Q. Mr. St. Pierre, I have one question that I would like to clarify. I believe you testified that there were two b(1) pound reducers in parallel, and that in the event one of them failed, clogged up, the other is cut into the system?
A. Yes, sir.

Q. This implies in my mind that normally only one is in the system. Is this transfer automatic or does it have to be done manually?
A. It could be both; it could be done both ways. The reducer that is normally in the system is a b(1) pound reducer. Actually the stand-by reducer, we still refer to it as a b(1) pound, when actually it is a b(1) . So with b(1) pounds downstream of this stand-by reducer, the reducer would be inoperative. Now in the event that the reducer that is installed in the line and working the system -- if that be cut out of the system and the downstream pressure, because of components being operated, the pressure dropped to b(1) this pressure reducer automatically reduces the pressure from b(1) .

Q. If your downstream pressure drops then below b(1) they would both be cut in?
A. Well, no. I made the statement that the b(1) pound would be removed from the system, would be out of the system.

Q. Yes, but assuming this and that the --
A. Yes -- yes -- yes.

Questions by the president, VADM Austin:

Q. Mr. St. Pierre, was the frequency of difficulties coming from contamination of the air lines greater at the beginning of the overhaul or at the end of the overhaul?
A. I'd say it was greater at the beginning, sir.

Q. And it gradually decreased?
A. Yes, sir.

Q. Seeming to indicate a gradual clearance of the lines the hard way?
A. Yes, sir. I was on THRESHER five or six workdays prior to her leaving on trials and I had to rectify a deficiency that was signed by Lieutenant Smarz. I located Lieutenant Smarz and got the information necessary to take care of the deficiency; and while I was there I asked if there were any problems with the air system, and he answered in the negative. I also asked the same question of Chief Johnson -- he was in contact with us quite often about the regulators and about the high pressure air reducing station and the system itself -- concerning any other deficiencies in the air system; he also answered in the negative.

Q. Did you know about this spike in the filter before reading the newspaper accounts?
A. No, sir.

Q. It was never brought to your attention?
A. No, sir.

Q. In retrospect, do you feel that the quality of work in connection with the air system on the THRESHER could be improved to eliminate or reduce in any way this large amount of trouble with the contaminated system?
A. Yes, I feel that more care could be taken so that these contaminants do not enter the system.

Q. Have you been inclined to wonder if there were actually deliberate contamination of that system?
A. I have never given it any thought, sir.

Q. Do you have a sufficiently high regard for all the workers that worked on that air system to feel that it would be probable or improbable or impossible for any one of them to be guilty of contaminating that system?
A. No, sir.

Q. What do you mean by the answer, "No"? You don't think any of them would?
A. That's right, sir, yes.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

COUNSEL FOR THE COURT: Mr. St. Pierre, what classification would you accord to the sum total of your testimony?

WITNESS: ~~Confidential~~. Unclassified

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court recessed at 1142 hours, 25 April 1963.

The court opened at 1310 hours, Thursday, 25 April 1963.

All persons connected with the court who were present when the court recessed were again present except (b) (6) who was relieved by (b) (6) as reporter.

No witnesses not otherwise connected with the inquiry were present.

Richard Riley, Captain, U. S. Navy, was called as a witness by the court, was informed of the subject matter of the inquiry, was advised of his rights under Article 31 of the Uniform Code of Military Justice, was duly sworn, and was examined as follows:

The witness was informed that he was privileged to disclose classified information and at the end of his testimony he would be asked to assign the highest classification he considered applicable to his testimony.

Unclassified

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, rank, organization and present duty station.
A. I am Captain Richard Riley, U. S. Navy, Bureau of Ships, Code 423, which is the Ship Protection Section in the Design Division.

Q. What is the nature of your duties in the Bureau of Ships?
A. As the head of the Ship Protection Section, I am responsible for the incorporation of all possible measures and facets into a ship design, other than offensive means, to insure its maximum reliability in time of battle.

Q. State, briefly, your naval and professional background and experience.
A. I was graduated from the Naval Academy in December, 1941, served at sea until mid-1944, at which time I went to postgraduate school, and since 1946 have been designated for engineering duty with duty in Puget Sound Naval Shipyard; Commander Service Force Pacific Staff; Bureau of Ships; Bay City, Michigan, Supervisor of Shipbuilding. That is about it.

Q. How long have you been in your present billet in the Bureau of Ships?
A. Since November, 1960.

Q. This court has information that THRESHER underwent shock tests just prior to her recent post shakedown availability period. Are you familiar with those tests?
A. I am, sir.

Q. Do you have a copy of the preliminary report of those tests in your possession?
A. I do.

Q. Will you produce it please?
A. Yes, sir.

Unclassified

Unclassified

The court then examined the subject document. Counsel for the court then offered it in evidence. There being no objection by the court or counsel for the party, RADM Palmer, it was so received as Exhibit 83. Counsel for the party, RADM Palmer, waived reading the exhibit at this time.

RPTR: This will be Exhibit 83.

Q. Briefly describe for us how the tests were conducted?
A. Well, as indicated in Table 7 of the report, six shots were fired against THRESHER at varying ranges from b(1) resulting in shock loadings which we refer to in terms of shock factor. The maximum shock factor is an emperical relationship of the weight of the charge and the slant distance from the charge to the ship's hull. The first shot fired on the 17th of June was at b(1) and the final shot on 29 June was at a b(1) The table gives the weights of charge as b(1) and the condition of the ship at the time of the shot.

Q. What was the location of the test?
A. These tests were conducted off Key West in approximately 300 feet of water with THRESHER submerged at periscope depth for all shots and the charge at about b(1) submergence.

Q. Who authorized the tests?
A. The tests were authorized by CNO Message of 15 January 1962, date time group 22523Z.

Q. Have you covered comprehensively the shock levels in those tests?
A. The shock level was of increasing severity for each test as indicated in this Table 7 -- b(1)

Q. Have similar shock tests been conducted on other submarines?
A. Yes, sir. THRESHER's test is the most recent of a series of six tests against submarines of recent vintage.

Q. You were in the Bureau during all of those, were you?
A. All except one, sir. Starting with the TROUT in Fabruary of 1960, and SKATE, BONEFISH, SKIPJACK, and THRESHER. -- Excuse me, there were five.

Q. Briefly compare the maximum shock level used against THRESHER with those used against the other submarines you've mentioned?
A. Well, reading down the list, TROUT was tested to b(1) SKATE to b(1) BONEFISH to b(1) SKIPJACK to b(1) and THRESHER to b(1)

Q. Has the Bureau of Ships estimated the lethal hull splitting shock intensity for THRESHER?
A. We have estimated the shock factor required to cause severe hull deformation, which for those same ships in the order listed is TROUT, b(1) SKATE the same. BONEFISH b(1) SKIPJACK b(1) and THRESHER b(1) This results from her deeper test depth and stronger hull.

Q. And to recapitulate, how does it compare with the levels used in the shock tests?
A. In the case of THRESHER, it is about b(1) The shock test was conducted at about b(1) if you can call it that. In the case of SKIPJACK, b(1) approximately, b(1) lethality on BONEFISH. So it is about the same ratio of maximum shock severity

Unclassified

to hull lethality.

Q. Are you familiar with the damage sustained by THRESHER as a result of these tests?
A. I am, sir.

Q. Will you relate the damage that she sustained, at least as to her critical systems - those that affected her critical systems?
A. Well, in total there were 622 damage items in THRESHER and they ranged in importance from nuisance or minor value -- minor importance -- to potentially serious. Significant items are listed in the report and I can read from those if you like. We have attempted to single out all the items which we felt, had they occured under combat conditions, could have affected the safety of the operability or control of THRESHER's attitude.

Q. Single out the key items that you have described?
A. Well, the first item 1-1 -- the series number refers to the shot number and the item number under that shot, 1-1 being the first casualty reported for Shot 1. The item was hydraulic piping to the forward trim line valve to the forward torpedo tank. The actuator supply line became disconnected at valve due to failure of sil-brazed connection. The main hydraulic system was lost for about one minute. And there is further description of the casualty here. Altogether, there are probably 40 to 50 of these items. I don't know how specific you would like me to be.

Q. Forty to fifty key items?
A. Items that we feel reflect on safety and ship control and propulsion capability.

Q. Can you limit this to use, as your criterion, criticality in peacetime operation instead of war?
A. I have not so attempted. Bear in mind that these were casualties under simulated battle conditions.

Q. The witness is calling attention to page 26.
A. There are 77 items which we had singled out of the total 622.

Q. Do you have them summarized on a piece of paper?
A. I do, sir, by time, item number and reference of the item number in the report. (Hands document to counsel)

PRESIDENT: I think we want to examine these but I don't think we need to take testimony on them.

Q. Would you describe this paper for us before we offer it in evidence?
A. Well, this is a list of deficiencies occuring during THRESHER"s shock test which includes all items considered to be concerned with the safety of the ship; namely watertight integrity, ship control and propulsion.

Questions by court president:

Q. Safety of the ship under what conditions, Captain?
A. As to her watertight integrity, closure from the sea, her ability to control her attitude and depth and her ability to manuever with her propulsion plant.

Unclassified

Q. Would there be any expectation of similar derangement, in the absence of a shock wave, emanating from charges of the magnitude which you described as used here?

A. In the case of certain of the watertight integrity items, yes, sir, from pressure alone. In the case of -- for example circuit breaker failures, no. In the case of stern plane control, no.

Q. Would the pressures experienced at periscope depth at which the ship was operating be the same in the absence of shock wave from the explosions that they would be with the shock wave?

A. No, sir.

Q. How then can these be too applicable to just plain submergence?

A. If I might give an example, sir, Item Number 6-208 which is the Number 2 PUFFS hydrophone, - there was a cracked weld in the well. It would be expected that under full submergence depth this leak would develop just as it did under shock attack at shallow submergence.

Q. Was the weld cracked before the shock tests explosions or afterwards?

A. Afterwards, sir.

Q. And you feel then that this weld could have cracked --

A. Might have cracked, sir. Certain of the sil-brazed joint failures--

Q. Might have failed?

A. Might have occurred under deep submergence.

Q. What you are saying, as I understand it, is that there is a relationship between the damage or deformation experienced from these shock tests and those which would be experienced from the submergence to deep depths, but that this relationship is not a direct one.

A. That there could be a relationship.

Q. There could be?

A. Yes, sir. Primarily in the watertight envelope.

A document summarizing information contained in Exhibit 83 was offered in evidence by counsel for the court. There being no objection by the court, counsel for the court, or counsel for the party, RADM Palmer, it was so received and marked as Exhibit 84.

RPTR: This will be Exhibit 84.

Question by counsel for the court.

Q. After examining the history of the damage which was sustained by THRESHER during these tests, did you form any opinion as to the quality of workmanship and materials reflected by tests?

A. Well, THRESHER, as in all the previous submarine tests exhibited failures due to poor workmanship, poor maintenance, and poor design. We exerted considerable effort in THRESHER prior to the shock tests, to weed out, as it were, as many of these deficiencies that had shown up on previous tests, as possible, in a pre-test shock hardening availability. We expected better performance from THRESHER as a result of these efforts and THRESHER performed better than other ships. I, this morning, compared the total number of damage items sustained in

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the other two nuclear submarines tested and the two conventional submarines, with the number of damage items sustained by THRESHER. As an example, SKIPJACK at b(1) which was the most severe test in the series - sustained a total through the test of 380 casualties. THRESHER at the b(1) in her series had sustained only 292 casualties. I drew a little graph of this performance. The lower curve is THRESHER to plot a shock factor versus number of items and the upper curve as it is drawn through the total number of items on each of the two previous tests and THRESHER's test. We would expect that THRESHER would sustain many more at the higher shock factor than either of the other two at the lower test level. So we expected THRESHER to perform better and she did.

