavy cruiser *Pittsburgh*.

LEIGHTON: Yeah, okay. So that's after the *Indianapolis* was sunk...

GRADY: Right.

LEIGHTON: And they finally recognized that I was alive. So I'm on *Pittsburgh* at this point?

GRADY: Yeah. And they had been damaged heavily in a typhoon and...

LEIGHTON: Yeah, they lost the bow. They lost the first 104 feet of the bow. And I know where that was because when I arrived on the *Pittsburgh* I was assigned to the officers' bunkroom, which was at that frame. And they were, at that point, putting a new bow on.

Well, I was a fresh caught ensign and I didn't know anything about the ship. And they got a requirement—did we go into that last time, of going to the shore patrol?

GRADY: No. This is where you pick up the shore patrol.[12]

LEIGHTON: Okay. So the ship received a requirement to provide a junior officer on temporary duty for shore patrol duty in Bremerton. Since I didn't have a job on the ship and here they had this fresh caught ensign they sent me over for the temporary duty, and it was rather interesting.

The head of the shore patrol office in Bremerton was a Navy Reserve lieutenant commander. He had flown with Eddie Rickenbacker in World War I, and done barnstorming with him, and so he had some very interesting stories about that. But at the time he was called

[12] From his pre-prepared notes: After the Bureau of Personnel was notified that I was alive – but never corrected the telegrams – I was ordered to the heavy cruiser **Pittsburgh** that was in the Puget Sound Naval Shipyard getting a new bow to replace the one lost in a typhoon. I was on two month temporary duty on Shore Patrol in Bremerton the only day she had at sea before orders came to make her the first major combatant to go into mothballs. I was then sent to temporary duty on the Reserve Fleet Staff in the shipyard where my job was to be a "Go Fer" for three Captains. While there I bought and read the recently released book *The Effects of Atomic Weapons.* Next I was sent home to Rhode Island on leave awaiting new orders, then back to San Francisco awaiting transportation to the heavy cruiser **Chicago** in Yokosuka, Japan.

back to active duty in World War II he was a lieutenant commander and he was the head of the police detectives in Tacoma. So he had a lot of experience in life, both his World War I experience, his barnstorming with Rickenbacker, his later ending up as chief detective in Tacoma. He was a very interesting gentleman. And the thing he really wanted, he wanted to go to sea on an oiler. He'd see an oiler going out of Puget Sound, etc., and he'd just—that's where he really wanted to be. But he'd gotten this job heading the shore patrol at Bremerton.

So I learned a lot from that gentleman and I had some very interesting experiences. Do you want me to discuss any of those?

GRADY: Yeah. Discuss the ones that you think were the most interesting.

LEIGHTON: Okay. I was only twenty years old at the time, and I guess the law still required that you be twenty-one to drink. Is it twenty-one?

GRADY: Yeah.

LEIGHTON: I think it was twenty-one at that point. And so we, of course, had a lot of Sailors that had come back on ships and they wanted to go ashore and wanted to get drunk if they could, or whatever. One time the *Essex* was coming back. We got word that the *Essex* was coming in to the yard for some repair work. They'd been out of the country for eighteen months. So I had two shore patrol wagons and I called my guys in and said, "*Essex* is coming in today. I want you, when it gets to the afternoon and Sailors can go ashore, I want you to go over to the Navy yard, and any Sailor coming from the *Essex*, offer him a free ride in the patrol wagon down to the ferry that goes to Seattle." Because I visualized that we were going to have a tough time with this carrier coming in, all the crew wanting to go ashore for the first time in a long time, and I wanted to avoid trouble as much as possible.

So we did that, and we shuttled from the yard down to the ferry landing to go to Seattle. I figured Seattle's a big city and they had a big shore patrol office and lots of things to keep Sailors occupied and happy, whereas Bremerton really didn't have much to offer in that regard.

So then that night when the last ferries were coming in I did the same thing going the other way. I sent them down there to the ferry landing. They'd say, "Off the *Essex*?" Yeah. Give them a ride back to their ship.

And you know, the ship came in and we didn't have a single call about any Sailor off the *Essex*. *Essex*, you know, they had, well, many hundreds of Japanese flags painted on their stack, because every time they shot down an aircraft or something they'd put the flag, Japanese, and their stack was covered with these paintings of the flags of the Japanese that they'd shot down. And we didn't have any trouble.

Now, over a period of time I would find that certain bars—well, there was one in particular—they'd call up and they'd say, "There's a drunk Sailor here, we want you to come get

him, he's going to wreck the place," or whatever. And so I found that some bars had no problem, and other bars were a problem.

So this one point got this call from this one bar, and it was a Marine and his buddy. The Marine had gotten belligerent, the first one, and his buddy was trying to tone him down. And so when my guys went there they picked up the one that had been causing trouble, and his buddy wanted to go with him. So my guys took the two of them down, but there were no charges to be filed against the second one; he was just trying to help his buddy. So I told them to both go over and sit on a bench there, and I told the buddy to just keep him quieted down and help him get over it. Well, he had an American Indian background, and that's when I found out what they meant when they talked about Indians can't handle firewater.

Well anyhow, so finally things were quiet so I called him up to the counter and asked him his name. And then out of the corner of my eye I saw him leaning over and clenching his fist, and I just instinctively ducked. And this fist came flying by. It ended up hitting the shoulder of the chief petty officer that was standing next to me. And I told this Marine, his buddy, "You take him over there and sit down, and I don't want to hear a word." So they did that, and it got around to about two o'clock in the morning and then I called him up and I said, "I'm going to send you and your friend back to the ship and I'm going to have my driver tell the officer of the deck not to let that guy ashore until he's totally sober. And I want you to tell him, when you see him and he's sober in the morning, you tell him he's one of the luckiest damned Marines there is." I said, "If I put charges of his attempting the strike an officer while under arrest in shore patrol headquarters, he's going to get a nasty court-martial. So you tell him he is damned lucky." And that's what I did. And we never heard about him again. Not a problem.

And, you know, I suppose you could argue, oh, I shouldn't have done that. And I don't know to this day whether I should or shouldn't have. But as far as I know he never got in trouble elsewhere. But, you know, that guy's trying to strike an officer when he's under arrest and I'm booking him, that's not a very smart thing to do. But he had this buddy and his buddy kept him tamped down. So it was an interesting experience.

GRADY: You did this for two months, too, didn't you?

LEIGHTON: Oh, yeah, well, I didn't do <u>that</u> for two months but we had some interesting cases. I got a call one night, we had to go down and pick up a Sailor that was under arrest. He was in chains, and what had he done? He'd bitten off a woman's nose. Of course, all we had to do was pick him up and deliver him to another ship. But he was already charged, I guess over in Seattle, for having bitten off this woman's nose. Fortunately I never had to get in it any further than to pick him up and deliver him.

But I got thinking about which bars gave us trouble, and so I went around and went into these bars. Now, legally I wasn't twenty-one, I was only twenty, so I legally couldn't get a drink anyhow. But I'd go into this one bar that was always giving us trouble, I went into the men's room, and it was filthy. I came out and I said I want to talk to the manager. "Oh, he's at home; he's not here." The night manager. "Oh, he...." I said, "Look, who's in charge of this bar?" So I get that guy. And I told him, I said, "You know, you guys want to sell all these Sailors drinks,

etc., and you're always complaining about the Sailors. That men's room is filthy. It is not fit for a Sailor in the United States Navy. I am leaving here. I will be back in a half an hour. If that isn't cleaned up, I can't do anything to you but I can put this bar off limits to uniformed personnel." Well, I didn't know if I could do that or not, but anyhow.

GRADY: And they didn't know either.

LEIGHTON: And they didn't know either. So I came back in half and hour and it was spotless.

Well, what I did was, I picked out the bars that gave us trouble and got the names of all the people that worked there. Usually it was an underage Sailor, and they'd get him drunk and then they'd call us up to take him out when he'd get belligerent. And so I sent my guys around and said, "You look at the Sailors and see whether they are minors or not. If you think they're minors you tell them that, gee, you're not allowed to drink here. And if they give you any guff you tell them to sign this piece of paper." The piece of paper said: I have been served beer or wine by one of the following people, and listed everybody that worked in the bar. And now they say, well, they don't want to sign that. "Say fine—you're under arrest for underage drinking." Oh. "You've got a choice. You either sign this piece of paper saying that you've been served beer or wine by one of these people, or you're under arrest." None of them wanted to be arrested, so they'd get up and leave the bar. They'd sign, and then they'd leave the bar.

This happened on a weekend, and I told the shore patrol officer when he came back on Monday morning, said, "You're going to get visited by some people." He said, "Who's that?" I said, "The three bars that have given us the most trouble. They're calling up all the time and want us to arrest a Sailor." And I handed him these pieces of paper and I said, "They're going to come and complain about it." "Oh, well that was a pretty good idea." So he shoved the pieces of paper in a drawer.

Sure enough, one morning hour these guys came pounding, they wanted to see the senior shore patrol officer so-and-so. So I asked him later, "What happened?" Then I'd see them leave. I asked my boss, I said, "What happened?" He said, "Oh, they came in screaming loud, this is terrible, you can't do this." And so I said, "What'd you do?" He said, "Well, I pulled out the drawer and I said that this guy—does so-and-so work for you? Does so-and-so work for you? Does so-and-so work for you? Yeah. Well, it says on here that this fellow, age eighteen or seventeen or whatever was served beer or wine by one of those people. That's a violation of law."

So that afternoon I walked through town—Bremerton's not a big town—and so I walked past those bars, and all of them had signs up. "Nobody Under 21." "Must Show ID." And we stopped having trouble from those bars. I suppose I exceeded my authority or whatever, I don't know, but I never bothered to ask.

GRADY: When in charge, be in charge.

LEIGHTON: Yeah. Well, I don't know whether I was doing the right thing or not.

GRADY: It apparently helped a lot of Sailors.

LEIGHTON: Well, I figured these guys were all coming back from the Pacific battles. Every one of them was a guy who'd been getting shot at. They had suicide kamikazes bombing their ships, the first guided missile, with a human being as the guide. They were young men and they'd been fighting for their country. They wanted to get something to drink and the guy kept pushing more on them and getting them drunk. Where the other bars, they wouldn't give the guy more to drink. You know, the guy would have something. I didn't care if the guy was eighteen or nineteen if he had a drink and he handled himself. That was his problem, not mine. And I didn't think my function was to see how many Sailors I could put under report or send back and get some bad mark on their record. I'd leave that up to somebody else to decide.

GRADY: How did you end up being a gofer for three captains in the reserve fleet?

LEIGHTON: Oh, well, so then I get sent back to my ship. They go to sea one day with the new bow, and then they get orders to be the first major combatant in the reserve fleet.

GRADY: Okay.

LEIGHTON: Because by now—of course, they found the old bow, you know, eventually, and they dragged it in, but they wanted to put a new one on and they changed the design somewhat in doing it to try and prevent this from happening again. So that ship is now going to go in the reserve fleet.

Well, now what do they do with Leighton? Because here I have some shore patrol experience but that isn't doing the ship any good, and meanwhile I'm back on the ship. Well, meanwhile the ship gets a request for a junior officer on temporary additional duty on the staff of the Nineteenth Fleet, and here's the first ship that's going to go into that, first major combatant to go in the reserve fleet. So now I was sent over to the Nineteenth Fleet staff. They have three captains in that office, and I forget which—one of them was in command of the whole unit, and then the other two have...

While I was there the Manhattan District issued a book on the effects of nuclear weapons. Recognize that the Manhattan Project was highly classified, and divided so that nobody knew why they were doing what they were doing except a few leaders. And even with some very senior leaders they knew the piece that they were working on but they didn't know what it was for. And they kept the concept of nuclear weapon as limited to the smallest number of people that they could. But of course once they had dropped the bomb at Hiroshima and then later at Nagasaki, everybody in the world knew that we had nuclear weapons. And so the Manhattan District then assigned people to review all the data and decide what they could make public, and this was issued in a report with the title—I don't remember the exact title but it was the effects of nuclear weapons.

And I bought a copy. Now, at the time I had that copy I was assigned on temporary duty with the Nineteenth Fleet, which was designated for putting ships in mothballs. The *Pittsburgh* was the first major combatant—of course they had the cruiser—was the first major combatant

assigned to be put in mothballs. I was on temporary duty with three captains who were assigned to the activities in Bremerton Naval Shipyard for the Nineteenth Fleet.

I wanted to go to sea. I wanted to get new orders and go to sea. So I figured if I would—I sat outside the three captains and I worked for all three of them. I was a gofer. So I thought if they saw me reading this book they'd know I didn't have enough to do. And I had told them I wanted to get some sea duty. I wanted to learn something about being a naval officer, and I'm not doing that here.

Well, they didn't want to lose me because, you know, if they had something they wanted done. One example was, they were getting confused to what ship was in which dry dock, etc., so I went off to the yard and arranged to have them set up a bulletin board in Captain Ackerman's office that showed what ships were in dry dock today. And anytime they were changed they changed them. So you could have a visual picture of the shipyard on these plans, which were shipyard plans, and then showed what ships where at any given time, because they were trying to keep track of when they came out of dock, etc. I did things like that.

One day I went to see a lieutenant commander and I told him I was ordered to tell him that the captain wanted to see him and that "he ordered me to tell you that when he says 'frog' you jump, sir." I was ordered to tell him that and I did. I didn't feel comfortable with this lieutenant commander telling him as an ensign that when my boss says jump you are to jump like a frog.

Well anyhow, the only thing that happened from this reading the book was that two of the three captain went by, saw me reading it, and said, "What's that you're reading, Leighton?" I said, "The effects of atomic weapons, sir. It purports to be all the unclassified information on the atomic bomb." "Oh, that's interesting. When you get through, let me read it." So my ploy didn't solve anything.

However, I was aware of the fact that Admiral Rickover, then Captain Rickover, was involved in the Nineteenth Fleet, or had been involved. And I talked to some of the Nineteenth Fleet guys and they had all Rickover stories about this Captain Rickover, who was—one of the first people assigned to the Nineteenth Fleet was Rickover. Well, I found that interesting. Prior to this time I had heard that there was a nuclear submarine being worked on, and I had heard that Captain Rickover was in charge of that. Now, sequentially, he left the Nineteenth Fleet and took over nuclear power before the time I've been talking, so I'll have to straighten that out here.

Now, I got to the Nineteenth Fleet. I then started hearing a lot of stories about Rickover when he was in the Nineteenth Fleet.

One of the stories that they talked about in the Nineteenth Fleet was when he was inspecting one of the ships. He would inspect each one before they put it out. In the very early days he would always take the captain of the ship around with him. And so with the scene that one fellow pointed out to me, that he had witnessed, Rickover said, "Somebody give me a quarter." They were looking down into (phonetic) this tank at the bow of the ship, beautifully painted, and Rickover says, "Somebody give me a quarter." And then he stood up and he threw it

down. And that beautiful coat of paint? The quarter went right through it, the water splashed up from under it. They had painted the tank but they hadn't taken the water out before they painted. And so somebody didn't get their quarter back. But they got a diatribe from Rickover, and the captain of the ship he was taking around with him got his ears blistered on what he was seeing. But that was just a little vignette of how Rickover went about his job. So I found that interesting.

It rang a bell in my mind in the sense that my father, when he was commandant of the Eighth Naval District, went around and inspected all the warships that were being built in the naval district. And he always carried in his car a set of overalls that he'd put on before he'd go look at a ship. He was a rear admiral but he also knew machinery, and when he'd go inspect them he really inspected the ships. So to me that story about Rickover, which got some people very upset that he was doing this, to me it was a positive thing, to me, as to what he was doing. He wasn't just going to take it for granted; he was going to go see what the hell was going on. And I was interested in anything to do with Rickover because he was in charge of the program.

I'm just trying to think of how we should go at this point. You really want to get more about what attracted me to nuclear power.

LEIGHTON: This was in the shipyard, yeah. This was in the shipyard. So this is now the Nineteenth Fleet establishes an office in the Puget Sound Naval Shipyard. So I get assigned to the three captains.

When you came into their office they had separate rooms, and then you have this outer office and there I am, and people come in that needed things. My function was whatever one of those captains wanted—well, I called it a gofer—to do something they'd holler for Leighton and: Would you do this, this, this this?

One day they wanted me to go down and get this lieutenant commander they wanted to talk to, "Go find him." And Captain Alderman, he told me, "You go tell him, when I say 'Frog,' he jumps." So I found out where this lieutenant commander was. I went to see him and I said to him, "Sir, I have been ordered to tell you when Captain Alderman says 'Frog,' you jump, Sir." That didn't go over too well, but what else am I going to do?

But, oh, I did odd jobs for them. Like they were having trouble keeping track of what ships were in dry dock and which were at Pier So-and-so, so I got the shipyard to put up a bulletin board for them that they could keep up to date with pins, and which ship is in which location at a given time. Because they were starting to get a lot of ship under their business.

But basically, I wanted to go to sea. This was at the time the book "The Effects of Atomic Weapons" came out. Did I talk about that last time?

GRADY: No, we did not. It's right in here.

LEIGHTON: Okay. *The Effects of Atomic Weapons* was a book intended to take from the Manhattan Project, take everything they could declassify and put it in one book on nuclear

weapons. I thought that was pretty interesting and so I bought a copy. This was the first book that had ever been published that got into details of the effects of atomic weapons.

I'm reading this book on the effects of atomic weapons and I figured, well, boy, they'll see I haven't got anything to do so they'll get me some orders to go to sea. And every time I'd tell them that, they're old sea dogs captains and "Oh, you'll have plenty of time to go to sea; don't worry about that." I said, "Look, I spent three years in that canoe club and I want to get to a ship and learn something about it."

So one of the three captains—I don't remember if it was Alderman, I can't remember the other two's names, but anyhow one of them comes in and says, "Leighton, what's that you're reading?" And I said, "This is a book on the effects of atomic weapons." I said, "It's got all the unclassified stuff on the Manhattan District." "Oh, that looks interesting. When you're through with it let me see it." That was that, you know.

Also, there's a guy up there who I mentioned Captain Rickover to him. Rickover had been assigned to the Nineteenth Fleet as its Inspector General. So I heard some tales about Rickover's inspecting for Nineteenth Fleet.

For example, at one point he was inspecting this ship, he looked down in this tank that had all been repainted, all beautifully painted, and he said, "Somebody give me a quarter." He took the quarter and he threw it down into the bilge and what do you know? It popped through and splashed up. They'd painted it, it was all nice freshly painted but there was saltwater underneath it in the tank. I heard a lot of tales about Rickover's inspection of ships in the Nineteenth Fleet.

So that's just a little background on Navy nuclear.

So anyhow, eventually they decided to let me go and went back to the Bureau of Navigation. I don't know if it was BuPers yet or the Bureau of Navigation. I think it was still Bureau of Navigation.

GRADY: It probably was.

LEIGHTON: I don't know when that changed.

GRADY: I think that all came about in '47, '48.

LEIGHTON: Yeah, the whole Defense business. So I think it was still Bureau of Navigation. Well, anyhow, they went back and requested new orders for me. And I did, so I got new orders.

GRADY: What was your rank at this point?

LEIGHTON: Oh, I was still an ensign. We were ensigns for three years. And they weren't making temporary appointments. No, we spent three years as ensign and three years as jg. That goes back to what had happened before. Matter of fact, when I got an appointment to the Naval

Academy my father said, oh, it was too late; you shouldn't have done that because you're going to be behind when the war ends, you're going to be behind this big block of people. Because he'd been in the Class of '09, and the Class of '07 was a huge class, and so they struggled and struggled and struggled and it took him so many years to get promoted. And he said the same thing's going to happen after this war. Of course, he was telling me this in 1942. And he was right, they did have a big block. When the war ended they took a lot of people in as regulars, and so you had these masses of people in front of you and so promotions really got slowed down. I think you would be normally spending fourteen years to get to be lieutenant commander, or something like that.

So anyhow I got orders to the USS *Chicago*. So I get sent back to San Francisco again awaiting transportation. Actually they sent me home on leave. I had plenty of leave stacked up so they sent me home on leave awaiting orders. So I got detached from my temporary duty with Nineteenth Fleet and then I took the train back.

The train ride was interesting. You want to talk about that?

GRADY: Yeah. You're talking about from Puget Sound?[13]

LEIGHTON: Yeah, Puget Sound. I went over to Seattle, caught the train, and I get in a train to go to New York and then Rhode Island, which was my home, awaiting orders. But en route: blizzard. The train is coming into Fargo, and we're in the freight yards in Fargo coming in and this big blizzard. And in the freight yards the freight cars on other tracks have started big drifts, and the drifts came over the operating track.

So I'm back in the observation car with some other officers. We had a group that was all getting sent home awaiting new orders. They weren't guys I knew but they were other junior officers. So a group of us were back there in the observation car and in comes a brakeman covered with snow. And he says, "Take a look out the rear window." So we all go look at the rear window, and what do you know? About a half a car length away is this big searchlight from an engine of a train behind us. We thought that was interesting.

He tells us this story. He says he was back there and he was worried that—he knew this other train was due in and he was worried that the engineer wouldn't see the block signal because it was snowing so hard, and so he was standing up on the tracks with a red lantern swinging back and forth to try and catch the guy. He stands there and he jumps off at the last moment. Well, the engineer did see his red lantern and he had not seen the block signal. He puts on the brakes of the train and the train ends up a half a car length from us. So we said, "Oh, boy,

[13] From his notes: The next three Navy transport ships to go west from San Francisco had breakdowns, so I had some time again in that city, some of which was spent on Shore Patrol duty. The next transport was to go out of San Diego, so a bunch of us were sent there only to find it also had broken down. That was real luck for me because, due to the delay in leaving San Diego, a good friend introduced me to Helen Milligan there. We were married fifteen month later.

we're in great shape. We've got a whole train in front of us and a whole train behind us. We're all set."

So about fifteen minutes or twenty minutes later, Whoompf! And so we get up and look out the back window and there's the searchlight right up against the back of the train. And what had happened was a third train, that guy hadn't seen the block signal and hadn't seen the brakeman, and he plowed into the train behind us. But it was so heavy and snowy he slowed down a lot. Well, he hit it hard enough to shove it a half a car length up to us and we felt it, but nobody in our train was hurt. And the guys in the train behind us, there was nobody badly hurt but they got really shaken up when the third guy ran into them. So now we've got it really made—we've got one train in front and two behind us!

Okay, so it's not long before one of the conductors comes back to the—we're in the last car, he comes back to us. He's been going through the train telling everybody that they're running out of fuel and they can't keep the cars heated. So everybody's got to move forward to one of the baggage cars. They had two or three baggage cars, mail and also other baggage. He said, "We've got coal-fired heaters in those baggage cars and we're going to have to put everybody there because we can't keep the train heated.

So now you've got, you know, you've always got the guy that doesn't have his heart medicine or the woman who's pregnant and got problems or whatever, because you've got a trainload of people. So we all go up there and everybody's trying to find a soft bag to lay out on or whatever, and then go through the night.

Okay. Come the next morning they say, "We're going to give everybody a hot breakfast. We're going to take twelve people at a time." So they get up to your twelve, that you're now going to get your breakfast; then you see what's really happened, because you come out of one car to go to the next and here's this whole pack of snow with a hole cut in it so you can get to the next car, you know, which is normally just open, but the snow is totally over the train. They've cut the hole through so you can walk from your baggage car to the next car, to the next car, until you finally get to the diner.

When you get to the diner you come in, and they've gotten it thawed out to the oven but the car isn't thawed out. You sit down. They hand you your hot meal, and you sit down and brush the frost off the table and put the thing down and eat it quickly before it freezes.

Well, the train crew, they were magnificent. I mean, they'd been working all night, they'd been cutting these holes through the car to car, and doing everything they could to try and make it so that nobody would be hurt. But we're still stuck. Our train's the lead train, and the guys behind us are all stuck and nobody can go anywhere.

So then they finally get two steam engines out from Fargo and get them hooked up to our engine and back it off, and that's enough to break the train loose. So they get us into Fargo.

Well, this is now late on the second day. We've had one whole day tied up, and then late on the second day we get into Fargo and they're going to put you up in town. Well, I think I was

in the YMCA. They put women in the YWCA and the men in the YMCA and local hotels, anyplace they could get them because Fargo was not a big place then. Fargo's much bigger today; it's still not all that big. So we're going to be there all day and however long it takes to try and get this train thawed out, so then another day is gone. So then they tell us—we overnight there and then I guess it's some time the next day they say, well, we're going to be able to get underway. Meanwhile they've pulled in people from other trains that were delayed and filled our train up.

So we get underway. It turns out that one side has been thawed out but the other side is still pretty darned cold. A lady, she was in a compartment and she calls the steward and says, "My bed, the sheets are cold." And somebody yells out, "Well, get into your bed, lady, and that will warm them up." I mean, she was complaining because the sheets were cold, for God's sake.

And during the night every time the train would stop people on the one side would jump down to try and grab the blankets off the other side, where people had gotten off and nobody had taken their place. Fortunately I had my Navy overcoat which, you know, those are big heavy things, and I was using that as an extra blanket where I was.

We arrived in New York I think, I think I arrived three or four days late on the original schedule to New York, and then I get another train and go up to New England, waiting for orders. But it was an experience, and I learned from it. As I say, the train crew was magnificent. They did everything they could.

So anyhow, I'm now home again and waiting for orders again. So, having gone from Seattle to Rhode Island, I now get new orders to the *Chicago,* which is in the Pacific. And I get orders to go to the Twelfth Naval District. Twelfth Naval District thinks the *Chicago* is or is going to Yokosuka, so they cut me orders to take the next available transportation to go to Yokosuka. Meanwhile they're doing the Magic Carpet, you know, and bringing all the people home, and ships are breaking down right and left because they're running, you know, around the clock and day in and day out and they have casualties in the engineering plants. I guess the next couple of transports broke down so we're held up in San Francisco.

By the way, while I was there I got assigned to shore patrol there in San Francisco, which is a different deal in a big city like that. But I did get assigned to some shore patrol duty while I was in San Francisco awaiting transportation.

So the next transport's going to go out of San Diego, and there are a bunch of us waiting for various ships in the far Pacific. So they put us on a train from San Francisco to San Diego. We find out later that just after the train pulled out of the train station they got a telegram from San Diego to San Francisco saying: Don't sent those people because the transport's broken down; keep them in San Francisco. And the people in San Francisco had decided to hell with it, they'd already been through three of those in San Francisco and they had us on the train; take them and send them on the next one out of San Diego. So off we go, and we found that out after we got down there, when we reported in all set to get on this transport and they said, oh, that's been delayed.

Well, it turned out that was a good break for me because my roommate for three years at the Naval Academy was Bert Decker, whose father had about that time made commodore, and eventually, I think, rear admiral. But he was in Yokosuka. He had command of the Japanese naval base in Yokosuka which was taken over by the U.S. Navy. So I called up his home to see if he was home. I didn't know where he was. No, he's not home; he's on duty somewhere—I can't remember where it was but he had duty elsewhere. But his older brother, Ben Decker, is home on leave. And Ben was off to go to aviation duty. He had been accepted to go to flight training. And I knew him very well. I knew the Decker family from the time I was knee high to a grasshopper. His father was in the Class of '22. I later realized it was in Rickover's class. But anyhow, Ben was home. His father was in the Pacific. And his brother was—I don't know where it was.

So I told Ben I'm going to be here a few days while they're getting this transport fixed. He says, "Well, I'll see if I can get you a date. We'll go out to the officers' club." So I said, "Well, fine. That would be a good idea." So at that point he's dating a girl called Helen Milligan that he'd met. I don't know exactly how they met but he'd been dating her for a while. So he calls Helen up and says this fellow, friend is here and we'd like to go out on a double date; can you get him a date? She said, "Well, I'll see what I can do." She did, she got me a date with a very pretty blond. And we did that for two or three times. So I got to know Helen, but she was always Ben's date. You may have noticed she's now my wife.

GRADY: Yes. I figured that out.

LEIGHTON: Well, the girl that she had gotten me a date with was a very nice girl but I just kind of liked Helen very much. So finally they get the troop transport working and we're going to go. So I say goodbye. I told Helen, well, I'd write to her and I hope you'll write back.[14]

So I get down to the ship and they don't want to take me. "How many points do you have?" They'd been told anybody who had over so many points was not allowed to go west of the West Coast, and they were not to take anybody who had enough points to get discharged. Well, my three years at the Naval Academy counted towards that, so I had enough points I could get discharged. And I told them, "I don't want to get discharged. I'm not a Reserve officer. I'm a regular officer. I want to go to sea on a ship."

So finally they relent and they say, yeah, you can go. Well, I had some other contemporaries there too, had the same problem, but they finally agreed that that other thing applied to Reserve officers or people who intended to resign.

[14] From pre-prepared notes: When the transport was ready to leave San Diego the Navy did not want to let me aboard, since they had been instructed not to let anyone aboard with enough service credits to allow discharge. After considerable argument I convinced them that I was not in the Naval Reserve, that I had no intention of resigning, and was anxious to serve at sea. When I reported in to the Yokosuka Port Director's Office they said that **Chicago** was in Shanghai and that they would cut me new orders to go there. I pointed out that I had passed the Chicago at anchor when I took a boat in from our transport ship, and that all I needed to do, after the Port Director endorsed my orders, was to take a boat from the pier to the ship.

So I get on the ship, and that was interesting too. They assigned us, while we were on the ship—they had all this useless talent, I mean had talent but no job, so they assigned us to watch sections, and I'm assigned to a group that's assigned as officer of the deck for this transport.

And you were getting shots every day. God, I think I had twenty-four shots—encephalitis, all kinds of things that you could get in the Far East. And the ships now are going into ports. And so they had all sorts of stuff they had to give you shots for.

So I made it a practice when I was assigned watch, before I'd get on watch I'd go check the message traffic. And I see this message that a typhoon has hit in Japan, and it's expected to hit in Hawaii the next day. And I turned to people there and I say, "What does a typhoon look like"—no, it was a tsunami. "What does a tsunami look like between hitting there and hitting here when it goes by?" Because I look and see it's starting here and expect to hit here, and then I looked to see our track, and what do you know? We're going right through it. Well, does anybody here know what a tsunami looks like when it's leaving there and going here, 3,000 miles away? No, nobody had any idea. So I look in the encyclopedia and I can't find anything. So I said, well, it will be interesting because it's going to go by here a little after midnight—by where we're going to be at midnight and they're going to be at midnight. And I'm going to be on watch. It's going to be on my watch.

Well I found out nothing. And it did, and it hit. And as a matter of fact, not long ago, when they were having all these tsunamis around they had, in the news item, they had pictures of this one in Japan and the one in Hawaii that had gone by, just recently, or a few months ago.

GRADY: Right.

LEIGHTON: A few months ago. But it doesn't do a damned thing. It might raise the surface of the water a half an inch or something, but nothing detectable. So I was wondering about it, but I did find out that nothing happened.

But sometimes what you have is—and one reason I always go read these messages, is because any ship that detected a mine was to report it. And there were a lot of mine reports because there were mines that had broken loose from their cables or whatever, and there had been an awful lot of mines planted. There were mines all over the place, and a lot of them on the open sea because they drifted. And so any ship of any kind that sighted a mine was required to report it. And then if you were a warship you tried to sink it if you saw it. And we did that. We used 50-caliber machine guns set up on deck to shoot at them, and we sank several of them on the way over. But of course you just didn't want to hit one of them or they'd take you out. So that added some excitement to the whole thing, to go after these mines.

Okay, so I come in to Yokosuka, and my orders are to report to the port director's office in Yokosuka and do whatever they tell me. So I'm coming in the boat, in the ship's launch, and I look over here and there's a heavy cruiser and it's got the hull number for the *Chicago*. And on the stern it says "*Chicago*." And so I go into the port director's office and I say, "I have orders to report to you." And so they take that, and the guy says, "*Chicago.* Oh, yeah, that's in Shanghai. That's in Shanghai. Give me a few minutes, I'll cut you some orders to go to Shanghai."

I should have kept my mouth shut. I said, "Sir, I just came in from the transport and there's a ship out there that has the hull number and the name *Chicago*. "Oh," so then he shuffles some more papers. "Oh, yeah. They're here. Just go down there and get on the boat and it will take you out." So that's how I got to the *Chicago*. And a lot of things happened there.[15]

But when I got to the ship they hadn't gotten their people discharged yet. And so I reported aboard. I had classmates there who had gotten right out of graduation, aviator types that got sent to sea and they got on the *Chicago* and they'd come up from Shanghai, where they were at the end of the war. At this point the ship is still overmanned for peacetime. So as I come aboard there are no bunks available in officers' country, so I get assigned, along with some other officers, to chief petty officer quarters. But it's getting pretty close to where they're going to take all the extra people they had from wartime and send them home or to other duty stations. So I'm only in chiefs' quarters for a couple of weeks; I don't remember exactly how long. And then get moved up to cots in the passageway outside the number two barbette. And so now we're elevated to officers' country on a cot in the passageway. And then finally all hell breaks loose. Everybody's getting orders, either to go to another ship, because now they've got to have another guy so they take him off your ship, or going back for discharge. And now I get assigned to an eight-man bunkroom with two officers, one other and myself.