EXAMINATION BY THE COURT

Questions by a court member, Captain Hushing:

Q. What was your general impression of THRESHER at the end of the shock trials as to material condition?

A. Well, it has been my opinion that any ship subjected to shock tests was in substantially better material condition at the end thereof, both from a material and a crew training standpoint, in that many hidden deficiencies which could have been ground in during the building period have been discovered and eliminated and the crew has actually undertaken damage control procedures under simulated battle conditions.

Q. Well, were there any major elements of the ship's system or components which were out of action at the end of this shock trial that you remember?

A. It is my recollection that THRESHER conducted a full power trial shortly after departing Kev West in route to New London for post shakedown availability. She was, however, limited in diving depth because of a hull leak, and I believe she had some ordnance systems that were not fully operable. But, basically, as far as ship control and ship propulsion, she was fully operable.

Q. Between each shot was there a very careful inspection of the ship to determine the items that had failed and the items that had not failed and then perhaps a determination of the conditions of the items in between?

A. Yes, sir, there was. Prior to the first shot there was a thorough inspection both by ship's force and by Electric Boat Division personnel and BUSHIPS personnel of the entire ship to attempt to record pre-test conditions. After each shot, a detailed inspection was made by these same personnel in an effort to record all deficiencies or lack thereof.

Q. After the last shot, how long did the inspection take in time?

A. I do not recall the exact time required but it was a matter of days. In addition to the damage inspections, there were acoustic signature trials conducted. I think an index to this might be in the fact that THRESHER was given her last trial on the 29th of June and the time from there to her arrival in New London, other than transit, was basically devoted to inspection and acoustic trial.

Q. Turning to some of the other ships which have been subjected to shock, during the post shock availability, has it been rather general that additional items of damage have been found by the inspection of the Shipyard and the ship's force?

A. Yes. In fact some of the items of damage in THRESHER do not appear in the report in that they were discovered during Shipyard examination subsequent to the arrival of THRESHER in New London. A couple of specifics in this case-deformed ballast tank plating which was underwater, loose main condenser bolts--

items that were hidden from the inspection force because of the cramped conditions in the ship at the test site.

Q. SKIPJACK had a rather long availability after her shock tests, as I remember. Did the Shipyard continue to find shock test damage items in SKIPJACK all the way through the availability? -- Do you have any knowledge of that? What I am trying to determine is it a usual thing to continue to find items of shock damage through the entire availability of one of these ships?

A. I would think the answer to your question would be no, sir, that during the initial stages of the availability as the components are being disassembled, items do come to light, but I think that we probably have as complete a list on THRESHER - excuse me - I don't know when the last item was reported on THRESHER.

Q. Well, there was one quite late in the post shakedown availability and for this reason I was attempting to find out whether this is the usual situation. Let me ask your opinion relative to the probabilities of having undiscovered damage in salt water systems on THRESHER during the post shakedown availability. You know of the inspection that was done on the ship at Key West and you know, generally, the plans for the Shipyard availabiltiy inspection. What would your opinion be as to the probability of undiscovered damage in salt water systems at the end of the availability?

A. I would estimate that the probability would be very low of any undiscovered deficiency.

Q. Can you think of any kind of damage that would be hard to discern?

A. Outboard valves, of course, are not subject to hydrostatic test with the system. Their hull connections are not subject to hydrostatic test with the system. However, these should be relatively easy to verify visually - the large valves. I don't believe I could pinpoint any specific item that would be difficult to isolate.

Q. How about flexible couplings in various kinds of salt water systems?

A. I'm not an expert on flexible couplings but I know they do have a stated service life. They are subject to the hydrostatic pressure in the system test.

Q. How about residual stresses of piping systems resulting from shock and perhaps inadequate pipe hanger supports or inadequate pipe foundation supports?

A. I think, in general, the shock tests would tend to relieve residual stresses rather than to induce further residual stress.

Questions by a court member, CAPT Osborn:

Q. Captain Riley, have you gone into any investigations where you have, say, maximum deflections with respect to shock, particularly where these are associated with flexible couplings of the EB type rather than flexible hoses, where if you went through maximum deflection you could pre-stress say a silbrazed joint in tension or torsion?
A. I'm not sure I understand your question.

Q. Well, the point I am trying to make is, could you, if you put something up against a limit of a snubber with respect to shock, put enough torsion on a fitting to weaken its bond, and would a hydrostatic test most likely pick this up?
A. Well, there again, I am not a piping connection expert. I see your question but I would think that either through hydrostatic or sonic testing, that a joint so deranged would become apparent.

Q. There wasn't any question in your mind when THRESHER went to sea, that all the deficiencies, either induced stresses - relieving of stresses - or any other deficiency that might exist, had not been found, was there?
A. No, sir. The commanding officer of THRESHER, the overhauling activity, and the Bureau personnel involved, all had complete damage information, as complete as was available, and I would have no reason to believe that they did not proceed to repair every item of damage.

Questions by a court member, RADM Daspit:

Q. Referring to the leak in the THRESHER hull, which I think was in the PUFFS foundation -
A. Yes, sir.

Q. - which could have been induced through a crack or porous weld or something of that nature, can you tell us anything about what was actually found when the ship reached the Yard?
A. I do not know what was actually found, Admiral.

Questions by a court member, Captain Hushing:

Q. Captain Riley, in your earlier testimony, you stated that there were deficiencies observed, poor workmanship, poor maintenance and poor design--did you say that?
A. Those are the three basic categories, yes, sir.

Q. Regarding THRESHER, and comparing her to say SKIPJACK, was the workmanship better than SKIPJACK, or worse than SKIPJACK?
A. From my recollection of SKIPJACK, I would say they were about on a par, sir.

Q. So that the deficiencies from workmanship were generally of the same kind?
A. Yes, sir.

Q. You have said poor maintenance was also a potential cause for this kind of damage. How do you mean that poor maintenance was a cause for deficiencies?
A. Well, the first thing that comes to my mind is a paper clip in the crypto machine which put the crypto machine off the line for a period of time. This is ship's force maintenance--loose gear, poor housekeeping-type maintenance.

Q. Was THRESHER any better or worse than SKIPJACK and the others in this regard?
A. I would say about on a par, sir. It is a common deficiency.

Q. Now, let's talk about poor design. Was the design of the THRESHER, in the deficiency areas particularly, any better than or worse than SKIPJACK or that of the preceding boats?
A. I'm sure the board is aware that THRESHER was of a different design, especially in regard to her main propulsion plant and crew's living space, which served to demonstrate a much better performance by THRESHER than the other ships.

Q. So that, from what you could see, the design of the THRESHER contributed to her better performance?
A. Yes, sir.

Q. Do I understand, then, that your comments relative to poor workmanship, poor maintenance or poor design are simply categories into which the deficiencies could generally be put?
A. That is correct, sir.

Q. Rather than a general overall description of the ship?
A. It applies to all of the ships we have tested.

Questions by the court president:

Q. After the conclusion of the inspection following these shock tests, you were quite familiar with those things which have been shown up to be weak spots in THRESHER, were you not?
A. Yes, sir.

Q. Now, is there anything that comes to mind, which might have been a more probable cause than anything else for the loss of THRESHER?
A. I do not believe so, sir.

Q. In other words, the failures which you observed in THRESHER as a result of this shock test did not disclose to you, or anyone else, to your knowledge, a design deficiency, a material condition or a training deficiency which might be suspect as having caused the loss of THRESHER?
A. As my previous answer was based, so is my answer to this one, on the presumption that all of the deficiencies were corrected during the post shakedown availability, and corrected properly. I am not aware of the work that was done there, so presuming adequate corrective measures, I know of no single item that is highlighted as a possible cause, and I have wracked my brain considerably on this point.

Q. In other words, the shock tests did not cause any condition which was not correctable?
A. Not to my knowledge, sir.

Q. Nor did it disclose any condition which was not correctable?
A. Not to my knowledge, Admiral.

Q. Therefore, in your opinion, if those items which were correctable, which were shown to need correction by the shock tests, were appropriately attended to during the PSA, there is no doubt in your mind that the ship would have been safe to go to deep submergence depth?
A. I have no doubt at all sir.

Questions by a court member, Captain Osborn:

Q. Captain Riley, with respect to the ships that we have subjected to shock, and in comparison with sister ships of the same class, where you do have a sister ship of the same class, has there been any tendency with respect to the ship having been shock tested, to exhibit a greater rate of failure in any particular area of the ship?
A. Well, bear in mind that we have only tested one ship in each class. We have not had repeated tests.

Q. Well, I am talking for instance, with respect to the SKATE's performance since her shock test and subsequent yard overhaul as compared against SEADRAGON or anything else as exhibiting a pattern of failure?
A. Well, my point is that SKATE was the only ship of her class tested. SKIPJACK was the only ship of her class tested; likewise, THRESHER, TROUT and BONEFISH,--all one ship of each class that we have tested thus far, so we have no comparison within a class of relative performance.

Q. Well, I am comparing to the ships that have been shock tested within a class, to the ships that have not been shock-tested within a class; and have you looked into this issue?
A. No, sir, I have not made such a comparison. Of course, as I stated at the outset, we are attempting to simulate battle conditions and we would presume much better performance under battle conditions of a shock-tested ship than of a nonshock-tested ship. As far as routine performance in a peacetime environment, I cannot speak on that point.

Q. Well, obviously, no definite pattern with respect to weakening the ship has been established with respect to having conducted the shock test. You think a ship having been shock tested is in just as good a shape after the deficiencies have been corrected as one that hasn't, is that correct?
A. As far as hull integrity is concerned?

Q. Yes.
A. Yes, sir, and possibly better condition due to the relieving of the residual stresses that we talked about a moment ago.

Questions by the court president:

Q. May I follow up on that question? As I understood it, Captain, you said that the shock test, rather than making a hull more likely to fail, would because of the relief of residual stress, would tend to make it less likely to fail because of such tests, is that correct?
A. That is my feeling, yes, sir.

Unclassified

(b) (6) was relieved as reporter by (b) (6) , at this point.

Q. Do you have any knowledge regarding the effect on hulls of repeated submergence to deep depth?
A. I do not have such information, but I know that such information does exist.

Q. Do you know the nature of that information?
A. In general.

Q. Would you state it for the court?
A. There is a fatigue limit for any steel structure, in fatigue life, due to repeated loading and unloading of the structure.

Q. Has the length of this life been determined for a hull of the THRESHER type by any means?
A. I believe it has, Admiral, but I'm not certain. However, in this regard we peen a weld to relieve the stresses, and for shock tests we were essentially peening the whole ship.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Do you know of any main sea water valve derangement in THRESHER as a result of the shock tests?
A. If I might refer to my summary list (the witness was handed Exhibit 84).
b(3) 10 USC 130

Q. We don't care to hear about that.
A. I believe that's all.

Q. To the best of your recollection, was any encountered in SKIPJACK as a result of her test?
A. I'm not certain, sir.

Q. You testified that after her shock tests, THRESHER was operative. Compare her condition, in that respect, that of SKIPJACK in her tests.
A. Well, my recollection is that SKIPJACK was also fully operative. I'm not certain of that, but I do know that in the case of BONEFISH she was not operable, because of main vent valve failures, and had to be drydocked.