The junior officer that was qualified as officer of the deck underway was a lieutenant (j.g.) who'd been selected for lieutenant. The rest were lieutenant commanders or lieutenants. And my classmates that had been there for months had not been certified, qualified, officer of the deck underway.

So we got underway, and I had one watch under instruction. Said fine, you're qualified officer of the deck underway. Along with all my classmates that had been there for months and had truly gotten qualified, but weren't standing watches. So I got it as fast as any of them except that I didn't have any of my certifications.

I had some interesting experiences as officer of the deck. One time up in the Inland Sea we were going to Kure to celebrate the queen's birthday. At this point in life we're the only major warship in anybody's navy in the Japanese Empire. I mean, the huge fleet of all these people—the Brits and the French and the Americans, all gone, and we're the only big ship left in the whole empire. I'm officer of the deck up in the Inland Sea, in fog. And I recommended to the captain, I sent a message to him that I recommended we slow down. No, we've got to get here at

[15] From his pre-prepared notes: When I reported abroad **Chicago** in the spring of 1946 there were so many officers already there that I was assigned with some other officers to Chief Petty Officers quarters. Within a couple of weeks we were moved to sots in the passageway in officers' country next to the barbette for the Number 2 turret. A few weeks later the post-war massive detachment of officers to go home took place, and I was assigned with only one other officer to a room fitted out for eight officers.

At the time, I reported abroad all officers qualified to stand Officer of the Deck watches underway were full Lieutenants or above except one Lieutenant (j.g.) who was due for promotion. Several of my classmates who had been abroad for months were waiting to receive their qualification. However, the first time we got underway after I arrived so many officers had been detached that I stood one watch as Officer of the Deck under instruction and was then certified as qualified to be an Officer of the Deck underway as were those who had been waiting for months to receive their qualification.

such and such a time. So, okay. I'm sounding the whistle for fog. So I moved my lookouts all the way up in the bow, as far as you could get, and told them: If you see a buoy you let us know immediately.

On those damned ships you've got the helm down here at the other end of a voice tube. You don't have the helm on the bridge; you've got a voice tube. But the navigator says: I recommend coming right to course so-and-so. Now, it was just at the same time my lookout on the port side of the bow says, "The buoy's passing down the port side of the ship." So I called down the voice tube and said, "Hard left rudder," and the navigator: "No, no, no; we want to go right." I said, "No, we don't. I want to get clear of that damned buoy." The lookout, it was right next to the ship, and I was worried that the way we were going that it might tangle with our screws. I didn't want to pick up the buoy cable in my screws, so I gave "Hard left rudder," to try and jerk the stern around. And then gave "Hard right rudder," to get back over, and then come to course so-and-so. Well, we didn't hit the buoy. But you get into some interesting situations on these things.

So things are changing rapidly. The ships are all leaving. We're now, at this point, which I can't remember exactly when it was but it's a few weeks after I reported for duty, we're down to being the only major combatant ship in the whole Japanese empire, of anybody's navy. And, of course, prior to that the place was flooded with ships of all navies. But now we're the—they've just taken masses of people out, taken them home, or sent them to other duties in some cases, and now we're the only one left of any size.

When we went down there for the queen's birthday at Kure and I went over to Hiroshima—the streets were cleared and they'd patched together the bridges so you could drive through the city, but they hadn't touched anything else. It was just flat, with nothing left, except—that was very interesting—every house had a safe broken open out in the yard, so you never knew who broke it open. But when the emperor issued all metal had to be turned in, they either didn't require them to turn the safes in, or everybody ignored it, because every house had a safe. And that also pointed out that they didn't trust each other totally.[16]

I mean, just visualize one thousand planes bombing the city. And the damage and numbers of casualties in the August 6, or what it was, fire raid on Tokyo, the number of people wounded was more than in Hiroshima. But, again, you'd always come back: one plane, one bomb. And in fact at Hiroshima, when they picked up the plane coming in on radar they sounded the alarm, but then they canceled it because there was only one plane so they figured it was a

[16] From pre-prepared notes: In my five month tour in Japan I had learned a lot in my job, and I also learned a lot about the aftermath of war. I had graduated from the Academy too late to engage in combat, but in Japan I had ample opportunity to see the results of the devastating non-nuclear attacks on such cities as Tokyo and Yokohoma, and the atomic bomb attack on Hiroshima – where the streets had been cleared but little recovery had been accomplished.

The Japanese people had little food. At every meal abroad ship all edible food of any kind left on our plates was scraped into separate garbage cans. Everyday Japanese boats came alongside to collect this garbage. When we went ashore we would see long lines of people waiting their turn to receive a share of the slop ladled out in one bowl carried by each person. For many that was most of the food they had for a long time. This made such an impression on me that to this day I hate to see food go to waste.

reconnaissance flight. They had a whole division out there doing exercises, and they fried them. They were all out on the field, the whole bunch, and sssss, were evaporated, essentially. But, again, it wasn't the—it was the one plane, one bomb.

Now, later on I went back to Hiroshima. I took my wife. And that's a bustling city. You know, people talk, oh, you could never, you know, the radiation would destroy it and all that kind of stuff. On the Internet there's a set of photographs of Detroit at the end of the war, which was a booming city, and Hiroshima, which was a ghost town. And then there's a set of pictures on Detroit today, which is a ghost town, and Hiroshima, that's a bustling city. Because the only thing left is the one under ground zero, which was there when I was there. I remember seeing it.

GRADY: And this was the spring of 1946?

LEIGHTON: Yeah, early '46.

I was assigned right away to the Third Division, and I was made the Third Division Officer, which, of course, is the after gun turret on the ship. The catapults are there and the ship's cranes there, and the Third Division Officer owns all those things.[17]

So one day the—I think his name was Appleby, a lieutenant commander; he was the gun boss. He called me in and he says, "Leighton, are you a qualified catapult officer?" And I said, "No, sir." He said, "Well, have you ever been to catapult school?" "No, sir." "Do you know anything about catapults?" I said, "Well, sir, when I was a midshipman I was standing down on the waterside on the Severn River and there was a cruiser anchored out there, and in the distance I saw them launch an aircraft." And I said, "That's my only experience or knowledge of catapults on cruisers." He said, "Fine. You're now the new Catapult Officer." And then he told me the name of the chief warrant officer who had been to catapult school and knew a great deal about it, and he said that he is leaving the ship in another week. "I suggest you get in touch with him and follow him around."

[17] From pre-prepared notes: Within a matter of days the **Chicago** was the only naval vessel in any Navy of cruiser size or larger remaining in Japan. The rest of the time I was abroad our crew size was so limited that the Engineering Department could only man two watch sections when underway which meant twelve hours watch per day for every engineer. In the Gunnery Department was so short-handed that we could either man the main battery of nine eight inch guns or man the secondary battery of anti-aircraft guns, but not both at the same time. On one occasion we actually fired the main battery in an attempt to sink an old LST for target practice. We were only allowed to use armor piercing shells, which went right through the superstructure, and we finally had to sink the ship with smaller guns.

The Gun Boss asked me whether I was a qualified Catapult Officer. I told him that the closest I had come to a catapult was as a midshipman when, from the shore, I had seen a cruiser anchored in the Severn River launch an aircraft. He said: "Fine, you are the new Catapult Officer." He suggested that I get together with previous Catapult Officer who had been to Catapult School and was to leave the ship in one week. In the ensuing several months we had a number of rather exciting experiences while launching and recovering aircraft (OS2U, Kingfisher) but did not lose any, damage any planes, or injure any pilots. I certainly became a great advocate of rigorously following a carefully worded check-off list!

So I did exactly that. I contacted the chief warrant officer, who was fully qualified in this, and he gave me a copy of the check-off lists that he used and explained to me what the duties are. So the next several months, the rest of the time I was on the ship, I was the Catapult Officer.

And we had some rather interesting experiences. We didn't kill anybody, we didn't damage any aircraft, but we did have some interesting experiences. You want me to talk about any of those?

GRADY: Sure. Yes, I do.

LEIGHTON: Okay. So today, one day when we were at sea—we didn't go to sea very often, by the way, because we only had left aboard enough ordnance people to handle manning the main battery or the secondary battery. We couldn't man both at once. And so in the engineering staff we could handle port and starboard watches, but anytime we were underway everybody in the engineering department was on watch half of the day, of every twenty-four hours. Because when they stripped it down they stripped it down, so that left them short.

Okay, some of the experiences with the catapult. One of the most memorable that I remember is—first, you have to understand, these are OS2Us, these aircraft, and they're propeller-driven aircraft. We had two pilots aboard. One day we're set up for launching and—one thing about ships when they roll, people have a visualization when a ship rolls it rolls one way and then the other one way, and then the other. It doesn't always work that way. Sometimes it rolls over and hangs. And the name of the game when launching an aircraft from a cruiser catapult is to launch on an up roll. What you do is, you get the plane all hooked up to the catapult, and on the cruiser the energy comes from two 5-inch powder bags, the same kind of powder bag that you used in a 5-inch gun. Then you have a chamber that you put two powder bags in, and then when you fire it they burst, just like they do in a 5-inch gun. And then that pulls a wire and the wire pulls a carriage, and the plane's hooked on the carriage.

Okay, several things about that. One day I'm getting ready to launch, and I want to launch on an up roll, but the ship—I'm going to launch to port and the ship rolls to port, and that goes down. So then I give the signal to the pilot to rev up his engine because I'm going to fire him on the up roll. Well, the ship rolls over and it doesn't want to roll back, because the seas are such that it hangs there. And I've got him up at full power because I want to have him on the up roll come up and launch him, and then he gets launched under full power. And then if you do that when you're on the up roll, once you get him up towards the horizontal and you give him the signal to go, he goes, and the catapult powder bags explode. That drags him down to the end, so that by the time he's at the end of the catapult he's aiming up, not down.

Well, one day it wasn't working out that way. I mean, the ship just didn't want to come back up. So that was interesting. It did finally come up and I did launch him. He was unhappy that I had him at full power as early as I did, but that was based on his coming up now, and it didn't come up now. So I didn't have any choice in the matter.

Well, another time, fine, we're going to launch him to port and it's all fine. I get him up to full power, and I just—my eye looked down the catapult. And there's a lever that drops. The

lever's not in the exact center, so the wire can come up the center of the catapult and the lever is to one side. And I just catch in the corner of my eye that the wire is not on the open side of the catapult; it's around the lever. And here I've got him at full power and I'm ready to go, fire, and I look at that and it flashes through my mind: that's not right. And then I say to myself: What happens if I fire now and the lever drops and he's going down the catapult? As soon as that lever drops that wire's going to be slack. Is that safe?

Well, you know, you're working on a second or two. You haven't got time to go get out the book and see what it says. But I knew that that wire should be on the other side, so I cut his engines. And he's furious. "Why? What are you doing? I'm at full power!" Yah yah yah. I said, "Take a look." And the wire's on this side of the lever. What had happened was, when the crew brought the table back after it fired the last time, the wire was slack, and when the lever came up it came up on the wrong side.

So that was a lesson to me. In that event it said "Something's wrong." I saw that and said—because it wasn't too obvious but you could see it. And I don't know to this day what would have happened if I'd have fired him. There wasn't anybody on board that could tell me. There wasn't anybody who knew anything about catapults except me, and that's what I had gotten from the guy who was qualified on catapults.

GRADY: The Catapult Officer's long gone.

LEIGHTON: Yeah. So anyhow, the pilot calmed down when I showed him the wire. He didn't like the idea of that being on the wrong side, either. He didn't know what it would do, but he knew it shouldn't be there.

Another day we're firing and recovering, sending them out on scouting and bringing them back. And the way you recover a plane, you're towing a sled and the sled has ropes attached to it, and the idea is that there's a pontoon on the plane and the pilot lands behind the ship and then revs up his engine to bring him up—he has a hook on the bottom of the pontoon. And he drives his plane forward to get his pontoon over the sled, which is being dragged in the water. And then he cuts his engine, and when he does that the plane drops back a little bit and that hook hooks around one of the ropes and now he's being towed by the ship through dragging the sled, and then the plane with the hook that's hooked onto the sled. Then—I also owned the crane, being Third Division Officer, and my guys manipulated the crane. And then they have to drop the hook from the crane over the pilot. They turn the crane so it is over the plane, and the pilot is standing up in the cockpit, with ship motion and water motion, and he reaches up over his head and looks up and our guy is slowly lowering the hook. You don't want to do it too fast because you don't want to knock the pilot out of the cockpit. You want to get it where he can steady it and then take the hook. Then in the plane he's got a line that comes up out of the cockpit that has a place for him to hook. And then he has to be in this cockpit heaving around and take this hook and get it in that, and then signal that he's got it hooked. And then our guy starts pulling up on the crane slowly and then lifts him out of the water, and we swing him out over the deck and then back onto the catapult.

Well, the plane has landed. He's driven forward. He's gotten his hook over the sled and he cuts his engine and the hook hooks onto the sled. However, he's closer to the ship than usual, and the water motion of the propellers is pulling him forward and his pontoon is hitting the stern, and basically not just controlled by the sled. It's being controlled by the water motion from sucking the plane forward hitting the pontoon while we're trying to get him the hook. That was pretty unpleasant because we're worried that the pontoon is going to rupture. And, of course, if that happens it's a whole new ball game.

So my guys are maneuvering the hook as fast as they can and not get it loose to where it can whack into the pilot, and the pilot's frantically trying to get the damned thing and get it hooked in. Well, it worked out all right. We got him and got him up. But that was a different experience.

To my recollection we didn't find anything wrong with what anybody had done, but the ocean can get very turbulent. We'd already been trying to calm the sea by doing a big turn, and when you do that you tend to calm the sea behind you. It was a rough day and so we had to do that. Well, those were some of my catapult experiences.

We did have another interesting experience. We heard an SOS from a Japanese fishing boat and we got a message that said what its location was, and it was very near where we were. So we watched out for them, and sure enough we found this fisherman whose propulsion had failed and he was just floating there in the water. It was on the Inland Sea. So we went up. And he had a place where you could hook a tow line in the bow, and that's where he wanted us to hook onto him. So we did that. However, it failed, and the bow came off, a part fortunately above the waterline. But this place that he had that you could hook onto, it broke. Broke on the boat.

GRADY: What was that vessel made of?

LEIGHTON: Wood. It was a wooden fishing vessel.

GRADY: I kind of figured it was.

LEIGHTON: An old wooden—I don't know how old or anything else, and I don't know what kind of rotting had been in it or anything else. So we lost the tow. So then we decided, well, what we'll do is put a cargo net behind him, and get that over behind him and tow him forward of a cargo net, where the load will be distributed throughout the whole stern. And we did, and we got him into a port where they could come out and tow him in. But, of course, you know, they were a vessel at sea and they were in trouble. And, of course, it didn't hurt public relations with the Japanese that we went and rescued them. The fishermen were very happy that we had come and rescued them. They weren't too happy about breaking off the bow, but they got home safely and that's what they cared about.

GRADY: You mentioned in here one gunnery exercise.

LEIGHTON: Oh, yeah. We had a gunnery exercise where we had an old, I think, LST. And we were supposed to go sink it. Well, they were trying to get rid of it and so they picked a place that was deep enough that if you sank it it wasn't going to hurt anything. But we were required to use armor piercing shells, main battery. And that's the only experience I had where we ever fired the main battery while I was aboard the ship, was on this exercise.

As the division officer I was in the check observer's seat in the turret, which for me was—I'm a very tall person and not too light. I weigh more than I used to, but the check observer's seat, I think, was designed for somebody of more normal height, so I had one hell of a time getting in and out of it. I had to get up over it and let go and go down, and then I had a big problem getting out because my knees and everything else would hang up on everything. It wasn't built for a large person.

Anyhow, that's the only time we ever fired the main battery in my experience. And we didn't sink the LST; the shells went right through it. They were armor-piercing; they just put a hole in it. They hit the superstructure and went through. So we ended up sinking her with the secondary battery. We took people out of the primary battery and put them in the secondary battery and sank them with the anti-aircraft guns. But I think that's the only time we fired the main battery while I was there. I know when I came back all the lights in the passageway around the barbettes were all shattered. People that had been there when they'd fired before said that, yeah, the lights all shattered in the passageways when they fired the main battery.

I can't be sure. We may have fired the main battery on one or two other occasions, but I don't think so. I think that's the only time we actually fired.

GRADY: What was the morale like aboard the ship? You had so few...

LEIGHTON: Well, the morale, as far as I knew—I was mainly associated with the junior officers and we were all learning something, so we were very happy about it. I mean, the skipper of the ship was popular with the crew, and people had to work pretty hard.

Well, some other things happened that were not exactly happy occasions. As I mentioned, ships kept breaking down. The transports were, but also the food supply ships. And so what would happen is, you'd get a reefer that would come out to the Pacific and then it had to start making all the ports in sequence. And by the time it got to your port it would break down and have to go into a shipyard for repair, so no fresh food. Well, the last three reefers that had come had broken down before they got to us so we hadn't had any fresh food aboard for quite some time.

Okay, then the fourth reefer comes and we get a lot of fresh food. However, we also get a high incident rate of amoebic dysentery. And so you can't use any of the fresh food, because they put us on rations, even to the point that at lunchtime we could go up on deck and pick up our C ration that was in our place and go up on deck and have a picnic on the deck. And so here we have all this fresh food aboard and can't use it. And in fact I was one of the victims that got caught in this amoebic dysentery. This is not long before I'm going to leave the ship, and I get

sent over to the dispensary. They gave you a pill that was about that big around, a thick thing; we called them "horse pills."

GRADY: Right.

LEIGHTON: And Admiral Decker came down to see me as a courtesy to see how I was doing. It was shortly after that that I got sent back. I had applied for the electronics engineering course, which is my next duty assignment. Do you want me to talk about that a little?

GRADY: Yeah.

LEIGHTON: In World War II, MIT, the Massachusetts Institute of Technology, in Cambridge, Massachusetts, took on the development of radar for the Navy. It worked on basic inventions by the Brits, but MIT developed the first shipboard radars. And they had a building called the Harbor Building down on Boston harbor where they had antennas for these things up on the roof. It was all highly classified work. As a matter of fact, my brother was one of the—well, no; let me start over.[18]

The Navy persuaded MIT to establish a six-months course in radar to train Naval officers and some Marines, and some civilians in radar. It was a highly classified program. And my brother, in the Class of '41, was one of the early attendees of this program, the six-month course. And I know from his experience—he was in the battleship *Texas*. He had graduated in February of '40, half a year early. He was the first class to graduate early. So he was assigned as radar officer on the *Texas*. And what he told me was that the only people allowed to enter the radar room were the captain, himself—my brother, who was the radar officer—and an operator for the radar, and nobody else was allowed in there. So it was all very hush-hush even on the ship.

[18] From pre-prepared notes: During World War II the Massachusetts Institute of Technology (M.I.T.) developed radar for the Navy. They established a six month long Radar School in which a total of almost five thousand naval officer enrolled over a period of years; many were reservists who left the Navy shortly after the war ended. The Navy then persuaded M.I.T. to expand this course into a five term, 22 month, undergraduate course in Electrical Engineering to train naval and marine officers in the fundamentals of radar. The course was attended by some members of USNA Classes of '43, '44, '45, '46, '47', and '48A, as well as a few from earlier classes, and some students from other universities. However the largest group of students who took this post-war course consisted of 45 members of USNA Class of 1946. The students were assigned to five groups that enrolled between Jun 1946 and June 1947. I was selected for the second group, which enrolled in September 1946, fifteen months after graduation from the Academy. Jim Doyle, USNA Class of 1947, whom I had known since childhood, relieved me in the **Chicago**. (See Naval Historical Foundation interview of Vice Admiral Doyle 1997)

When each group arrived at M.I.T. we were told that we could receive M.I.T. credit for every USNA course for which M.I.T. had an equivalent. Since M.I.T. did not have courses in ordnance, seamanship, etc., we started out in the second half of sophomore year. The first term we had five courses, four of which required regular use of Calculus including one that was Advanced Calculus. All '46ers will remember that the three-year course at the Academy taught Calculus only in the second year and used it only for Mathematics exercise, not in other courses. We found ourselves burning a lot of midnight oil to master the math required at M.I.T.

He had an experience that really bothered him, because when the battle cruiser *Tirpitz* was loose in the Atlantic he was convinced that they detected it on radar. As a matter of fact, he kept the radar plots that they had. And I remember he brought them home with him and went over it with my father to see if he had any evidence that this was the *Tirpitz.* But he tried to convince the captain that the target he was tracking was in fact the *Tirpitz* based on messages that they had of where they thought the *Tirpitz* was, and the captain didn't want any part of it so that didn't make him popular with the captain either. Anyhow, that's just a little aside that I knew about this school.

And so at the end of the war, when they were discharging people right and left and a lot of Reserve officers, etc., the Navy was concerned that they were losing a large number of people that had been through this six-month course, and that they needed to have more officers who had a fundamental understanding of radar. Because, of course, the whole radar program was going forward in new radars and more capability radars, etc. So the Navy persuaded MIT to take the six-month course and expand it to a twenty-two-month course, and give a bachelor's degree in electrical engineering.

So there was an ALNAV put out that there was going to be a selection, and that picked the grades you could be and your experience, what you had to have for qualifications. I read this with great interest because I was interested in increasing my technical education. I recognized that the three-year course at the Naval Academy gave you a degree, and it actually was a bachelor of science in engineering, but not any particular type of engineering. A lot of people thought their degree was electrical engineering but it wasn't. I've got one hanging on the wall if you want to see it.

I applied, and I was eligible, I was in the group. As a matter of fact, five times they ran this twenty-two-month course, five terms. They started one of them after each term. And so by the time you got to the fifth one you were in the last one. But at any given time you had several groups there. You started out with one group, and then you ended up with a large number, and then you finally had the end. I was selected for the second group to take that course.

When we got to MIT they said: Well, we will give you credit for any course you took at the Naval Academy that we teach. What's Ordnance? We don't teach that. What's Seamanship? We don't teach that. What's Navigation? We don't teach that. So by the time they got through putting X's in all the courses that we'd taken at the Naval Academy that didn't count, you ended up at the second half of sophomore year. And you were lucky to get that, because at MIT you started taking calculus in the beginning.

And it was very good for me because when we took calculus at the Naval Academy.... When we took physics they said: You know that big "S" thing in there, has infinity here and zero there, don't worry about that; that's calculus. You don't worry about calculus when you took physics. Well, at MIT the first term—and this is the second half of sophomore year—the first term there were four courses that required the use of calculus. One of them was advanced calculus. And they used calculus in all sorts of places. Now that squiggly "S" in there they told us to ignore at the Naval Academy had a meaning after all. Now, we took calculus at the Academy, but we never used it for anything except mathematics exercises. They were teaching

you how to calculate something, and so you only used it to calculate something, but you didn't use it to solve a problem. At MIT, you had a problem, you'd say, well, how do I solve this, well, you use calculus, and so we had to do that. So that was very good from an education standpoint, to do that.

MIT set up this course, it's twenty-two months and you're going to end up with a bachelor of science in electrical engineering from MIT, and supposedly know a lot more about radar than you otherwise would.

We were going to have five courses the first term. Of those five, four used calculus. Not teaching calculus—use it. One of those four was Advanced Calculus. The one that didn't require calculus was Economics. So you were going to take a course in Economics, and then you were going to take Advanced Calculus, and then the other three courses required the use of calculus also. So we burned a lot of midnight oil to remember what we had been taught at the Naval Academy, and then try and figure out what they assumed that you knew being a second-half sophomore student at MIT. And that was wonderful because now we learned it. We were taking Advanced Physics and Electronics, so now we knew what that big "S" meant and how to use it. So it required a lot of work but it was well worthwhile to us, those of us taking it.

GRADY: How many officers were in your class?

LEIGHTON: Ah, I had some numbers on that. Of the whole five groups the Class of '46 had the most, and I have those numbers somewhere. I wrote up an article for *Shipmate* and I'd have to dig it up. I'll try and find that for you...

GRADY: Okay. That would be helpful.

LEIGHTON: ...in which I cited a lot of these numbers. I got hold of a pamphlet one time at one of my class reunions at MIT. They had a whole bunch of stuff they wanted to get rid of so they offered to sell you—you could look at all this pile and all that pile, and for twenty cents you could have the thing, etc. So one of the things in the pile was an MIT brochure on this course, and listed all the people that took it during that five terms that they ran it. Well, they ran it more than five terms because they had to get to the last one, but the five groups, and they listed them. And so I did a numbers count. They had people back in the Class of '40, I think, was the earliest class I saw that took it, and then '41, '42, -3, -4. But by far the largest number was '46. And then they had some '47 and some '48A. I don't think they took anybody from '48B. I don't know, I can't remember. So I put that all together in an article that they put in *Shipmate* one time, or put in the class column, I guess, in *Shipmate.*

GRADY: Where did you live while you were there, at MIT?

LEIGHTON: When I was at MIT it was before I was married. One of the guys that was in the first group was a classmate, John Hughes, and he and I rented a room in a house, a private home. Some people got into the dorm, etc., but we agreed that we'd rather live separately from the dorm. And so he and I—he was there ahead of me, so he was starting his second of the five

terms. And, of course, it was helpful to me because when I got there he'd already had the first term.

And then before he graduated I got married, so at that point I rented an apartment for my wife and myself while I was there. And then she got accepted at Boston University for her senior year, at Boston University, while I was taking this—it was during the last year of this twenty-two-month course. And so that worked out very well. So John and I rented that room and then we checked out of that because he left and I rented this apartment and fixed that up and got married.

GRADY: How did you and Helen stay in touch?

LEIGHTON: How did we stay in touch? Well, I came back to go to this course, and on the way—we had been corresponding. I had gotten a camera, a second-hand 8-mm movie camera, before I left for Japan because I knew I'd want to take pictures. And then Helen sent me film, bought film. It was hard to get film, you know. Hard to get a camera. But a friend had gotten me a camera, arranged for me to buy a camera second-hand, and Helen sent me film for it. And I took a lot of pictures in Japan. I've got several hundred feet of film.

So anyhow, we corresponded, and I stopped in San Diego on the way back to MIT. She was living with her mother. Her father died when she was very young, six years old or something, six or seven, and she lived with her mother. And then her mother, during the war, had opened up two rooms for rent, because they were trying to get anybody that had extra bedrooms in their house to rent them. And so she had two high-school teachers that were living with her and Helen. And then Helen had gone on to San Diego State College but was living at home. And I stopped to see them on the way back from Japan, and so I stayed there, I think—that's the first time we ever actually had a date together. All our other dates she'd been Ben's date when we went out. But we'd talked a lot in our letters, and I was very much in love with Helen. It didn't take me long to think, boy, that's the girl for me.

So anyhow, I went on to MIT and then John and I rented this room and I kept writing to Helen. John had a girlfriend who was also going to San Diego State and knew Helen. So he, of course, told her that....

Well, I wrote and asked her to marry me, and I called her a week later and said, "Did you get my letter?" and she said, "Yes." And I said, "Well, I asked you to marry me." She says, "Yes, I know that." And I said, "Well, are you gonna or not?" And so she said, "I guess so."

Well, she was a young girl and was having a wonderful time in college and knew a lot of guys and they all wanted to date her, and she was having a good time. And so John's intended would write and say, "Gee, you say she's engaged to your friend David, and she's going out with all these guys." So I told John, "Don't worry. The little blue flame is there. We're going to get married." And I thought it was fine. She was the president of her sorority and she got lots of invitations. She was a beautiful girl, and naturally she'd want to go out and have some fun, and I don't see anything wrong with that per se.

And then that Christmas she came East and met my family and we became officially engaged at that point. But she had already accepted. And then the following summer, the 5th of July we got married, of '47.

GRADY: Where did you get married?

LEIGHTON: We got married in my mother's garden. My father and mother had bought a house just before he died, in Jamestown, Rhode Island. My father had worked out—it was a summer home, but he'd worked out the calculations for how much heat it needed and he had located a second-hand furnace he could put in. You couldn't buy a new furnace. You know, they didn't have anything. Everything was in the war effort. And so he had put that in. And actually the first time he saw the outside of the house painted was when he was in the ambulance going to Newport; he never came back. So my mother lived with my aunt, and that's Maude Ellen Trent. That's my middle name, and there's a whole story in my life that goes with that. She wasn't literally an aunt. My father used to refer to her as his adopted sister. And if you're interested I can tell you something about that...

GRADY: Mm-hmm. We'll pick that up.

LEIGHTON: ...but that's another whole subject. There's several Trents now in my family, and it all comes from her.

So anyhow, while I was at MIT that time we got an apartment. Getting apartments was very difficult. One apartment I looked at—by law, to rent it as an apartment it had to have a kitchen. One apartment I looked at, the kitchen was a pull-down unit that pulled down over the master bed. You had a king-sized bed and you pulled down this kitchen that came out of the wall.

GRADY: I remember pictures of <u>beds</u> coming out of the wall but not kitchens out of the wall.

LEIGHTON: Yeah, this was a kitchen, and that's where the stove was, and refrigerator, and the whole nine yards. I didn't rent that place.

The one I did rent was an old brownstone row house up near Fenway Park. 828 Beacon Street was the address, and it was about a block or so from four mainline railways that came through there. And when we'd come back my wife, Helen, went to Boston University and I went to MIT, and she was in her senior year because she'd had three years of college before she went there. One of us would be walking home, and if you'd see the smoke coming from one of these engines you'd run in to make sure all the windows were closed. And when they'd go by at night they'd wake you up with shaking of the bed. Every time the train went by you knew it.

But it was a nice apartment. A classmate of mine who was one term ahead of me—he was in the first group—his wife had just gotten pregnant, and so they needed larger quarters. So they found another, larger, place and so I got this place. I completely repainted it. I scrubbed all the walls down and repainted. My mother came up and made slipcovers for all the furniture. So it

was very nice and fresh when we got married, because all the furniture had at least slipcovers on it. It was all fresh and all the painting had been done. So I repainted the whole apartment before she came East and we got married.

My mother had a beautiful garden. As I say, they bought the house just before my father died, and my mother had turned things upside down to make it a beautiful garden. By now my father had died and so my mother moved all the furniture up from New Orleans into the new house, new to them. It was an old house but she had it fixed up beautifully. She had a beautiful rose garden and the trellis—well, I can show you a picture. We were married under the trellis by the Navy chaplain.

These days kids, you know, they expect their parents to spend $100,000 for a wedding. We had a wonderful wedding and it's lasted sixty-three years, and it was very inexpensive. My brother made the champagne punch and my aunt, Maude Ellen Trent, she baked three wedding cakes before she was satisfied. And so the one that we used at the wedding was the third one before she was satisfied with how it came out. And the top tier of the wedding cake, we cut that off first. I had my father's sword, which my mother had given me after he died and I used at the Academy, but the top tier we took with us on our honeymoon. And on the second night out, up in New Hampshire, we got caught in a hailstorm, and by the time we got to the hotel it was so late there was no food in sight, so that was our dinner.

GRADY: I was going to say, there's dinner.

LEIGHTON: That was our dinner, was the top layer to the wedding cake.
Well, I sure am wandering all over.

GRADY: No, no. We want to add that kind of material in. And I think that right now we're pushing over two hours. So let's cut it here, and you said you will be...

September 21, 2011

David F. Winkler and John Grady
Interviewers

GRADY: I'm John Grady. We're interviewing David Leighton on September 21 in his home in Arlington, Virginia. You are?

LEIGHTON: I'm David Leighton.

WINKLER: And I'm Dave Winkler. What we'd like to do today is to talk a little bit about your entry into the Naval Reactors organization, with meeting Admiral Rickover for the first time, and your initial duties and responsibilities. I assume you were more than working in the mailroom. How did you get involved in Naval Reactors?

LEIGHTON: I got ordered to the carrier *Wright*, and we were in Pensacola doing air qual for the pilots. Eventually, and we'll have to fill that in, the ship gets assigned to the Atlantic Fleet. The *Saipan* and the *Wright* alternated in carr qual in Pensacola, so the *Saipan* comes back and we go to the Atlantic Fleet.[19]

I was coming into New York harbor. I'm on a collision course with five ships in a heavy fog. So I turned around and went the other way to try and readjust the positions of this whole thing, because I could hear the foghorns and my foghorn, and I just didn't like being on a closing course with five ships at the same time. Then I called the captain and told him what I was doing.

There are a lot of crazy things can happen. On the carrier when I was officer of the deck I hear coming up from the voice tube, I hear: Seaman so-and-so requests permission to relieve the helm. Well, you don't know who Seaman so-and-so is or what his qualifications are or anything else, and he's requesting to relieve. "Permission granted." Okay. So then I get where I want to change course, and so I call down to come left to course so-and-so. Nothing happens. Well, I made it a practice that I always looked at the rudder position on the bridge, down low here and whenever I gave a rudder order I looked to see if the guy goes to the right direction on the rudder and the right amount.

So I called down and I said: Come left to course so-and-so. "Aye-aye, sir." Nothing happened. I turned to the junior officer of the deck and said, "Relieve the helm." "I don't know how to steer, sir." "Quartermaster, relieve the helm." "I don't know how to steer, sir." "Chief boatswain's mate, relieve the helm." "I don't know how to steer, sir."

So about then the captain comes up on the bridge and he wants me to tell him what's going on. I said, "Captain, I'm sorry. I'm busy right at the moment. I've got a helmsman that doesn't know how to steer the ship." So then I gave "Left fifteen degrees rudder." Ah. I now know he knows left and right and how much rudder. But then I say—I watched to see how we're doing—I say, "Ease your rudder." He'd always repeat. He'd been told to repeat back whatever they say to you down this voice tube.

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[19] From pre-prepared notes: After graduation from M.I.T. in mid-1948, as a Lieutenant (j.g.), I reported abroad the light (17,000 ton) aircraft carrier **Wright,** CVL 49, in Pensacola to conduct carrier flight qualifications for new pilots. The only other Academy graduates abroad were the Captain, Executive Officer, and Chief Engineer. I asked to be assigned to the Engineering Department, but was told that they had a serious shortage of deck officers. I served two years as Radio Officer in the Communications Department, first in Pensacola and later in the Atlantic Fleet operating out of Quonset Point, Rhode Island. For the last eighteen months of this tour I was also Electronics Repair Officer, responsible for the repair and maintenance of all radio and radar equipment in the ship. When I reported aboard the Exec said he was pleased to see that I had been qualified as an underway Officer of the Deck in the **Chicago**. I explained how that had come about and said that I was sure that did not qualify me for such assignment in a carrier. However the first time we got underway I was assigned one four hour watch under instruction and was then certified as qualified to stand underway Officer of the Deck watches which I did the rest of my tour of duty. I was also put on the watch list as one of four Communication Watch Officers, although I did not get the benefit of standing a watch under instruction before being certified as qualified.

Well, the bottom line was, it turned out that we had a helmsman and a relief for him, and the third guy in steering aft, and what you did is, you relieved the helmsman and then he goes back to steering aft, and then that guy comes up and takes over as helmsman. And so this other third guy in the whole deal, who was the second guy down at the end of the voice tube, he doesn't know how to steer. Nobody's told him how to steer. All he knows is you talk on that voice tube to the officer of the deck up there and ask for permission to relieve the helm.[20]

As far as I know I'm the only officer in the ship that ever went up and steered the ship, because I wanted to know how the ship handled, this cruiser. You know, I'm the officer of the deck. I'm telling these guys where to go. I wanted to have a feel for how fast the ship responded, etc., etc. And so I got permission to go up and steer the ship and went up and steered the ship. Then one night we had a storm, and I did the same thing. I wanted to see how it worked in a storm.

When I was in the carrier in the North Sea—and it was important to me in my later life—we went out of Narragansett Bay for a month's operation in the North Atlantic in the winter. We started rolling as we came out of Narragansett Bay and we stopped rolling a month later when we came back. We were able to fly aircraft for two hours in a month. Now, wartime, we would have launched but would have tried to get them back somewhere else to land, and if we had to we would have tried to land them and we would have lost some, and some would have gotten back. But we were pitching and rolling like mad.

That has always stuck in my mind because later on, when I was handling fighting for the Nimitz class, and fighting Zumwalt, who wanted to build small conventional carriers, when I was on the Navy's board—I got a letter of commendation, as a matter of fact—on how big should the next one be, etc., I got the figures for different tonnages, of pitch and roll that we could anticipate. And, of course, the Nimitz class or the big carriers, they can roll too. As a matter of fact, the *Enterprise* lost a plane. One of their elevators was on the side and it was sent down to the hangar deck, and meanwhile the ship had a big wave, washed the thing off of the elevator, and they lost an aircraft. But they don't roll anything like the lighter-tonnage ships. And this carrier I was on was only 17,000 tons; it was a cruiser hull, but the *Wright* was one of two. *Saipan* and *Wright* were built as carriers from the ground up, but they started with the design of a cruiser hull.

WINKLER: I guess like the *Independence* class.

LEIGHTON: And then built it up from there. The other ones that were on cruiser hulls were started as cruisers and converted. These two were built at the end of the war and they were designed as carriers, but they were basically cruiser hulls. And, as I said, the *Wright* was at 17,000. Of course, the later cruisers were heavier than the treaty cruisers.

[20] From pre=prepared notes: While home-ported at Quonset Point the **Wright** participated in several Atlantic Fleet exercises. In one we almost collided with another carrier at high speed at night which darkened ship due to the OOD misinterpreting the zig –zag plan in effect.

So I had the experience on that ship that taught me some first-hand lessons that helped me a great deal working on the design of the Nimitz class. It was not my business but we had a big fight with Zumwalt, you know, and with the systems analysis people on what kind of carriers to build. Even prior to that, when Vinson was chairman of the House Armed Services Committee, he held up CVA-67. We tried to get that made nuclear, but McNamara and the systems analysis people wouldn't buy it. The Navy wanted to make it nuclear too. The *Enterprise* was -65. 66 [*America*] was conventional, because the *Enterprise* hadn't been to sea. The CVA-67, the *John F. Kennedy*, we pushed hard to get that made nuclear, and we had convinced the Congress to make it nuclear. However, McNamara really just wasn't going to do it, and that was a big fight.

We had a huge fight to get the *Nimitz*. You already had the rumblings of small, light, and cheap, and we ought to build smaller ships. Vinson's Armed Services Committee held up the funding of the ship until the Navy had completed a study: How big should the CVA be? And that's what delayed what was to become the *John F. Kennedy*. So the Navy Bureau of Ships, then—I think it was still the Bureau of Ships, I don't know; they kept changing the name very time you turned around, but I think it was still the Bureau of Ships then—they had a big study group on how big a carrier should be, and finally convinced Vinson that we ought to build a big carrier. This, of course, is before Zumwalt. So the Joint Committee on Atomic Energy tried hard to get it made nuclear, but you just couldn't convince McNamara.

I had the personal experience.... Rickover found out that McNamara was going to go to Pittsburgh for his daughter's graduation from high school, I think it was, and so he said, "Well, why don't you come over to the Bettis Atomic Power Laboratory. We'll at least show you what we're doing." And McNamara agree to. Now, by this time McNamara was feeling a bit bruised by having the Joint Committee on Atomic Energy really give him a blast. And McNamara, he was just doing what Enthoven told him. He said no, we ought to build a diesel carrier. He didn't even know that we didn't have a diesel plant for an aircraft carrier (chuckle). And he presented to the Joint Committee on Atomic Energy a life cycle cost of a nuclear versus conventional carrier, and if you ever look at one of those studies you'll find that the real cost is the aircraft.

In this whole thing there's also a war going on between us and the systems analysis people that you should do it on life cycle costs, because they would charge us for the nuclear fuel that we put in the ship, and that's going to drive that ship for years. In the case of the *Enterprise* the first cores were three years. The second cores, with a slight modification, were four years. But what we were planning to put into this carrier, well, we said thirteen-year core life. And the reason for that was that I didn't trust those bastards because it was said that anything more than that—we had gone through a terrible fight to convince the systems analysis people that we should base our carriers on a twenty-five-year life, and we said we'd make it so you only had to refuel it once. Well, half of twenty-five is twelve and a half, so I said we're going to call this thirteen years of life.

Ultimately, the third set of cores for *Enterprise* were substantially greater than that. I think it was nineteen years or something. The *Nimitz*, I think, went twenty-something years. But those are rated at thirteen years, and the reason they're rated at thirteen years is I didn't trust the systems analysis people, and they would turn around and say, "Well, you're going to refuel it

once; then if it lasts twenty years, then you're going to have another one you're going to put in there for five. It's ridiculous." And they'd want to charge it that way. So I was worried they'd tell us to put in less fuel.

What we were doing was, we were putting in the maximum fuel we could calculate would last the life of the core and still be, by our calculations, capable of withstanding shock. Well, let me tell you this was no easy little thing. We were pushing very hard to get the long-life cores. I personally wanted to get it where you didn't have to refuel it as often.

So that's where the thirteen-year core life came from. It was just half of twenty-five, rounded off. We knew it would last longer than that. And we were putting in as much fuel as we felt we could calculate to be safe to put in. And there's a whole bunch of issues that get involved with that. We were working very hard to extend the life of cores because refueling is a big problem on a nuclear ship and we were trying to reduce the number of refuelings needed on any of our ships.

But the carrier size, I and others—most of the technical guys, they thought we ought to build a big ship. Well, why do you want a big ship? You can get more aircraft on it. But McNamara goes up and he presents a cost-effectiveness study which takes life cycle costs—and they may have used only ten years, I don't know; it was a big fight to get them up to twenty-five years for life cycle. Of course, now they want to run fifty.

This whole thing—you understand that the General Specifications for Ships of the United States Navy at the time the *Enterprise* was built were based on a ship life of twenty years. All major warships, the specifications were that the life cycle of a warship should last for twenty years. That means the number of full-power hours, the number of times you go from low power to high power, etc., all your stresses and thermal stresses and everything else, were based on twenty-year life cycle for all your machinery for the *Enterprise* and all other warships at that time. So when they came along with this life extension on carriers, that's no simple thing, to take machinery that was designed with the idea it would run for twenty years, and now say run it twenty-five, thirty, forty years. Machinery doesn't work that way, you know, too well.

Well anyhow, on the size issue, McNamara had put—since the *Enterprise* carried an extra squadron he, in making a comparison of the costs, life-cycle costs, included an extra squadron of aircraft. Well, there's the real money. Because let me tell you, in life-cycle costs of an aircraft carrier, including its escorts, the big number is aircraft, how long they will last and how many. Well, when the Joint Committee found out that he was making this comparison they said, "Why don't you just leave the squadron off?" Okay? But you put the extra squadron on, the life-cycle costs of the squadron of aircraft, and then they're not going to last for thirty years, another whole bunch, then that's the big money, and the Joint Committee pointed that out. And that made McNamara look like the fool he was.

But over and above that, then you have the people that want the small-light-cheap so we get more smaller carriers. Well, there's another whole study we did on that. I got them to put in there, for different parts of the world where you might be operating aircraft carriers, what is the number of days out of a calendar year that you can probably operate aircraft? And believe me,

for a 17,000-ton ship and a 95,000-ton ship there's big difference. So we managed to convince people that...

WINKLER: Bigger is better.

LEIGHTON: We never convinced Zumwalt; he was stuck. Well, we got a whole class of the Nimitz anyhow. We got ten carriers.

The *Wright* gets assigned to an availability at the Norfolk Naval Shipyard. I get temporary duty orders to Edgewood Arsenal to take the six-week tri-service course on the effects of atomic weapons. And there you learn about alpha, beta, gamma, etc., and just a little bit on biological weapons but mostly it's on the effects of radiation and effects of atomic weapons. Well, of course, I already had an interest in that and read the book on that, the declassified book.

I come back after the six-week course and I get assigned additional duty on the carrier, on the *Wright*. At that point I was the electronics repair officer and the radio officer and I'm in the communications division, and I'm standing watches as officer of the deck underway, also in port, and I'm one of four communication watch officers. And I now have additional duty as the radiological defense officer. And I'm the only one on the ship that's ever had any training whatsoever on the effects of atomic weapons and on alpha, beta, and gamma, what they are.

So now, in my capacity of an extra job, I'm responsible for taking care of radiological defense on this aircraft carrier. Of course, it's not a big carrier, it's just a 17,000-ton carrier. And of course that would be nice if you had a Geiger counter somewhere. We didn't have any of those things.

So we go to Guantanamo for training and then an examination. We get through the training. At Guantanamo on the staff they had a couple people who had been on a three-day course on biological and atomic weapons. Three days. And they wrote the battle plan.[21]

I had written an appendix for damage control; my watch station at general quarters was in damage control because I was the radiological defense officer, and if we had an atomic attack, supposed to be making sure we did the right thing, which of course we couldn't do a damn thing

[21] From pre-prepared notes: While in the **Wright** I attended the six-week tri-service course in Radiological Defense at Edgewood Arsenal and was subsequently assigned additional duty in the **Wright** as Radiological Defense Officer. No one else in the ship knew anything about Rad Defense, and we had no radiological equipment of any kind on board. I wrote up a Radiological Defense Plan as an addition to the Damage Control Plan, and assigned people as Rad Defense monitors, but without equipment there was no way it could work. When the ship was reassigned to operate with the Atlantic Fleet we were sent to Guantanamo for refresher training. Our final examination was a battle exercise in which we were told an atomic bomb had just exploded on the fantail. The ship got a failing mark because I had not had wooden blocks cut and labeled "Geiger counter" to give to the assigned monitors who the inspectors expected to be sent to the fantail to measure the radiation levels there. I was beside myself and felt that somehow I had let the ship down, although I knew full well that the battle problem was totally unrealistic and that the inspectors judging us had no concepts of the effects of atomic weapons.

because we didn't have any instruments. I had made up, assigned people as radiation monitors. I refused to take a block of wood, label it "Geiger counter," and have a guy take that. I did make armbands that said "Radiation Monitor," so that we did have people assigned as radiation monitors on each of the damage control teams. And I did have lectures, I ran lectures for both officers and people that were assigned, to tell them that they were assigned and that eventually we'd get some instrumentation and would show you how they worked, etc. And I did work out some things that if we had radiation, if you knew when the bomb went off and how long it had been since it had gone off, I figured some rules of thumb that would tell you how much, if you got a radiation reading in a given location, that if you knew how long it had been since the bomb went off when you took that reading you could calculate how much radiation you'd get if you stayed there. So you could use that to then evaluate whether that's a place that you could get a life, or death, thing in five seconds or ten days. And I talked about these rules of thumb to the members who were assigned as monitors just so they'd know something about what the thing's all about.

Well, they assigned us the battle problem. The battle problem was: A bomb like the one at Hiroshima has just gone off on the fantail of the ship. Well forget the battle problem. If you had an atomic weapon of 20,000 tons of TNT that just went off on the fantail...

GRADY: There's no ship.

LEIGHTON: There's no ship.

GRADY: There's no ships around it, either.

LEIGHTON: We got an unsat. Why did we get an unsat? We got an unsat because I had not cut blocks of wood, labeled them "Geiger counter," and issued them to all of the...and put them in the damage control lockers, etc., and have the monitors carry those around. And I actually, it brought tears to my eyes, because I felt very badly that we were getting an unsat on our final battle problem on the ship from Guantanamo, but it was so ridiculous. The battle problem just didn't make any sense whatsoever. But I was upset because I had been the cause of the ship failing because I hadn't done this, which I thought was a stupid thing to do. I mean, I tried to do what I could do within the framework of what was made available. If we'd had instruments I'd have shown them how to calibrate them, I'd have shown them how to use them, I'd have shown them how to go survey. We didn't have any of those things and we weren't going to get them for a long, long time. So I thought it was just utter stupidity of the problem that people in Guantanamo were assigning to us, you know? I mean, that wasn't testing our readiness for battle. So it made a big impression on me.

And I guess, am I a jg by now? I don't know. I'd have to think about that. It took me three years to make jg and then three years to make full lieutenant. So I'll have to go back and see what year we're in for this particular time. But that made a big impression on me. And I did know something about the effects of atomic weapons, I'd taken their six-week course, and I'd been given an impossible assignment to do anything useful because we had no instrumentation to do it. I tried to do what I could do within the framework of what I knew.

So then I go—I've already made up my mind I really would like to work on the *Nautilus*. So now I get orders from the ship; I've been on the ship for two years, and I get ordered to the six-week course at Treasure Island, to be an instructor.

GRADY: And that's the Damage Control Training Center?

LEIGHTON: That's the Damage Control Training Center, Treasure Island, which has a subsection that's assigned on the atomic weapon business, and mainly radiological defense. I guess it was called a six-week course in radiological defense. We had some brief stuff on biological weapons.[22]

And one of the ones they told you about is where a biological team went into the Pentagon and got the Secretary of Defense's secretary to help them hook up a vacuum that distributed biological—it was simulating that in the Secretary of Defense's office it was pumping out through the other end of a vacuum cleaner biological weapons. Which were not weapons; it was a innocuous substance, but you can trace it, and they just wanted to show you how little anybody knew about the hazards of biological weapons. And they actually did that in the office of the Secretary of Defense and then they did an analysis afterward. And what they were doing, they pumped out this stuff that under black light shows up, and it was all over the office. And the Secretary of Defense's secretary helped them run it. It was an interesting exercise.

But anyhow, that's neither here nor there. My main point was this six-week course. They told me when I got there that the first thing I was to do was to take the six-week course to prepare. And I said, "Well, I don't need to do that; I took the six-week course at Edgewood Arsenal." And it's the same course, because the Army ran one at Edgewood Arsenal and the Navy ran one here, and I can't remember whether the Air Force had one also; I think there may have been a third one that did. Did we have Air Force yet?

GRADY: Forty-eight when the Air Force came in.

LEIGHTON: So maybe we didn't have the Air Force yet.

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[22] From pre-prepared notes: Upon leaving the **Wright** I completed the Navy's four week Instructor Training Course in San Diego in preparation for the next two years teaching. Radiological Defense at the Damage Control Training Center on Treasure Island. When I reported for duty at the Damage Control Training Center I was told that my first assignment would be to enroll in the six week Radiological Defense course there. That course was a mirror image of the one I had taken at Edgewood Arsenal. When I protested, I was told that all new instructors had to take the course at Treasure Island, but that I should submit any comments I might have on the lectures. By the time I finished the course I had suggested changes in most of the lectures because I considered that they were not effective in preparing an officer for later assignment in the Radiological Defense field, as I had learned through my experience in the **Wright**. The Center's Commanding Officer, Captain John Madden, then assigned me the task of proposals he ordered me to put them into effect. I mention this experience as it was through these efforts that I got a though lesson in the importance, and increasing difficulty, of recognizing and performing the three phases of (1) identifying an important problem, (2) working out a solution, and (3) putting the solution into effect.

So I'm now assigned to be instructor. Well, so they sent me to instructor school first, which, by the way, was very good. They sent me to San Diego and it was a five- or six-week course on how to be instructor. The Navy had awakened to the fact that just telling somebody to be an instructor doesn't solve their problem, and so they set up a separate course in how to become an instructor. And I was very happy to go to San Diego because that's where my wife's mother lived, and she was very happy to go back there because she had a lot of friends in San Diego. So we get, I think it was six weeks.

But I learned a lot in that. I'm a coin-jingler, and I learned that every time I give a lecture I empty my pockets, because otherwise you fidget and you stick your hand in your pocket and they hear the coins jingling, etc. You know, that's one of the first things you do, take all the stuff out of your pockets.

Well, there were lots of tricks. They showed you how to make training aids. In those days you made them on plastic and a projector and could put them on screens, etc. And a lot of useful things, actually. It was a busy six weeks. I learned a lot doing that and I certainly became a better instructor because of it.

Okay. Now I report in, and they tell me to take the six-week course. And I say, hey, you know, why do that? Just give me a job and I'll do it. Tell me what you want me to do and I'll do it. I've had the six-week course, I know what it covers, and I have some opinions about it, but tell me what you want me to teach and I'll go teach it.

No, no, no. You must take the course. Every one of our instructors has to take our course. And since you've had it, you just take the course and any comments you have, give them to Lieutenant Commander—oh, it will come back to me, but he was in charge of the rad defense part of the whole thing. I know his name very well; I can't remember now. I'll find it somewhere.

Anyhow, okay, that's what you want, that's what I'll do. So I sit down at the first lecture, and write up about five pages of comments. And then the second lecture, several more. And the third lecture, several more. So at the end of the first week I write comments on the whole first week. Well, by the time I got through the six-week course I have my notes about that thick, and—this course needs changing.

Well, they'd gotten the course by going to University of California professors, and they came up with a lot of things dealing in physics and all that kind of stuff. And I said: Look, there's certain things in the physics that we have to tell people, but we need to tell them why they need to know that and how they should use it. And furthermore, we should teach them $E=mc^2$, but we shouldn't teach it that that's converting mass into energy. That that's not true. That's not what it means.

So I said, you know, how can it be? You take an electron and you accelerate it, and the faster it goes the more it weighs. That's converting mass into energy? It has more energy; it has more mass. So how can that mean you're converting mass into energy?

So I did some looking in various things and I found a *Popular Mechanics*, and I have it downstairs, as a matter of fact. The article was written by a guy named Albert Einstein for the layman to explain the importance and meaning of $E=mc^2$. And, of course, it was very simple, that in all physics up until that time, mass and energy were considered two separate physical properties. But he showed that in the cgs system that the energy equals the mass times the constant c squared, which is the speed of light. And that now we've found that mass and energy are not independent variables, that in x=ky, that defines dependent variables, where x is equal to y times a constant. And that when you set off the atomic bomb you don't convert mass into energy; you move it. And where you had the bomb here it has mass and it has a latent energy, and if the mass is greater the energy is greater. And when you blow it up you'll move it over here, or you'll move some of it over here, and you've now moved some of this mass and some of the energy. And since $E=mc^2$, you now say, how much mass am I going to blow up with this thing that comes over here, and multiply it by c^2 in cgs units, and that will tell you how much energy you're going to have over there. And it's one hell of a lot of energy. And so that's the reason we teach you this stuff is so that you now understand that we're taking mass and moving it, and that moves a hell of a lot of energy and so it does big things.

Well, so I reconstructed the whole approach to talking about alpha, beta, gamma. One day when I talked about alpha, beta, gamma, there were two Greek officers, and those poor guys were commanders in the Greek navy and they'd been ordered to come take this course, and they didn't speak a word of English when they started. They were told that next month you're going to go to America and take the six-week course. And those poor guys, they came up after classes, "Do you speak Greek?" And I said, "Alpha, beta, gamma; that's it." I felt so sorry for them because these guys had to take the notes every day and translate them into Greek and then study the Greek to understand what we were telling them so they could pass their exam. I just felt so sorry for those guys because every time you'd say, well, this is alpha and that's beta and that's gamma, they could understand that, but that was it. And they had to go at night and get together and try and piece together the English they'd learned in the month or so they'd had to study English.

Well anyhow, so I redid the whole technical part on what is it that we're dealing with. Now, I knew that none of these guys had ever been assigned as a radiological defense officer so I worked out a course on the approach to being a radiological defense officer. What are you going to do? You're going to leave here and they're going to make you the radiological defense officer; what are you going to do? And so I tried to give a structure of how to approach that and what they needed to know to do it.

Now, one of the things I did was I got some people in to talk to them. I learned about a girl who had been in Hiroshima when the bomb went off, in school. And I arranged for her to come over and talk to our class. I mean, here's a person now, what was her experience? And she was there in class, in the school when the bomb went off. And she gave a wonderful talk about it and what they had done.

The Japanese had taken rags and made a little helmet for every one of the kiddies that they took to school and carried in their book bag. When they got a bomb alert, you know, or something they'd take that and put it over their head and crawl under the desk. This was for

conventional weapons. And they didn't know this was a nuclear weapon at all. They'd never heard of a nuclear weapon. They assumed that their school had been hit by a bomb. The windows, of course, all shattered (phonetic) etc., and then of course when they got outside the whole downtown city was on fire. The school was out on the outskirts. And so they were just told: Go home. People got to the bridges were knocked down; they had to wait till the tide went out low enough they could go across.

She got home. She didn't even know she'd been damaged till she got home and a nurse saw her bleeding all over and took the last piece of thread she had to stitch it up. People were just in shock.

She gave a very interesting talk, to bring home to the students to have some concept what the effect when a nuclear weapon goes off.

To me, when I saw Hiroshima at a later time I'd been to Tokyo and I'd been to Yokohama, and the damage there from the August raids was terrific. To me it demonstrated a couple of things. One, that we had very good—that the Norden bombsight was very good because they could pick out the factories and blow them up but they left alone the Dai-Ichi building and government...

GRADY: These were the conventional raids on Tokyo.

LEIGHTON: Yeah. But the thing that hit you when you saw Hiroshima was not the damage; it was the one plane, one bomb. Because the fire raids in August of '45 were one thousand aircraft.

WINKLER: Right.

GRADY: One of the things you had on here relates to Captain John Madden in the restructuring of the courses, and this is what you were talking about.

LEIGHTON: Yeah. Now, did I already cover all this?

GRADY: No, no. I'm just saying, this is off your talking points here.

LEIGHTON: Yeah. Okay. So now I finish the six-week course. Ramsing, Lieutenant Commander Ramsing, Vern Ramsing, very nice guy, Reserve officer, and he was in charge of that school. And so he showed Madden, who was the head of the Damage Control Training Center, these comments he'd gotten from me. So Madden called me in and he said he'd read that and that he agreed with my comments.

Now, I was proud of myself, to be honest, that I'd really learned how to recognize a problem and work out in my mind what needed to be done. And so I thought that was a good life lesson. Because I worked hard on this thing, taking this course and then figuring out, gee—I looked at every lecture to say to myself, okay, these guys graduate, like I was they're going to get assigned as radiological defense officer in their command, and what should they do? And how does this lecture help prepare them for that? Recognizing, of course, until they got

instrumentation they couldn't do anything, but nevertheless why are we teaching them this, and what is it you want them to do?

So Madden said, "Do it." Oh. Now I've got to take all my comments and figure out specifically, what do we do with this? Well, I did that, and then I got assigned certain areas to be the instructor.

By the way, when I brought in people like the girl that had been in the bomb attack I also brought in a couple Canadian officers that were students in the course and got them—I asked: Anybody here been in a disaster? And these two Canadian officers said yeah, they had been assigned jobs in two disasters. They were huge floods. So I got them to work up a lecture. I'll never forget, in the communities they were in they had assigned women, society ladies, as ambulance drivers. So they had assigned ambulance drivers so when they had an emergency they had all the ambulances with a driver, one driver per ambulance. And their point was that eight hours later, who's driving the ambulance? And their comment was, the military, accustomed to stupidity, was assigned to take over solving the problem.

And then they told me some of the kinds of things they had. For example, they'd be in a boat with the water up to the second story of the house, everybody up on the roof including the pet chicken. And those people were not going to be rescued until they could get their pet chicken back, or the pet dog, or the pet cat, because to them their pet was a member of their family and they weren't going to abandon them. So they had to make arrangements for that. Well, we have that same problem, you know, every time we get a flood or something.

GRADY: I was going to say, the classic case is Katrina.

LEIGHTON: Yeah.

GRADY: I mean, we have had hundreds of thousands of pets in which the people were saying: I'm not leaving here until that dog or that cat goes with me.

LEIGHTON: That's right, and that goes with the thing. And I learned that through these guys. These two guys had been through two disasters where the army had been called in to take over and try and straighten it out. And so I thought their lectures were very interesting, and they'd worked up a good sound lecture.

I'd gone into the Army—I'd got the Army manual on how to go about setting up a battle plan, etc., and put that into one of the lectures, and then used these guys as examples. One could say, well, that's way out in left field, but it's not. I mean, if you're going to be involved in a nuclear disaster it's very much meaningful.

So I got to know Madden pretty well, because he asked me to do this and I did it, and he was very happy with the result. And, of course, it helped him because the people from Washington that come out and look at the courses and all were favorably impressed at the course.

As a matter of fact the chief of the Bureau of Ships, when he had to put an endorsement on my recommendation for the Distinguished Service Medal—for the DOD Civilian Distinguished Service Medal he had to write an endorsement, and he mentioned in that endorsement that he had known me since I was a lieutenant because he'd been assigned the six-week course at Mare Island and he gave me credit for having reoriented that whole course, and that that had impressed him when he was a commander and that he had personally benefited from that, and then he was endorsing me for work in the Bureau of Ships on the nuclear-powered ships. But I thought it was nice of him to put that in there.

So anyhow, we're trying to get to Rickover here. Madden took an interest in me after I'd been teaching at the course, and he called me in one day and asked me what area in the Navy would I like to get ordered to, because I'd be coming up for orders. I told him that I really would like to work on nuclear propulsion, that that intrigued me and I thought it was important and I was aware of the program.

And at this point I had had one further.... When I got ordered to Treasure Island I stopped by Washington and I visited a friend of mine who was in the Class of '39. I'd known him—one of my sisters had dated him when my dad was at the Naval Academy. And, of course, I was in '46, he was in '39, so he was very senior to me, but he was a full commander, been through the whole war. And I said, "I've heard Admiral Rickover describe this submarine and I would very much like to get ordered to that if it's possible." This is when I already had orders to go to Treasure Island. So he called Lou Roddis, who was the number one man in the Class of '39, and Lou Roddis at that point was essentially deputy to Rickover, although Rickover never really had a deputy, at least not at that time. But Lou Roddis was in a very senior position working directly for Rickover. And so he asked my friend how old was I, what rank, etc., etc., and he said no, there's no billet here that I could fulfill. So I'd made one shot at trying to get into it then. And I don't think that Roddis had talked to Rickover about it at all. I just think he knew enough about it to know that I wasn't eligible. And so that's what came back to me, was that I wasn't eligible.

So now, talking to Madden, and I told him, I said, "Well, sir, I really would like to go work on nuclear propulsion. I think that's a very important thing for the future of the Navy, and I know something about it, of the basis for it and atomic weapons, etc." And he said, well, he said he knew people in the missile business and he thought missiles were going to be extremely important in the Navy, and wouldn't I want to go work on that? I said, well, yeah, I'd like to work on missiles, but I really would like to work on propulsion. That blowing things up versus pushing them around, I would rather be working on how to push them around than I would be blowing things up. So he says, "Well, I'll tell you," he says, "I know Captain Rickover." He says, "I served with him in the S-boats. And I'll write him a letter."

Well, the ALNAV came out. Rickover was selecting four officers a year to send to MIT for a fifteen-month course. And up till this point—we're up to 1952...

GRADY: Right. August of '52.

LEIGHTON: ...because Rickover's a captain and I'm a lieutenant. '45, -6, yeah, I've just been named lieutenant, and I've been now at Treasure Island for close to two years, I think.

So he writes a letter to Rickover. Now I told him, I said the ALNAV says I'm not eligible because you have to be at least selected for lieutenant commander, you have to be an ED. I said I'm not an ED, I'm a line officer, because I'm not eligible to be an ED, because under the rules you have to have already been selected for lieutenant commander to apply for ED. That was the rule as of that time. So I can't apply for ED, I'm not senior enough, and the Rickover requirement is to at least be selected for lieutenant commander to apply. And I said I'm nowhere near that; I've just been made a lieutenant. So he says, "Oh, I'll write to Rickover."

So he writes a letter to Rickover. I don't have a copy but I do remember reading it. He showed it to me. And I do remember that he wrote to Rickover. He said: I have an officer on my staff that knows more about atomic energy than anybody I've known except you. Rickover. And I thought, well, that was a stretch, that I knew more about atomic energy than anybody but Rickover. But anyhow, he said that in his letter. And he says, "I hope you'll consider him for it."

Okay. Advance forward a long way. Eventually I end up going to Naval Reactors. I get orders to go for interview in Washington for possible selection for this course. And I get selected. Now, much later I found in the files, in a pink—are you familiar with the "pinks" system?

GRADY: No.

LEIGHTON: Rickover personally considered that every secretary worked for him. And every secretary was required, on anything she typed, to make a pink copy. And that pink copy was to be delivered to Rickover's office by the end of the working day. Anything that went into a typewriter, that was his deal for the secretaries, who all worked for him, and they were to do that. No exceptions. That system no longer exists. That's one of the first things that they did when Rickover got ousted. That was a very important thing in Rickover's business.

So Rickover personally got a copy of everything that was typed. He would take those home with him at night. He would read them, and he read those very quickly; he was the fastest reader I ever knew. And he said he couldn't read things fast if there really was something in it that was important to him, but he read every one of those pinks and he marked it up and put an "R" on it. And the next morning he'd have his secretary call in whoever was the one that had dictated or written the thing that was being typed, and he had a list of questions about it.

So that was his way of training his staff, the engineers. And sometimes he'd raise holy hell about a pink. But he was looking at it: Is this telling, the guy who had the incoming—somebody's going back on a proposal that's come in—is this ordering the contractor what to do? No way. He would not tolerate his engineers ordering the contractor that was responsible for doing the engineering what to do. If it's telling the guy it's disapproved, is it clear why it's being disapproved? What is it about the thing that's being disapproved that is not acceptable? Has that been made clear? Can the person at the other end understand what's wrong with what they proposed? And Rickover was a real stickler for this stuff. Or he'd call in the branch head of the guy, who had this segment or that segment of the technical work, and "Why have you allowed this letter to be written this way?" etc., etc., etc.

And basically he's training his staff to understand the quality that he expects from his people, the thinking to determine whether the proposal at hand is a good proposal or a bad proposal, why it's that way. Is it understandable to the reader, etc. Very important in understanding Rickover.

And he looked at the pinks; he wasn't just getting paper. He looked at it, and that's how he kept track of what's going on, how he kept track to make sure how his people were dealing with the contractor. He was well aware of people who might want to just be expressing their own opinions and tell the contractor how to do it. And he was training the contractors and he didn't want them telling them how to do it. He wanted the contractor to figure out how to do it.

GRADY: Now, in your selection for MIT at this time, how many officers were selected? This had to have been an extremely small...

LEIGHTON: Four. Four a year.

WINKLER: And you were talking about the pinks. I guess the pink in this case was really...

GRADY: Personnel.

WINKLER: Yeah, but was related to your application.

LEIGHTON: Yeah. Okay, well, now, on this pink it was in final format, and that told me that this has been bounced at least once.

WINKLER: Okay.