Q. Was the diving depth of all submarines subjected to shock tests limited to shallow depths after their tests?
A. BONEFISH was limited to surface operations. I'm afraid that I don't have the answer for that one.

REEXAMINATION BY THE COURT

Questions by the President:

Q. Captain Riley, as I recall, you said that in the case of the THRESHER they were able to make a full power run immediately after the shock tests.

Unclassified

This would seem to indicate that her nuclear power plant suffered no serious derangements: is that correct?

A. There were minor derangements in the nuclear plant area; the reactor did not SCRAM on any of the tests. If I might just refresh my memory for a minute. (The witness studied his papers) I can't put my finger on the specific statement, but it is my recollection that she did make a full power trial. In the conclusions of the report itself, it indicated that propulsion and depth control were maintained with only momentary interruptions. Under the existing test conditions, the reactor plant operated without interruption.

b(1)

Q. This is the point that I wanted to establish; that the THRESHER, insofar as her nuclear plant was concerned, was of a high order of reliability, as determined on shock tests.

A. Yes, sir.

Neither the counsel for the court, the court, nor the counsel for RADM Palmer wished to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

I think all of my feelings and opinions have been expressed in the course of the questioning, Admiral. I do have official movies taken during THRESHER's shock trials, which show details of machinery and equipment response to the various tests, which I am ready to show.

The president announced that the court would adjourn to a nearby projection room to view the film "Shock Test of the U.S.S. THRESHER."

The court adjourned at 1420 hours, 25 April 1963.

The court met at 1422 hours, 25 April 1963, in the conference room in the same building, Building 86, to view the aforementioned film.

After completing viewing the film, all personnel present returned to the regular place of meeting, where the court was reassembled.

The court opened at 1440 hours, 25 April 1963.

All the members, counsel for the court, counsel for the party, RADM Palmer, the witness and the reporter were present.

No witnesses not otherwise connected with the inquiry were present.

The witness was warned concerning his testimony and withdrew from the courtroom.

Frank Dunham, a previous witness was recalled as a witness by the court, informed that the oath previously taken by him was still binding, and examined as follows:

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. Dunham, the court is sitting in closed session and classified information may be divulged. At the end of your testimony I will ask you what classification you would assign to your entire testimony taken at this session.

A. Yes, sir.

Q. We have testimony that in the latter half of the month of June, 1962, THRESHER underwent a series of shock tests, and that later she came to Portsmouth. During her post shakedown availability certain work was done on her resulting from those tests. What instructions did Portsmouth have concerning work to be done at the Portsmouth Shipyard arising out of those shock tests?

A. The initial instruction we received from the Bureau related primarily to the task of reviewing the shock damage reports and determining what corrective action would be necessary to improve the performance under shock. The Bureau, in a letter, indicated that they would provide us with a list of these items that they wished us to investigate. We were to make the investigation, report back to them what our results were, with recommended action. They would review these recommendations and inform us where to go from there. I have letters here that show the results of these investigations. They were submitted to the Bureau in four separate packages. The actual work that was accomplished during the PSA was dependent on two things; first, whether the design information was made available in time, and secondly, whether the material to effect the improvements could be made available in time for the PSA.

Q. You have a letter from the Bureau of Ships which ultimately directed the Yard to perform certain items of work?

A. There were two letters which pertain to this. The first letter assigned us the task of doing the investigation. The second letter, in effect, told us to accomplish corrective action during PSA, where possible.

Q. Did it list the items?

A. It listed the items, and provided an asterisk in front of each item that they thought it particularly desirable to accomplish through this PSA. It is this top letter to which I refer.

Q. Would you produce it?

A. Here it is.

A letter from Bureau of Ships to the Commander, Portsmouth Naval Shipyard, dated 11 July 1962, was submitted in evidence, and there being no objection, it was so received and marked Exhibit 85.

Q. Do you say that you have another letter in this connection?
A. A second letter, dated 3 August 1962, added additional items to the list for Portsmouth to investigate.

Q. Will you produce that letter?
A. Here it is.

A letter from Bureau of Ships to the Commander, Portsmouth Naval Shipyard, dated 3 August 1962, was submitted in evidence, and there being no objection, it was so received and marked Exhibit 86.

Counsel for the party, RADM Palmer, waived the reading of Exhibits 85 and 86 at this time.

Q. Mr. Dunham, who was in fact responsible to see that these items were in fact picked up and checked on by the Yard?
A. I was responsible for the design investigation of these items. I was assigned the task of heading up a group in Design, comprising myself, a machinery man, an electrical man, a hull man, and a man from the test section. This group participated in the shock tests at Key West. They were also assisted by a man from P&E. Their main objective in the test at Key West was to become familiar with the effects of the shock test, obtain a first-hand knowledge of the results, so that when they came back they would be prepared to immediately jump into the main task of writing up the reports of damage. On our return to Portsmouth, this team immediately went into this job, analyzing each item of shook damage, determining if there was a design deficiency which contributed to the damage, and determining a corrective action for the damage.

Q. Were you able to determine corrective action for each item of damage?
A. I would say so, yes, sir. Where we could definitely determine that the damage was due to shock, we could come up, and if we determined that this was a design deficiency, we were able in each case to come up with a recommendation for a design fix, for those items for which Portsmouth had responsibility.

Q. Could you hazard an estimate as to the proportion of items which were determined to be damaged as the result of shock?
A. You mean, of all the items that were assigned to us for investigation, what percentage we could attribute to shock failure?

Q. Yes, shock failure.
A. I would say, at the most, fifty percent.

Q. Did you arrive at any conclusions for the reasons for the failures of the other items?
A. Yes, sir.

Q. What were they?
A. Some of them were due to faulty installation. Some of them were due to improper operation. Some of them were due to installations that were not covered by design work. By and large, I would say the majority of them you could class as faulty installation.

Q. Can you think of any major items in that category?

A. One would be the failures in sil-brazed connections. There were some in which the bolts were of the wrong material. There were some in which the welded connections were improperly made, not in accordance with the plan.

Q. Were these findings documented?

A. If they were on the list of items which we were to investigate, yes, sir. Our report would have indicated our reasons why the failure occurred.

Q. My question is related to the two lists which were admitted as Exhibits 85 and 86. In addition to the items listed in 85 and 86, did you make any independent investigation of damage resulting from the shock tests?

A. Yes, sir, this team did make a thorough over-all check of the ship when it arrived. Also, as each of the individual items was being investigated, items of a similar nature on the ship were also looked into to determine if the damage extended to them. We found cases, for instance, a case where a foundation attached to the hull failed. This had not been reported by the Model Basin. We did not stop at this one particular foundation, but we extended our investigation into other foundations similarly mounted to the hull, to determine if the effect of the shock were such that they would also have been affected in a like manner.

Q. Did you report the findings of additional shock damage uncovered during the post shakedown availability period?

A. Yes, sir, we did. We added those items that we found in our investigation in Portsmouth to the list of items that we felt that we were responsible to the Bureau for making a design investigation.

(b) (6) relieved (b) (6) at this point as reporter.

Q. (By counsel for the court) What were these additional items, Mr. Dunham?

A. I made a list of them, of the major items.

Q. Can you recall the major ones?

A. Yes, sir. I'm just trying to lay my hands on the piece of paper on which they are listed, if you will abide with me (the witness examined papers in his possession). I have it. These are major items that we found in our investigation at Portsmouth that were not included in the list of items provided to us by the Bureau. In the hull area, we have three. The first one was the foundation bolts for the main condenser The second one was the foundation for the main hydraulic accumulator. The third was the foundation for an air pressure in the main ballast tank. I will go over this list, and if you so desire, I will emphasize the details. In the electrical area, we found two that were significant: the battery air flow transmitter, a mounting flange, and on the steam plant gauge board we found some screws on a cover that had failed. In the mechanical area, we found a failure in one of the brackets that held the torpedo ejection pump. In a second one, in the diesel underwater exhaust piping, one the the expansion joints was flattened. A third one, a failure in the pressure transducer housing. The fourth one, a plastic fairing for the snorkel head on the ECM mast; a failure in the wave guide spacer. In the capstan, we had a small failure there. The main lube oil strainer pump, we found a sil-braze joint failure there. And a last one in the mechanical area, the b(3) 10 USC 130 overspeed trip.

I would like to mention at this time that some of these items were discovered because they were submitted by the ship as part of their deficiency items. I think when the ship got back here, the crew made a very thorough check and submitted additional items that they discovered that were damaged. They submitted them as deficiency items. These deficiency lists were reviewed by us with the Bureau, and if we felt that any of these items was a shock item, they were added to our list for a design investigation. If they were not shock, they were put on a regular work list as a repair item. I believe that summarizes the significant items that we uncovered.

Q. With reference to all of the items you have mentioned, did corrective action remain undone on any of them at the end of the period of post shakedown availability?

A. I think we will have to define "corrective action," for this reason: that our responsibility to the Bureau was to come up with a design fix to permit the ship to withstand shock loading. We also had a different type of corrective action which would involve putting the ship back in commission or operation without improving its shock resistance, and I think in order to answer your question, we really have to separate these two categories of corrective action.

Q. I should like my question to relate to items to be put into condition so as to insure the safety of the ship at sea.

A. All right, sir. To my knowledge, every item that needed action to be taken to put this ship back in operating condition -- and we define that as putting it in at least as good a condition as when she was first commissioned -- to my knowledge, all these items were corrected to that extent.

COUNSEL FOR THE COURT: I have no other questions.

EXAMINATION BY THE COURT

Questions by a court member, CAPT Nash:

Q. Where you found a joint failure, would you say, as a result of your investigation, that this was a failure of a good joint, or was the failure as a result of an improperly installed joint?

A. Well, I can only answer to a couple of those, because I did not follow the sil-braze failure problem directly. I was directly involved in a failure that occurred which resulted in flooding in the Number 5 shot, which is failure of the drain line for the Number 2 PUFFS well. I looked at that joint immediately after the flooding was secured, and there was, to my mind, evidence that the joint could have been made better, but it would have been adequate, I believe, for the loading if it had been properly supported, and I think this same statement can be made to some of the other sil-braze joints. Whereas, if the supports for this piping were not properly placed, then during shock the joint would receive enough additional loading to cause the failure. I think this points up that a test could be conducted, a static test, to show that this joint was perfectly adequate to meet its static condition. But during dynamic loading when it was required to support the movement, the additional bending load, or what-have-you, might cause another otherwise satisfactory joint to fail. But to testify as to whether these joint failures were attributable to poor workmanship, I don't believe I am in a position to answer that.

Q. Could you express an opinion as to the strength of those joints which remained intact after the test? By this I mean, do you think that any of them could have been damaged by the test and yet remain intact and susceptible to further failure?

A. I think this is a very remote possibility.

Questions by a court member, CAPT Hushing:

Q. Was any shock damage found during the last few months of THRESHER's availability, say after 1 January 1963?

A. Yes, sir.

Q. What items can you recall?

A. As I can recall off-hand, the main condenser foundation bolts was one. The supports for the torpedo ejection pump was another.