LEIGHTON: And the letter is going back and saying: Thank you very much for your recommendation, but no thank you. Can't do it. Doesn't meet the requirements, doesn't have the experience lever and, you know. And the drafter was Ed Kintner, because you could always tell from the pink who was the drafter, and it was Ed Kintner. And Kintner was one of the first ones to interview me when I came back. He never mentioned this but I looked it up in the files. After I got there I looked through the files to see what was the answer that was going back to Madden. The answer that actually went back to Madden was temporary orders for me to come to Washington on a certain date for interview. So obviously it had been considered by the staff and no, we ought to write back saying it doesn't meet the requirements, but Rickover thought enough of Madden that he decided either it was time for me to overrule these guys, or whatever. Just get him in here, you know.

WINKLER: Okay.

LEIGHTON: So that's how I got interviewed, was because of Madden's letter, because Madden did know Rickover and respected him, and Rickover respected Madden because they'd been together in the S-boats.

And by the way, I don't know whether you guys ever looked that up. Rickover had a Secretary of the Treasury medal for saving a man's life when they had a battery fire in one of the S-boats, and that's something you ought to get in to your thing about Rickover. It goes all the way back to when he was a junior officer in the S-boats and they had a battery fire, and Rickover went down to see if—my recollection. Well, you can probably find the actual description, but my recollection is that he went down and found this guy and got him out. And I don't remember if he was unconscious or conscious or why he—but anyhow he saved his life. And for some reason he got a Secretary of the Treasury medal, and I don't know how that worked, but there was a thing at one time where lifesaving...

WINKLER: Okay, Coast Guard.

GRADY: Right.

LEIGHTON: ...were given out by the Treasury Department, but I don't know what the history of that is, either.

GRADY: Yeah, the lifesaving service and whatever the other one was before it became the Coast Guard. Yeah, it was all under the Treasury Department.

LEIGHTON: Yeah, and that's what...

GRADY: And rescues at sea in non-wartime. That would be what they would recommend.

LEIGHTON: Yeah. I go back for interview and figure that I'm not going to get selected, but if I do then they're not as nuts as I think they are.

FROM PRE-PREPARED NOTES:

In 1951 I discussed with Captain Madden my desire to work on the development of nuclear propulsion for the Navy. However, only officers who were already designated for Engineering Duty Only (EDO) and at least Lieutenant Commander in rank were eligible to apply. I was a general line officer and had recently been promoted to Lieutenant. Captain Madden said he had served in the S boats with H.G. Rickover. Captain Madden wrote him a personal letter in which he urged him to select me for the nuclear propulsion program even though I did not meet the eligibility requirements. I soon received orders to report to Naval Reactors to be interviewed. Captain Rickover, after I was interviewed by eight people including himself, included me as one of four officers to go to M.I.T. in 1952 for a 15-month nuclear engineering course. The keel for the **Nautilus** was laid at the same time we started this course. In August 1953 the four officers in our group were the first M.I.T. students to get a Master of Science degree in Nuclear Engineering. (Officers Rickover sent to M.I.T. in earlier years received degrees of Master of Science in Physics, but by the time I went to Rickover had persuaded M.I.T. to establish a degree in Nuclear Engineering).

Just before graduation from this course I got a call from Captain Lou Roddis, USNA Class of 1939, who was then in a very senior position in Rickover's office. He said that Rickover, recently promoted to Rear Admiral, was furious with me. When I asked why, I was told that the Bureau of Personnel was cutting orders for me to sea on a destroyer and the Admiral thought that I had tricked him in order to take the nuclear engineering course without subsequently serving in the nuclear propulsion program. I told Captain Roddis that nothing could be further from the truth, that I very much wanted to work on nuclear propulsion, just I had told then Captain Rickover two years earlier. Captain Roddis asked whether I had applied for designation as an Engineering Duty Only officer. I told him I had not because I was not senior enough under then current BuPers instructions. Captain Roddis later called me back and told me that if I wanted to be assigned to Naval Reactors I must write a letter to the Chief of Naval Personnel asking to be designated for EDO even though I was too junior according to the rules at the time. Subsequently I was fortunate to be selected below the promotion zone for Lieutenant Commander. I was glad that the Admiral had succeeded in getting me designated for EDO designation such that I would then have been too senior to apply for EDO.

. My first assignment in Naval Reactors, in August 1953, was reporting to Jack Grigg, a civilian who headed up the Naval Reactors work on Electrical, Instrumentation, and Control Systems. I was assigned responsibility for the Control and Electrical systems being developed for the sodium-cooled reactor for the submarine **Seawolf** for which the keel was laid the following month. The **Seawolf** started sea trials in February 1957, two years after the **Nautilus**. Robert Y. "Yogi" Kaufman, USNA Class of 1946, was the first Executive Officer assigned to the **Seawolf** and served in that capacity from construction until it was decided after almost two years of ship operation to replace the sodium-cooled reactor with a pressurized-water-cooled reactor like the one in the Nautilus. Chuck Carlyle, USNA Class of 1947, who was Engineer Officer in the Sea Wolf from the start relieved Yogi as Exec. Jimmy Carter, USNA Class of 1947, was an assistant in the Engineering Department, but resigned from the Navy during ship construction. When I reported to Naval Reactors the Nautilus was still on the building ways and its propulsion plant land prototype in Idaho was undergoing its first tests at power. Leslie Kelly, USNA Class of 1946, was the first Engineer Officer in the Nautilus.

. In September 1954 I started working directing for Rear Admiral Rickover as the Project Officer for the Submarine Advanced Reactor (SAR) and its land prototype (later designated as S3G for the land prototype and S4G for the shipboard plant) being developed at the Knolls Atomic Power Laboratory (KAPL) for the two-reactor submarine **Triton SSRN586**. Rickover was so impressed with Kelly's performance in the **Nautilus** that he insisted that he be assigned as Engineer Officer in the **Triton**. Captain Ned Beach, USNA Class of 1939, was the first Commanding Officer.

I continued to be the Project Officer for the Submarine Advanced Reactor until August 1959. However, for the last three and one half years of this period my duties were substantially expanded to include being responsible as Project Officer for the development of the two reactor propulsion plant for a nuclear destroyer leader (later designated cruiser) and it's land prototype and as KAPL Laboratory Officer responsible to Admiral Rickover for oversight of all naval work at the Laboratory including the transition of the transition of the Laboratory to be fully qualified in water cooled reactor technology. Early in 1960 Captain Beach took the **Triton** on its first

voyage- a circumnavigation of the world in eight-three days, independent of the earth's atmosphere.

. In August 1959 I started a two year tour as Nuclear Power Superintendent at the Mare Island Naval Shipyard. When I arrived the **Sargo SSN 583** was starting her Post Shakedown Availability. The **Hailbut SSGN 587** (the only nuclear powered submarine ever built to fire Regulus guided missiles) was undergoing dockside testing prior to sea trials the next month. The **Theodore Roosevelt SSBN 600**, for which my classmate Joe Russell was the first Executive Officer, was two month away from being launched. The **Scamp SSN 588** was on the building ways with 14 months remaining until launch. The keel of the **Permit SSN 594** had been laid a month before I arrived and the keel of the **Plunger SSN 595** was laid seven and a half month later. The keel of the **Andrew Jackson SSBN 619** was laid four month before I was detached , and the keel of the **Woodrow Wilson SSBN 624** was laid a few days after I left. In my two years at Mare Island the work on the eight submarines listed above covered all phases of nuclear plant construction during which a wide variety of problems were encountered and solved. In those days the Nuclear Power Superintendent was the Naval Shipyard official directly responsible for all matters affecting the Shipyard. As such I was in charge of the Nuclear Power Division and reported directly to the Planning Officer and to the Production Officer, with a dotted line to the Shipyard Commander and a dotted line to Admiral Rickover who wrote concurrent fitness reports.

. In September 1961 I reported for duty again in Naval Reactors Headquarters. By then I was a Commander. Rickover called me in and said: "The first thing I want you to do is to take charge of the forthcoming propulsion plant sea trials of the **Enterprise**" which was then being readied to go to sea for the first time. Milton Shaw, a civilian, had recently left Naval Reactors. Rickover assigned me the job Milt had been doing overseeing the programs for nuclear propulsion for the aircraft carrier **Enterprise**, the cruiser **Long Beach**, and the frigates (later designated as cruisers) **Bainbridge** and **Truxtun**. Initial sea trials of the **Enterprise** commenced in late October 1961. By the end of 1961 **Enterprise** and **Long Beach** were in commission, **Bainbridge** had been launched and **Truxtun** was under contract. At that time the nuclear submarine fleet in commission consisted of the **Nautilus**, **Seawolf** (with a pressurized water plant), the radar picket submarine **Triton**, the Regulus guided missile submarine **Halibut**, the hunter-killer submarine **Tullibee**, the four submarines of the Skate class, the six submarine of the **Skipjack** class, the first submarine of the **Thresher** class, and the first six Polaris SSBN's – a total of 22 nuclear submarines in commission – with thirteen more **Thresher** class and thirteen more SSBN's on the building ways.

EXCERPTS FROM LETTERS WRITTEN TO HELEN MILLIGAN FROM JAPAN BY DAVID TRENT LEIGHTON -- 9 APRIL TO 7 SEPTEMBER 1946

April 9, 1946

Well, here I am in the middle of the Pacific. We arrive in Yokosuka the 19th. We passed the dateline yesterday. This morning we still had 1900 miles to go. There certainly is a lot of water in this ocean.

Yesterday we sank a floating mine. We had to change course to miss it. We fired for about an hour before we hit it. I guess we'll pass more when we get closer to Japan. The darn things get cut loose in these typhoons and such.

April 20, 1946

Yesterday (Friday) is the first time I have had liberty. A classmate and I went into Tokyo. It is very hard to describe Japan, because it is so unlike the United States. Perhaps someday I'll have a chance to show you my movies that I am taking. I certainly wish that I could get more coloured film. It is impossible to get out here. In case you are interested, I'll try to describe to you what we saw on our little trip. If you get bored just skip through it.

We got a boat ashore at 1300. (You might as well get used to Navy time.) It takes about 15 minutes to get to the landing. From there you go through the gate and walk a block to the train station. Yokusuka is only a small town and looks something like the slums of New York. Everybody is very poor looking. All the men and children wear the remnants of their uniforms. Almost without exception, the male children are dressed in ex – uniforms. I guess they don't have any other clothes. Many of the women wear brightly coloured kimonos (or whatever you call them.) It is not at all uncommon to see women carrying children on their backs like the Indians used to. Most of the adults and children wear wooden shoes. They wear thick socks with one slot for the big toe and one for all the others. Like so: From the side the wooden shoes – more correctly sandals – look like this: they have thongs on them which go around the heel and pass between the slots in the socks. When they run they make a clattering noise. You can always hear them coming. There seems to be an awful lot of Japs. The train station is always full. Allied personnel don't have to pay anything, but the Japs do. Almost all of the trains have at least one car for Allied personnel only. The cars are in pretty bad shape. They never seem to tire of it. I thought that by this time they would be used to us. I forgot to mention that you would see quite a few people wearing a gauze mask over their nose and mouth (something like a doctor's mask). I am told that the Japs (as do the Chinese) require all their people to do this when they have a cold. They really do look odd that way.

There are an awful lot of Japs that look just like the American movie version. A lot have buckteeth and horn rimmed glasses. Some of them are really funny looking. Almost all of them are very short. When you see them and how they live, you wonder how such a people almost beat us. They don't know what living really is. Well, to get on. The station was quite crowded and smelled horribly. As a matter of fact, you notice the smell almost everywhere here. It is pretty bad at times. They are anything but a clean people. It is an hour and fifteen minute run on the Express from Yokosuka to Tokyo. They stop at Yokohama and Kamikura and several other stops on the way. The locals take quite a bit longer. There are a lot of trains and you never have

to wait for more than ½ hour for one. The countryside around here is very hilly and there is not much good farmland. You do see farms along the tracks on the way in. The farms are between hills. We must have passed through at least 5 tunnels between here and Yokohama. On each side of the tunnels one passes through a farm village. The farms all seem to be very small. The houses in the villages are mostly a mess. Every once in a while you pass a group of well-kept looking places and then you see a U.S. Army sign. Most of the ones the Japs live in are a mess. They are crudely constructed and are in great need of wood and paint. Just before you arrive in downtown Tokyo you pass through large bombed out areas. They are leveled. In these sections you will see huts built out of large pieces of rusted sheet metal. These thrown together houses aren't much better than nothing at all.

Next we arrive in Tokyo itself. The station smells terribly. Also I should mention that it is dry and dusty everywhere despite the fact that we have had rain. There is always a chocking dust here in the air in congested areas. The Tokyo RR station was pretty badly bombed. It is pretty much of a mess now. The whole top was lifted off.

From the station we walked three blocks to the Red Cross Building. There we had cocoa and doughnuts and received directions to a few places. Jap girls served you. Their vocabulary is strictly limited. In fact I was very surprised that so few Japs speak English. In fact I have yet to meet one that does.

There were quite a few rickshaws lined up outside the Red Cross. I have yet to ride in one. You usually find them around one of the American bldgs. Americans are about the only people that use them. The only decent busses are Army ones. There are a million and one jeeps running around, but they are hard to get. Quite a few if the Japs have cars. Most of these are charcoal burning. They have large burners on the rear ends. Jap busses are all falling apart and wouldn't ride in one for worlds. Wherever Japs pack in, it smells to high heaven. The only place that you can get a meal in Tokyo is a transient Mess at the Imperial Hotel and the line is so long there that it isn't worth the trouble. You can always get coffee and doughnuts at the Red Cross and the Ernie Pyle Theatre. You have doughtless seen pictures of the latter. It is about the best building in Tokyo. They have a huge theatre there with two shows a free daily. They have a small theatre with continuous newsreels. There are many lounges and libraries in the building. It is nice and clean and very nicely decorated. In the coffee shop all of the tables have fresh flowers on them. Jap girls serve coffee and doughnuts.

We walked around the outside of the Imperial Palace. You can't get in. They have a wide moat and a high wall around it. The grounds are terrifically large. Mostly we just walked around and then got the train back when it got dark. Most people don't think much of Tokyo for liberty. I, myself, am very interested in going back. The general street scenes alone interest me immensely. You get very tired of walking though.

Tomorrow the same classmate and I are going in again. We get liberty at 0830 on Sunday so that we shall have more time. Of course, the stores will be closed. We didn't get in any yesterday either. I'll have to go back again and try to get some souvenirs. The prices are sky high. The trouble is that we can't take American money shore. We have to buy Jap money aboard at 15 yen to the dollar. Yen aren't worth a damn to the Japs. I know a guy that sold an old

radio that he paid $10 for 3000 yen which is $200 in our money. The hitch is that once you get Jap money you can't turn it back into American. Of course, he wasn't supposed to sell the radio, but then most everyone here is mixed up in one racket or another. It reminds me of the old carpetbaggers in the South. I don't care to get mixed up in it myself.

Well, I hope I haven't talked too much. This is all extremely interesting country to me. I'm just sorry that I can't put into words what I see. I hope I'll get some good movies.

May 3, 1946

Please excuse the fact that this is all in capitals, but this is a communication office typewriter and all they have is capitals.

In this letter I shall tell you all about the sukiyaki party I went to last night. I hope that you will find it interesting, I know that I did.

First of all let me explain the set up in geisha girls. If you speak to the average American who has returned from the Occupation with reference to geisha girls, he will immediately interpret this to mean prostitutes. That is a misconception gained from the common practice of referring to houses in the red-light district as geisha houses. This is strictly an incorrect conception. Actually there are very few geisha girl has had anywhere from four to seven years of intensive training in the art of geisha entertaining. We were entertained last night by the best geisha girls in southern Honshu. The only place where there may be better ones is around Tokyo. At any rate, our party took place in a geisha house in Hiro which is just outside of Kure on southern Honshu. Hiro is not to be confused with Hiroshima which is about 16 miles from there. This particular house is down what appears to be the usual dumpy street in a Japanese town. The street is very narrow and not at all clean. The house is a good-sized two story Japanese style house.

When we got to the front entrance, we were greeted by some of the girls and given checks for our shoes which we left in racks at the door. The house inside was immaculately clean which seems to be unusual compared to the outside street. You would hardly expect to find such a nice looking inside to the building. We walked through a hallway and entered the dining room. The room had a three sided table about one foot off the floor and about two feet wide. At the open end of the table there was a sort of stage of dais. I'll draw a small sketch of the set up.

We walked in and sat down on little pillows with our legs crossed together. Each place was set with a saki cup and beer glass upside down and a small bowl of potato sticks (something like potato chips only in the form of sticks). There was a long white tablecloth covering the entire table. After we had sat down, the ten girls made their entrance. As each came in they got down on their knees and bowed to the floor, then got up and walked in. Each had on a beautiful very colourful kimono and obi. The obi is wrapped up and carried on the back in the shape of a rectangle. It is tied on with a wide belt which is attached to the obi. The girls brought in the food and set it on small tables in the center of the room. At this point the food was uncooked and was very carefully and delicately arranged on platters. They brought in two small charcoal pots which they used to cook the food. Two of the girls sat there cooking all during the meal. Each girl

would wait on two men. She squatted on the floor on the opposite side of the table from you and served you.

The first thing that we did was to turn our glasses right side up. The girls filled them with Jap beer which has almost had no kick at all. Then you turn your saki cup over and the girl fills that. Saki is lot like whiskey. The custom is to drink your beer and hand the glass to the girl. Then you pour her a glass which she drinks. Frequently all during the meal the girls would shift around from one man to another. Along about the end of the meal they would pick out one or two and stay there the rest of the time. Now for the meal.

The first course was a clear soup which had chunks of I don't know what in it. It was in a covered bowl and is eaten by holding the bowl in one hand and drinking it. It was pretty good. Next they bring a peculiarly shaped flat plate with a large slice of fish on it. Everything except the soup is eaten with chopsticks. The next course was a plate with meat piled on it with a fried egg on top and chopped lettuce on the side. After we had finished that they brought in a plate of dried peaches. At the point the meal was interrupted by a dance given by one of the girls. Two of the girls played a stringed instrument something like a banjo which is plucked with a flat wand shaped piece of bone. The music has a very mournful sound and is always high pitched, as in the singing that goes with the dance. The dancing girl moves her arms and hands in very precise gestures. Every movement of her hands, arms, knees, and fan has some significance which of course was lost on me. Although I did not understand the dance, it was easy to see that the girl had spent a lot of time learning all the intricate movement.

After this dance they brought in the final course which consisted of veal breaded veal cutlets and peas cooked in some kind of a flour paste. At this point my legs got tired of being in the squatting position, so I stretched them out under the table. I was quite surprised when one of the girls started tickling my feet and I moved them hastily. Now that the meal was about over, four or five of the girls got up and did a dance in a circle. The men are supposed to join in the circle and follow their movements with the arms and hands. You should have seen my try. All the time they were playing their high-strung weird music. The whole dance reminded me of the Japanese version of the "Big Apple". It is quite a dance, believe me.

Off and on all during the meal and afterwards, groups of people would break out singing various songs. All the girls know "You are my sunshine." We taught one "Shoo, Shoo Baby". Also everyone sings "Mushi Mushi Ananay" which is one the Americans made up from Jap telephone conversations. It goes like so:

Mushi Mushi Ananay, Ananay, Ananay
Mushi Mushi Ananay
O so dess ka

In English it means:
Hello Hello attention, attention, attention,
Hello Hello attention
Oh it is not so
It is sung to the tune of "London Bridge is falling down"

Most of the girls speak very little English. They have gouges which have some common expressions in them. I had bought a dictionary the day before in Hiroshima which was a great help in talking to them. It is very distracting to have to look up each word in a sentence as you go along. There were three expressions used very often during the evening. They were "bottoms up", "Chug-a-lug", and "hubba hubba". Hubba hubba to the Japs means "step on it." Chug-a-lug and bottom's up mean the same to them as they do to us. You should see me chug-a-lugging beer with a geisha girl, especially since I don't like beer anyhow. It livens up the party anyhow. Quite a few of the people got feeling pretty good by the time dinner was over. The beer is weak, but saki is not exactly water. The rest of the time was spent shooting the breeze, singing songs and playing stupid games which Americans have taught the girls.

I don't know whether this will be interesting or dull to you. It is very hard to convey a true picture of the party to you in a letter. If you will try to visualize the picture remembering the fact we knew very little Jap and they knew very little English and that most everybody got feeling pretty good before the evening was over. At the time I didn't think of it as being a wild party, but I guess in American standards it was quite a party. I seem to remember one officer teaching some of the girls to stand on their heads. I don't suppose that Lady Astor would approve, but it seemed amusing at the time. I guess that the fact that the table was only one foot high made it easier for some to roll on the floor than to roll under the table as they would it America. Come to think of it, I do remember several people rolling around.

Well at least I have tried to describe a sukiyaki, or saki, or geisha party to you. You'll have to imagine the rest or wait until I can tell you about it in person.

May 10, 1946

To answer your question about the Japanese attitude toward the Americans, I can only give my own opinion which is derived from my own rather hasty and incomplete observations. It is very difficult to decide exactly what the Japanese people think. The merchants are over-anxious to please the Americans. Naturally they want to sell their goods and the Americans are the only ones who can afford the inflated prices. On the surface they appear to be very friendly, but that really means nothings, as all Orientals are, as you know, capable of putting a knife in you back at any time. During the last weeks, many thousands of repatriated Japanese troops from China and Korea and PWs from French Indochina have been pouring though Yokosuka. These are the men of the Army who were taught to fight us. They have just come home and are not used to the Allied occupation. These men give you looks of open hostility. I have passed many with sheer hatred in their eyes. Since so many have returned, more and more incidents of violence have been breaking out at night. Personally I don't consider it safe to wander around after dark. No organized incidents have occurred here yet, but a sailor is beaten up here and a Marine shot there. Sometimes it is the men's fault, but friction seems to be increasing as more of the Japs are repatriated. These men are different. The average Jap on the streets looks poverty stricken and broken beyond resistance. Their cloths are poor and few have leather shoes. But the troops are fully clothed in uniform with good shoes. Each has a complete pack neatly tied. Each is completely outfitted except for guns. They move in formation under their officers. They salute their officers and obey their commands just as if they were under regular troop movement. These are the men I fear. They are not broken. In my opinion they will spilt up and go to their homes

and join underground organizations. I think that the Japs as a whole are being very careful to try to prevent outbreaks so that political pressure from Stateside will force us to reduce our forces of occupation. They are playing a waiting game. I don't trust them at all. Maybe I am wrong, but that is my opinion.

June 3, 1946

Four days seems to have disappeared here. We are now back in Yokosuka, where we expect to remain until about June 15. Yesterday I went ashore in the afternoon and went to O'Funa to see the Japanese Hollywood. There were just a few studios there. There really isn't much to it at all. One good western cowboy picture set would make this place look sick. Some of the movies they put out aren't bad though.

Last night I went up to Captain Decker's for dinner. He says that he is expecting Mrs. Decker June 23. It will be nice to see her. I had a swell dinner as usual. The Decker's have always been swell to me. There is a French light cruiser in here now. One the way back to the ship we gave two officers from the Frenchman a ride out to their ship. One of them was French and one an English liaison officer attached to their ship. They asked us abroad for a drink and we went out of curiosity. I didn't think too much of it. It wasn't at all clean. There were cockroaches running all over the wardroom. The men looked very dirty. It was interesting anyhow.

I received your very nice letter and the roll of film in the mail when I got back here. I am enclosing $5.00 in this letter which I hope will cover the cost and mailing and trouble. If you can get me any more, I certainly would appreciate it. It is impossible to get here. I know that it is hard for you to get, but any trouble you go to will certainly be appreciated no end.

I do not expect to go to the a-bomb tests. I would like to, but there isn't a chance. I expect to stay in Japanese waters until we sail for the states. At present we expect to go stateside around the end of August. We may go to MANILA FOR July 4, I don't know for sure.

We left Yokosuka Friday for Kure. (This was over a week ago). Kure is on southern Honshu. In order to get there you have to go up the Inland Sea. About 0600 Sunday morning we sighted land and entered the Inland Sea. It had been stormy all day Saturday, but cleared into a perfectly beautiful warm sunny day Sunday. (It took about six hours to get from the entrance up to Kure. We had to twist and turn to follow the channel in. In some places there is only 700yards between islands. The whole inland sea is full of small islands. It looks something like the Puget Sound area expect that all of the islands have hills on them. The hills start right from the water edge. There is no level land on them at all. The Japanese grow something on every piece of land that is fertile enough to grow a weed. All the sides of these hills on all the islands large enough to support people are terraced wherever you look. There are whole fleets of fishing boats in the sea itself. You really have to keep a sharp lookout to keep from running them down. Many of them look like the many pictures you must have seen of Chinese junks with clumsy gaff-rigged sails. Most of them also have small putt-putt engines. It is very hard to describe all this; you really have to see it to tell what I mean. I never was much good at description anyhow. (I'm not very good at typing either, which you can readily see.)

Anyhow about noon we tied up to a buoy in Kure. Kure and the surrounding area are controlled by the British. We have a very small AMG establishment there with two or three American naval officers. All the army there is Australian and Indian and there are a few small ships there. I had the duty Sunday and could not go ashore. The good weather held until the morning we left with was Thursday. Monday three other officers and an enlisted man and myself were lucky enough to get an AMG jeep. We decided to drive to Hiroshima to see what the A-bomb really had done.

The road from Kure to Hiroshima is pretty good as Japanese roads go, which isn't saying much. Japanese roads are pretty grim to say the least. Anyhow, after many bumps and jolts we arrived. I have seen many ruins in Yokohama and Tokyo. Ruins all look alike. You see everything reduced to rubble. Everything is in little pieces. Bricks are in halves, concrete is broken down, wood is burned, tile is chipped into little hunks. That is the way it is in Tokyo and Yokohama. But there are two noticeable differences in Hiroshima. The first is that only one bomb was dropped there. There were none before and none after. There were many thousands of bombs dropped in Tokyo and Yokohama. The second difference is that in Hiroshima the place is not bombed out in sections, it is flat everywhere. It looks like all the ruins of Tokyo and Yokohama all concentrated in one spot. To be sure there are buildings still standing in Hiroshima. Many of the concrete buildings are still standing, but when you get close to them you can see that the insides are all burned out and that the ceilings are caved in. Some of them are still usable, but most are completely ruined. In Hiroshima you can stand where the bomb hit and look around and you see where a city was. It is amazing. You really can't believe it until you see it. For miles there is nothing but rubble. It is a sight to see nature in all its splendor through the blown out remains of what used to be a big business building. It is hard to describe the complete devastation. I am glad that I have seen it for myself.

After we had seen everything that we wanted to, we started for home. Just as we were on the outskirts of Hiroshima, we had a puncture. What do you know, we had no spare and no tools. We were really in a mess. The enlisted man and I set off for the nearest intersection hoping that we would be able to stop a jeep and get some help. There just aren't many jeeps in Hiroshima and we had a very dark outlook ahead of us. We ran across an Australian soldier who told us how to get to the nearest Australian camp. We stopped a Jap truck and got a ride most of the way. It was about four miles from our jeep. The long and short of it was that the jacked up a trailer and took a tire off it. Then they drove us back to our jeep, lent us the tools to change the tire and took our punctured one. They were really swell. It really was damned decent of them to swap their good tire for the punctured one. Anyhow after two and a half hours we were underway again. On the way back to Kure we picked up two Indian sailors. They were very interesting to talk to and spoke excellent English. They were both quite well educated. They are nothing like our Negroes at all. When we got back to Kure we went to the ANZAC Officers Club and then went back to the ship.

Tuesday I went to Hiroshima again by tugboat. The trip was very beautiful on the boat. The Scenery around Kure is really BEAUTIFUL. Somebody could really build a beautiful summer resort there. Kure itself is completely bombed out. It is a mess of wreckage.

Wednesday afternoon one of my classmates and one of Ben's classmates and I went to Eta Jima to see the Imperial Japanese Naval Academy. It is now an Anzac hospital. A Japanese professor who had taught English there for 17 years showed us all around. It was very interesting to compare it with ours. You could see that it had had its better days. At one time it must have been a fairly nice place. The place had already been ransacked for souvenirs, so we didn't get any. They didn't have anywhere near the facilities that Annapolis had put some of their stuff wasn't half bad. Of course, all of the gunnery gear that they had has been ruined or destroyed by now. After we came back from Eta Jima we went to the sukiyaki party that I have already described to you. That must bring me pretty up to date.

I really do find Japan very interesting. We are supposed to go north about the fifteenth. I hope that we will make some more ports. I like to see everything that I can. The thing that strikes you every town is the utter poverty of these people. Everything that they have had for years has gone into the war effort. There is little or no paint on any of the buildings. The people are always crying for more food and would gladly collect our garbage to find more to eat. They are very poorly clothed in the remnants of their wartime uniforms. Most of them seem very dirty. Most of their towns look worse than the slums of New York. They have very few sanitary appliances. Americans cannot eat their food or drink their water. They work like hell, but use primitive means. It continually amazes me that these people ever waged the war that they did and they nearly won. More than half of the men wear thick glasses and have very poor eyesight. Also many have bucket teeth as the Americans movies have shown them. Altogether I haven't much use for them at all.

June 8, 1946

We had annual military inspection this morning and have emergency drills this afternoon for inspection. Tomorrow we go out for a day for inspection under operating conditions. It is a good thing they are inspecting this weekend as we lose 200 more men as soon as get back. With what we will have left, we couldn't hold a gun drill. A bright spot in the future is that we are expecting 400 replacements during June & July. They have to tie Bert's ship up in Bremerton in order to send us engineers.

They have just passed the word that the drills are canceled and that liberty will commence. I want to take some pictures today, as it is very clear.

June 10, 1946

We are still having Annual Military Inspection. We were supposed to go out today for underway drills, but the Captain had to go to Tokyo at the last minute to confer with ComNavJap, Emergency Drills in port today. We had abandon ship, collision, fire and rescue, and fire drills this morning and afternoon. When we go out we will simulate a Battle Problem including material and personnel casualties.

I really don't know what to say. We have no idea at all when we will be back to the States. It may be anytime from now until Spring of next year. I suspect that it will be between September and December. I have been to all the towns around here and have seen almost everything that there is to see in them, which isn't too much. We are planning to go to Hokkaido when the new admiral arrives. Maybe that will be an interesting trio, if we get any liberty. I

certainly would like to get some time off and a jeep and take a trip inland, but I am afraid that I can't.

Maybe I can think of something of interest. All the towns near occupation troops are full of souvenir shops. Prior to the invasion most of these shops were groceries, barbershops, bakers shops or what have you. Now everything is turned into souvenir shops. They typical shop has sliding doors in front which are kept wide open during business hours. The goods are usually set out on waist high tables. Each shop is usually only about 30 feet wide. There are whole rows of them in many towns. Most of them sell the same things. Silk scarves, handkerchiefs, and tablecloths are the most common. These usually have Fujiyama, or Japanese figures, or dragons embroidered on them. Their prices are terrifically high and I have yet to buy any silk in a souvenir store. The inflation has really hit this country. We only get 15 yen to a dollar. The dollar is actually worth between 50 and 100 yen. Therefore we cannot afford to buy much at the 15 to one rate. It is illegal to take American money ashore. Most of the shopkeepers speak very little English. However they speak enough to get along. They speak much better English than I do Japanese.

By the way, how much is 14 gauge silk worth by the square yard in the states? I would be very interested to know. I have bought a little from which I want to get some things made when I get back. I wish that I could get to Shanghai, as the prices aren't quite as bad there.

I forgot to mention that there is a lot of ivory for sale in the shops. However the price here again is prohibitive. Things now cost much more than they did a few years ago. I guess that after a few years prices will come down again, but they certainly are out of the question now.

June 13, 1946

We are clear up around the Northern end of Japan. We got in this morning at 0745. We are picking up General Eichelberger, Admiral Griffin and twelve other high-ranking officers tonight. We will get underway about mid-night and go back to Yokosuka. They gave a few hours of liberty today, but I couldn't get ashore. I have been preparing a court martial case for the last 2 days. We tried it all this morning and afternoon and will continue tomorrow. I have to stop writing so that I can prepare my closing argument for tomorrow and list a few more questions for witnesses. I wish that I could have gotten ashore here. It would have been interesting. All of my time has taken up with this court martial.

June 21, 1946

Last week I was on S.P. duty one night and my post was the Taura Club. It is a Japanese dance hall. Only the Allied Forces patronize it, of course. Both officers and men use it. The entrance fee is 5 yen (33 cents at the legal rate of exchange) and 10 yet for two beers. The beers are in a quart bottle and are Jap brew. If you like beer (which I don't), Jap beer is very good. They get 20 yen for 10 dance tickets. They try to talk everybody into buying dance tickets every time they get beer, but the SP's and MP's keep them from robbing the customers.

The dance hall has a large floor surrounded by tables and benches. The furniture is poor, but that is accepted in Japan. The girls are all Japanese. They all wear western style evening dresses. Some of them aren't bad looking. There was one I remember in particular. She was

several inches taller than the rest, had a nice figure and a western hairdo. She was really not bad at all. The sailor she was with was oa good dancer and she was superb. She was a much better dancer than 9 out of 10 American girls. Most of the men have a good time there, and there is very seldom any trouble. All in all, it is a fairly nice place. These are three such dance halls in Yokosuka. They have a Jap orchestra that plays American pieces. They are a bit corny, also quite amusing. Well, that takes care of that.

I haven't seen Cap. Decker for quite a while. Mrs. Decker is supposed to get here the day after tomorrow. The first load of wives got in today.

The latest dope is that the mighty Chi will be here until January. Of course, that is always subject to change.

I think that a lot of people here are beginning to feel that shore duty in Japan would be pretty good if you are married and your wife is here. From what we hear, life in the States is just too damn expensive. Maybe in a couple of years, if I am married and my wife wants to go, I'll put in for a little Asiatic duty. I think it would be pretty good for a while.

I am quite used to the Japanese by now. They are short, bowlegged and ugly for the most part. Most have poor eyesight and buck teeth. You can have them all.

On the whole, I think that the women are better looking than the men. The Japanese idea of a good-looking woman is far different from ours. They do everything in their power to eliminate curves. Their kimonos come down to their ankles. The obis I have already told you about are for the purpose of hiding the curve of the small of the back. They try to look as square as possible. Some of the women dress western style, but most use kimonos, etc.

I have seen a few Japanese women that are really attractive. You get used to seeing Japs and you see very few good-looking American girls. Most of the white women I have seen here, I wouldn't give a plugged nickel for. I guess that if you could compare these people to a good old American gal, you wouldn't look at them twice. However, in my own case, I do not even own a picture of an American girl (one in particular so I have only distant memories to compare them with)

The immorality here, I must admit, rather disgusts me. For some reason, most of men here throw morals to the winds. There is absolutely no restraint of society to hold them back and they do as they please. I can't see it myself, but then who am I to judge others?

The black market and inflation thrive in Japan. The CID and CIC (Criminal Investigation Dept. and Crim. Inv. Corps) are doing a grand job on the black market, but it still goes on. You can get fabulous process for cigarettes soap, candy or most anything. I can never sold any myself. I don't believe in it. I guess that I am just old fashioned, but I believe in being honest no matter whether I'm in Japan or America. I had a big discussion about morals, etc. here with a French officer. When he was in French Indochina he lived with an Indonesian girl. Here he lives with a Japanese girl. He was quite a philosopher. He said among other things that he believed in

living the way the people do around you. He had the "when in Rome, do as the Romans do" idea. I told him I couldn't see it, but he is happy. Maybe he is right, who knows?

June 24, 1946

Saturday I went on liberty for the first time in two weeks. We got a late start so that it was 1600 by the time we were on our way. Jameson, a classmate, and I managed to talk the base out of a jeep for a few hours. We went on a picture taking expedition. Unfortunately it was so late in the afternoon and so cloudy that I am afraid that they won't at all come out. I took a whole roll, so I hope that they do. We drove south of Yokosuka right along the coastline. We drove through several fishing villages which are quite interesting to me. I like to compare them with the fishing villages in New England. Actually there is no comparison. A New England fishing village is trim and neat and always has a small white church with a high steeple. Along the waterfront you see all the boats and fishing nets, but the boats are usually pretty clean and trim. The streets in New England villages are almost always lined with well cultivated trees. There is a fresh picturesque look about them that has always attracted me. (Them referring to the villages.) But the Jap fishing villages like everything else in Japan are filled with filth and squalor. The streets are all dirt and very narrow. None of the houses are painted. They are all very close together. The boats are of an eastern design which is nothing like ours. Usually they look as if they would fall apart, but actually they are quite sturdy. It is common to see the Jap fishermen working patiently on their nets. The waterfront itself is quite similar to an American one, except for the design of the boats and the fact that they are much dirtier than ours. This time of the year it is very hot and you get very dirty in any one of these towns. I cannot describe it at all well. Maybe the movies will show what I mean.

In between the towns, the entire countryside is cultivated. The Japs grow something on every inch of the land. Saturday I went out in the rice fields and took half a roll of pictures that I have been wanting to get for some time. I tried to get a shot of each process. First of all they dig a field of soggy much with huge hoes. Then they grow rice in thick clumps. After it has grown, they pull it out of the water in large bunches and distribute it in one of the inundated patties. A group of the Japs put on waist high boots and go out to plant these bunches for the final growth. They stretch a line between two stakes and shove the stakes in the ground. Then each picks up a bunch of the rice that has been previously tossed out into the field and splits the bunch up into individual plants. These they plant along the line between the stakes. Then they move the stakes and plant the next line. When they get through they have neat orderly rows. They have ridges of dry land between fields so that you can get around. In the rice patties themselves, they sink up to their knees in the mud and water. I am afraid that I haven't described it very well. Maybe a simple diagram would help.

Field of stiff mud which is dug with a large hoe. One section of field is inundated and rice is grown in a think patch. Rice is bundled up in bunches after it is pulled out of patch. The whole field is flooded. The bundles are tossed out into the field in the general direction desired. The bunches are broken up and planted in neat orderly rows.

In the fields where I took my pictures, all of these processes were going on at once. At least half and maybe two thirds of the workers are women and often very old and wrinkled up women. Women even do half of the hoeing which is really heavy work. Well, so much for the

rice planting. I might mention that the much in the field smells to high heaven, as does most everything in Japan.

Japanese fields are always neatly terraced and quite trim. Their rice fields in all the valleys are really very picturesque. The countryside itself is really quite beautiful. There is nothing but hills around here and everything is very green at this time of year.

I could do much better job of describing all this if I could talk to you personally. When I read these letters over I get the feeling that I have said nothing but a lot of words.

It is hard to describe, because one of the things that continually impresses me is that there is nothing to compare it to in America. It is all so absolutely different.

When you go into any American town you can go to a drug store and buy the necessities of life. You can buy ice cream and candy, soap and razors, and most anything else. You can go to a hardware store and buy nails, paint, or tools. You can go to a hotel and get a room. You can go down nicely paved, clean roads in an automobile without anyone noticing you. You can get a bus or a trolley. You can do anyone of a multitude of things that we in America take for granted and assume that you can do anywhere. But in Japan you can do none of these things. These is no such thing as a drug store. Paint and even the crudest of building materials are almost impossible to find. The only water that we are allowed to drink is water provided at military bases. The only Jap vehicles on the road are buses and worn out trucks with a few American made cars owned by Japs. The buses are all wood burning and are absolute wrecks. They are always jammed to overflowing with passengers. They bounce and rattle and jerk over the bumpy dirt roads. The trolley cars in the cities are much shorter and narrower than those in America and are almost all in terrible condition. These too are always very crowded with people riding all over them inside and out. When you drive through a town in a jeep all of the little kids wave and yell anyone of four things: “Hello,” ”Good-bye,” ”Chocolate,” or “Gum”. Whenever you stop at least ten kids will crowd around your jeep. In America during hot weather, the kids wear pants and no shirts. In Japan, they were shorts and no pants, or they wear nothing at all. As far as that goes, there is little distinction between sexes in Japan. They never have bathtubs in the home. They all use community baths. In Tokyo they have about one to every block or so. These are usually huge tiled tubs with scalding water in them. Both men and women use the same one with impunity.

All of the public toilets are for the use for both men and women. For the most part they use the street or an alley. All in all it is most unsanitary and in the hot weather adds to the general aroma. The people do not look anything like Americans and their way of life is nothing like ours. As I have previously mentioned, the women do much of the heavy work. You can see women as old as 50 or 60 doing hard work in the fields. You can see them carrying heavy loads on their backs on the streets. On the whole, their way of life is at best primitive. They use ox carts where we use Ford pickup trucks. They use public wells where we have modern plumbing. They use rough poles lashed together with vines for the framework to many of their buildings where we use machined wood for our doghouses. They fight to get enough to eat to survive on, while we complain because the black market eliminates the luxuries of our life. They walk miles where we ride. They use picks and crude steamrollers and caterpillars to lay good concrete. They rig sloppy lines for electric power which often look as though some moron just tacked up each line to a

telegraph pole separately making a maze of lines while we have ours neatly laid in underground tubing.

I could go on indefinitely. The people are stripped and poverty stricken after eight years of war. At best the life of the Japanese country man is primitive. They are at least fifty years behind us as far as the surface comforts are concerned. When you see them you wonder how they manufactured the war machine that they did and how they had the audacity to try to conquer us. And then you remember that these same people did create that machine and that they came close to winning the war against us. It is then that you realise that what they have that we don't is the patience to work and work and work. They work like hell. They just keep on working. Everything that they had, and I mean everything, went into the war effort. In my opinion, if they were capable of doing it before, they are capable of doing it again and it behooves us watch them carefully. On the surface they are very docile and look thoroughly beaten, but I don't trust them. These are the same people that murdered 6,000,000 Filipions in cold blood. We, enough of my prattle about the Japs.

July 3, 1946

We left Yokosuka Monday and got to Kobe yesterday (Tuesday). We are leaving for Kure the 5th or 7th. From there we will go to Sasebo and then back to Yokosuka about July 14. I won't get any mail until then.

Let me tell you about Sunday. Stewart (Ben's classmate) Adams (My classmate) and I threw together four sandwiches four canteens, my camera and ran for the 0830 boat. When we got to the beach, I worked on the Transportation Officer for about ¾ hour for a jeep. Finally at about 0930 off we went. We decided to drive up to the Fujiya Hotel. Ben has doubtless told you about it. The road as far as Fujisuma (about 15 miles) is rather bumpy, but not too bad. But surprise of all surprise, the road from Fujisuma to Fujiya (about 35 miles) is concrete paved and very good for Japan with the exception of small sections. The drive is right along the coast for half of it and then goes inland. The scenery is really quite beautiful. The ocean of course is the same as in America. The countryside is studded with rice paddies everywhere. They are always divided into small lots and terraced off. The Hotel is in the town of Miyanoshita. You have to drive quite a way up into the hills around many hairpin turns to get there. The road is good and the views excellent. We got to the hotel about noon. Captain and Mrs. Decker were there for the weekend. I hadn't seen Mrs. Decker since she had arrived, so I dropped in for a minute. Capt. Decker gave us a map and suggested a scenic route to us. A few minutes later we were on our way. The Hotel is beautiful. Ben has probably told you all about it, so I won't repeat it.

We drove on up into the hills on a fairly good road which winds back and forth along the side of the hills. After you get higher you can look down into a huge golf course in the valley and the rest is rice fields. After you have ridden about 15 miles you go through a tunnel. When you come out the other side, there is Fujiyama in all her breathtaking splendor. We had a beautiful day for our trip. When we came out of the tunnel was clear and brilliant blue sky over Fuji and a ring of white clouds around her middle. It was a breathtaking sigh. I took a lot of pictures of Fuji. I hope some come out. Up until now the road had been fairly good but oh brother what was coming. We drove on down the other side of the hill. In all my life I have never seen such a road!! Even in Japan it is incomparable. It was nothing but huge rocks with all the dirt washed

away. I wouldn't even call it a road. We drove for miles and miles over this and similar roads. We made a huge circle like so: Fuji, valley, hills, valley, Fujiya Hotel, Lake Hakone, hills, flat area, hills.

When we had gone back through the valley and started climbing again we stopped for a moment to look at the view. Lo and Behold we had a flat! Here we were in the middle of nowhere and we had a flat! We had a spare but no tools. Then we discovered that the spare had no air in it. Oh! Woe is me, we were up against it! By sheer chance a weapon's carrier came up behind us with a jeep. We asked them if they had a pump which they didn't. Then I noticed that the weapon's carrier had a flat. We helped them change their tire and they lent us their jeep spare. It takes a really rough road to give a weapon's carrier a flat. One of their tires is so heavy it takes two men to lift it. They had a hole in theirs big enough to put two fingers through. You can imagine what the road was like. Well we finally got back to the Hotel about 1800. But, woe is me, we didn't have enough gas to get back to Yokosuka. There isn't any gas up there. We saw Capt. D. and he said we could take some from his car, but before we could, a soldier gave us some from an extra can he was carrying. So we set off for Yokosuka. On the way back it poured with rain, but we had a superlative jeep with automatic windshield wipers. When we finally got back to the ship I was absolutely filthy, starving (I only had one sandwich and 2 oranges to eat all day long) and worn out (I had gotten up at 0315 to go on watch), but it had been a wonderful trip. I'm afraid that I haven't described it at all well, but the trip was really beautiful. Of course, there is plenty of scenery in America as good or better, but it is nice to see something clean and pretty in Japan. All in all, it was a grand trip. Wee, enough of that. I'll tell you about Kyoto next time.

July 6, 1946

We arrived in Sasebo early this afternoon. Sasebo is a naval base on Northern Kyushu. I haven't been ashore yet, so I don't know anything about it. I hear it isn't much. I have the watch tomorrow. I guess I'll go over Monday.

Well, I told you in my last letter that I would tell you about Kyoto. Kyoto was the third capital of Japan and is a large religious centre. For that reason it was never bombed. It is, therefore, a pretty good example of what a pre-war Japanese city looked like.

Fifty men, three other officers, and myself started out at 0630. We loaded k-rations and 10 gallons of water into the boat and shoved off. When we got to the dock in Kobe, we had about a mile to walk to the station. It is a two-hour train ride to Kyoto. Kobe is a mass of rubble, as is most everything in the country. When we got there, we had about ½ mile to walk to the Red Cross. On the way, we passed a big 4th of July Parade in Kyoto. The RC gave us 2 trucks for 2 hours. The first place we went to was the Han Shrine which is a huge shrine. It is quite beautiful. It is all red and white. There are some beautiful gardens and lily ponds around the grounds. It was a very cloudy day, and I am afraid that the pictures I took won't come out. Then we went to the Emperor's Palace. Hirohito can have his palace, I like my home better. The streets in Kyoto are all narrow and crowded. The main ones are wide and paved, but most of them are dirty and narrow. The only difference between Kyoto's and the others is that they haven't been bombed into rubble.

I am so sleepy that I am afraid I am not doing very well with this letter. No kidding, I am dead.

We did something in particular of interest in Kyoto. We ran across a Jap-amusement section. They had Jap pinball machines, shooting galleries (cork pop-guns & archery) and fortune tellers. We were the only Americans around. It is all very interesting. It is hard to describe and was too cloudy to take pictures. It was interesting though, as this is the first that I have seen of this sort of thing in Japan.

July 12, 1946

I think that you would make a mistake to visit Japan and "make a point to avoid the sordid side of Japanese life." If you are to really appreciate a place you should look at all sides of it. Even in America I look at both sides of district, etc. but I also like to wander through all the junk shops and wander around the "other side of the tracks." That is the only way that you can get a true picture of a city as a whole. In Japan there are many things that are party of their life that we would call sordid. We have a different standard. But I think that these things that are part of their way of life add to the fascination of the East. They make it more interesting and add color and richness to the picture as a whole. It may be squalid and undesirable to us, but it is their life and only a false impression can be gained by avoiding it. Well, enough of that.

I hope that I shall be fortunate enough to have my application for M.I.T. accepted. They are pretty particular about whom they choose. I do hope that I'll get it as I want the education.

Of course, if the *Chicago* does go back I'll be all set, but I don't think that the ship will go back for many months. Contrary to all the scuttlebutt, I think that the *Chi* will be here until next year.

My life story is a little more complicated than yours seem to be, but if you will bear with me I'll acquaint you with a few of the facts.

I WAS BORN IN Los Angeles on 21 January, 1925. My father was at that time a Lt. Comdr. on duty in Long Beach on a ship. I was born in my grandmother's home. At that time my family consisted of my father, my mother, my aunt (Auntie Blue if whom you will hear more), my brothers and sisters in order: Elizabeth, Marian, Frank, Jim and myself. A few weeks later I was moved to Long Beach. My mother had to undergo two more operations, so my aunt took care of me. Auntie Blue's real name is Maude Ellen Trent. She comes from New Zealand. When she was in her twenties she decided to take a trip to the U.S. On the way over on the boat she met my grandmother who was just finishing an around the world tour with my grandfather. After Auntie Blue had traveled all over the U.S. she paid a visit to my grandfather. She liked it there and my grandmother asked to stay with them. When my mother was expecting her first child Auntie Blue offered to live with my father and mother until mother was well enough to get about. Auntie Blue was always going to go back to New Zealand, but every time she was about to go, my mother had another child and she stayed to help out. When I came along she decided to stay for good. My middle name is her family name. She is a twin and when they were little babies they tied a pink ribbon on one and blue ribbon on the other. They have been known as Pink and Blue ever since. Auntie Blue is really wonderful. I know that you would love her. Ben

may have mentioned her to you. She knows her very well. It has always been like having two mothers. She is one of the most wonderful people that I have ever known and I love her dearly.

Well here I am at Long Beach. I think that San Diego was next and then Coronado. Then we moved up to the Mare Island Navy Yard. Dad made commandeer about this time. I was still only about 4 and don't remember much about it. Then we moved back to San Diego where we lived on Sixth Street. Of course, the whole town has changed around since. You were living there then. Maybe we knew each other. Who knows, we may have known each other for years? (I wish that we had.) I remember that we had a big vacant lot next door and built a miniature golf course on it. It was a wonderful place. I enjoyed living there very much. Then we drove to Annapolis in our 1926 Buick. That was a real buggy. It huffed and it puffed, but we got there in fine style. It was a grand trip. We went to Bryce and Zion, Yosemite, and Niagara Falls. I was just old enough to remember all of them. I went to the first and second grades in Annapolis. They put me on probation to the third grade, as I was too slow at reading. I had to read an hour every day during the summer and I hated it. I wanted to be out playing with all the kids. When I was in the second grade I had eight girlfriends, a popularity that I haven't enjoyed since. I used to love to watch all the parades as most kids do. We used to climb up in the trees, but they never used to catch us. Next we moved to Newport, R.I. where my father went to the War College. We lived there the winter of '33. Boy was it cold. It went down to 17 below 0. We had 36 inches of ice on reservoir. Of course it was a lot of fun for me as we could sled and skate. I went to grammar school in Newport.

The next summer we moved to Jamestown, my present home. It is just a small place, but it is wonderful. I remember going out on a destroyer to watch the International Yacht Races during that summer. I wanted the British boat *Endeavor* to win but *Vanderbilt* won. I remember now that the destroyer was Captain Decker's. He was a Lt. or a Lt. Commander then. In the fall of '34 we drove to San Diego in our '31 Nash. We had sold the old Buick which I hated to see go. It was a real buggy. The Nash was a good car, but it was always breaking axles. This time we loved on West Palm Street just across the First Street Bridge. The number was 215. We lived there until'36. I went to Florence Grammar School up to the fifth grade there. I think that I even started the sixth. They had the exposition there, of course, in '35 and '36. We left before it opened the second year. I loved living there then. They were some of the most enjoyable years of my life. It is funny but one of old "cops and robbers" playmates of those years is in the class behind me and I found out last week that he is ordered to this ship. Of course, we used to haunt the exposition. Now that I think of it I am sure that I must have seen you in the house of Fun or maybe in the travel exhibit. I remember how I used to marvel at all of the scientific exhibits. In '36 we drove to Washington, D.C. where we lived until '39. My father was a captain now, having been promoted while we were in S.D. Among other places we visited the Carlsbad Caverns in New Mexico. They are a must. I forgot to mention the Grand Canyon on the other trip. Well, at this point I started junior high school in the seventh grade. I know there was something that I had forgotten.

Before we went to Washington, we went to my father's hometown, Tunkhannock, Pennsylvania for a few months while my mother and father looked for sister Elizabeth who graduated from Wellesley this year. My next oldest sister, Marian, was in her sophomore year at Wellesley. Frank had graduated from high school in Newport and had worked for a year in San

Diego. At this point he was going to prep school for Annapolis. Jim was going to high school in Washington. Both Jim and Frank and for that matter Marian and Elizabeth went to the "Old Gray Castle" in San Diego at one time or another. I loved living in Washington and moved back to Long Beach. Marian had graduated from college by this time and was engaged to be married. Elizabeth was working for the Public Health Department in Washington. Jim had graduated from high school and was going to Georgetown Foreign Service School in Washington. Frank was in the Academy. Jim, Auntie Blue and I drove as far as Omaha where we picked up Marian who was visiting with friends, her fiancé's brother and wife (a school friend of both of my sisters.) The four of us drove to Mare Island where my mother and father were. As it turned out my father was ordered to command the same ship my sister's fiancé was attached to, so it made it easy to have everybody there for the wedding. Marian was married in Mare Island in June '39 to Walter Jones Whipple, then a Lt. and now a Captain. Then we were off for Long Beach. I went to high school there. I really enjoyed life in those days. In the summer of '40 we moved to Bremerton, Washington where my father's ship was being overhauled. That was one grand summer. Mother, Day, Auntie Blue, Elizabeth, Jim and myself were there. Auntie Blue wasn't there for the first part as she was staying with Marian in Washington while she was having her first baby.

This is getting very involved I am sure, but I'll try to muddle through. Anyhow in September '40 we went back to Long Beach but lived in a different house. I forgot to mention that we went to the World's Fair in San Francisco going up to Bremerton and the year before going down to Long Beach from Mare Island. I took the cruise from Bremerton to Long Beach with Jim on my Dad's Ship which was a lot of fun. It is a 1500 mile trip. In November we left Long Beach for Annapolis. Dad's ship had left for South America so we went to live in Annapolis for the few month before my brother graduated. Frank graduated in February '41, so we moved to Washington where we got another house in the same neighborhood that we had lived before. I went to high school for the few month in Annapolis and then transferred to school in Washington. Jim had gone to U.C.L.A. the year we had been in Long Beach which had been his sophomore year. He had gone to Washington in time to take his junior year at Georgetown. He was taking a five year course, but finished it in 4 and a half. I took my entrance exams to Annapolis while I was in my senior year in high school in Washington. Just before I graduated in '42 my Dad got orders to New Orleans. When I found that I had won an appointment, I left school and drove my mother to New Orleans to be with Dad. While I was there I got my orders to the academy. I returned to Washington in time to graduate from high school on 16 June and entered the academy on 24 June 1942. At this time my sister and brother-in-law were still living in Washington. Elizabeth was working for the Office of Civilian Defense. Frank was at sea. Jim was working on a confidential job for the Army Air Forces. I went to New Orleans for leave Christmas of my Plebe year. My youngster year we moved to Jamestown. Elizabeth joined the WAVES in August '42. She was the first ensign in the outfit. We moved to Jamestown because my father was ill and was on sick leave. He was a Rear Admiral of the upper half at this time. I went to Jamestown on leave my youngster summer.

That fall in November my father died. It was a serious turning point in my life. I had been able to obtain emergency leave in time to see him in the hospital and was there when he passed away. From that time on I have been completely independent. I have insisted that it be that way. My father was a great man. I know that I am prejudiced, but his reputation was one of being one of the finest and best officers in the Navy. He was well educated having a BS from the Academy

and an MS from Cornell, and an MS from Columbia. I loved him and respected him greatly. It was a great shock to me when he died and one that took me a long time to get over. A few months before he died he bought a home in Jamestown. My mother has done wonders in fixing it the way he would have wanted it and it is truly a wonderful home. I wish that you could see it. We call it "Windward." I'll tell you about it sometime if you are interested.

I had fallen in love with a girl from Philadelphia who had a summer home in Jamestown when I was home my youngster summer. I had been interested in girls before and liked a few in particular at one time or another, but none had ever affected me the way she did. I was terrifically happy for a while even though I couldn't see her very often. Unfortunately she didn't see things the way I did and we broke up in January '43. This was two month after my father's death and the combination just about finished me. I dragged very little the rest of the year. The only thing that I could do to get my mind off things was to work. I did have some old friends in Annapolis which helped a great deal. My first class year I dragged very little. I didn't feel too favorably towards women at that time. I did drag a few times with some of my old friends that I had known for years. I rated three weekends first class year and spent them all in Washington visiting a girl I had known in high school. We used to have a swell time together. For some reason I never fell in love with her, but we did have a lot of fun doing things together. After graduation I went home for a month and then to Jacksonville for a month. Then I went to Frisco to wait for the Indianapolis. When that was sunk they sent me to Bremerton to the Pittsburgh for five months. Then I went home on leave, then to Frisco, then to S.D. where I met you and now here I am. Frank is now a Lt. Comdr., married and has a son. He was married to a girl from Dallas, Texas in January '43. Jim was in Calcutta, India for two years during the war. He is a Lt. in the Navy supply Corps. He came back last November and is now on duty in Newport. He married a girl from Boston last week. Marian had little girl this last May. Walter (my brother-in-law) is now engaged in the atomic bomb test. He was gunnery officer on the Denver and then gunnery officer for the Third Fleet on Halsey's staff during the war. He was on duty in Washington for a few months at the end of the war but was then sent to Japan on the Naval Technical Mission. From there he got command of the ex-Jap battleship *Nagato*. I hope that he will get home sometime this year. Elizabeth got out of the Navy in May as a Lt. She is now opening up a business in Jamestown. She bought some property and has built apartments on it. I really don't know too much about her business as it is very new and doesn't open until 14 July. However, her official stationary has this on the bottom: Educational toy-gifts and garden shop-hand crafts-specialty fruits-apartments. Everything from soup to nuts apparently. Knowing her I know that she will make a go of it. She says that she has 60 quarts of strawberries picked a day. It really sounds like quite a business from what I have heard about it.

Well there you have a story of my life. I am afraid that you won't find it very interesting. It seems to be all tangled up. I have a hard time putting a lot of the facts in chronological order.

On the whole I like simple things. I like to take long walks alone or with someone in particular. Especially I like to walk on a brisk fall day in autumn in New England or on a cool spring day. I like to be alone with my thought s or with somebody with whom I can share my thoughts. I love to dance, but I am not crazy about nightclubs. I don't like to drink, but I have nothing against it in moderation. I don't like to smoke, but I don't care who does, although, I would rather go out with a girl who doesn't smoke. I love to swim. I think that that is my favorite

sport. I love to walk along the beach on a moonlit night and watch and listen to the ocean. I like to work as long as the work is interesting. I like to read, but I seldom find the time. I love to travel and see new things. I get a big bang out of going through old junk shops. Also I like to eat. This latter is one of my worst vices. Unfortunately it does my figure no good. Auntie Blue is one of the best cooks in the world and delights in feeding me everything that I like.

I enjoy life very much as a rule. I had very happy childhood. During the last few years I have become too serious. I have had plenty of work with too little play. Of course, that is my own fault, but I don't have fun going out with anybody. I should like to have a girlfriend that I can talk to and do things with. Mostly I would like to be in love with a girl that is in love with me. I have been more or less afraid to fall in love in the last few years. I really got a pretty bad burn before. It took me a long time to get over it. Up until I met you I hadn't seen a girl who really interested me. I have friends of course and I enjoy going out with them, but the first time I saw you something happened. I am really quite crazy about you, you know. Perhaps you think that is quite silly. After all I have never even had a date with you, I have only seen you a few times in my life. But nevertheless, facts are facts and that is the way it is. I don't suppose that you will ever become interested enough to make anything of it, but you do mean a great deal to me anyhow. Perhaps it is all accentuated by the fact that it has been so long since I have had a girlfriend and for that matter several months since I have had a date with a woman (or any woman for that matter). However, I don't give much credit to that theory either, as I didn't go out much the last year or so in the States and I met plenty of pretty girls then they didn't mean anything to me. I don't know. It is all very confusing and I getting terribly involved. I hope that you won't find this letter too muddled and too boring. I really didn't mean to burden you with all my troubles and my life history. I guess that I am a bit lonely.

July 29, 1946

Today and tomorrow I am snowed under in a Summary Court Martial. One of my men is accused with assaulting a Jap girl and I am defending him. Unfortunately I can't get much information and he hasn't a chance. I feel pretty badly about it and will be glad when it is over.

In case you are interested I am enclosing a ticket to the War Crimes Trials. I had hoped to go tomorrow but I have to be in court here. I hope I'll get another chance to go soon. I am very interested in the trials.

I don't get on liberty much anymore, as I am so busy. We have a new Gun Boss (Head of Gunnery Dept.) whom I don't get along too well with. Maybe things will smooth out. I've heard nothing more about MIT and probably won't until Sept.

Scuttlebutt says we go Stateside the end of August. However, I wouldn't bet on it. We'll see one of these days.

Yesterday, Bill Adams and I drove to Tokyo. There isn't much to tell you about it that I haven't already. It was an interesting trip though, and nice to get ashore for a while.

I called on Mrs. Decker Friday. She seems to be quite well expected for a cold (which I also have at this point). I think that she likes Japan. Who wouldn't with 12 servants. The servant problem is non-existent in this country (Except to talk Jap. To them).

I can't get this court martial off my mind, which makes it very hard to write.

Perhaps it is out of taste to speak of such matters, but you have asked me to explain "how things are in Japan" and I see no point in neglecting that side of it just because it is unpleasant. If I offend you, please forgive me.

July 31, 1946

Please remember that existence on a ship is against all the laws of nature. We are a group of men (about 900) living our daily lives completely without the presence of women. Their pictures, their letters, magazines and movies are the only means of their influencing our daily life. At best this is an abnormal state. When men go on liberty ashore, they do see women, but they are of a different race and do not speak out tongue. They are in no position to offer companionship or personality or any of the other attributes of a female companion. Their only distinction is that they are of the opposite sex. It is important to remember this lack of female influence in the lives of Occupation Forces whenever you think of them. I think that the average American at home fails to understand the situation. If you take time to watch the men, the effect it has upon them is extremely noticeable. I would say that one of the most apparent results is in the tenor of the language. The longer you stay out here, the cruder it gets. Of course, the language of men in the states is nothing to use in Sunday School, but here it reaches a disgusting level of vulgarity. It is seldom that an enlisted man or many an officer carriers on a normal conversation without the introduction of many obscene and vulgar terms. It becomes a habit and they soon lost their meaning to the man. They become everyday words, but a similar discussion in the States would shock by-standers.

When Occupation Forces first arrive they usually think that Japanese women are most unattractive and don't want anything to do with them. After they have been here a while they get used to them. They begin to find some of them sexually attractive. Before long they judge one from the other purely by sex alone. A women comes to a mean a body, nothing more or less. It may sound crude, but it is true. There is nothing else in these women to seek and the Americans seek that. They are starved for the opposite sex and they satiate their desires by seeking out Japanese women purely for sex. In a sense, the whole thing is reduced to an animal level. It is a man seeking a woman, not for her personality or companionship, but merely to satiate his physical sexual desires. Now you may think that Americans are not that way, but I am afraid that you are under false illusions. My roommate and I were figuring out the other night how many officers off this ship that we ourselves knew have had sexual intercourse with Japanese women. We decided that we knew that 21 out of 46 abroad had and that there were only 8 including ourselves that we were sure hadn't Out of those 21, at least half are married. We estimated that between 50 and 75% of the crew had. I do not believe that our estimates were too high. As far as that goes, I would guess that 75% of the male population of America of a marriageable age has had pre-marital sexual intercourse.

Well, I am sorry to have gotten off on such a subject. I know that it isn't very nice. I mention it because it is a definite part of "what is going one in Japan" and the problem of controlling VD among the men is ever present.

I don't think that I need to say that I myself am an idealist and am perfectly content to wait for the woman I shall marry and love for the rest of my life.

I bring this all up because it is a problem you have with men anywhere and one which reaches an acute state here and I suppose also in Germany.

Well, now for other matters. Scuttlebutt goes on as usual. Latest estimate say that we will go to Hakodate, Hokkaido on August 5 and return August 20. Then hopefully, Scuttlebutt says we will get relieved and go Stateside. But, of course, it may all go wrong. I believe it because I want to, but the Chi may stay here until next year very easily. Of course, if I go to MIT, I'll leave the ship in September anyway. Twenty month in Boston wouldn't break my heart.

August 4, 1946

I went on liberty again yesterday. This time I went with a classmate who is in the Marine Detachment on the beach. His wife is coming out soon and he and I drove to Kamakura to see the house he is assigned. It is really a beautiful place. There is a sun porch upstairs with the most beautiful view of Fuji with the ocean between it and the house. It is on top of a hill above a deep ravine that at this time of the year is full of green trees. The road leading up to it is line on both sides with cherry trees for about 2 miles. The house belongs to Mr. Matsumoto, Japan's 2nd foremost commercial lawyer. The living room is western style. All the rest is Japanese style. There is a living room, a dining room, a kitchen and a bathroom on the first floor. On the second there are two bedrooms, a bathroom (with a shower) and two balconies (one on each side of the house). There are also servants' quarters on the first floor. The grounds about the house will be lovely when they are fixed up. Joe's biggest problem is getting furniture. Also he will have to pull up the Japanese matting in the dining room and bedrooms and put in flooring. I don't think that his wife would like sleeping like Japanese style. I know I wouldn't.

If I were married and my wife were here, I think that it would be swell to have duty on the beach here. The only think wrong with his house is that it takes about 40 minutes to drive there by jeep. Actually it would only compare to a middle class home in the states, but in Japan only the rich people own such homes.