Q. How, in your opinion, did they happen to be found so late rather than found earlier?

A. On the main condenser foundation, only this was never picked up during the inspection by the ship's force; it was picked up later by one of the crew when he was working in that particular area and happened to notice that one of the bolts was loose. He reported the fact to, I think, Mike DiNola, who looked into it and called us down, and we started an investigation. The other one, on the torpedo ejection pump, again was not picked up during the inspection by the ship's force. It was discovered when they started to run some of their torpedo firing tests and found that the piston would not retract all the way, and when they investigated, they found that one of those brackets had loosened up.

Q. Well, was there a plan or inspection which required either the ship or the Shipyard to look at the spot of any possible damage?

A. Yes, sir. The plan, as I recall it, was for the ship's force to do the inspection and make out damage reports, and that would form the basis for further investigation.

Q. And the Yard, then, was to take the report from the ship and take further action on that?

A. Yes, sir. There was one step in between that: the Bureau of Ships took the reports from the ship, screened them, and assigned certain ones to the Shipyard to investigate.

Q. In connection with the structural integrity of the ship, did the Bureau assign to the Shipyard special responsibilities in this regard for special tests and checks?

A. Yes. There was a special program for weld surveillance in which, during the shock-hardening phase of THRESHER prior to the test, a surveillance inspection was made by the Electric Boat Company. Portsmouth was asked, after the shock, to conduct a similar investigation in the same areas to determine if any damage occurred in these areas due to the shock. We have made such investigation under the weld surveillance program.

Q. What were the results of that inspection?

A. In general, I would say the results show that there were no significant damages resulting from the shock tests as far as the pressure hull welds on THRESHER are concerned.

Q. Was that inspection 100 per cent of all the hull welds and penetration welds on the ship?

A. No, sir. They were confined to certain specific areas of the ship, as agreed to between Portsmouth and the Bureau of Ships.

Q. But was it extensive enough so that the results obtained in the inspection could be extrapolated to the rest of the ship without having something fall through the cracks?

A. In my opinion, yes, sir. The areas selected were those areas which you would expect to be most seriously affected by the shock test and our experience in the weld surveillance program, which indicated that if these areas were free from significant cracking, then areas of less higher stress would be significantly free of cracks.

Q. As part of the project team, do you know whether a similar approach was used in the piping system in the ship; that is, a rather heavy inspection program?

A. I believe that part of the shock-hardening requirements was to review some of the sil-braze joints and effect repairs. I do not know if any follow-up action was taken by Portsmouth to check through to see if these joints showed any evidence.

Q. Who in the Shipyard would know that?

A. I think this would be someone from the Planning and Estimating Department, because this became a repair item, sir. It was not a problem of design, outside of a couple of areas where we felt we needed additional support. The repair of these items became a P&E item.

Questions by a court member, RADM Daspit:

Q. Mr. Dunham, I think you have testified that as a result of shock test, you found failures in welded foundations and in sil-braze joints. I do not recall any welded pipe joints that failed. Did you find any welded pipe joints which had failed?
A. I think there were one or two, sir. I think the one in the forward end of the torpedo room was a welded joint.

Q. Now, another question - and I may be going out of your field: I am under the impression that the inspections required for sil-braze joints now are such that the degree of bonding which is required provides that if the system fails under pressure, the joint is stronger than the pipe, and the pipe will fail before the joint fails; is that correct?
A. I'm sorry. I can't answer that.

Q. Well, assuming that is correct, is it possible that this would apply only to pressure failures and that such a joint would actually be weaker in shock than a pipe test?
A. I would say this is entirely possible.

Questions by the president, VADM Austin:

Q. Mr. Dunham, would you be able to give us an estimate of the number of joints which failed as a result of shock test?
A. Yes, sir. I think the last count I made, sir, was 29 joints.

Q. And of those 29, could you give us the number that were sil-brazed, welded, and mechanical?
A. Well, in round numbers, I would say 25 would be sil-brazed and possibly two in the welded joint category - although I'm a little unsure of this. The other two I would put in the category of mechanical.

Q. Now, you said, I believe, that you did not follow particularly the sil-braze failures. Did anyone in the Yard particularly follow those?
A. Yes, sir.

Q. Who would that have been?
A. Well, there's a regular team set up to review this problem, sir, and it would be the man in charge of that team. I can't give you his name.

Q. You don't remember what his name was?
A. No, sir.

Q. Would you assist the counsel to find the name of the person in charge of that team?
A. Yes, sir.

Q. Now, Mr. Dunham, you used the language, I believe, that you were to correct the results of derangements caused by the shock tests where "practicable." Was that the word that you used?
A. I don't recall having used the word "practicable." During the post shakedown availability we were asked to put the ship back in operating condition, which would mean to make repairs to the failures that would put them back in operating condition. From a design standpoint, the question

of practicability did not enter into it because we were not bound by our design work to any particular time period. All the Bureau was asking us to do for the design phase was to make a recommendation as to a course of action regarding the design fix, and whether this could be done in time for THRESHER's post shakedown availability, we were to do it, but if we could not have it done in time, then the design recommendation would still go through for later availability of THRESHER and also for other ships of the class. I might cite an example which I think will clarify this. Going back to the main condenser foundation bolts, we reviewed that damage and determined that a design course was necessary to improve the shock performance. However, we knew we did not have time to make that design fix on THRESHER during the PSA, so the decision was made to take out the damaged material and replace it with the material that had been put in there originally before the shock test, and this would put the THRESHER back in the same operating condition that she was before shock test.

Q. Is it correct, then, to say that the focus of effort was to improve THRESHER's capability to resist shock under war conditions rather than to increase her capability for safe operation?
A. Yes, sir.

Q. But you also stated, I believe, that every action was taken that was necessary to put her in as good condition as when first commissioned.
A. Yes, sir.

Q. So that, although the focus of effort was to increase her resistance to shock, she was, in your opinion, put back in as good condition with respect to safe operations at all design depths as she had been when she first went in commission?
A. Yes, sir.

REDIRECT EXAMINATION

Question by counsel for the court:

Q. Do your records show the number of sil-braze joints inspected by ultransonic methods at the Electric Boat Division prior to shock test and certified as satisfactory and which of those actually failed during the shock tests?
A. No, I don't believe I have a record of that, sir.

PRESIDENT: That should be a possible determination from available records. I think it is an answer that is well to have in the record. It is a pertinent point that has to do with this area of argument which has to do with the various type joints, and the--

COUNSEL FOR THE COURT: And the efficacy of the tests.

PRESIDENT: And the efficacy of the tests.

Neither counsel for the court, the court, nor counsel for RADM Palmer, a party, desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

WITNESS: Well, the only thing that I have not pointed out, and I don't think I've heard it mentioned, is the fact that the THRESHER withstood these shock trials very well. I, personally, do not think that any of the damage that she suffered was what you would call critical from the standpoint of the hull. The shock loading that she received was on the order of b(1) of what would result in lethal damage to the hull. I think, all in all, the THRESHER's performance on these trials was outstanding from the pressure hull standpoint. I do not consider that the shock loading would have in any way reduced the ability of the pressure hull to withstand hydrostatic pressure. I think that's all, sir.

The court gave me a task before I left yesterday. I have looked into this. Would you want me to report on the results?

THE PRESIDENT: Are you ready to report on that?

THE WITNESS: Yes, sir.

THE PRESIDENT: All right.

THE WITNESS: The court asked me to look into the availability of information related to the shell thickness and yield strength of the shell of THRESHER. We have complete records on the thicknesses of the shell plating. On the yield strength, physicals of the material, they are not available here; but they are available in records down in Boston. We have sent for them. They will be here Monday. The next step that I took--I was not asked to do so, but I thought it was important to the question, was do we have records which show which plate went where on the hull. I have been told these are available in Shop 11, and if I interpret the court's question correctly, that I was only to determine if this information was available. I would like to ask if any further action in this regard is required, such as determining the actual collapse strength, the actual shell thicknesses, and yield strengths. If you wish this, this can be done, also.

PRESIDENT: I think we need that, yes.

COUNSEL FOR THE COURT: For the various compartments.

COURT MEMBER, CAPT OSBORN: I think we want limiting conditions in each compartment.

PRESIDENT: Do you know the order of collapse or the actual collapse pressure? I think you will have to determine the collapse pressure in order to determine the order of collapse. We might as well get those figures for the collapse pressure as computed.

THE WITNESS: I think it would be suitable in conjunction with the exhibit I offered showing the factors of safety, showing minimum yield strength and normal thicknesses, to show those points which would be representative of actual thicknesses and actual yield strengths.

Unclassified

PRESIDENT: Fine. It is pertinent to our needs, insofar as the information as to which compartment collapsed first.

Unclassified

The witness indicated that a classification of "~~Confidential~~" should be accorded his testimony.

The witness was duly cautioned and withdrew from the courtroom.

(b) (6) , a civilian, was called as a witness by the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: Mr. (b) (6) , this is a closed session of the court and classified information may be divulged here. At the end of your testimony, I shall ask you to assess the classification which you would attach to your testimony as a whole.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Will you state your name, address and present occupation, please?
A. My name is (b) (6) , (b) (6) (b) (6) ; Electrical Engineer in the Design Division, Electrical Power Section here in the Shipyard, Code 272A.

Q. What is the general nature of your duties?
A. We develop the power systems for submarines, electrical power systems.

Q. And what is your background and experience in that field?
A. I've worked in the Electrical Design Section here in the Shipyard for twenty-three years. Previous to this, I worked in the Electrical Section at the Bath Iron Works. Previous to that, I attended college at the University of Iowa for one year.

Q. Please give us, if you will, some background on the contract plan, detail specifications, design philosophy and concept, including damage control, that led to the final design of THRESHER's electrical systems.
A. The electrical system, as developed on the THRESHER, was governed by the detail specifications furnished to us and the contract plans, which provided for AC power on the ship, and DC power. The AC power is provided by turbine generator sets. The DC power is provided by motor generator sets. Also, DC power picking up motor generator sets is the battery. There is also a diesel generator set installed. This system was developed to operate a b(3) 10 USC 130 Your turbine generator sets provide for carrying a hotel load to maximum AC power load on the ship. From this, motor generator sets are driven and they float on the DC bus. As I mentioned before, this is b(3) 10 USC 130 on the ship. In the event of power being lost on a turbine generator set, the circuit breakers that tie the motor generator and turbine generator set together opens up, and the motor generator set immediately.

Unclassified

supplies AC power. This power that it supplied will be connected to what is called b(3) 10 USC 130 It gets its power, b(3) 10 USC 130 from the battery, so as long as the battery has any charge left to it, it will run these motor generator sets. You have b(3) 10 USC 130 These supply the vital systems on the ship, such as lube oil systems, electronics, reactor control systems. The b(3) 10 USC 130 in the event of a loss of power on b(3) 10 USC 130 I mean transfer device. The loss of power b(3) 10 USC 130 Also, you have b(3) 10 USC 130 I think this is fairly generally a description of the system.

Q. For the record, would you please define a "hotel load"?

A. A hotel load. This is with many of the ship's auxiliaries running which, under normal operation of the ship, would be your ventilation systems, air conditioning systems, refrigeration, various pumps, and also your vital equipment.

Q. Based on your intimate knowledge of the systems, could you give us your view of the possibility of a severe electrical failure, such as a flooding casualty to the b(3) 10 USC switchboard, which might cause a half-second voltage dip to vital power?