We took along Mr. Kobiashi as an interpreter. He interprets for the MPs. He was formerly a Captain in the Japanese army and is very intelligent. We had a very interesting discussion with him which I should like very much to continue sometime. He tells you what he really thinks which unusual for the Japanese. Most of them just agree with you all the time. Kobiashi was the head of the propaganda section of one of the armies during the Philippine occupation. He says that, contrary to popular American belief, Japanese troops were kept informed of American advances. He says that they were not told of the number of Japanese casualties, but that they were kept up to date on the progress of the war. For that matter the U.S. today (just between you and me) is not being kept up to date on the number of American Marine casualties in China. I doubt if most Americans realise that they are fighting, but they are really

having a rugged time of it. Anyway, Kobiashi says that he doesn't know whether or not the Jap people at home were informed of American advances. He says that in the Philippines that from the beginning they always had to fight guerrillas and never did gain complete control. I asked him whether he thought that the men in command should be tried for war crimes and he agreed that they should. He says that they should be thought that they cannot just do as they please because there is a war on. He says that the high command knew of the atrocities and that the discipline in the Jap Army was such that they could have stopped it. He cited as an example of one area in the Philippines where the commanding general forbade atrocities and they were not committed. He thinks that the War Crime Trials are a good thing and will prove to be of great value. He says, however, that America will make a great mistake to publish a defense argument to the Japanese people. I believe he is right, and furthermore I think that the mistake will probably be made. His point is that the people of Japan are not used to thinking for themselves or are they used to receiving information. When they are given this sudden flood of information, they will accept it as true, without picking out the good from the bad. If they are given both the prosecution and the defense, they will be confused and are more likely to believe the defense which will defeat the purpose of the trials.

We asked him about Pearl Harbor and he said that it came as a surprise to most Japanese, even most of the Army. He says that the Army had always trained for war with Russia, but never with America. He says that they were well informed concerning Russian tactics and had studied them intensively, but that they knew nothing about American tactics. He recalled December 8, 1941 when he was a 2nd Lt. He said that his battalion commander, a Lt. Col. called in all the young officers and told them that this day (Dec. 7 your time) marked the time that all of them would die. He said that many of the Admirals and Generals felt that it would be suicide to fight America, but they were purged before Pearl Harbor.

We asked him when they first knew that they would lose the war. Kobiashi said that the high command knew that after Finchhaden (In New Guinea shortly after Guadalcanal) that Japan would lose. He says that they did not admit it at this time, but that they knew it.

We asked him about the effect of the atomic bomb on Japan. He said that the bomb was ghastly, but it was not a complete surprise. He said that their men were working on one and that in Aug.'49 (A year before the A-bomb) one of the leading Jap scientists addressed the Diet and told them of a "terrible bomb" (as they called it) so powerful that a matchbox of powder would sink a battleship. He said that the people had been told that such a thing was possible. They were expecting it, but the U.S. had it first. Kobiashi says that the A-bomb did not shorten the war much. They were expecting us to invade Japan in November. They did not expect to hold out for more than 5 months. He said that they had virtually no transportation left to move their men and that munitions were short. He said that rifles were so scarce, some soldiers only had spears.

I asked him what effect Russia had upon the war. He said that psychologically she had some effect, but that militarily speaking, Russia's entering the war had no effect. Japan was ready to quit anyhow.

We were discussing the reasons for the war in the first place. We decided that the biggest reason was the lack of understanding of the two peoples for each other. We do not understand

them, nor they us. I do not believe that the world will ever have peach until all the governments of the world make an honest effort to understand the others. Kobiashi says that Japan had to fight in order to survive. I should like to discuss this point with him further as it is extremely interesting. After you have been here a while, it becomes obvious that Japan really does need more room. Why they didn't move into Manchuria is another story. We left at this point. I shall have to go back and get his view on why they had to fight.

I have been having something made in town as a present to my wife (when I get married, if ever). I have had some very interesting discussions with the girl who has been fixing it. She is only 16. Her boyfriend was killed in the war and her father, mother, and sister were killed in the bombing of Yokohama. She is really quite cheerful and a good worker. Among other things, I find that it is not a custom for Japanese boys to kiss Japanese girls before they are married. The boy has some choice for his wife, but the girl has little. Some match maker suggests a boy's name to the girl's parents. If they approve, the couple is married. The girl can refuse, but with the man shortage due to the war there is little choice for her but to accept. Some marry for love, but very few. I told her that I was going to give this present to a girl. She was amazed and said "Americans must be a very happy people." It seems that Japanese boys don't give their girlfriends presents or for that matter do much else for them. She asked me what occupation the girl was engaged in and I told her that she is going to college. She thought that American girls are very lucky indeed. I wish that I could quote her exact words and intonations. They were really quite touching. The only trouble is that the Americans really do not realise just how lucky they are. Perhaps the people who have been in Japan, China, Germany, Italy, Russia and almost anywhere else do, but most do not. Indeed we are very lucky.

We, I have rambled on and on. I have to go on Shore Patrol in a few minutes.

Scuttlebutt still says Stateside the end of August, which should put us in Long Beach the first week in September. If I am going to MIT, I should have orders by then.

August 9, 1946

We have been in an out on training exercise the last few days. I haven't been able to get ashore much. I did get ashore for a few hours Wednesday. I called on the Deckers. I think that Mrs. Deckers likes it here. Naturally she likes being with her husband. They have twelve servants all together and a very nice house. They are kept pretty busy at night with official parties, and Capt. D. works very hard on his job in the daytime.

August 19, 1946

Sunday, the 11th I heard the Nippon Philharmonic in Tokyo. I'll enclose a program, if you are interested. They are quite good. I enjoyed it very much . Last Wednesday, V-J Day we had a holiday and Ed Poerschke (my roommate) and I drove up to the Fujiya Hotel. I told you about it once before. We had a lovely drive, but had jeep trouble on the way back and almost didn't get back to the ship that night. Jeeps and roads in Japan are nothing to brag about. Last Saturday night, I went to see the "Mikado" at the Ernie Pyle Theatre in Tokyo. I had seen it at the San Diego Exposition in the Ford Bowl. The performance in Tokyo was exquisite. I wish that there had been enough light to take colored movies. It was beautiful. The costumes were all genuine, some coming from Japanese museums. They were gorgeous. The singing was all excellent. All

in all, it was by far the best stage performance I have ever been. I enjoyed it immensely. I am very fond of Gillbert and Sullivan anyhow. I think that people that have been here a while are more capable of enjoying some of the more subtle satire than people still in America. It is really a very amusing show and well done.

All in all, last week was quite interesting with my three excursions. It made a very enjoyable break in my work. I am still trying to get to the War Crime Trials. I hope I shall anyhow.

A lot of our men are getting pretty bitter. We are getting the feeling that everybody in the States has forgotten we are here. We have not had regular mail service for 6 weeks which always lowers morale. Secondly, we ran out of fresh provisions over a month ago. We have been feeding them in dehydrated food that was sent here during the war. The result is that we have 200 out of 1000 men in Sick Bay with dysentery. It threatens to make us immobile. We are getting a few provisions today, but we cannot see why a provision ship- was not in here a month ago. We are stuck with a nasty job here, while almost all the Navy is enjoying Stateside duty. They might at least feed us. Many of the meals are so bad, I don't even eat them at all. I eat on the beach at the O-Club whenever I can.

I wish that I would hear whether or not I have been accepted for MIT. I would like to know one way or the other.

Four Ensigns out of '47 came abroad yesterday. Three should be here tomorrow. We are glad to get them, as we are so short of officers. I hope I get one for a JO, so that I'll be able to leave, if my orders do come.

You know they say you can save a lot of money here, but I certainly manage to spend plenty. I send everything I don't allot to War Bonds or the Bank. Souvenirs are so very expensive here that I have only bought a few.

August 21, 1946

Our trip to Hakodate and Oteru in Hokkaido has been postponed. We were supposed to leave today. We are now going to just go out in Sagani Wan and do circles for a week or so. We postponed our trip due to the dysentery.

Tonight when we walked into the Wardroom we saw grapefruit and celery on the table. I never thought that I would ever consider these to be rare foods, but they were wonderful. We finally got provisions yesterday (1/2 of what we needed). Boy! It is nice to get some edible chow!!

August 28, 1946

Our trip to Hokkaido was postponed due to the dysentery. We went out in Sagami Wan for a week to get clean salt water to scrub down with. We even lived on K Rations for 5 days to keep the food handlers from spreading the disease. While we were out we got an emergency call about a Jap fishing boat that had broken down. We steamed 180 miles to take it in tow and haul it back to Yokosuka. It had been adrift for 15 days and the 5 Nips in it had been without food for

5 days. When we spotted them they were waving everything they had to attract our attention. They were really happy to see us. I took some pictures of them. I hope they come out.

We are going out tomorrow for a two day training exercise. Scuttlebutt says we will make our Hokkaido cruise next week. They never will tell us in advance.

I still haven't heard anything about MIT. I keep hoping, but if my orders don't come soon, I won't have time to get back before the course starts.

The personnel shortage is becoming acute again. If I don't get some men soon, I don't know what will happen. I have a rotten cold, a lot of work and everybody is getting very grouchy. I wish that I could get away from the ship for about a week. I could sure use a rest. We have a new Gun Boss and he and I don't get along so well. Oh well, I guess things will improve.

I like my roommate, Ed Poerchke, very much. We have a swell time together. He has a record player and we play music sometimes when we can get a chance which relaxes one's nerves. Just now he put on Spellbound which I like very much.

I haven't been ashore- except once to eat dinner at the O-Club – since I last wrote. 5 days on K Rations and you can get damn hungry.

I am getting rather tired of Japan. Especially as I don't get much liberty time. If we must stay here, I hope we will go to China for a while. I should be interested in seeing Tsingtao, Shanghai and Peking. Particularly, I should like to see Peking.

September 1, 1946

Well, darling, my orders came through about midnight late night. I am leaving the ship tomorrow (Sept. 3 your time). Unfortunately I have to check through the hospital before I can proceed home. Due to the dysentery epidemic on board, everybody leaves must be passed by the hospital. I have no idea how many days that will take. I hope to fly back, but even so it will take some time. There is a large backlog of passengers in Guam and in Pearl. I have no idea whatsoever of when I will be back. In my cable I said "anytime after the tenth." I mean just that. The sooner the better as far as I am concerned. My orders state that I must report in Boston on 25 September. I plan to get into Providence sometime on the 24th and go home for the night and then drive up to Boston on the 25th. I hope that you got my cable and that you will be able to get me an air reservation to Providence. I guess I cause you a lot of bother what with film first and now air reservations.

September 3, 1946

Things have been really fouled up. In order to get off the *Chicago* you have to be released by ComNavJap and the dispensary, due to the dysentery epidemic aboard. My release from ComNavJap didn't come in till this afternoon at about 1400. The ship was scheduled to get underway for Hokkaido at 1500. The Chief of Staff didn't want me to leave until we came back from Hokkaido, as he was afraid I would get some leave. He is a "so and so", as you can plainly see. However, the Admiral overruled him and here I am. But where am I? – In the dispensary. They are suspicious that I have the bug, so I am in an isolated room all to myself writing this

letter. How long it will take to get released is any body's guess. The sooner the better!! I just have to be patient and let them have their way. The next obstacle will be to get an air priority. When I accomplish that, I must then get back to the States, if I am lucky I'll get there in ten days from the time I am released from here. It can be flown in 39 hours, but there is a long waiting list in Pearl & Guam. I just have to be patient and hope. As I said before, you can expect me anytime after the tenth. However, everyday it looks gloomier.

September 4, 1946

I feel like a trapped animal. All I can do is stalk up and down in my room. I try to keep from lying down too much, as I am afraid that if I spend the time in bed I shall feel too weak when they do let me out. I suppose that there really is nothing they can do but hold me, as they are fairly certain that I have the disease, but it leaves me so frustrated. I am really lucky that I have only had a mild case, as it can be exceedingly painful. But I am afraid that rather than looking at the brighter side, I take a dim view of it all and curse under my breath.

September 5, 1946

Well, tomorrow morning they will know for sure whether or not I had the bug Monday. It takes 96 hours to make a complete test. If I have it, they will give me more test until it is gone. Unfortunately, they are quite sure that I have it. I keep telling them that I feel perfectly well (which I know I don't – but I just have to get out of here). They have no sympathy and I must stay until they are good and ready to let me go.

One of the nurses got me a Calculus book today, so that all of my time won't be wasted entirely.

I dodged the problem of having one of the nurses bathe me by grabbing the pan of water and throwing her out. I guess she was just as glad as I that I would rather do it myself.

I am afraid that I do not make very good patient. Every time a doctor comes near me, all I do is gripe about being here. Maybe they'll get so tired of me that they'll throw me out. I hope so!!!

September 6, 1946

Well today is Friday and they told me that I definitely have the bug. They should start taking more tests tomorrow. I hope that they will be better but I wonder. It seems to take a long time to eliminate all the germs once they start. Fate has certainly been cruel to give me this at this particular time. I don't see how it could have happened at a worse time, I have never been hospitalized in my life before and just when I was about to see you this has to happen. Being confined in this little room is driving me crazy. All I do is curse under my breath. At least I am getting a little studying done anyhow.

September 7, 1946

At Captain's inspection this morning, Captain Ousley, Senior Medical Officer, told the doctors to discharge me on Monday so that I can catch Tuesday's plane. Now I have to get an air priority so that I can fly. That will mean that I will be leaving here the tenth (ninth your time). I've been figuring the Date Line backwards. Now I find that I gain a day instead of losing one. I

am pretty sure of getting the plane to Guam Tuesday. Then I don't know how long it will take. It will all depend on the backlog of passengers. I'll have to allow ten days anyhow. Maybe it will be less and maybe more. At least I can now see my way out of Yokosuka.

Mrs. Decker was in visiting Cmdr. Lucking across the hall from me yesterday and I told her that I was here. I think that she spoke to Capt. D and that he spoke to Capt. Ousley and that is why I am getting out of here Monday. "It ain't what you know, it's who you know." I also think that Capt. D will see that I get a plane Tuesday to Guam. He is really a swell guy. I don't like to ask favors and I didn't. But I am quite sure that Mrs. Decker did start the ball rolling.

Post Script to these letters. Helen and David were engaged by telephone on 12 October 1946 and married 6 July 1947. David did have time to visit Helen in San Diego for a week before entering MIT, and Helen spent the Christmas holiday, 1946 in Jamestown, RI with David and his family.

Commander David T. Leighton Speech on Naval Nuclear Power Program to the American Society of Materials, Golden Gate Chapter: Circa January 1961

To listen to the talk visit http://www.nd.edu/~dtl/family/asmlecture.mp3

EMCEE: Our speaker tonight is Commander David T. Leighton, United States Navy. He is at the Mare Island Naval Shipyard. Commander Leighton has been the nuclear power superintendent of Mare Island Naval Shipyard since August of 1959, and during the preceding six years he was attached to the Naval Reactors Branch, division of Reactor Development, United States Atomic Energy Commission, in the Nuclear Propulsion Division, Navy Bureau of Ships. During this period, he worked on the development and control of electrical systems for the sodium-cooled reactor plant in the USS *Seawolf*. For five years he was the project officer for the development of the nuclear propulsion plant for the USS *Triton*. During the final two years of this period, he served also as project officer for the development of the nuclear propulsion plant for the first nuclear powered destroyer-leader, USS *Bainbridge*. My pleasure to introduce Commander Leighton. Applause.

LEIGHTON: Can you hear me in the back of the room? OK. People in my office say I'm the only one in the office that talks to Washington without using a telephone **(laughter)**. I'm told there are more ladies present here this evening and somebody wondered why, apparently this group just doesn't understand the ways of a Sailor **(laughter).** Anyhow, I for one, am delighted to see the ladies here and I'm sure the rest of you gentlemen aren't **(laughter)**. Let's see if you know any more about naval nuclear propulsion. I'm going to talk about naval nuclear propulsion tonight, but before I start, I'd like to get some idea of what this audience already knows about it. Now, I'm gonna ask a few questions, and I'm gonna ask the ringers not to answer them because we've got a number of people here from Mare Island tonight who know all about it. I see a couple of people here who used to work in Admiral Rickover's group in Washington, and they know more about this than I do I think, so it's not fair for the ringers to answer the questions. But let me ask some of you people that have not been associated with the Naval Nuclear Reactor Program a few questions.

To get some idea of where we stand today, how many nuclear powered submarines has the United States Navy operated at sea to-date? Now would someone like to answer that who has not directly associated with this program, just to get an idea of what you know about this?

AUDIENCE: Six, murmuring, fifteen.

LEIGHTON: Six. Now how many of you would say. Let me ask it this way, how many here would say it's more than six? Well, then that means a lot of you say it's less than six, or it is six. When the *Roosevelt* went to sea last month, and I assume some of you may have known that from your local newspapers, when *Roosevelt* went to sea from Mare Island last month, she was the fifteenth nuclear powered submarine to go to sea. Within another month there will be, we hope, at least a couple more. How many types of nuclear powered submarines has the United States Navy built?

AUDIENCE: Fifteen (laughter).

LEIGHTON: That sounds like a, that sounds like a former submariner because **(laughter)** it just so happens I don't think all during World War Two the United States Navy built two submarines identically the same **(laughter)**. But, there are four basic types of nuclear submarines that have been built to-date. Attack submarines, the predominant number, the attack submarine is a submarine which fires torpedoes. There are actually four different types of attack submarines that have been built. But basically we call the group, the lot of them, attack submarines. These are ones that fire torpedoes, these are ships that are built to fire at other ships. These are submarines or surface ships. The, another type that has been built is a missile submarine which can fire regular-size missiles. There is only one nuclear submarine of this category and will only be one. There, another type is a radar-picket submarine, there is only one of these, the *Triton*, and the chances are there will not be anymore, although this hasn't been finally determined. And the fourth type that has been built is of course the Polaris missile launching submarine. The *Roosevelt* falls in to that category, the *Theodore Roosevelt*. Now I'll say that to those that are Republicans and Democrats can divide up **(laughter)**. In any case it's the *Teddy Roosevelt*.

AUDIENCE: Murmuring and laughter.

LEGIHTON: How many ship builders are building nuclear submarines in this country today, what is the scope of this program in the country today and how many of these builders are located on the Pacific coast? Now who'd like to take a whack at the number of builders altogether?

AUDIENCE: Two, three, five, seven.

LEIGHTON: Well, I hear a wide, a wide run down. There are six nuclear boat builders, the most predominant one of course is the Electric Boat Division of the General Dynamics Corporation in Groton, Connecticut has built the largest number. The other yards which have built submarines which have operated at sea are the Portsmouth Naval Shipyard, which is a government installation; the Newport News Shipbuilding and Dry-dock Company at Newport News, Virginia; and the Mare Island Naval Shipyard which is the only West Coast yard that has built a nuclear powered ship. The other yards that are building nuclear powered submarines are the New York Shipbuilding Corporation in Camden, New Jersey and the Ingalls Shipbuilding Corporation in Pascagoula, Mississippi. Did I get the six? Should have. I think I got six, now that's submarines only. The other yard that's building nuclear powered ships - suddenly I've got a Bethlehem representative in the crowd. The other yard that's building nuclear powered ships for the Navy is the Bethlehem Shipbuilding division of Bethlehem Steel Company at their Quincy yard in Massachusetts. They are building the first guided missile cruiser that is nuclear powered, and the first guided missile destroyer leader that is nuclear powered. By the way, in case any of you want to take notes, don't bother on this because I've got a handout that will be on the back table when you leave that lists all of the nuclear powered ships authorized by Congress to-date and the yards that they're being built in. I've got one more question in this regard, how many nuclear submarines have been authorized by the United States Congress to-date?

AUDIENCE: Thirty-five (murmuring).

LEIGHTON: Wow, pretty close on this one, forty-three that have been authorized by Congress to-date. Just to give you an idea on how that stands relative to the overall Navy, there are approximately one hundred conventional-type submarines on active duty in the United States Navy. Now you can see that as far as authorization is concerned, we're well on the road to converting the submarine service to nuclear propulsion and within a few years, within three years, all of those authorized to-date should have been completed. Now tonight, I would like to point out some of the highlights in the development of naval nuclear propulsion which may be of interest to you, and explain to you some of the problems we've had, and some of the lessons that we've learned. Now I will be glad to entertain questions as we go along because if you've got questions in your mind that indicates what you're interested in, and I'd much rather talk about what you're interested in than what may be here. So, please, I'll be very happy to answer questions, particularly if you feel they may be of general interest to the group. Within of course…

Audience member asks a question.

LEIGHTON: Pardon? **(repeats question)** How many types of reactors is the question that we've had here. I'll tell you what I'll try and do. I'll try and answer these questions in a direction that would have been some of the information covered here anyhow. The beginning of the naval nuclear propulsion development saw the road being taken down two paths, pressurized water as a coolant for the reactor, and sodium. Now an evaluation of all the possible coolants for the reactor in the days following World War Two, led all the technical people concerned to propose that these two coolants offered the earliest opportunity for rapid development. Nobody knew of course whether either one would work. Following the close of World War Two it was obvious that you could build a reactor as far as the physics is concerned, but nobody knew if you could take this and put it in a weight and space and have the reliability necessary to produce power for running a ship. Now Admiral Rickover, as you all know, went down to Oak Ridge in '46 to '48 and he succeeded while he was there in convincing the people back in Washington that we should one- have a nuclear propulsion project, and two- that it should be on a submarine.

Now I'll come back to reading for submarines a little later. He succeeded in getting the Daniels Pile power pile group in Oak Ridge to work on pressurized water for submarines in lieu of the gas cooled reactors that were working for central station plants. Now, and if you know Admiral Rickover, realize that you don't just walk in and get people to change their minds, but he's pretty good at it **(laughter)**. This group did change their mind and instead of working on a gas cooled reactor, ended up working on a design, conceptual design, of a pressurized water plant for naval application. Also at this period, the General Electric Company at Schenectady, New York already had contracts with the Bureau of Ships for investigation of sodium as a possible coolant for a reactor cycle and they were working on this along, the thinking of that time was along the development for a destroyer plant. Furthermore, the General Electric Company at the Knolls Atomic Power Laboratory had investigative contracts with the U.S. Atomic Energy Commission for the development of a sodium cooled power breeder type reactor – one that produces power and one that breeds fuel at the same time. So General Electric had already chosen the path of sodium as a possible reactor coolant. Admiral Rickover in his own inimitable

fashion succeeded in one- getting the Atomic Energy Commission to accept as a secondary project at the Knolls Atomic Power Laboratory the development of a sodium cooled reactor for a submarine, and then by his own persuasive personality persuaded the U.S. Atomic Energy Commission to drop the power breeder project and establish the submarine project as its primary project for that laboratory. I think that he was right. I want to make it very clear that Admiral Rickover is very persuasive, but he also has a habit of being quite right on important decisions, and I think history has shown that there is not any great advantage today in building a sodium cooled power breeder reactor, but there was a great advantage in developing a sodium cooled submarine reactor in the years, in the early '50s. Since at that time we needed nuclear power for the Navy and there was no assurance that either project would work. The, these were the two cycles that were picked out to start with. Many other cycles since that time have been looked at. We have looked at high temperature gas, liquid lead, lithium seven, fused salts, organics; if it'll flow and it won't absorb too many neutrons, it's been looked at as far as reactor design is concerned. People talk about pebble bed reactors, all sorts of things. But, in looking over the last decade and a half, and evaluating all of the cycles for naval nuclear propulsion, the one cycle that stands out, that has the most advantages for the Navy, for naval applications for ships, is pressurized water. And today we are using all water cooled reactors and of all the cycles that have been suggested to-date, this is the only one that the Navy is currently developing.

Now you say, how many types of reactors. It's like asking a physicist how many kinds of cars do we have because they'll say that a 1901, or a 1905 Ford, or whatever Ford, when did they start? Anyhow, it's the same as a 1960 Cadillac because after all it has an internal combustion engine and it's somewhat the same when you talk about pressurized water reactors. There are many different pressurized water reactors and we are continually improving them. But they are pressurized water. Some people say, well they're all the same type. They're not all the same type, each one is different than the last one, it has improved features in it, but the Navy and the AEC and the Naval Nuclear Propulsion Program are trying to develop as much as possible pressurized water reactor technology for naval propulsion. I'll say a little more later about some of the advantages of pressurized water to the Navy. One should be obvious, every reactor plant, every reactor cycle has a lot of auxiliary systems. There is one very nice auxiliary system in a pressurized water plant. That is, it uses water and you can make your own coolant. This should not be overlooked. If you have any reason why you want to dump the coolant, you can make some more. For a ship at sea, this is a very valuable thing since we normally make water aboard ship. And if we use up the water, we can make more. This is one very important reason why water is of real advantage to the Navy for their reactor plants. There are many more reasons.

Now, the development that started with both of these approaches going on simultaneously, the sodium cooled reactor, actually the sodium cooled work was started before the pressurized water was. In order to carry this development on, Oak Ridge started the conceptual design, then it was transferred to Argonne. Argonne developed the design further - and at this point Admiral Rickover being in both the Atomic Energy Commission, and in the Navy Bureau of Ships - when the Atomic Energy Commission passed, got the AEC to authorize the fission uranium submarine project, and also got the Atomic Energy Commission to let a contract with the Westinghouse Electric Corporation, for the development of the reactor plant which eventually ended up in the *Nautilus*. Now at this point in history, this plant was not designated for the *Nautilus* and clear up in to 1950, it was not known which of these plants

would go into the first nuclear submarine. The first nuclear submarine, if you look back in the authorizing legislation, was appropriated for in order to have a nuclear powered submarine, there was no designation of what reactor would go into it. The second nuclear submarine the same way, and even though both of these submarines were authorized, there was no commitment as to which reactor was going into which submarine. The two projects were both going along and both submarines were being developed. But, there was no commitment to which plant was for which submarine when they were first authorized. As a matter of fact, there were a lot of people in 1950 who were very knowledgeable in this program who felt that the first one would be sodium, and there were a lot of people in those days that thought that would be a better plant. Today I don't think too many people feel that way.

The Bettis Plant of the Atomic Energy Commission was created for the purpose of developing the pressurized water reactor, Westinghouse staffed it, it was built on an airfield near Pittsburgh, Pennsylvania and the laboratory was built from the ground up for the purposes of developing the *Nautilus* plant. The, I think all of you know the history, in 1953 the first and last prototype of the *Nautilus* plant went into operation in Arco, Idaho. Perhaps you don't know that clear back in 1953 the reactor design for the *Skate* class was already started and clear back in 1951, two years before, or, at this point a year and a half before the operation of the land prototype of the *Nautilus*, the beginning of the *Triton* project took place – namely looking for an improved reactor design, looking for something going beyond either the sodium plant, or the pressurized water plant. And in those years, a tremendous amount of effort went into investigating all kinds of coolant cycles. That's what my answer to your question, "How many kinds of reactors" is.

Virtually every kind of reactor was looked at. Conceptual designs, cartoon studies, whatever you want to call them, were made to determine the feasibility of the different coolants for naval reactors. The Knolls Atomic Power Laboratory, which is one of the major laboratories today working with the Naval Nuclear Power Program, just as a matter of interest, was created at the end of World War Two under a contract between the Atomic Energy Commission and the General Electric Company. General Electric took over the operations of the Hanford Works from DuPont and part of their price for taking it over, or part of their reward for taking it over was the dollar a year for operating Hanford, plus the establishment of a research laboratory in atomic energy in Schenectady and the Knolls Atomic Power Laboratory was built by the Atomic Energy Commission, it is an Atomic Energy Commission laboratory, and then operated under contract by General Electric Company and gives GE a place to do research work in atomic energy. It did start out with its major project being the power breeder and was then changed to submarine work. Today the Knolls Atomic Power Laboratory works full time on naval nuclear propulsion development, so does Bettis. Bettis works in addition of course on the Shippingport plant which was the first central station nuclear power plant in this country. But that was a special project assigned to Admiral Rickover in order to get a central station plant into operation at the earliest possible time. Now, in the early days of this work, there were some problems that might be of interest to this group. In the development of the pressurized water plant, there were some very knotty metal problems. The first thing it needed was a core structural material. Now, you had fission so you had to pick a fuel. It wasn't hard to pick a fuel, as we only had one, you had to pick uranium, and uranium 235 is what you needed. Now uranium 235 is very nice for fissioning, but from any other aspect in terms of structural applications, it's a terrible material.

It's pyrophoric, it burns in air, you can't machine it too readily, all the chips would come off and you would have a nice fire on your hands, you have to be very careful in how you handle it. It has no structural strength, it's heavy and that's about all you can say for it. It's a very nasty material to work with when it comes to building a core.

Now, we need, for naval application, not just, well other people talk about a football or a baseball of uranium. I read these articles all the time, well, they just throw in another tennis ball of uranium and run around the world a couple more times **(laughter)**. You just don't do that. We've got to have something that'll stand up, not just that you can put together and look at it, it's got to stand up, not only under the terrific radiation conditions of a high neutron power level, but it's got to stand up under high impact shock and vibration. We're gonna run this thing around in a ship. Furthermore, somebody someday might take a shot at it, and long about the time somebody drops a depth charge right next door, that's no time for the core to fall apart. So, you've got to have metals that will hold this thing together. Well, here was a very knotty problem, what to use for a structural material. Now, you can't just go pick any old thing as a structural material, you're in a new game now. You're in a radiation business. You got high neutron levels, and who knows what happens under radiation. I mean, who in 1946 knew what would happen under radiation? In 1948 you had some experience with the plutonium producing piles, but very little experience in terms of structural metals for building a reactor core. You need something not only that's strong, but you gotta have something that doesn't have a high neutron cross-section, something that won't take all the neutrons and stop the reaction from proceeding. You need something in the case here where you're gonna use water at fairly high temperature, at least it's high temperature as far as reactors were concerned at that time, not high temperatures as far as what we know today in a modern steam plant. But, high temperatures compared to the Hanford piles which run their water practically at ambient temperature, these were high temperatures in a reactor and you need a material that is corrosion resistant under these circumstances.

Well, I read with interest that a couple years ago in building your new headquarters in Metals Park in Ohio, that one of the materials that was used was zirconium and I think it's true that there is more zirconium in that building than existed in the whole country in 1948 when Admiral Rickover decided to use zirconium as the basic structural material for the *Nautilus* project. This was not an easy decision to make, and here you have a few pounds available, and you needed tons to build one reactor. Well, that's an interesting metallurgy story, we don't have time to go into it here, but the whole story of the development of zirconium is a very interesting story, and in those years, then-Captain Rickover was known as Mr. Zirconium because of this. At many times along the way, people wondered, "Was it gonna work?" The whole mining process in order to get large quantities at a reasonable price, all the processing, all the fabrication techniques et cetera had to be worked out and even today, of course, there is still a tremendous development in efforts going into zirconium and the improvement of zirconium and fuels in order to take care of things that we have to face today.

We're continuing to try and get longer and longer lives in cores. You want to extend them so they last longer, you go around the world once submerged, let's go around five times submerged, well obviously we don't want to go around five times submerged, but we like to stay submerged for a whole war, come up to get supplies, but keep the ships on the line, run at high

speeds for long periods of time, come in for supplies only, ammunition only, but keep the ships on the line and that means keepin' them running, don't have to refuel them. And the longer you go, the more corrosion resistant the material has to be, the more it has to take the neutron irradiation et cetera, so there is still a very large development effort going into improving this material and making it a better one.

There was another fundamental metals problem that was facing the group when they had to set up the basic parameters for this plant. You had to pick something to build the whole plant out of. What do you use, what do you use for the pipes to push this pressurized water through? What do you use for the pumps, what do you use for the heat exchangers, what do you use for the reactor vessel? You have to pick a material again that is corrosion resistant. Here you're interested in corrosion resistance for a couple of reasons. If you get very many corrosion products, they're gonna go into the reactor and what do you know, they get radioactive and now they can run around the system and deposit out, and pretty soon you'll build up such a high radiation level on all your components that if you ever want to go in and work on 'em, you can't do it. Now this, of course, is brought home tremendously by the situation out at Arco today where the reactor blew up and there, they're in a different situation, but there are people that I think are impressed by the fact you have an entry time of 65 seconds that somebody can afford to stay inside the building. Well, this is a different situation working on components, but it's still a serious one.

What if you wanna take one of these components out and work on it? You can't afford to have it that a mechanic can only work on it for three minutes at a time, or you'll take every mechanic in the shipyard to make a minor repair. You can't afford to have a large amount of corrosion products for that reason. Another reason you can't afford it is, if you get a lot of corrosion products and they go into the fuel and block off water passages, you'll starve the flow and melt the fuel, and that's just no way to run a reactor **(laughter)**. You can't do that. There are people in this room who have worked on this very problem and it sounds very simple, but it's not so simple. Now, so you had to pick a material to do this, that has the strength, that you can make an all welded system, et cetera, and the material that was chosen was of course stainless steel. Now, we all sit here and eat with stainless steel, I can't remember if we ate with stainless steel tonight or not, but a lot of us have eaten with stainless steel and everybody knows all about stainless steel. On the other hand, 1948, you'd be surprised how little was known about stainless steel. Every time you picked up some data on stainless steel you'd find out it wasn't true, it wasn't so, it didn't have these properties. There was not very much experience with stainless steel as a structural material in 1948—very little experience with it. This was another major commitment. Even today the Naval Reactor Program is one of the largest single users of stainless steel in this country. The largest castings in this country that had ever been made were made in this program and an awful lot of development workforce had to go in to doing it.

I was talking to Mr. Swanson earlier this evening and he and I agreed, I think, that the foundries and the mills are very reluctant to try anything new, they are very reluctant to go off into developmental programs, maybe foundry and mill people here like to throw a rotten tomato at me at this point **(laughter)**. Well, it's so, nevertheless. Across the board it's been my experience anyhow that you have a hard time getting, in that part of the industry, getting people to want to go into development of new things and an awful lot of work had to be done to get

these things developed so that you could fabricate whole plants out of this, so you could fabricate a pump out of stainless steel, a large pressure vessel, or steam generators, or cladding. Build a carbon steel vessel and then clad it with stainless steel so that all your surfaces would be stainless steel. This was a major metals problem. I mention this because I think some of you would be interested in the metallurgy aspects.

On the sodium side on the other hand, there were some very interesting metals problems too. The whole technology of liquid metals had to be entered into in the *Seawolf* project. The, we were using liquid sodium, we were using NaK, sodium-potassium alloy. We were using liquid mercury. All these were used in the project in one place or another. An awful lot had to be learned about the properties of these liquid metals. The Knolls Atomic Power Laboratory wrote the liquid metals handbook which is still a reference in that field, a reference document in that field even though we are not working on the, in the liquid metal area today.

Now, stainless steel, to go back to it for just a moment, we're still learning a lot about. It's a very nice material, but it has one very nasty characteristic. It doesn't like chlorides, I think any of you work with stainless steel know, know about chloride stress corrosion. And we, unfortunately have to live in a sea water medium. Now, this still bothers us and that's why we're spending a considerable amount of money and time to develop other structural materials for pressurized water reactor plants. The problem here is that you use a highly purified water in the reactor system, but you are making it from sea water. You are always subject to the possibility of flooding of a compartment, and bringing the salt water against hot stainless steel pipe and getting yourself into trouble. We always have to worry about the plant being hot, flooding the compartment, filling up with sea water, now we've got the salt water soaked up in the insulation right up against stainless steel and then worry about getting chloride stress corrosion. Therefore, considerable effort is still going on trying to develop better materials. As a matter of fact, in some of the nickel materials, again the largest castings and forgings in this country today are being made in this program, to try and find a material which may be more suitable than stainless steel. I think that you will find that the Naval Reactors Program in the next several years will make a significant contribution in the development of technology related to fabricating large parts out of some of the nickel alloys.

Now, I'd like to go back, go for a few moments through the development of the various nuclear submarines to give you some idea of what the Navy has built and where they came from. I mentioned that in 1953 the land prototype for the *Nautilus* was operated the first time. This was the first power producing, first reactor producing useful power, operated in the world. The, in the same year, the basic design for the next class of submarines was determined. And, at that time, there were a lot of people that didn't like the *Nautilus* and one reason they didn't like it was that it was too big. And you could get the kind of feeling from a lot of submariners that the *Nautilus* was too big and you, so you'd say, "Well, why is it too big?" "Well, it's too big" **(laughter)**. And, "Well, what do you mean it's too big?" "Well, it's bigger than any other submarine that we've built." Well, it's true that there was some feeling against large submarines. The French had built *Surcouf* which was never a successful submarine, the United States had built the *Argonaut* which was a large submarine, very cumbersome, and was never really a successful submarine, and then some people just didn't like big submarines. Of course they never had a

nuclear powered submarine, and they didn't really know what that meant, but large submarines are just too big.

So there were people who make decisions on these things who wanted a nuclear submarine no larger than the boats being built at the end of World War Two. Now, you can go back in and find out how did they get that big, it's just the way they were so you shouldn't build them any bigger. Furthermore, there was no operational requirement for submarines much faster than those boats because they never had a submarine faster than those boats **(laughter)**. So why'd you need them any faster: they wouldn't know what to do with it **(laughter)**. I suppose I shouldn't say this sort of thing …
Mumbled question from audience member.

LEIGHTON: Pardon?

AUDIENCE MEMBER: How fast are those old boats?

LEIGHTON: Oh, how fast were those old boats? I've been asked a lot of questions about speed tonight and I'm not talkin'. The only thing I'll say about speed is, a nuclear submarine can go faster than 20 knots, that's all. No other comment that's unclassified, that's the only thing I can say. But, there were a lot of people who felt this way, and of course these nuclear boats were expensive and money's hard to come by too. Furthermore, there are people who didn't like nuclear submarines because there wasn't enough uranium around. You gotta go back in your minds, any of you in the nuclear programs today, uranium's plentiful. U235 heh… heck, we have ladies present, heck U235 you can get anywhere you want. You can probably buy it at the dime store if you have enough millions of dollars now **(laughter)**, but in those days it wasn't that way. There were so many kilograms of U235 and you argued with the weapons people who wanted to blow up some city versus one nuclear submarine. So, there was another reason for bringing power levels down.

Anyhow, the next class of submarine was born at that time, but remember this is almost two years prior to operating the *Nautilus* at sea, and the *Skate* class was originated. This is a submarine of the *Skate* class. There are four submarines in this class. The *Nautilus* and *Seawolf* are attack submarines, they fire torpedoes. This is the next class, the *Skate*. This is the *Sargo* here which was (I have to put a plug in for my alma mater up on the screen here) this was built by Mare Island. This is identical to the *Skate*. The *Skate* was built by Electric Boat, the *Sargo* was built by Mare Island, the *Seadragon* and the *Swordfish* which are the same class of submarine where built by the Portsmouth Naval Shipyard and those are the four ships of this class. *Skate* and *Sargo* have both been to the North Pole and back, so I think we can say they're pretty reliable ships – and very worthwhile ships. They're an outstanding submarine. You note the twin screws on this submarine, you note the general hull form. The hull form here is very close to the World War Two submarine. Very much like it. The *Nautilus* and *Seawolf* are also very close to World War Two submarines but expanded, larger in size. To get some idea of nuclear submarines, the *Sargo* on its shakedown cruise, which is the first cruise after a submarine goes through after builder's trials and we go out to make sure it runs and then it's delivered to the fleet, it's commissioned then it goes on a shakedown cruise of some length of several months' period of time to get all the bugs out of it, it comes back. The *Sargo* for example, her shakedown

cruise took a cruise of 19,000 miles, almost all of it entirely submerged. She submerged when she left and she came back up and that was about the extent of her surface operation.

The, in this same period, the *Nautilus*, excuse me, the *Triton* plant was being determined. The *Triton* originally was a two reactor submarine, that is one of the characteristics that has stayed with it throughout its history. There were several reasons for this. One- the Navy was looking for, in this case, a high-speed submarine, there were some people who wanted a high-speed submarine and so the thought was, "Well, let's take a look at something that will give us high speed". That means lots of power and in order to get that much power, we'll have to have two reactors. The other thing was to get extra reliability. Again, remember, the first reactor hadn't even been run yet, so how in 1953 somebody says to you, "How reliable are nuclear reactors? Naval nuclear reactors? How reliable are they? How long will they run?" When the Mark 1 prototype of the *Nautilus* started out in the desert, it had an expected life of several hundred hours plus or minus several hundred hours **(laughter)**.

There was actually an experiment in the Chalk River pile in Canada just preceding the prototype running out in the desert that gave an unidentified deposit, a very high corrosion product in the loop that was running in a reactor up at Chalk River and this loop, special loop went into the reactor and back out again, the stainless steel system, and my gosh the samples came out and they were covered in an unidentified deposit. And, people shook their hands in horror and said my goodness gracious is this what happens when this stuff goes through the reactors? Is there something going on in the reactor that gives us this high corrosion rate? This was known as the Chalk River Unidentified Deposit which is Cee Are You Dee and is the standard term in the technology of pressurized water reactors. So CRUD **(laughter)**. And I mean that literally. Today when you talk about CRUD in the reactor system of a pressurized water reactor technology, it really means Chalk River Unidentified Deposit. To this day that particular experiment has never been explained. But, there was real worry when the land prototype was operated because there was not enough time to find out where this came from and whether it applied. I mention these things because people seem to think that, "Gee, pressurized water reactors, that was simple, they were on the shelf" and that just isn't the way it was. They aren't even on the shelf today. A little later I'm going to say a few things about the kind of metals and stuff people give us today and I sometimes wonder if we can ever make them run **(laughter)**.

AUDIENCE MEMBER: Oh come on now.

LEIGHTON: Mack, you gotta defend me, Mack I wanna give your people hell, and I'm gonna. Because we need help, we really do. We try and keep them runnin' but, the question I'll ask you is, you go, you give us the products for these things and now you're gonna go ride this thing under the arctic ice and go up and say hello to the North Pole, and whether you come back depends on what you gave us. That's gotta be reliable.

Triton on her shakedown cruise, she sailed out of New London and everybody said, "Goodbye, goodbye, goodbye" comes back a couple months later and, eighty something days later. Been around the world submerged, never came up. Except to transfer an injured man and throw some ashes over the side. That's pretty good reliability I think for the maiden voyage of a ship. But, it's got to be good, it's just got to be good. You're gonna have these things so they'll

run and run and run, otherwise what's the use of nuclear power? If you substitute an oiler for a tender, what good is it?

Now, there's this metal problems, I have a note in here. See, I've got something that says here, that says, "The gamut of metal problems which are encountered in reactor design appears to be endless". It, sometimes I think it is endless. When you look at each one of the reactor technologies in itself, there are just endless metals problems. And even in pressurized water, all by itself where we're specializing today, we have one metals problem after another.

Now, let me go on with these, with the ship development.

In 1955, there was the concept, now this is the thing, the *Nautilus* hasn't even gone to sea yet, in this time. It takes time, lead time is terrific, it takes seven years to do anything. It takes seven years from concept to finish of a project. We've now got it down to so you can do a nuclear plant in five years, it takes seven years to change a uniform in the Navy, but now we can get down to five years here. If you think that's not true, look up the statistics on how long it takes to change the uniform in the Navy. That's true in any business though, not just the Navy. Don't you people misunderstand me. I'm not trying to tear down the Navy, I'm in the Navy and I'm all for the Navy, but it takes a long time to get anything done and developing a nuclear propulsion plant takes quite a while too.

So in 1955 there were some other classes being determined. The *Tullibee* is one. The *Tullibee* (I don't have a representative here because we only have the Mare Island ships here) is a hunter-killer attack submarine, this was a smaller, even smaller size than the *Skate* class. Again, the thinking in those days was still towards getting smaller submarines and getting, it didn't matter if they were perhaps slower, if they were quieter. Now you gotta recognize submariners worry about noise and we're running a lot of propulsion machinery. High power means noise. No matter which way you cut the cake, some percentage of some fraction of all your energy is going to go into noise vibration and people worry about, say "Fine, I'm out there running around but they can hear me halfway around the world, they'll know where I am", so the *Tullibee* came in to being in concept. That is a so-called hunter-killer submarine. Its basic function is to shoot at other submarines, it is smaller than any of the others. It happens to have an electric propulsion as opposed to a steam turbine propulsion – again, in an effort to get quieter.

The *Tullibee* is one other class, the reactor developed for the *Tullibee* was developed by Combustion Engineering at Windsor, Connecticut. They set up a laboratory in conjunction with the Atomic Energy Commission for developing this project. They did develop and build a land prototype of the *Tullibee* and the *Tullibee* started operating at sea last year. This class is still being evaluated, I think that the turn of events has superseded it. People now are interested in faster submarines and I doubt we'll build any more like the *Tullibee*. A lot of lessons were learned from it. Many lessons are learned from every one of these projects which are then factored in to future projects.

But, also in 1955 came the *Halibut* which was Mare Island's second nuclear powered submarine. This is a Regulus-firing guided missile submarine and is actually the first nuclear powered missile firing submarine built. The, the history of the *Halibut* is this ship was authorized

by the Congress as a diesel-driven submarine. And was actually authorized, plans drawn and was set for construction. There were some people who had demonstrated that you could take the same kind of a propulsion plant that you had in *Skate* and *Sargo* and that you could put it into this diesel-driven submarine in lieu of the diesel without changing the submarine design from one end to the other and make it nuclear propelled. Therefore, this ship was changed in the Congress from a conventional submarine to a nuclear submarine and was built as a nuclear powered submarine. She went to sea in the fall of 1959 for the first time and is currently operating in the Pacific with the other Regulus-firing submarines that are diesel driven.

Now these ships are on the line and they can carry a hydrogen warhead. They don't have the range of a Polaris and you have to surface to fire them, still in all, it's a mighty big ocean, and a hydrogen warhead can blow up a city no matter what kind of missile it's carried in. So it's a very, very potent weapon. See this is old-style now, it only has more firepower than the entire United States Navy of World War Two. We're not building any more because now all the effort on the missile firing submarines is going into Polaris. Now in '55 also, and again we're talking at the time that *Nautilus* first went to sea. You gotta think back on these things. You know sometimes it's hard to say, "Why did so-and-so do this?" and, "Why did they think that?". Well, it's the old Monday morning quarterbacking. It's an awful lot easier to say now what you would have done as opposed to what you did in those days.

But there were people, there were some people who felt that once they got the *Nautilus* to sea that the Navy would, that the people who made the decisions in the Navy, would change their mind and decide that they did want a fast submarine—and might even want one faster than the *Nautilus*. Well, events proved this to be the case. Now the Navy also in the non-nuclear area was working on the *Albacore* at this time. I think most of you probably heard of the *Albacore.* After fifty years of submarine design, or whatever it is, about fifty years at that time, people decided that the whale was a pretty good idea after all. And the whale happens to have a pretty good hydrodynamic hull form, and is very close in shape to what we're building as attack submarines these days. The *Albacore* approximated a teardrop sort of design. The *Albacore* was a diesel-driven, or is a diesel-driven submarine, and was built as an experiment in hydrodynamic hull forms. It was built to find out would it do what the naval architects thought it would do. And it did, and performed very well to give high speed with a single screw. But, of course it was diesel-driven still.

Well, why do we want nuclear power anyhow? The reason we want nuclear powered submarines of course is to get away from the use of oxygen. The *Albacore* can dive and run very fast on a battery, and how long can you run on a battery? If you're running very fast you'll take a lot of power and you don't run for very long. And then if you want to run longer you have to come up to where you can get oxygen to run your diesels. Well, with nuclear power of course you can get oxygen-free power and that means you can dive and stay down and run for long periods of time. So, with the *Albacore*, with the work going on in hydrodynamic design, with the *Albacore* and then with the higher speeds available in the *Nautilus*, if you match the two, you come up with the *Skipjack* design which is the same as the *Scamp* that we're building at Mare Island.

That's a picture, that lower picture there, some of you may want to look at these afterwards. Here's the *Skipjack* on the surface. The *Skipjack* just likes to submerge, that particular picture is taken at high power on the surface and it is only about what, 5 percent of the ship that shows on the surface, and that's fully surfaced in that picture. When you're standing on the Bridge of the *Skipjack*, at full power and you look out in front of you, there's a nice long bow in front of you, and you can't see it. It's all underwater. You look straight down and there's the water. All that's above the surface when you're doing full power on the surface is this sail and a little bit of the superstructure aft here. The whole bow is underwater. You can, if you look down in clear water you can see it underneath, but it doesn't even come up to the surface. These boats go down and stay down.

Somebody asked me earlier don't they have a deck on here? Particularly on one of these other models, is there any deck? Well, why put a deck on a submarine submerged? It's kinda wet **(laughter)**. They're built that way. They're built to be submerged and with fairing surfaces to get the streamlining for submerged operations.

Now, with the *Albacore* you have a single screw, this again is to get this hull shape for higher speed and to get a higher propulsive coefficient with the propeller. A single screw submarine has a higher propulsive coefficient than the twin screw here where the wake from one interferes with the other and reduces the propulsive coefficient, which means in this case that a higher percentage of power goes into making wake et cetera than on this ship. Given power put in, more power goes into moving the ship on the single screw design with this hull form. Well, again, the reactor design for this plant, which is different than the *Nautilus*, then the *Skate* class, then the *Skipjack* class. Those reactor designs were all under development before the *Nautilus* ever went to sea. And that was to try and out-guess them on what was going to be wanted and to get a jump ahead. Otherwise, these ships would not have gone to sea when they did if you didn't have these things well under development by the time the ship was authorized. You'd take longer to get to sea. It is really for that reason, that in the six years since the *Nautilus* went to sea, it's six years this month since the *Nautilus* went to sea. It's because of the lead time that's put into these plants before she ever went to sea that we're able to have as many nuclear submarines as we have today. Or as many different types, to gain the experience from them.

Now, we're building a lot of the *Skipjack* type or *Scamp.* This is *Scamp*, it was launched over at Mare Island last October. This particular one, as I said we only advertise our own product here. These are the Mare Island boats. But, this one will go to sea this year. God willing and if I stop giving talks and go back and go to work. There are some of my people here, what's their excuse **(laughter)**. Now this class was being built in '57 they were under construction, and the *Scamp* for example at Mare Island had been laid down, on the ways. There were five ships of this class already under construction in various yards around the country, two at Electric Boat, one at Portsmouth Naval Shipyard, one at Mare Island, and one at Newport News, when it was decided that the Polaris program could be speeded up, that the missile could be made ready sooner. This also was the time of Sputnik. What was Sputnik, October 1957 I think, was it not? Or was it end of '56? October the fourth, what was it? '56? '57? '57 I think, October 4th, 1957. Yeah, after Sputnik, there was of course the Polaris project was already underway as a missile project and one Polaris submarine was already in the mills for authorization to Congress. But the concept here was to have a ship by I think 1963, to have the first ship on the line, something like that.

But, after Sputnik, there was a lot of flurry in Washington to try and get this out sooner. Furthermore, the initial stages of Polaris had been quite successful so that the five ships of the same class as *Scamp* that followed *Skipjack* were all changed to Polaris firing submarines.

In our case, what was laid down as *Scamp* was changed to *Theodore Roosevelt*. And the way this was done was to, you can see that it's a heavier submarine than the other one **(laughter)**. The way this was done was to separate the ship right here, at the tail end of the sail. We call this part the sail, these are the bow planes here, and the stern planes here, and the propeller of course, and rudder here. That the ship was separated at the tail end of the sail and moved forward and then it was, the after section was moved back here. Now here's the propulsion machinery and here's the torpedo firing and crew's living quarters et cetera. And a missile section was installed in between. Being capable of firing sixteen missiles and of course then all the missile control equipment et cetera had to be also built into the ship. This is a considerable design job, take the submarine and just pull it apart and design the part that went in between. Fortunately, at this point on all five of the ships, the state of construction was such that all you were moving was hull sections and machinery had not yet been installed in these, so you could physically separate them on the ways. You didn't have to cut a lot of wires and pipes et cetera to do it. And that is the beginning of the five Polaris submarines that are currently either operating at sea, or in the case of the fifth one, completing construction now.

There's the *George Washington*, *Patrick Henry* of Electric Boat construction, and the *Robert E. Lee* from Newport News and the *Theodore Roosevelt* from Mare Island and the *Abraham Lincoln* from Portsmouth Naval Shipyard which has not yet been to sea, but is pretty well along in construction. These ships truly do have more firepower. Actually in explosive power, you probably heard this a hundred thousand times, they have more explosive power than all of the ordnance of all the military structures of the world since the history of man started. And that's why these things are like saying the National Debt is umpteen billion dollars. You just can't comprehend it. It's a remarkable thing and here is a ship that's staying submerged, can fire a missile which can, if it hits anywhere close to its target, obliterate a whole city. And we think, the Navy thinks, and apparently the Congress thinks that the taxpayer is getting something for his money because this gives you a retaliatory weapon that gives you time to think. You don't have to worry about the guy in the first thirty seconds of war obliterating all of your missile launching sites, or saboteurs building their own missiles inside your hangar so-to-speak. Got pretty good control over that, he doesn't know where your missile launching platform is, et cetera, et cetera, et cetera.

I'm sure you've read many articles on this subject. But, it is true. Two thirds of the world's surface is covered by water and these things can go anywhere with enough water. Including under the arctic ice and if things get, if they get good detection methods out there in the open sea, which nobody's ever gotten yet, then give them the problem of finding you under the arctic ice pack. Picture a hole in the surface, you can go twenty miles in any direction and find another hole. And surface and sit there, or don't surface, stay under a hole, shoot it out of the hole. Well, it gives the Russians an antisubmarine problem now, we're gettin' tired of the antisubmarine problem **(laughter)** with the Russian submarines. They've got four hundred fifty submarines running around the ocean and it's a tremendous problem for the Navy. The Navy today has a couple very major problems. One of which of course, is to provide Polaris

submarines as a deterrent weapons system and the other is to find some means of controlling Russian submarines. Now one of the means you get after that is of course the nuclear submarine. The nuclear submarine is one of the better antisubmarine warfare vessels. It's a very good anti-submarine warfare ship, actually, and of course that's one reason that we're building so many of them.

Now, going on from there, the last class that we're building right now at Mare Island is the *Permit* class. This, the forerunner of this class is being built at Portsmouth right now, the *Thresher* is nearing completion. We're building two like this, the *Permit* and the *Plunger*. These ships are an improvement in design over the *Scamp* or *Scorpion* or *Skipjack* class. But they are essentially the same, same thing. They are an attack submarine, a torpedo-firing submarine. Of course torpedoes these days are getting even more exotic you know. You can talk about putting nuclear warheads in torpedoes too. The Atomic Energy Commission has certainly done a fine job working with the military to develop nice compact destruction for the world, and you can put a nuclear warhead these days on, I guess on almost anything you want to.

Now, let's talk for just a minute about the surface ships. Naval surface ships. There are three Naval surface ships, the aircraft carrier *Enterprise* which has been launched and has had one reactor, one of its eight reactors go online. The guided missile cruiser *Long Beach*, as Ben may have mentioned, the *Bainbridge*. That's the *Bainbridge* up there, the one surface ship in the pictures. It's a guided missile destroyer leader. For those of you who are old destroyer men, you'd never recognize her, it's almost eight thousand tons which is larger than many former cruisers. But, you have to recognize today you're trying to put long-range missiles on ships, you're trying to get sustained high power, it takes large power plants and the ship comes out wherever it'll come out. You decide on what you want to put on it and don't expect to put everything on a sub-chaser. You want to get these modern weapons on it and get the modern electronic equipment on it and propulsion plant et cetera, you've got to recognize it's going to take some weight and space.

I'll only touch for just a moment on the basic design factor in a naval nuclear propulsion plant. By far the most important consideration given in the design of a naval nuclear propulsion plant is to the protection of the public from radioactivity. This is an overriding consideration. For the first time we're building ships which not only serve a war function, but do have the possibility of creating a real public hazard. Now, we can have a naval ammunitions ship blow up in a city and get us in trouble, we can have any one of our ships blow up and knock out a few piers or something like that, but for the first time, of course, we have something like a pot full of radioactivity on a ship and we have to be very careful about that. And about all I can say here is that a tremendous amount of effort has gone into designing these plants to make them safe and the whole design is predicated around that. The design is reviewed by the Reactor Safeguards Committee in Washington, which is a statutory group set up by the Congress for the specific subject of reviewing reactor designs before they're allowed to operate. This committee reviews the reactor designs of all reactors before they're allowed to operate in populated communities in the United States, including naval reactors, and that committee gets into the designs of these things in intimate detail. I've been up before this committee and had them questioning individual valves and the design of individual valves and why they were placed where they were placed. They look at all the safeguards aspects of these reactors.

A second major consideration of design of a naval nuclear propulsion plant is reliability and maintainability. If it isn't reliable and it isn't maintainable, it isn't much good to you in a naval nuclear propulsion plant. We're not looking for something that says, "Here's nuclear power" we're looking for something that'll drive a ship through the water for sustained periods of time and will stand up in combat. Pressurized water plays a great deal in this part. One of the things that have caused many reactor coolants to be ruled out is their vulnerability. Their vulnerability to either vibration or shock, or just plain lack of reliability. They'd be fine as long as they'd run and then they wouldn't run any longer. You'd always have to worry about that. The *Seawolf* plant was an outstanding plant and if we had not had pressurized water work, we'd just be delighted to have the *Seawolf* plant today. And we'd be building, if sodium had worked, and pressurized water hadn't, we'd be building all sodium-cooled reactors right and left. We'd still be building a nuclear powered Navy. Because having nuclear power versus not having nuclear power is very important to us, and sodium would give us nuclear power. The *Seawolf* operated successfully for several years at sea. You may remember Dick Laning staying submerged sixty continuous days on *Seawolf*. Why did he surface at the end of sixty days? Well, if you stay submerged for sixty days, how long do you want to stay submerged? And this is the longest anybody'd ever been submerged. But, they coulda stayed longer if they wanted to, but you reach the point of no return, why stay any longer? The *Seawolf* has performed very well. On the other hand, pressurized water plants for our purposes are even better. Well, then, why not build the kind that are better? The *Seawolf* today has a pressurized water plant in it. *Seawolf* was taken in to Electric Boat for reactor, the sodium reactor was taken out at the end of the first core life, when the fuel is all used up, instead of refueling it, it was replaced with a pressurized water plant. Yes, sir?

Audience member asks a question.

LEIGHTON: Ah sodium, so the basic drawbacks of a sodium system. One, you cannot tolerate leaks of any size whatsoever. This is a serious drawback. You just can't afford to have any leaks. Now, you got to manufacture large components, large heat exchangers with many, many, many, many welds, and you've got to produce them on a production basis for a whole Navy and you gotta have 'em without leaks. Well, we worked very hard to make the *Seawolf* very carefully and we had leaks. And the first thing we had was a leak that leaked in to the superheated steam system and this was a sodium potassium alloy that was used as another fluid in the plant, leaked into the superheated steam system and caused caustic corrosion and just chomped its way through a stainless steel pipe in a matter of hours, and we had to isolate the superheaters from the system. We had other leaks in the sodium system. At West Milton we had leaks, both in to and out of the sodium systems. Small leaks on both plants. Once they would operate for any period of time, we had no further leaks so the chances are that these particular leaks were in the initial fabrication. But doggone it they'd be hydroed and re-hydroed and hydroed again and they'd been inspected to a fare-the-well on every weld and every place, but you're asking for a lot to ask for large components to be made leak-tight. There are other big drawbacks. Sodium has a fourteen point eight-hour half-life; it becomes highly radioactive. You want to dry-dock the ship, what are you gonna do? You gonna drain the sodium out of the system? If you want to dry-dock in a hurry, if you're willing to wait, you wait two weeks, but if you're not willing to wait, then you wait seven or eight days while you drain it out, flush it out et cetera to try and get this

radioactivity down so that you can put the thing into a dry-dock and drain the seawater out around it. So the people can work in the dry-dock. You wanna go down not because of the power plant, you want to go down to get a look at your sonar dome, you ran in to a whale last time you were out **(laughter)**. Well laugh, the *Seadragon* on initial sea trials chomped in to a whale: she chomped one of her screws into a whale and limped home on the other shaft. They had to dry-dock it right away to look at the propeller and find out what was the matter with it. There are many reasons why you wanna dry-dock a ship, that's why we've got dry-docks. We have four of them over at Mare Island and it's not at all uncommon to bring a ship in. *Howell* had gone out on a sea trial and she had a mine cutting cable cut loose, get caught in the propeller, dragging it. Dry-dock her, clear the propeller, send a diver down if you can, but if you can't, dry-dock the ship. We dry-dock them all the time. It's a matter of routine, but in a sodium plant, it's not a matter of routine to dry-dock your ship. This is a disadvantage to a ship.

Far away from theoretical advantages. You say, well it has fine theoretical advantages, one of the things people are always gonna say, yes but it gives you high temperature and that's not an advantage, high temperature's not an advantage. High temperature is a disadvantage. Now, if you get less weight and space, increased efficiency or some such thing, it's an advantage, but high temperature per se is not an advantage, high temperature per se is one of the darndest disadvantages you can get. One of the real disadvantages of a sodium-cooled plant is that it operates at high temperature and has a high delta T across the reactor. Which means that every time you go through a transit, you slug it with a thermal shock, that's a real disadvantage unless you get something for it. Well, we got something for it, we got a higher efficiency in the *Seawolf*. What's that mean? Higher efficiency, we can run around the world on the uranium anyhow. It has a higher thermal efficiency, but be careful! In fact the overall efficiency is not higher, because it just so happens it has an intermediate spectrum and it just so happens that the ratio of neutron captures to neutron fissions in uranium at the intermediate spectrum is higher for the neutron captures and therefore, the efficiency, the thermal efficiency was higher, but the efficiency in terms of kilowatt hours per gram of uranium burned was less because of the nuclear characteristics. So don't just talk high thermal efficiency, that doesn't mean anything if you're burning more uranium. You can design it maybe to get a thermal reactor. We also happen to have there a type of core, in order to use the structural material for this you had a stainless steel, and this has a higher neutron capture cross-section so it takes more uranium to make the thing critical in the first place, which means a bigger investment of uranium. But the net result was that for the same power between the *Nautilus* and *Seawolf*, the overall weight of the plant and size of the plant was about the same size and was a little heavier. The machinery was smaller in the engine room because you had better steam conditions, but you put it all back in, you put it all back in to the weight of the shield, to shield against the radiation of this sodium. Well, those are some of the disadvantages of sodium. It's a harder material to play with, it's just not as nice as water. It's a wonderful thing, it was a very marvelous plant. I don't want to in any way imply it was not a successful plant. We had problems with it and we had, I said cons with the superheater et cetera but the *Seawolf* operated successfully on a sodium plant for several years and ran a hundred, matter of fact, went a hundred thousand miles on her sodium plant. It was a very fine plant, but it wasn't as good as a pressurized water plant for our applications. That gets into reliability and maintainability, the very thing I'm talking about. It was not as reliable or not as maintainable in any case. She ran and she ran beautifully. The thing we never knew was whether

it was going to conk out tomorrow, and if it did conk out tomorrow we couldn't do anything about it. We couldn't get in to the reactor compartment to look at it.

Now, we've had cases for example, in pressurized water plants where a foundation, some; you're always at the mercy of every mechanic, every welder, every electrician, every inspector in the country **(laughter)**. Now, some guy doesn't make a weld properly on a pin that's fastening a major component down in a reactor compartment see, and some inspector doesn't catch it, Joe Dolt, somebody. You can find out from a card who it was alright, but somebody didn't do it right. You had to get down and inspect it once in a while. For two years we couldn't get into the reactor compartment on the *Seawolf* because the radiation level was so high, and in order to do it, we were gonna dump all the sodium, we would have had to flush it and flush it and flush it et cetera. So, it was never worth putting the ship out of commission long enough to get down there to find out, and you never knew. Now, fortunately it was put together right and we didn't have to worry about it, but I've seen plants where you go down, you go look, you find some little thing wrong. Something that if you didn't catch it then, would lead to trouble tomorrow. We actually had a pin, we had on one ship, we had after her sea trials, she came back in and a weld hadn't been put properly on the end of the pin, the locking device, the locking device fell off, the pin supporting one of the main components was backing out. Now you go out for another half a dozen dives, the thing drops out and the component falls off the bulkhead, then you're in trouble. But, in a pressurized water plant we can get down and look at these things. We can, when the ship comes in, we can dry-dock it if we want we can shut down the plant and as fast as we get the thing open we can get in and look, and any time we want to. These are operational advantages. These are not the things that you talk about with high temperatures and the theoretical advantages, but in this game also, in any new game, don't go by the old advantages. High temperature is better. I mean that's something, high temperature isn't better and even in high temperature steam we pay a price to get it, but we got something for it. If you get something for it, fine. If you don't get something for it, don't do it because it hurts. High temperature metals people, you must know that. High temperatures are harder to get. Of course it, somebody always says, "Yeah, but look at all the interesting problems" **(laughter)**. Well there are people that think that way, but we don't. We're looking for the simple way **(laughter)**.

Ok, another one, another major factor that's for reliability and maintainability, another major factor is cost. Cost is a real problem. We're expensive, we're in an expensive business. People think for some reason you ought to get nuclear power, they think it's fine, and they want it, but they want it cheaper than you had diesel power or something else. Well, it just doesn't come that way. All modern technical developments cost more money, it's a fact of something or other. I'm not an economist, it may be the fact of the economy, it may of metallurgy, I don't know what it's a fact of, but it's a fact. Modern developments cost more money, and you've gotta face up to it. You've got to look to see what you get for it, and in our opinion, you get something for it of course and that's why the Navy's building nuclear powered ships even though they cost more than conventional ships. Although today, in nuclear powered submarines, it does not cost as much as twice the price of a conventional submarine, and boy they're worth more than two conventional submarines. So, that's why the Navy's building all nuclear powered submarines. In surface ships this is a big argument—a big argument. That's why the Navy's only building one of each type, and until they operate them at sea and they sit and evaluate them for

several years, nobody is gonna want to build very more of them. There are differing opinions on the subject. I have my own, but we won't take time for that now.

Weight and space is another major factor considered in the design of any of these plants. It is something that you are continually fighting to bring down, the weight and space. At the same time we put higher on the list of the design: the reliability and maintainability. And when you wanna talk increased ranges, increased operation, you can go full power for many, many years, so why not do it, and let's go. You are pushing machinery harder than it's ever been pushed before in a naval vessel. At Arco, the land prototype of the *Nautilus* at one point was operated at full power continuously for sixteen hundred hours. That is a long time to operate a machinery plant. The Navy and its normal certification of propulsion plants runs for four hours at full power, and then ships operate at full power every once in a while. Those of you've been in the Navy can count on your fingers the number of times that the ship you were on operated at full power. Even during the war, during the war you're always saving that fuel to get home, or get out, or run, or something **(laughter)**. And, you burn up your fuel too fast. You don't operate at full power very often. Your range at full power is very limited, so you don't go up there very often. So our machinery history in the Navy for just plain propulsion machinery is not based on operating at high power for long periods of time, and that doesn't make the stuff get lighter, it makes it get heavier. This is a constant fight, to bring down the weight and space, but we have to maintain the reliability. If we make it weigh half as much, but it will only operate occasionally, it isn't much good to you.