A. Flooding or failure of the b(3) switchboard or the b(3) 1this would be in b(3) 10 USC 130 on the ship, causing the turbine generator circuit breaker to trip. In the event of tripping of the turbine generator circuit breaker, it would also trip the motor generator bus circuit breaker. This keeps b(3) 10 USC 130 It would interrupt this circuit breaker, which in turn would cause the motor generator set to reverse itself. When I say, "reverse," I mean it changes from generating DC power to generating AC power, and continues supplying AC power b(3) 10 USC 130 You would have lost your power b(3) 10 USC 130 at this time, b(3) 10 USC 130 Now, b(3) 10 USC 130 if power is lost--Well, first off, I should say this causes the power to go to the motor generator set supplying the b(3) 10 USC 1 so there would be no loss of power on the vital system at that point. In order to lose power on b(3) 10 USC 130 if you lost a motor generator set in any way, you became disabled, and power for your vital circuit was taken from b(3) 10 USC 130 and then it shifts and takes its power then from b(3) 10 USC 130 Getting to the time elements involved, the transfer device is made to operate when it reaches a reduction in voltage of b(3) 10 USC 130 of rated voltage. When the voltage reduces itself to this point, this device transfers instantaneously b(3) 10 USC 130 and you continue to get power on to your vital systems.

(b) (6) relieved (b) (6) as reporter at this point.

Questions by a member, CAPT Osborn:

Q. Would you make one thing clear, Mr. (b) (6) , when you're talking about the transfer or automatic transfer switches, you refer to particular automatic transfer switches because there are several in the ship which have different characteristics of shift; is that correct?

A. Yes. The transfer device that I'm speaking about here is a b(3) 10 USC automatic bus transfer switch.

Q. That supplies what?

A. This supplies power through its device b(3) 10 USC 130 to the 1C switchboard.

Questions by counsel for the court:

Q. You haven't mentioned the time frame yet, have you, Mr. (b) (6) ?

A. I'm trying to get to it. I'm trying to see how I can get to it. In fact, I really don't know how I can get to the time. What I can say is the transfer device here, when the voltage drops b(3) 10 USC 130 the device operates instantaneously. Instantaneously is what is indicated on the plan of the transfer device. I looked it up in the specifications for the transfer defice and "instantaneous" says that nothing knowledgeable has been put into the circuit to delay it in any way. In the matter of time, I do not know what exact time it takes for this thing to transfer from one to the other.

Q. Could we simulate a test on a similar system?

A. A test like this could be simulated, yes, on another system, on a similar system.

Q. What would be the validity of the findings as to time?

A. This would tell you how much time it took for the -- or how much time that the circuit was actually open during the time that this started to act until it closed. This would be in the matter of cycles, I feel quite sure.

Questions by the president, VADM Austin:

Q. But even so, Mr. (b) (6) , this would not indicate a loss of power?

A. No, sir.

Q. But a drop in voltage?

A. Yes.

Questions by a member, CAPT Osborn:

Q. Can you visualize, Mr. (b) (6) a fire or a flooding casualty in b(3) and b(3) switchboard which would, by selective tripping involved, shut the air bank stops on banks 2, 3 and 4, if they were on service?

A. In the loss of b(3) 1(TG sets, the motor generator sets would instantly shift from b(3) 10 USC 130 , picking up the load on the b(3) 10 USC 130 and, to the best of my knowledge, there would be no appreciable voltage dip to cause these valves to malfunction.

Question by the president, VADM Austin:

Q. Or fail safe?
A. Or fail safe, yes, sir.

Questions by counsel for the court:

Q. Mr. (b) (6) , is there anything you can think of in the design of the electrical systems on board THRESHER which could possibly, because of a deficiency, have contributed to the casualty?
A. To the best of my knowledge, no.

EXAMINATION BY THE COURT

Questions by a member, RADM Daspit:

Q. The SKYLARK received a message from the THRESHER saying, "Experiencing slight difficulties. Have positive up angle. Attempting to blow." Considering that they had a leak someplace back in the engine room or the auxiliary machinery room, we know that if power to the main ballast tank control board fails that banks 2, 3 and 4 will fail shut and secure the header. Is there a possibility of a casualty of this nature, which would temporarily prevent his blowing?
A. This flooding gets me back again to the b(3) 10 USC switchboards, or to the turbine generator sets, and you would have again the sequence of events that I have gone through as far as failure b(3) 10 USC 130 Maybe I haven't given it to you quite the way you wanted me to give it.

Q. You answered this once before. I was expressing the question in another way and you have said again that this failure of the switchboard would not cause these banks to come off the service. Is there any other electrical apparatus back there which might be short-circuited by flooding?
A. A failure of the b(3) 10 USC switchboards. These switchboards provide the power to your b(3) 10 USC 1: A failure of these switchboards would cause these valves to fail safe.

Q. Where are these switchboards located?
A. In the same compartment in the auxiliary machinery space, the same compartment as the b(3) 10 USC switchboards.

CAPT OSBORN: We are not talking about the circuit breakers themselves. We are talking about the basic power distribution, which is located in the engine room, Mr. (b) (6) , rather than the individual circuit breaker.

RADM DASPIT: I'm asking him about anything at all.

WITNESS: I don't quite understand, I don't think.

PRESIDENT: I think we're getting awfully confused. Does anyone question Mr. (b) (6) statement that the b(3) 10 USC switchboards are in the auxiliary machinery space?

CAPT OSBORN: The b(3) 10 USC switchboards are in the auxiliary machinery room.

Questions by a member, CAPT Osborn:

Q. Are the b(3) 10 USC switchboards in the auxiliary machinery room?
A. Yes, sir.

PRESIDENT: All right, you say no.

CAPT OSBORN: I say yes.

PRESIDENT: I understood you to say, "No." He said they were in the same compartment. Isn't that right, Mr. (b) (6) ?

WITNESS: Yes, sir, in the same compartment.

Questions by the president, VADM Austin:

Q. Same compartment, but separated by how much distance?
A. Separated, as a guess, switchboard b(3) 10 USC are separated by switchboard b(3) -- by distance in feet, possibly or approximately eighteen inches.

Questions by counsel for the court:

Q. Do you have the plans right there?
A. I do not have the plans of the switchboards.

Question by a member, CAPT Osborn:

Q. I will ask a question that I think will clear up what I'm thinking about. What do you call the power distribution panels that are in the engine room that are powered from the b(3) 10 USC switchboards
A. These are compartment distribution panels that are fed power from the b(3) 1) USC 130 and b(3) switchboards.

PRESIDENT: Now are we back on the tracks?

NOTE: All members of the court indicated their concurrence.

Questions by a member, RADM Daspit:

Q. Following my line of questioning, it appears then at this time the UQC, the underwater telephone, was in full operation at all times. Can you describe a set-up which would permit the UQC to remain in operation while the main ballast blow switchboard is off?
A. No, sir. This has gone through my mind, knowing of the casualty and of the messages that were received and the fact that the UQC was in operation. This also tells me that they had power on the ship b(3) 10 USC 130 . Therefore, the power b(3) 10 USC 130 would also be supplying power to your valves.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Would the flooding or spraying of seawater on the compartment distribution switchboard in the engine room result in the loss of b(3) 10 USC 130

A. To the best of my knowledge, no. These distribution panels have circuit breakers in them which would interrupt the circuit and isolate them from the b(3) 10 USC 130 or b(3) switchboard.

RE-EXAMINATION BY THE COURT

Questions by the president, VADM Austin:

Q. Mr. (b) (6) , I believe you said that as long as the UQC operated, there is no doubt that the ship had power b(3) 10 USC 130 is that correct?

A. To the best of my knowledge, yes.

Q. It would be a freak and not normal if it were otherwise?

A. Right.

Q. You also said that as long as you have b(3) 10 USC 130 , the solenoid valves for your 2, 3 and 4 main ballast stops would be energized?

A. Can I qualify this a little bit in saying, when I say this, this tells me that I have power b(3) 10 USC 130

Q. Yes.
A. The b(3) 10 USC supplies power to the IC switchboard. The IC switchboard furnishes the power for the valves that you're talking about; and the panel that the IC switchboard gets its power from also supplies power to the UQC. They both get their power from the same --

Q. Same panel?
A. Yes.

Q. The IC switchboard?
A. The IC switchboard gets its power from a distribution panel which is the same panel that the UQC gets its power from.

Q. Is it not possible the, is it not possible that the IC switchboard would be, by fire or flooding, unable to furnish power to the solenoid valves and yet have the UQC getting its power from the panel that furnishes the IC switchboard?
A. To the best of my knowledge, this is right -- that if you did not have an IC switchboard you could still conceivably have power for the UQC.

Q. Where is the IC switchboard, Mr. (b) (6) ?
A. It's in the control area.

Q. In the control area?
A. Yes, sir.

Questions by a member, CAPT Hushing:

Q. Have you had any experience with automatic bus transfer switches or other transfer devices not working properly in the switching?
A. No, I have had no experience of them not working.

Q. Not working on shift type ships?
A. No.

Q. Have you had any experience on the FBM's?
A. No, I haven't, on any of the ships. I haven't had any experience -- when I say "experience", I mean that I have not had any difficulty with bus transfer devices coming back to us, as they might, and experiencing difficulty and us attempting to resolve the problem; we haven't had this problem.

Neither counsel for the court, the court, nor the party desired to examine the witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

PRESIDENT: Mr. (b) (6) , this line of questioning which, at times, has been so confusing is most important and if, on thinking this over, you find that you have given us any information which you later find not to be borne out by search of actual circuits or diagrams, you are requested to come back and tell us. This is a very important bit of information.

Unclassified

COUNSEL FOR THE COURT: What classification would you accord your testimony, Mr. (b) (6) ?

WITNESS: ~~Confidential~~. Unclassified

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court recessed at 1628 hours, 25 April 1963

The court opened at 1638 hours, 25 April 1963.

All persons connected with the court who were present when the court adjourned were again present in court.

Samuel R. Heller, Jr., Captain, U. S. Navy, a former witness for the court, was recalled by the court, reminded that his previous oath was still binding, and examined as follows:

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Captain Heller, you were requested by the court to study certain aspects of flooding [illegible] relating to THRESHER's loss. Do you have all or a portion of this material ready to present now?
A. I have a portion, sir; studies are still continuing.

Q. Please proceed.
A. I have two studies which might be termed recovery times rather than sinking rates. These were generated by various members of the court at different times and they have been summarized into the two charts which I will present today. The first one concerns the case of not blowing main ballast tanks but of recovery by use of stern plane angles for one speed. The assumptions are hard rise on the stern planes; the ship coasting at eight knots; the hard rise applied at the zero time scale; the discharge co-efficient to be .61, which corresponds to the infinite reservoir; and a hole in a flat plate; and a somewhat simplified drag co-efficient of .5, which is maintained constant and assumes that the ship is on an even keel, although a more sophisticated calculation would show that this is not the case. The chart shows that a hole of just under half-inch diameter can be sustained for continuous flooding; and that as the hole size increases, the time that is available for securing the flooding decreases in a hyperbolic fashion. For instance, at two knots you have twelve seconds of flooding that can be --

Questions by various court members:

Q. You mean a two inch hole, don't you?
A. Two inch hole; thank you, sir.

The witness continued his answer as follows:

A. Same speed condition as before, twelve seconds only is available for survival. Now this is but one of a rather infinite family of conditions that could

be studied. This came as the first of several studies. The second case is what might be called the opposite end of the spectrum. There is no speed involved. We blow main ballast tanks aft only. And we start the blowing fifteen seconds from zero time. The same discharge co-efficient is used in this case and the same drag co-efficient for the ship's vertical motion. Two cases are presented here: one for blowing the Captain's Air Bank only -- this is Bank No. 1, capacity (b)(1) cubic feet; the second is the more normal case of Banks 2, 3 and 4 available, a total of b(1) cubic feet. These two conditions match two of the conditions previously presented to the court. With the use of the Captain's Air Bank only, the size of hole that can be sustained for continuous flooding is just under a third of an inch in diameter and, as before, the available time decreases in a hyperbolic fashion so that for the two inch hole it has now dropped to about eighteen seconds. With the more normal case of three banks on the line, a hole diameter of four-tenths of an inch can be sustained indefinitely; and using the two inch diameter hole as typical of the hyperbolic variation, this now gives us thirty seconds; and this, too, is but one of an infinite family that could be presented.

Questions by a member, RADM Daspit:

Q. I don't quite understand. Take your two inch hole, you have thirty seconds. That means if you blow within thirty seconds--

A. No, sir, that means that flooding can continue for thirty seconds from the time of casualty if the blow is initiated at fifteen seconds from the time of casualty.

Q. And then you would go on out?

A. Yes, sir.

Q. If you wait longer than thirty seconds, you may go out temporarily but you'll eventually settle?

A. I have to give that as a "yes" and "no". This is based on a blow starting fifteen seconds after the casualty and says that you have only thirty seconds from the time of initiation of casualty for securing it and surviving. The trajectory that corresponds to the particular case you mentioned has not been worked out in detail, sir.

Questions by counsel for the court:

Q. On Chart #1, will you explain your postulate of eight knots speed and coasting? Is there a loss of main propulsion power at time zero so that it will slow down, or do you keep it at eight knots.

A. We keep it at eight knots. We have not assumed any loss in propulsion power. We have maintained the speed constant at eight knots with the stern planes on hard rise.

Q. On Chart #2 where is flooding assumed to be located; in what compartment?

A. In engine room only. This applies for both cases and it should be clarified.

RADM Daspit: Could you put Chart #1 on the chair so we can look at it?

WITNESS: Look at both at the same time (the witness held up Chart No. 1).

COUNSEL FOR THE COURT: I would like to introduce Charts #1 and #2 in evidence at this time.

Two charts referred to by the witness in the foregoing testimony were submitted to the party and to the court, and were offered in evidence by counsel for the court. There being no objection, they were received in evidence.

PRESIDENT: The court has no objection but is skeptical.

REPORTER: These will be Exhibits 87 and 88, respectively.

Neither counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

WITNESS: I have only one statement to make at this time. The studies are continuing. The next one that I expect to be finished will be the study requested by the court with a rather long and involved sequence of steps at various times; and I am hoping to have that before the week is out, sir.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court adjourned at 1648 hours, 25 April 1963.

Unclassified

VOLUME III OF 12 VOLUMES

RECORD OF PROCEEDINGS

of a

COURT OF INQUIRY

convened at

U. S. Naval Submarine Base New London
Groton, Connecticut

and

Portsmouth Naval Shipyard
Portsmouth, New Hampshire

by order of

Commander in Chief
U. S. ATLANTIC FLEET

To inquire into the circumstances
of the loss at sea of

USS THRESHER (SS(N)593)

which occurred on

10 April 1963

Ordered on 10 April 1963

Unclassified

Page 559 to 846

Unclassified

Unclassified

TWELFTH DAY

Portsmouth Naval Shipyard
Portsmouth, New Hampshire
Friday, 26 April 1963

The court met with closed doors at 0900 hours.

All persons connected with the court who were present when the court adjourned were again present in court, with the exception of (b) (6) , who was relieved by (b) (6) as reporter. RADM Palmer, a party and LCDR Hecker, a party, and his counsel waived their right to be present. Counsel for RADM Palmer was present.

No persons not otherwise connected with the inquiry were present.

John J. Hinchey, Captain, U. S. Navy, was called as a witness for the court, was informed of the subject matter of the inquiry, was warned of his rights under Article 31 of the Uniform Code of Military Justice, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: Captain Hinchey, this is a closed session of the court. Classified information may be divulged here. At the end of your testimony I shall ask you what classification you would ascribe to your entire testimony taken as a whole.

DIRECT EXAMINATION

Questions by Counsel for the court:

Q. State your name, rank, organization and present duty station?
A. John J. Hinchey, Captain, U. S. Navy, Portsmouth Naval Shipyard.

Q. What is the nature of your duty at the Portsmouth Naval Shipyard?
A. I am the Nuclear Power Superintendent.

Q. Can you describe in a little greater detail the nature of the duties which the Nuclear Power Superintendent performs?
A. The Nuclear Power Superintendent is head of the Nuclear Power Division which functions in both the Planning & Production Departments and is responsible for all phases of any work that has to do with reactor plant construction and testing and operation in the Shipyard.

Q. State, briefly, your background and experience in naval and professional matters?
A. After leaving the Naval Academy in December 1941, I entered the Submarine Service, was in submarines from May of 1942 until April of 1945, at which time I came back to Boston to attend a postgraduate course at MIT in naval construction and marine engineering. Upon graduation in February of 1948, I was assigned to the Portsmouth Naval Shipyard, spent approximately two and a half years in this Shipyard at that time, about 50 per cent of the time in the Production Department as a Ship Superintendent and the balance of the time in the Planning and Estimating Division as an Assistant P&E Superintendent. In June of 1950, I returned to MIT to take an advance nuclear physics course in anticipation of entering the nuclear power program. In July of 1951 I reported to Code 390 in the Bureau of Ships-- Code 390 is presently Code 1500--and spent about two and a half years in that organization.

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In January of 1954, I was assigned to the Schenectady Reactor Operation Office, and was assistant manager for operations for that office from January 1954 until August of 1959, at which time I returned to the Portsmouth Naval Shipyard, as the Nuclear Power Superintendent.

Q. Then, you have been stationed at the Portsmouth Naval Shipyard during THRESHER's period of construction, as well as her period of post shakedown availability?
A. During most of her construction. The ship was under construction when I arrived.

Q. Are you familiar with the scope of work done in THRESHER during her post shakedown availability and the source or authorization of the work with respect to the work in the reactor plant during the post shakedown availability?
A. Yes, sir.

Q. Will you briefly state the source or authorization of that work?
A. Well, over 90 per cent of the work done during the post shakedown availability of THRESHER was authorized by the Bureau of Ships, primarily in the form of ShipAlts; one of the biggest packages being from ShipAlts that resulted from the shock tests that were performed on the ship during the spring of 1962.

PRESIDENT: Captain, when you say 90 per cent of the work, are you confining yourself to the work on the nuclear reactor plant?

WITNESS: Yes, sir. I am speaking only of the work done on the reactor plant.

PRESIDENT: Thank you very much. I felt that was pertinent.

WITNESS: Yes, sir. I am only talking about the reactor plant. I have no firsthand knowledge of how this breakdown would be throughout the ship.

Q. Would you give us some idea of the total effort involved in man days, and whether there was any growth in the volume of the work during the post shakedown availability of THRESHER?
A. The total man days expended during the post shakedown availability of THRESHER on reactor plant work was approximately 14,000 man days. Now, I'd like to explain for the benefit of those who are not familiar with the effort that has to go into working on a once radioactive plant, that 14,000 man days of effort in a reactor plant which has been radioactive and which we have to treat as a contaminated plant, is probably comparable to five or six thousand man days of mechanic effort on a normal type work in an uncontaminated area. We estimated, initially, that the cost of the reactor plant work during the PSA would run approximately eight hundred thousand dollars. The return costs were $791,952. I did not have a good man-day estimate at the time that the ship came in because my eight hundred thousand dollars was based on what I knew at the time and my estimate as to what I was going to be able to handle during the time that I expected the ship to be here, and we could have spent more money if we had agreed to take on more work, but I didn't feel we could do additional work and that is about the way it came out. We spent $791,000.

Q. Will you identify those items of work which were performed which you consider might affect ship safety or hull integrity?
A. There were about six jobs that in some way might have affected either hull integrity or safety of the ship insofar as flooding of sea systems, for

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example, might be concerned. The first one is the completion of a ShipAlt which we undertook in THRESHER during a restricted availability of December, 1961. We completed the bulk of the ShipAlts that required changing from sil-brazed to welded joints of all the through-piping in the reactor compartment. We completed, in that earlier restricted availability, most of the big piping. The balance of the big piping was completed by Electric Boat Division in an availability that the boat had there just before her shock tests. The only part of that ShipAlt that was not completed when she returned to us last spring, were some small priming lines in the trim and drain system. We completed the conversion from sil-braze to welding of those small joints.

Q. What were the total number of the joints changed over from sil-braze to welding at that time?

A. I don't know, but it couldn't have been over a half-dozen because these are two small lines--two three-quarter inch lines--that tap off of the trim and drain system rather forward in the compartment, and they go through the bulkhead. It couldn't have been over six or eight.

Q. And the number prior to that time?

A. This is another one that is real hard to answer because, actually, that system started out to be a welded system and it so happened that we had welded some of the copper-nickel trim and drain piping in her construction period by the time they decided to change over to sil-braze.

Q. Can you give us an approximation?

A. Approximate total number, or approximate number that we converted during--

Q. The approximate number that you converted?

A. In the order of a dozen.

Q. Will you give us the job order number for each one of these items as you relate them to us?

A. That job order number for the change of sil-brazed piping to welded was 15-939-50803. The second job that falls in this category was a job that was required by BUSHIPS Instruction Number 9480.56 which called for the inspection of all ball-type submarine hull valves. In the reactor compartment--in the reactor plant system--we had three such valves, all of which were inspected. They were removed from the ship because we did have leakage with them. A teflon-coated ball was installed in accordance with the latest instructions. We reinstalled the valves and tested each of them to full submergence pressure. In addition to that, the back-up valve on one of those stop valves also leaked on subsequent testing, so we removed it and put a teflon-coated ball on that one. The job order number on that one is 15-939-21509.

Q. As you relate these jobs, would you please indicate the design effort involved?

A. I think I can best clear that up by pointing out that we do not perform the design effort on any reactor plant work in Portsmouth. Any design effort that's expended on ShipAlts is done by Electric Boat Division as the lead yard and the planning yard for reactor plants for all S5W ships. The next job in which we played some part was, there is a change order 252 to the 593 which called for stiffening of the flat plate structure in the b(1)
The change order 232 did not specifically limit itself or apply only to the
b(1) but that tank is covered by the change order. That tank

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was stiffened. In order to stiffen it, it was required that we cut certain holes in the tank top for access. When we cut the holes, we weren't particularly happy with some of the welding we found so we replaced the complete tank top as a part of that job.

Q. Do you remember the difficulty with the welding which you found?
A. There was some indication of possible slight void; whether or not it had slag in it was pretty hard to tell at the root of the double "V" and when we dug down in--when we cut the holes in the tank top and tried to prepare the surface for rewelding the insert plate--we found that we had to chase this indication into the parent metal, so we decided rather than chase, we would cut out the complete tank top and replace it.

Q. Were there any cracks found in the flat plate, on return of the THRESHER for her post shakedown availability, in the b(1) tank heat exchanger?
A. In the heat exchanger?

Q. In the tank.
A. I really shouldn't be answering this question because I was not responsible for its surveillance. I think that you probably should get that information either from Captain Heronemus or Captain Guerry. I might point out that this is one job in which there is some dual responsibility in that I am interested in this tank because it contains my b(1) heat exchanger. The structural work and the design work on that specific job would be done by the Design Division. The Design Division, with us, decided to replace that tank top. We did not take it upon ourselves to replace the tank top, because it is not my tank.