Well, in that regard, I'd like to take just a few minutes to discuss a point near and dear to my heart. And I'd like to take some of you to task for this, your society is devoted to the improvement of metals, and a great many of you here are in the education field, and you've trained engineers. People coming along in this business, others of you are from fine American industry that produces a lot of this junk, and I mean junk, that we get **(laughter).** By junk I define it this way, I don't care if it cost a hundred million dollars, if it doesn't work, it's junk. And I mean that. I've had people say, but it's so beautiful. Look at the technology that's gone in to it, everything else, but it doesn't work. No, then it's junk. I don't care how many PhDs or anybody else massaged it and design or anything else. If it doesn't work, it's junk **(laughter).** I don't have a PhD so I'm not insulting myself **(laughter)**. But, it is so. Now…

Audience member asks a question.

LEIGHTON: I was asked a question to compare the weight of a nuclear plant to a diesel plant for the given horsepower. Actually, the pounds per shaft horsepower which is a term I don't wanna use because again, it's misleading. It's like high temperature. But, in a nuclear submarine, pounds per shaft horsepower-wise we have an advantage. The nuclear plant's lighter in pounds per shaft horsepower. The ship, however is larger and heavier because there's more horsepower. But, there is an advantage in submarines. Surface ships, where pounds per shaft horsepower has been really worked down in conventional surface ships, we're hard to compete. The pounds per shaft horsepower in a nuclear plant for the same horsepower is greater. And this is one of the reasons we haven't been able to get the smaller surface ship. Because the, they're larger. Let me qualify that to one extent though. People are very much misled on that subject too. If you're gonna spend the price of nuclear power to build a surface ship, for crying out loud put something else on it besides a propulsion plant, and that makes the ship get expensive, it also makes it get

large again. I mean, this works both ways. I don't know how much you know about naval design, but actually in some of our conventional surface ships, if the ships were made bigger for the same propulsion plant, they would actually go faster. Because people have this idea, make it small, make it small, why do you want it small? "I don't know, but I like it small." And some of them are not optimized at all for maximum speed for a given power, actually making the ship longer, to some degree, for a given power you may make it go faster. And then you can actually put more into the same ship and have it go faster.

Well, let me get back to the subject that I wanna mention **(laughter)** and that is the question of detail in what you work on. To work on the details and don't get up in the office to go make big decisions, let's worry about that goes in to it, and the other is to make sure that all of it comes through right, not just one of it. Now, I got a table with a whole bunch of junk over there, you may wanna look at. Pieces of pipe for example, that come to us, fine reputable pipe manufacturers who send us stainless steel pipe to stick in a ship. We also, they've tested it, it's all fine, wonderful, high quality control, paid a huge price for it, we ultrasonic test it, find big gouges on the inside of it. Not frequently but I don't have to find it frequently. All I got to find it once and I'm in trouble. If I install a piece of pipe like that in a submarine system I can get in serious trouble. And the poor guy, he's there under the North Pole and he says goodbye cruel world, and that's a wonderful vendor, but one half of one percent of his pipe was no good, it ruptured, and here we are sinking gaily. It's no good. It's gotta be one hundred percent working, not ninety-nine point nine percent, one hundred percent. There are a couple pieces of pipe like that over there, there are all kinds of examples on the table, you might want to take a look at them. Maybe some of them were made by your companies, I don't know.

I'll just tell you a little story to try and bring this home. I was on sea trials with one particular submarine, on the first time we went out, and I won't mention the submarine, and I'll try to keep away from anything classified. But, let me show you the kind of things that can happen to you. We were making full power and fortunately we were on the surface. First time we'd been out to sea in this fine ship. Worked our way up to full power, everything is wonderful. We're all smiling, feeling very proud of ourselves. The ship's Commanding Officer elected to blow a couple of the tanks dry. Well, he wasn't gonna blow them dry, he was just gonna blow them down to prove that you could blow water out the tank through this line, while he was underway and he was gonna leave a water seal on the bottom, and he watched the tank gauge, and when he gets down to this point in the gauge stops blowing and leaves water in there, no air coming out of the ship. First thing that was wrong, the tank gauges didn't work. He blew it and there was still water in the tank, according to the gauge. But there wasn't any water in the tank. The air blew all the water out and the air was blowing out of the ship. Well, alright, that's no great sin. Second problem, the designer of the ship had built bilge keels on the bottom of the ship. That would be as if you'd taken, this ship doesn't have that kind of a keel, but that's as if you'd put a keel on here for roll stabilization on the surface. A lot of you are familiar with that.

Alright, he put his bilge keel down here, he calculated it from a ships standpoint, and it was just fine, great. He ran it back in here, and from a naval architecture standpoint, that was swell. But this gets to another subject, find out what the other guy's doing. Don't just sit in your own corner, or don't allow your people, and those of you in education please teach this to your people. Tell them when they're working on anything in design, go find out where it's going and how it's going to be used. These particular bilge keels, after we dry-docked the ship afterwards,

we could see that it ended right next to the sea suction for the main turbine's condenser. Well, air coming out here, riding back, trapped by the bilge keel, and sucked into the suction of the main pump for circulating water into the condenser. Grand. Pumps don't run on air, they run on water. Pumps are air bound, they don't pump water anymore, so what happens? Condenser loses vacuum, condenser loses vacuum you can't run a turbine that way. That closes stop valves, and that shuts down the main turbines. Also shuts down the turbine generators. Well, these reactors require coolant, and to have coolant you gotta have pumps, and to have pumps, you've gotta have electricity. Shut down the TG, sets the pumps stop. Pumps stop, reactor shuts down. Well, we'd just gotten up to full power on the surface and like that we weren't running anymore, just coasting to a stop, reactor shut down. All safe, mind you, nothing unsafe, but very disconcerting **(laughter)**. Thankfully while I was in charge of the propulsion plant, Admiral Rickover was driving the submarine **(laughter)**. I wasn't exaggerating, it was very, very disconcerting.

Member from audience: What did he say?

LEIGHTON: Oh, he's a very understanding gentleman **(laughter)**. You know what he says? He said, "That's happened before and I don't understand why these guys didn't know it" but that's another point **(laughter)**. Anyhow, that's just the start of our problem, when you notice one little old thing like a gauge in the tank, some designer worked on somewhere, it wasn't working right. Another guy who does here, and the real lesson here is, not lookin' to see where he's right on this thing. He's taking care of naval architecture, but not worrying about where it ends. That we'll find out about later, at this point all we knew was we had shut down the reactor. Now, this is just the beginning of the story, do you mind if I take the last five minutes to finish the story? The next problem, you try to start the diesel generator, well that starts all right. We have an auxiliary source of power in these things just in case nuclear power doesn't work and of course the ship immediately went on to battery. That's automatic, but the battery doesn't have an awful lot in it so you start the diesel to get yourself some electric power back, some more electric power. We had, for the battery, you get a small amount of electric power, you can run the vital loads, but you can't run the ship on that for any length of time on a nuclear submarine. So, we start the diesel generator and that's all fine, but the diesel generator has to be cooled, as does any good piece of machinery, and to cool that you've got to have seawater pumps to shove seawater through it, and we have also sea suctions for the auxiliary seawater pumps and they're right aft of the main suction and that's right next to the bilge keel again. So those pumps were air bound.

Now, here you are inside a massive steel hull, that's where you are you know, you try to figure out what this is all about, and the ship's force figured out what had happened, they knew they'd blown the tanks, they figured the air somehow had gotten back to these sea suctions, didn't know anything about this bilge keel problem at that point, but knew somehow this air had gotten carried back and figured that these pumps were air bound. But here's where we got ourselves in worse trouble. What we didn't know was that in the Napa River, see now I've already said it's Mare Island, let's say in the Yangtze River or whatever you want **(laughter)**. They had a peculiar form of animal life that particular year that was growing quite rapidly called hydroids. I don't know if you know what hydroids are or not. I'd never heard of them before, I have now. These things look like seaweed but they're actually living organisms and they just grow and grow and grow. And, in the river and that particular season, for some reason beyond all previous years, they had grown like mad. And these hydroids had grown inside the sea suction sea chest in the ship. We didn't find that out until we came back either and dry-docked the ship.

They'd grown right up inside and made a very handy-dandy, handy-dandy filter. Then, as luck would have it, the ship when it came to a stop, came to a stop in a bed of jellyfish **(laughter)**. Now your design has gotta knock off these jellyfish or something, but I think you can't control that. But, anyhow **(laughter)**. There also were some shrimp because in the torpedo tube sight glass there was actually one shrimp living inside of the glass. We knew we'd come in to some marine life in that area **(laughter)**. It sounds funny now, but it sure wasn't funny then. The, what actually was happening to us, but unbeknownst to us, was that these jellyfish were getting sucked up against the sea suction and against this fine mesh of hydroids, and normally jellyfish will just get sucked right into a sea suction and get chopped up in the pumps and out the other side, because the seawater pump is of that nature. Well, with this fine mesh, these things jammed up against it, and when we dry-docked later we could find these jellyfish hangin' on this thing. Well, we didn't know all about that and what was actually happening was these were blocking off all the sea suction, so while the crew was frantically trying to vent these pumps, to get the air out of them, they long since had gotten the air out that had come in by blowing air in, but they couldn't get any sea suction and didn't realize it. They thought their problem was that they were still air bound from the air that had blown in. Didn't know, and there was no way to know. Well, the subject came up of well let's blow out the sea chest just in case something else has gotten in there and clogged it up. But, of course, and I think at that point it appeared logical, no don't let's do that because we're already air bound. Blowing air down the chest isn't gonna help us any. We've already got air in it and the thing to do is to vent it out. Well, that was the problem and improper diagnosis you might say, if there are any doctors present.

Anyhow, things were not going so well though. The diesel was overheating and had no way to be cooled down. The reactor meanwhile had been put back on the line and we could get enough sea suction to get enough auxiliary cell water for spurts. Now a reactor, any reactor, has some kinds of control elements, and control elements imply motors, and without getting in to classification I think we can say there's some electrical equipment involved in control of a reactor, and any electrical equipment, the chances are requires some kind of cooling, and this particular one requires water to cool it. And the water was not seawater of course, but it was a, another kind of water and this kind of water though, has to be cool. On any ship, you end up cooling anything from the sea sooner or later. So, you had to have a source of auxiliary seawater for cooling this thing through some sort of a chain. Now, if you didn't keep 'em cool, then you're not allowed to operate the reactor. And the problem here was that, that a number of control elements indicated that they were going over temperature for lack of water, and therefore the book says, so many minutes of this and you gotta shut down. We were within three minutes of so many minutes. So, this gets very disconcerting because by this time the diesel had to be shut down for overheating due to lack of cooling water. And, there you are, you're on your first sea trials of a brand new nuclear powered submarine, and you have no diesel, you got the reactor runnin' but you got three minutes left to figure out your problem or you're out of business.

Well, I didn't want to tell Admiral Rickover we had to be towed into port for sea trials **(laughter)**. You laugh, I wasn't laughing. Neither was anybody else that was there, and I think there's some people in the room that were there besides me. Furthermore, I was very hot because by about this time point, to get minimal electrical load, you have to shut down all your air conditioning system and in a nuclear submarine, air conditioning is fundamental. Now the British had tried building one steam-driven submarine before this. People overlook this. Putting nuclear power in a submarine is new, but putting steam in a submarine is new also. The British

had built one steam-driven submarine, it's been an abysmal failure because it just got too humid, and too hot, they didn't have good air conditioning in those days. That was long ago, and of course Admiral Rickover, and I keep mentioning his name, and I mention his name because he personally has made the decisions on these issues, and all the ones I mentioned tonight in particular were major decisions made by Admiral Rickover. Very often over a great deal of opposition by technical people on technical subjects, and air conditioning is one of them. It is a history of a fight in Washington that's strewn with blood, the subject of how much air conditioning to put in nuclear submarines. Well, he always insists that we not let an air conditioning set be the thing that makes a nuclear submarine come home, let's make it the nuclear reactor plant that requires us to go home, not just the air conditioning. And so we put a lot of air conditioning in. But, in this case we had to shut it all down in order to use the electrical motor. So things were getting pretty hot and humid, and you have a lot of electrical equipment and it won't keep running as long as it's humid. So we were getting in a nasty situation. Not safety, don't misunderstand me, we were on the surface, we hadn't dived at all, we were just sittin' there, nothing unsafe, but doggone awkward, and certainly no way to be doing this thing, and a similar situation in wartime could be disastrous, that's the other thing.

I'm trying to get in some principles that do affect this though, of the interrelation of events that get you in trouble and you've got to worry about detail. I'll take the blame, we should have had divers check those sea chests before we got underway. As it turns out had they checked them, the chances are we wouldn't have seen it because the stuff was on the inside, not the outside, and the diver probably wouldn't have seen it. But believe you me, we don't send a submarine out of there that hasn't had a sea chest thoroughly cleaned before she gets underway these days, and we watch the hydroid growth in the Napa River right now **(laughter)**. I mean that literally, we know it grows in that river and we keep track of what grows in that river and when it grows. You can't, at least we try to learn our lessons.

Ok. So at this point the ship's force got smart and they figured out how to cross-connect some of their saltwater systems and they got enough water to cool off the control elements, get the reactor, keep the reactor on the line. We didn't have to shut it down, and finally blew the, we knew it was air, but we blew what turned out to be jellyfish and what else was whatever out there. We did see after that in operating lots of jellyfish in that area and we're convinced that that was what finally did us in, the jellyfish on top of the hydroids. And blew it out and we got going back on the line. I only cite this to show that very small things, very small things can lead to success or failure. Now in this case it was initial trials, that's what we run trials for, we go find out these things, another case, one of our ships took a very severe down angle, and why? Because a valve stuck. A valve stuck. Forward tanks are flooding all right, but the after tanks wouldn't vent, and when you do that, you flood the forward tanks, the valve was down and the after tanks won't vent, it stays up, and that can get very embarrassing too. Along about the time you pass the forty-five-degree angle you start getting nervous in the service **(laughter)**. Details, and I mean that literally. Details. One lousy valve hanging up on you. Sure, you could put a hundred of those valves in, ninety-nine of them will work, but one of them doesn't work, things happen in a hurry. They happen doggone fast.

So, I would like to at least try to encourage any of you that have anything to do with training engineers to make them worry about details. Don't be above a detail. It's a detail that kills you every time. I don't know what's gonna come outta this situation, Arco, with the Army

reactor plant that blew up, and nobody else knows right now either. But I'm willing to bet you that you could put together a story not too far different from our hydroids and jellyfish and a gauge that didn't work et cetera. Well we didn't have a real problem, and never was safety involved in any way, but nevertheless it had considerable consequence to us, and always on these things, you can put together a story like it and the only way you can beat it is to worry about the details, and to think about it, and then think about it again. And in this business the only way you do, you worry about it, is to look at what you're getting and look at it again.

Of all the components we get in, one out of four pieces of hardware that I get requires something to be done to it before I can use it. And this is after it's been certified and we can assure you the manager of the company thinks it's the grandest thing that ever happened, that we have checked it and checked it, and checked it, and very often it is junk. Literally. We had to cut a ship open here recently and take a component out that everybody said was just fine, and we finally found out it wasn't -- very poor welding -- very, very poor welding. Out of the eighty-eight joints it had in it, there were eighty-seven that had cracks in them. Made by a manufacturer and we stumbled on to it and we had to take it out of there, and there are many other ships being cut open today to take the same things outta their ships from fine U.S. industry. So, I don't want my remarks to be taken as being critical of the United States government or the great American people. But, if they want to compete, if they want to compete in technology today, they've gotta work harder and they've gotta be more careful of what they're doing. You've got to be and you've got to train your people that way. You've got to train them to worry. You've gotta train them to look at what they're doing and look at it one hundred percent and then look at it again. And to worry about how one thing affects another. Well, if it's anything I can say, that you'll believe me, I hope that's it. Because that is something that in this program we have tried to do, is to worry. A lot of us spend a lot of hours worrying and that is why I think, that nuclear power plants have been reliable and why these ships can cruise around the world submerged, they can go to the North Pole and come back, they can go on station with Polaris missiles and make the enemy worry. But, we aren't gonna make the enemy worry until we worry, and we oughta make our products work. Are there any questions? Yes, sir?

AUDIENCE MEMBER: Speaking of worry, does a submariner worry about getting all sixteen Polaris missiles off the submarine with no malfunctions?

LEIGHTON: Well, submariners get paid submarine pay, I guess that's to take care of the worries. The obvious thing there is, that a tremendous amount of effort has gone in to trying to make these ships reliable and make their systems reliable. You read in the papers of course, where some of them have been fired, some functioned and some did not function. As far as the submariner is concerned though, he doesn't really worry about the thing blowing up his submarine, he is concerned whether he can deliver all his missiles to the target, and actually all these can function. But the system is such that the missile does not ignite its engine while it's in the ship. It's ejected by air, so if it didn't eject, the missile hasn't been activated. He doesn't have to worry about it sitting there going off and it's held back and it's gonna burn up the ship. It is an air ejection system as you may have noticed from Edward R. Murrow's program on "The Year of Polaris." It is hurled into the air and then ignited. So he's not worried from that standpoint, but naturally he's concerned that he has a reliable system and that's why such a tremendous amount of effort goes into checking these out. That's why these things cost one hundred million dollars apiece, it's because of worrying about these things. Is it worth one hundred million

dollars? I don't know, what is freedom worth? And certainly this is one of the things that's helping to protect what freedom we do have. Another question? Yes, sir?

Audience member asks a question.

LEIGHTON: The question is, what do we put on these ships in case there's just an enemy ship you want to shoot? The Polaris submarine, is designed as a deterrent weapon. It is not designed to shoot at enemy shipping, from the standpoint of going to war to do that. It is armed with torpedoes to defend itself. But, the function of this ship is to be a deterrent to enemy attack for wholesale war. You just can't design every function into the same ship. We've got the deterrent power; we've got to be able to fight another war. These are all attack submarines, and they fire torpedoes, their function is to shoot at enemy shipping. Submarine or surface ship. That is their function. Not to shoot at cities, to shoot at ships.

AUDIENCE MEMBER: They have no deck guns?

LEIGHTON: No, no, they don't surface to shoot, they fight their war underwater. They fight their war underwater, no guns. There's no point in putting guns in these things. If this guy can't perform his mission submerged, he isn't gonna bother coming home, or somebody's gonna fix it up so he doesn't.

Audience member asks a question.

LEIGHTON: The question is, "Is the torpedo used today the same as it was twenty-five years ago?" The answer is no, a tremendous amount of development has gone on to try and develop better torpedoes. If you'd asked that question at the beginning of World War II, the answer would have been yes, but because of course that was one of the real problems in the Navy, that there had not been torpedo development between World War I and World War II, and of course the Japanese had torpedoes far superior to ours, the great Americans did not have them, but I hope again that we learned our lesson, and an awful lot of our effort went to improve torpedoes, but I can't go in to any details in that. Yes, sir?

Audience member asks a question.

LEIGHTON: Well, that's a good question, there are a lot of arguments of one screw versus two screws and of course the obvious question is, if you have two screws and something happens to one of them, why then you can run on the other. If you only have one, then you've had it as far as operating. Another means of propulsion which I don't want to discuss is provided, but will not give you any speed at all, but the answer to that is, what you do, you buy one screw in order to get the improved ship performance, and then you do everything you can to guard this propeller. To keep it. It's one thing about it is, it's centrally located, you've got the planes and the rudder to help protect it and to divert things, and you build as much guard around the propeller as you can to prevent damage to the one propeller, but if you in fact do any major damage to the one propeller, then you seriously immobilize the ship. As I said there's another means of propulsion, but nothing than other just a slow speed.

Audience member asks a question about noise.

LEIGHTON: Quieter than diesels. Well, I don't wanna get into what's quieter and what's noisier because I get in to classified areas. All I can say for that is that a tremendous amount of effort. First of all, we have high powered machinery which automatically generates a lot of noise. Now a lot of effort goes in to trying to find means of making them as quiet as possible. I can say this, that those people who, in our Navy, that have tried to stand up against the nuclear submarine in attack exercises find that they have enough trouble with conventional submarines, it's even more trouble with nuclear submarines. But, I can't go into definite noise comparison. Always get in trouble. See, I'm lucky - I don't know the answers to these questions, but I can say it's classified **(laughter)**. And, in fact it is classified but also in fact, well I know the answers to some of them, but not all of the details. Yes, sir?

Audience member asks a question.

LEIGHTON: Are any of the nations of the free world building nuclear submarines. The British have launched their first nuclear submarine. The propulsion plant for the *Dreadnaught* is the same as this type of propulsion plant, and was procured from the United States under a special contract bilateral agreement between the United States government and the British government. The British worked for several years on the development of a nuclear propulsion plant for a submarine and finally concluded that they just couldn't afford to keep working on it. They're better off to buy one of ours and work on development from there. So, arrangements were made to sell them one propulsion plant of the *Skipjack* type, or the *Scamp*. This is same type. All these, well this, and this one, and that other one have the same basic propulsion plant, and they're buying one of that type. That ship hasn't been launched, I'm not sure when she's going to sea, someone here might know the answer to that. Now that's the only one I know of that is anywhere near completion. I think the French have announced that they're working on the design of a nuclear-powered submarine, but I don't know the status of it. The Russians, that's something else again, and the Russians of course have stated that they are building it. The first official statement, or first statement by an official to a member of our government, that they were building a nuclear submarine was when Mr. Kozlov told Admiral Rickover that they definitely were working on nuclear submarines. And as far as I know, this was the first official statement on their part, but they have made statements since, and Mr. Khrushchev has stated that they have nuclear submarines. But, they have made no official statements as to how many and what their state of completion is. They of course have built the *Lenin*, which is the nuclear-powered ice breaker, with three reactors in it. The power of each of those things…

AUDIENCE MEMBER: … four Russian nuclear subs that are actually in the water?

LEIGHTON: I can't answer that; it may have but Janes may have listed that. Janes usually has some pretty good dope that's usually on that sort of thing somewhere close to the truth. I don't question for a minute that the Russians have nuclear submarines or have them under construction. If they don't, they certain can have, let's put it that way. No question the Russians have the technical capability to build nuclear-powered submarines. Now, whether they're building them or not, how many, I don't know. Yes, sir?

AUDIENCE MEMBER: Is zirconium considered an absolute requirement for a workable submarine?

LEIGHTON: The question here was, "is zirconium considered an absolute requirement for workable submarines?" No, I wouldn't say that. Zirconium is a very good material for what we want, but the *Seawolf* had no zirconium in it. And it was a workable submarine. So, it's not an absolute requirement, but it is the, of the metals that we know, it is one of the best, and it's the one that we are making a lot of use of. Yes, sir?

Audience member asks a question.

LEIGHTON: Oh, I mentioned a pebble-type reactor. I'd rather not take the time on that. There were some discussions of a reactor using so-called pebble. You put the fuel in the little pebbles and then you ran, or you actually fluidize the bed, you ran a gas stream through it and actually ran the stuff in suspension in the gas stream. It's just a conceptual design study. Submitted by some company, I forget, Flue or something like that, or somebody. People, you can, if you think of it, it can be done. Well, somebody thought about it for a reactor design and of course it's true of any business, and some of these things may be good concepts.

AUDIENCE MEMBER: Are they graphite pebbles?

LEIGHTON: I can't answer that. I don't recall. As far as I know nobody's talked about actually building one. Yes?

Audience member asks a question.

LEIGHTON: Oh, the activated rudder.

AUDIENCE MEBMER: Yes.

LEIGHTON: I don't know. I guess people still work on that sort of thing. I can't tell you the status of the concept of the activated rudder today, it's been proposed off and on for many many years. I don't know. It's not, well, let me put it this way, it's not currently employed in any U. S. warship. But, if it's another subject, it has nothing to do with nuclear power, this is a question of an activated rudder, which makes a ship swim like a fish tail. Any other questions? Yes, sir?

Audience member asks a question.

LEIGHTON: How long does it take to refuel one of these? That gets in to a classified area. How should I answer that? *Nautilus* has been refueled, what, now refueled twice now, right? Or three. *Nautilus*. Been refueled twice, been refueled twice. I don't know. You talk, you do it, the concept of refueling nuclear submarines is to do it during an overhaul where the refueling is not the controlling item. You do, as in any machinery plant, you have to overhaul, and so you save them all up, and you overhaul it, and while you're doing it, you refuel it.

Audience member asks a question.

LEIGHTON: The question is, on the wings, the, with the *Albacore* hull form, going to nuclear power, the bow planes were moved, *Sargo*, *Halibut*, all the World War Two submarines, the bow planes are on the bow. In this hull form, they've been moved to the sail and it gives you a better

hydrodynamic performance submerged in the high-speed submarine of this hull form. It's a better control over the ship's angles at high speed.

AUDIENCE MEMBER: But the *Halibut* had none.

LEIGHTON: No, with the *Halibut* you can't see it, there are bow planes on the bow on the *Halibut*. You can't see it from where you're sitting. But these, all of these high speed submarines, this hull form, single screw boats, all of them moved the bow planes to here. It just gives you better control submerged, which is a naval architects' problem and I won't try and explain to you all the reasons why.

Audience member asks a question.

LEIGHTON: No sir, no. Bilge keels are not common on submarines.

AUDIENCE MEMBER: do any of the component tests from the alloy or lower alloys able to compete with the stainless hardware?

LEIGHTON: For…

AUDIENCE MEMBER: Pressure vessels.

LEIGHTON: No, I don't think so.

AUDIENCE MEMBER: Are there still stainless steel fabrication problems?

LEIGHTON: Right now we're having stainless steel fabrication problems, that's right, and there are problems. Now, these are not unsolved problems, our problem is find one to go solve it, you can do it, but we can weld stainless steel, the problem is to do it in production. The problem is to do it with the kind of welder you can hire and the kind of training you give them, anything that requires a higher state of training costs you more money, fewer people that can do it, a higher rate of inspection. It's a cost proposition. There's no question that we can weld stainless steel. We can build stainless steel components, the question is, can we do it on a production basis, and do it repeatedly, at any reasonable price? That's our problem. These problems are obviously solved, you can build these plants, the question is, can you do it at any kind of reasonable price? Yes, sir?

Audience member asks a question.

LEIGHTON: Can't answer that one. I think, I'm not even sure what the unclassified depth you're allowed to say is. I think over two hundred feet or something. Can't talk about submergence. Another question back there?

AUDIENCE MEMBER: Is there any bright future for conversion of heat to electricity?

LEIGHTON: Oh, any bright future for the conversion of heat to electricity. Well, that really has nothing to do with nuclear power, so I won't go in to that.

AUDIENCE MEMBER: I meant, instead of running a generator.

LEIGHTON: I know exactly what you mean, but it ain't got nothing to do with nuclear power **(laughter)**. No, this is one, well let me just take a moment on that. That's been one of our problems. People have all kinds of ideas, and naturally, in order to sell those ideas, they go to a program that is moving and has money in it **(laughter)**. That's literal, don't laugh, that's so. For example, for years people tried to sell the idea that you should work on direct conversion of heat to electricity, and base it on the nuclear program. Missiles have got money today, and I wouldn't be the least bit surprised to see that come in, and people come in and say well now, this is what you need for your missile. People naturally go where they think there's some money that they can work on their idea. And this isn't an unreasonable thing, but it is as long as you're associating in your mind that these things have anything to do with nuclear power. When you can get a good heat conversion straight to electricity fine, the talk about applying it to nuclear power which is a heat source. But get your thermal-electric power first and then talk about applying it to nuclear power. If it's hard to do with heat, it's gonna be harder to do when you've got radiation involved in it, and if it's hard to get materials to produce thermal-electric power, it's gonna be even harder when you add on to the fact to the material you get all the problems of materials to start with to get thermal-electric power, now you say they must stand high radiation fields, and that makes it even tougher.

I have a personal opinion in this subject, I don't think the thermal-electric power for nuclear applications is going to be seen to any advantage in any near future. There is no question that you can get thermal-electric power, heck the Russians power their radios in their homes, and a lot of rural communities with a kerosene lamp and you may have seen one of the Russian radios with a little kerosene lamp, and it provides the electrical power for running the radio. Or an ice box that way. They've got ice boxes you can run off a kerosene lamp. Refrigerators. So there's no question that thermal-electric power, well let's start with the thermocouple, we use those every day, and go on from there, and it is a subject which needs greater exploration, a lot of work should be done. I don't wanna say it isn't important, but I think for nuclear applications as a source of heat, it's not be coming in the near future to an advantage.

AUDIENCE MEMBER: It does seem like a nice quiet way to run a submarine.

LEIGHTON: It seems like a nice quiet way to run a submarine. One of the fundamental problems with thermal-electric power for a nuclear plant is that, by it's nature requires you establish a thermal gradient, and to establish a thermal gradient requires a large amount of power. Now, what do you do when you wanna go from full power to zero power? You reject some, even at twenty percent efficiency in a thing which is very hard to get, you reject eighty percent of your heat to the sea, and if you've gotta run your reactor at eighty percent power to run the shaft at zero power, you gotta be real careful how you go in to this. Furthermore, you have to have maneuvering transients in these. You talk about a base load plant that's gonna run at full power the whole time, it's a different proposition than a submarine which has to maneuver, and when you're gonna maneuver, you either run this doggone thing at high power, you additionally have to worry about thermal shock. So, there are a lot of problems, but they're not insurmountable problems perhaps. It's another whole major field. Yes, sir?

Audience member asks about materials after exposure to radiation.

LEIGHTON: Well, I did say that we do lack information, and one of the best places to get information on the technical nature on this, is of course in the experimental piles at Arco. They have the materials testing reactor, the engineering test reactor at Arco, that are built specifically for the subject of putting experiments inside them and taking out the results at a given time, and looking at them to see what happens. All I can say on our course, we're not experimental reactors. We put them in there to give them life and when the fuel is burned out, we take them out and put more fuel in. What I can say is, that before we ever commit a core to a nuclear reactor, we have ensured within the capability of engineering development, that that core will last the life of the fuel before we ever put it in. In other words, that the material will stand up throughout the life of that core. We don't put it in until we feel convinced that it will. So where we get the engineering information to determine our limits is out of experimental facilities.

Now, the land prototypes I might add are a real asset to the country, the land prototypes are used as experimental facilities in addition to being land prototypes. All of our land prototypes for these propulsion plants are built to simulate submarines and we train our crews on those land prototypes. A crew gets trained to operate a reactor before it ever sees a ship on the land prototypes. But in addition to that, the land prototype reactors are designed to be able to run experiments in them. In addition to actually being operating reactors, we can run experiments in them to gain such information as you're talking about. Although, in the prototypes, we do not run experiments which we think will lead, or are liable to lead, to failure of fuel, in the experiments. We run those in places like, at Arco in the engineering test reactor, materials testing reactor. Today, a lot of information's available, on the other hand, a lot of times it takes a year, or two years from the time we start the experiment, you start the experiment, until you've got back the results. It's a very slow and painstaking process to develop information. Particularly for trying to get cores to last the length of a war for example. Now you're trying to get a long-life core and you want to subject it to life testing, you've gotta subject it to a long-time test. And then when you get it out, it's highly radioactive so in order to analyze it, you have to do it in very, you have to do it in these hot cells, you know, where you can do remote control et cetera. Yes, sir?

Audience member asks a question.

LEIGHTON: I would say the question is, are costs going up or are they coming down when you come to multiplicity? Where we have built multiple submarines the prices have come down. Electric Boat's prices on three nuclear submarines of the attack-type, some are displayed over here, were considerably less than prices for individual submarines. Now there's no question that multiplicity will lead to some reduction in price, but we are in a high priced business nonetheless.

AUDIENCE MEMBER: Still changing so frequently.

LEIGHTON: You're still high priced, you're still making changes, you're still trying to improve, but we get some price reduction from multiplicity, but we're still in an expensive business no matter what we do. We aren't gonna cut by a factor of ten or anything like that, but you can pare off ten percent, twenty percent, something like that. Any other questions? It's getting pretty late here.

Audience member asks about testing components and accepting weld x-rays.

LEIGHTON: We use x-ray and ultrasonic both to a great degree, yes.

AUDIENCE MEMBER: So the failure of these welds, have they been weld x-rayed?

LEIGHTON: Generally speaking, if we have satisfactory radiographs, no. For example I mentioned a heat exchanger, uh, a component we had to take out **(laughter)** the particular welds concerned which had cracking had not been radiographed. That's how we found out about it, we radiographed them. They had not been radiographed. It was a type of a weld that was very difficult to interpret the radiography on, and therefore it had been put together with a dye-check team, dye-checking every pass, et cetera, and not radiographed and we happened to find reason to radiograph them and did radiograph and found defects and went from there. But we do use radiography a great deal on our welding and we of course accept the results of that, as leading us where to go.

END OF LECTURE.