PRESIDENT: Captain, although not primarily responsible for this work, if you have, of your own knowledge, information which would be responsive to the question asked by counsel, you are requested to give that information.

WITNESS: You are talking with respect to the cracks that might have been found on surveillance?

PRESIDENT: Yes.

WITNESS: I do know there were cracks found in the tank on hull surveillance. I do not know--because I wasn't paying that much attention to the details--I do not know of the exact number or extent of them. I do know there was one that was rather extensive. I know that it was repaired; I know that the Bureau of Ships was involved in the details of this repair.

PRESIDENT: All right.

Q. Would you proceed please.
A. The fourth job was a rather minor one. We had again a change order. change order Number 273 which called for the replacement of a valve in the sampling sink. It is a sampling sink drain--primary coolant sampling sink drain. CS-8 was the number of the valve which was to be replaced by the change order. This drain travels from the sampling sink into the auxiliary sea water system and it is only by virtue of the drains into the seawater system that it might possibly fall in this category. The job order on that is again 15-939-21511. The fifth job was a testing of all hull valves and repairing any valves as a result of that testing, in addition to the

b(1) salt water side valves that I have already mentioned. In the reactor plant we have an overboard discharge valve from the primary system; we have relief valves overboard, both in the steam and primary coolant systems. All those valves were tested. One of them we found that we had to repair, which was CD-92, which was an overboard discharge from the primary coolant discharge system. That valve was repaired and it was tested upon completion and returned to the ship. The job order Number on that one is 15-939-50618. And the last job was the cutting and replacement of a hull patch in the reactor compartment area. This patch was cut for the specific purpose of removing the b(3) 10 USC 130 which is stowed in the b(3) 10 USC 130 The b(3) 10 USC 130 took a pretty good shock during the test trials. It was the Bureau's desire to get the b(3) 10 out, send it out to the vendor and have some tests run on it to determine the effect of the shock. The only way we could get it out was to cut an access hatch in the compartment. That hatch was replaced; it was fully radiographed in accordance with HY80 standards 250-637-3. And those are the only jobs, of all the reactor plant work that was done, that I feel could conceivably fall in that category.

Q. At the time of THRESHER's sea trials, was there any uncompleted work remaining to be done in this category?
A. No, sir, none. At the time of THRESHER's sea trials, the only potential job that I knew of was one with respect to a very minor leak at low pressures on MS2 packing gland. I happened to be talking to the ship's engineer the night that they went into drydock, and on cooling down he noted that there was a very small leak. I asked him if he wanted to have us fix it. He said no, he was not at all concerned about it. It was leaking very slightly at low pressure and he didn't want to go into it.

Q. Did you share his lack of concern for that item, that it was not affecting the ship's safety?
A. I did, sir.

Q. You mentioned, at one point, a division of responsibility jurisdiction which existed between your division and other departments and divisions of the Shipyard, specifically Captain Heronemus', you mentioned. Was there any question as to who was responsible for what during THRESHER's post shakedown availability, so far as you were concerned?
A. None whatsoever.

Q. Was there any confusion or lack of cooperation in that respect?
A. No, sir.

Q. With reference to the work which you have described, is there a record of the tests or inspections which were completed on it?
A. We have records of all tests that were completed during the PSA, as well as during the building period.

Q. Do the records show that every test and inspection that needed to be done was done?
A. Yes, sir.

Q. Do they show that each one was completed satisfactorily?
A. Completed satisfactorily. There was one waiver. With respect to any of the testing there was one waiver that was granted by the Welding Engineer's office. There is a requirement in 250-637-1 that if you make a weld in HY-80 plating, and that weld crosses another weld, you magnetic particle inspect one foot either side of the new weld. The patch that was cut out for the replacement of the b(3) 10 USC 130 is so located that the welds of the replacement patch runs parallel to and within six inches of a frame. On the other side of that frame there is hull damping installed. Because of the additional effort that would have been required to go on the other side of the frame and cut out that damping, and because of the experience that this Yard has had, and because of discussions they have had with the Bureau, in this particular case the Welding Engineer's office waived that inspection beyond the frame, but we were able to inspect six inches; we did not inspect one foot.

Q. You refer to 250-637-1?
A. Excuse me; that is 250-637-3 is the standard for welding HY-80.

Q. Is that a Bureau of Ships instruction?
A. That is a Bureau of Ships standard, yes.

Q. Did you agree to that waiver?
A. Yes, sir.

Q. We would like to hear from you now, an account of the quality assurance system as it relates to the nuclear power plant in THRESHER?
A. Well, one of the divisions, one of the branches in the Nuclear Power Division is the Quality Assurance Branch, the head of which reports directly to me, and he is responsible for all inspections, non-destructive tests which we perform ourselves as a division. We rely on Code 303's radiographic laboratory for any radiographic work. If we have materials testing to do we rely on the Materials Testing Laboratory, but we do our own inspection, magnetic particle, liquid penetrant, and we read and evaluate the radiographs made by the Shipyard's radiographic laboratory.

Q. Are there applicable instructions covering the administration of this quality assurance program?
A. Yes, sir, there are a series of such instructions either in the form of Shipyard instructions, Shipyard process instructions, or Nuclear Power Division quality control instructions.

Q. Can you identify those specifically issued for the nuclear power reactor plant system?
A. I can identify them. It is quite a package. (holding up book) This book contains Shipyard instructions and process instructions and quality assurance instructions that my Quality Assurance Division puts out.

Q. As long as it is available for the inspection of the court I don't think we need to go into that.
A. I brought this along too. (Holds up small booklet) This book is one of several that holds reduced sized copies of the instructions that are in this book, and each of our inspectors has copies of these which they are required to have. Each instructor doesn't require a copy of everyone because some of them pertain to electrical stuff and I don't have my hull people or my pipe inspectors carry all of these around and vice versa.

Q. Can you tell us whether the standards for the Quality Assurance tests and inspections, are generally higher, the same, or lower than standards for similar items which the Shipyard inspects in areas other than the reactor plant system?
A. In general, across the board, I think that the standards and requirements in the reactor plant area are higher than they are in other areas--not necessarily in all other areas.

Q. Do you think you could amplify that and give us a better idea of just what you mean?
A. Well, all the piping systems in the reactor area are carried under what we call a target system, and in order for material to get into this system, it has to have a pedigree from the vendor who supplies it, or we make physical and chemical examination of the materials to determine exactly what the material is and whether or not it meets the specifications that are required in each case.

The material is ordered to those specifications. It is ordered to be marked accordingly. We receipt-inspect it. I have my own receipt inspectors; they receipt-inspect every bit of material that goes into the plant and we maintain control of the material from the time it arrives in the Yard until it is installed and signed off as accepted in the ship. This is done on all of our primary coolant piping, all of our steam piping, until we get to low pressure drain. In the past it has not been done in our reactor air system, in the low pressure fresh water system, and I guess in the shield water system which is a low pressure system. It has not been necessary in the past. However, in recent months we have included all of our systems in the target system.

Q. Now with reference to THRESHER specifically, that was not applicable during the period of her construction, is that correct?--You stated it was in the last few months you started that?

A. The applicability of the target system to reactor air, fresh water and shield water systems was not in effect at the time THRESHER was built and it was not applied to the THRESHER's post shakedown availability.

Q. Can you give us an illustrative example to explain that the Quality Assurance standards were somewhat higher in the reactor plant system than in the ship as a general whole?

A. Well, I think probably the clearest example of that is in the welding and radiography, welding and radiography of reactor plants and associated reactor plant systems,--and that includes anything for which I am responsible as covered by 250-1500-1.

Q. A Bureau of Ships Instruction?

A. This is a Bureau of Ships standard. It is a welding standard for reactor plant systems and associated systems and components. This standard is, in my opinion--and I think it is generally shared by people in both the nuclear and non-nuclear areas--this standard is more restrictive than both the quality of radiography, the manner in which the interpretation and evaluation is made, and the welding defects which are acceptable or rejectable, the amount of slag, the amount of porosity that are acceptable under 250-1500-1, are more restrictive than they are under any other welding standard that is being used.

Q. In what area of work in the reactor plant system are the workmen required to hold a card which demonstrates their qualifications?

A. Welders are required to hold a card demonstrating that they have qualified in accordance with the requirements of 250-1500-1. Pipe grinders are required to be qualified. I have not required that they actually carry a card. They are required to be specially trained and qualified. This is my own requirement on the shop.

Q. How do you assure that they are, then?

A. We have a training course which my inspectors audit, and the names of the people that complete the training course and the names of people that the shop considers are qualified, are submitted to me and to the inspection organization and it is a matter of my inspectors auditing who is doing the grinding. Beyond that, there are no specific requirements that people carry a card as such to show that they are qualified. However, there is a Shipyard instruction of about April 1961, I recall, which required that the shops assign people to reactor plant work only if they have had either experience in prior reactor

plant work or they have been specifically trained to work in a reactor plant area.

Q. In your functional areas of control and inspection, you have mentioned material identification, nondestructive testing and laboratory analysis. Would you cover piping fabrication for us?

A. Well, all the piping fabrication is performed under a quarterman in the shop who is, and has been for at least three years now, or close to three years, designated as the reactor plant quarterman for Shop 56, the pipe shop. His leadingmen are picked people and his people are picked by him and they perform all their pipe fabrication in accordance with our target system instruction, our pipe joint make up and identification instruction, and existing plans and nuclear power engineering authorizations which we might issue from time to time to give them specific detailed instruction.

Q. In the area of quality assurance, will you now describe the operational testing in trials?

A. In the pipefitting area?

Q. Yes.

A. Well, as I indicated we inspect the material when it comes in. We have in-process instructions of the pipefitting. My inspectors are present on every target system joint make-up. They inspect the fitup. They pass on the fitup. If there are bends involved in the piping, they examine, and on a spot basis spotcheck basis, they will measure the bends of the pipe. We used to do this on a hundred per cent basis but we found the reject rate on that particular audit was less than three per cent. We now do it on a spotcheck basis. They check, not only the fitup of the joint, but they check the configuration against the plan dimensionally, and although the plans do not have specific instructions on them with respect to the tolerances on dimensions, we have been rejecting anything that is not within plus or minus a half an inch of the plan planned dimensions. Now that does not mean we do not put things in there that are not more than half an inch out of dimension, but the inspectors reject them. If they go in beyond a half inch out of dimension, they go in with one of my engineers knowing what the situation is and actually writing a waiver of this plus or minus half inch dimensional tolerance. If you want to go through this, once the system is completed, we have specific requirements that are placed on us by the Bureau for flushing all of our systems. These instructions are in the form of test procedures which are written by the Bettis Laboratory which is the prime contractor for the S5W reactor plant. They are approved by the Bureau of Ships. Before we perform them, we review the procedures in detail with the ship's force and with the Shipyard people. In most cases if we have some comments about them, we go back to Bettis and the Bureau will resolve them, and we then perform the tests. So all these systems are flushed, and then before we put water in the primary coolant system, we go through an installation check in which my inspectors go hand over hand, over every piece of pipe in the plant with the plan in hand and check to see that each specific system is installed in accordance with plan. After that's completed we then put water in the system and we go through a rather elaborate program of flushing the complete system, running cold operations, running hot operations, filtering the entire reactor plant, and after that we pull the filter, put the core in and go through similar operations with the core in. Then we are ready to take the plant critical.

Q. You talk in the present tense. Are we to understand that all of this applied to THRESHER's post shakedown availability?

A. Yes, sir. Now what I have just explained did not. It would have applied to THRESHER's post shakedown availability, but we did not get into that kind of work in her availability. We cut into the primary coolant system in two ways during her availability. One was to cut into a pipe in which we installed a thermo-sleeve in the pressure riser surge line. That work has to be done under completely Grade A conditions, so we have to insure we do not put any dirt into the system, because we don't go through this type of flushing operation with the boat in the shape that she was in.

Q. In your quality assurance effort, total effort, how many officers and civilian supervisory personnel were assigned to work in THRESHER during her post shakedown availability?

A. Well, it's a little bit hard to limit that to the quality assurance business because actually of the 14,000 man-days that we expended, there were approximately 1300--close to 1400--man-days of engineering services. These are, in themselves, some quality assurance type of work. I had, during the period of THRESHER availability, about 80 to 85 inspectors in my quality assurance organization. There was probably no time around the clock when there were less than three or four people assigned to that ship from that organization. One of my assistant nuclear power superintendents was the ship superintendent for that availability. I had a GS-12 project engineer assigned for that availability. And, as I say, there were close to some 1400 man-days of engineering effort expended by various engineers in my organization on that job.

Q. Did you feel that in numbers, training and competence, they were fully adequate to do the job required of them?

A. Yes, sir.

Q. As you have reviewed this tragic loss in your mind, do you feel that you could have used more people in this area?

A. No, sir, I have no reason to believe that any more people would have helped in the THRESHER work.

Q. You mentioned that approximately 12 joints in the sea water system were changed from sil-brazed to welded type and you have indicated the high welding standards required when the joints were made. Was any particular problem encountered in welding the 12 joints?

A. Well, this also requires a little bit of explanation. These particular joints are copper-nickel joints in the trim and drain system which penetrate the reactor compartment. Now the trim and drain system is not part of the reactor plant. It was only by virtue of the fact that this work was being done in the reactor plant, in a radioactive area, in a potentially contaminated area, that I performed the work. The work was performed under my supervision. The standards to which we worked on that particular piping are 250-1500-1, but they were the non-nuclear piping standards that were in effect at the time. At the time we did the work in the THRESHER, the non-nuclear standards were almost as restrictive as the nuclear standards. The radiographs were read by my people, so they were read almost as though they were reading them from 250-1500-1. We did have difficulty, yes, sir. Any time you go to welding three and four-inch copper-nickel backing ring joints, you have difficulty. It is my recollection that we did not, on THRESHER, require any waivers to the standards on those joints at that time. And I feel fairly confident of that at the moment because I do know that we did have to get some waivers on another ship in that area.

Q. Do you recall the reject rate with respect to THRESHER in that work?

A. No, sir. All I can say is, just banking on memory, at that time we made several repairs to each joint before we had an acceptable joint.

Q. What was the maximum number of times a single joint had to be reworked, if you recall?

A. I honestly don't recall.

Q. Roughly.
A. I am sure that there were joints that had to be repaired at least three or four times in those systems.

Q. Did this work become the controlling work in the reactor compartment?
A. No, sir, it did not.

Q. What was your evaluation of the overall competency, to do the work required of them, of the workers in this Shipyard?--I am relating this question to THRESHER.
A. Well, the people that we had working in the reactor area, during THRESHER's PSA and during her building period, I was completely satisfied with.

Q. Do you wish to say any more on that?
A. Well, across the board, not only in this Shipyard, it has been my observation completely across the board that we could stand higher talent, as in the welding. However, I have to admit that by virtue of Shipyard policy of work in the reactor area, I think I had the best people in the Yard to do the welding in the reactor plant work.

Q. Postulating a sea water flooding casualty in the reactor compartment during the flooding of THRESHER, and that this flooding is not brought under control until the main coolant piping is inundated by sea water, could any form of serious casualty occur?
A. It would seem to me if we had salt water flooding in the reactor compartment to the extent that the primary coolant piping was covered, the additional weight in the boat would be next to impossible to handle if we didn't have full power of the plant, if you are talking about covering the primary coolant piping, because the main piping is fairly well up in that compartment.

Q. Assume that it can carry the weight of water which we are postulating?
A. I really haven't thought about this. The thing of course that we're always concerned about in the reactor compartment, even with respect to small amounts of water, is b(3) 10 USC ;. This would not be a matter of immediate concern, so that the fact that some of the primary coolant piping is underwater immediately would not be a particular problem. I'd have to give that some more thought before I could say that there might not be some electrical gear that might get shorted out and grounded out. I don't think it would offhand though.

(b) (6) was relieved by (b) (6) as reporter at this point.

Q. If you have any reason after reflection to change your testimony on this point, please get in touch with me.
A. Yes, sir.

Q. During the course of the post shakedown availability, did you discuss with ship's company the operation of main coolant pumps, as relates to the mode of operation; that is high speed or low speed operation for optimum reliability in casualty recovery operations?
A. No, sir, I did not.

Q. Do you know what THRESHER's philosophy was with respect to the mode of operation of main coolant pumps when at or near maximum operating depths? By philosophy, I mean their habitual mode of operating.
A. No, sir, I don't. I do not know what their philosophy was.

Q. What would be your recommendation if THRESHER's personnel had asked it of you for the operation of the main coolant pump at or near test depths?

A. This is a little bit hard to answer as to what I might have said then, particularly in view of what we know today, after what I have read as of today. I think I would have recommended as a matter of philosophy that they run the pumps on slow, for the simple reason that at that depth I have never been one in great favor of running around at maximum speed, and with their pumps in slow you can still get b(3) 10 USC 130 and it seems to me adequate power and speed available with the pumps in slow.

Q. What instructions or training did your personnel give the ship's company during the post shakedown availability in the operation of their plant?

A. We gave no particular training to the ship's crew during post shakedown availability.

Q. Can you say what training they got during the construction period?

A. Well, the basic training for all people who are involved in operating the reactor plant --

Q. Coming from your personnel.

A. Very little from my personnel, because I know what training they have had before they get here. The last place the engineering people have been before they get here is a five or six weeks school at Bettis, and I know they get more and better information than I have available for them.

Q. For the record will you describe Bettis a little more fully, so that it will be a little more intelligible for the reader?

A. Bettis is the name of a laboratory outside of Pittsburgh, Pennsylvania, that is operated by the Westinghouse Corporation for the Atomic Energy Commission, for the sole purpose of doing research and development and design work for naval reactors.

Q. Thank you. I show you Exhibit 57; will you examine it please. (The witness did so). Have you conducted any tests that might explain the darkened areas which have been described in the courtroom as "charring?"

A. Yes, sir, I have, because I was a little bit disturbed to read in the paper that this particular piece of borated poly had seen a rush of flame. I decided to run a mock-up to try to reconstruct what I felt this darkening had been caused by. When we install shielding on a deck or on a bulkhead, we install the lead, the virgin poly, the borated poly and the canning plate in solid pieces, and if there are bulkhead penetrations, or penetrations in the deck, we do the machining through the completed sample. In the performing of that machining operation, we used for a lubricant on the drills, Neolube. Now Neolube is a graphite suspension in one of the alcohols. I was convinced that this darkening on Exhibit 57 was the remnants of the Neolube, so I had my people draw up a little sketch and we had the shop make a mock-up of just a sandwich of some steel plate, virgin poly, borated poly and a layer of virgin poly to fill out the void, which is our normal method of installing polyethelene. We drilled two holes, as similar as we could get to these two holes (indicating the holes in Exhibit 57) and then cut the canning plate off and lifted the poly out. I have the piece of borated poly here with me which came from that mock-up.

Q. Would you state for the record that it is an identical material and similar in size and shape to Exhibit 57?

A. I cannot say that it is identical material; it is approximately the same material. It is my understanding that our laboratory has analyzed this stuff (referring to Exhibit 57) and decided it to be borated poly. It looks like borated poly to me, and this particular sheet is similar to and approximately the same size. The holes have been drilled in approximately the same arrangement and I think the holes are about the same size as the holes that are in this sheet (referring to Exhibit 57).

Q. Proceed with your testimony.

A. This sheet, as I say, was removed from the mock-up that we ran. I think that upon close examination there are two or three things that are rather obvious. Along the edges you can see the weld bead pattern. I think this is also evident on the edges of Exhibit 57. There is some along this one edge, not only the weld pattern, but there is some of the Neolube that is in that weld pattern. This is evident in at least one area on Exhibit 57. The other thing is that on both sides of this sheet there is abundant remnants of the Neolube material. Now it is obviously much more heavily concentrated on this sheet than it is on Exhibit 57. I think the reasons for that may be two-fold; one, this particular sheet was drilled on yesterday, and I'm sure that in time this will lighten up some. The other is that this material, if it did come from the THRESHER, has taken a trip through several feet of sea water and some of it has been probably washed off.

BY THE PRESIDENT: Do we have a laboratory test to determine in fact that the smear on Exhibit 57 contains Neolube?

WITNESS: That I do not know, Admiral; I am not sure that there is enough for them to do it; there might be; it's pretty thin.

Questions by counsel for the court continued:

Q. For the record, then, Neolube has a high carbon content?

A. Neolube, to the best of my knowledge, is a graphite suspension in isotopyl alcohol, and the alcohol would evaporate. In fact, I hadn't expected to duplicate the pattern on this; it is very much the same.

BY THE PRESIDENT: Yes, the pattern is very much the same.

EXAMINATION BY THE COURT

Questions by a member, CAPT Osborn:

Q. One thing I would like to clear up with respect to the size. On the other side of your particular example, was the canning procedure you used in the experiment you tested, very close to the canning procedure that is actually used with respect to actual reactor installations?

A. Very close, especially when we used borated poly. The requirements are b(3) 10 USC 130 be borated poly. You do not always arrive at that point just before the canning plate b(3) 10 USC 130 , so you may put in b(3) 10 USC 1 borated poly, and in this particular case it turned out we needed b(3) 10 USC 130 virgin poly. That is why you will see right here (pointing to the bottom of his piece of borated poly) some virgin poly on this sheet.

Unclassified

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Did you perform additional tests in this matter, Captain Hinchey?
A. Yes, sir, I performed one additional test just to demonstrate what would happen to a sheet of similar material if it were hit be a flame. (The witness exposed another sheet of polyethylene). We placedthree different flames on this particular sheet of poly. This grayish area here, we played a blue flame on until we got ignition; that has been burned. The very black area, we used a reducing flame, and it just charred the material, as you can see.

BY THE PRESIDENT: Yes, positive carbon from the flame.

The witness continued his testimony:

A. In between these two -- it's difficult to see -- we held for twenty or thirty seconds, about four inches away, a fairly hot flame, and it melted the material in here, and you can see the original pattern of the material is gone. I think if you inspect Exhibit 57 the original markings of the rolling, or whatever the process of making the sheet, is still apparent. It is obvious that it is none of these three, the three different methods of burning this sheet.

REEXAMINATION BY THE COURT

Questions by a member, CAPT Hushing:

Q. Can you describe the dark line on the bottom, which is outside?
A. To tell the truth, I can't tell what the origin of this is. I don't know where this sheet has been, other than we played the flame on it. This may have been a piece that had been taken out of this particular mock-up. I honestly don't know where this sheet came from. We just used it to play the flame on it.

COUNSEL FOR THE COURT: For the record, counsel intends to recall this witness for additional testimony in this respect. At this point I would like to offer both of these in evidence, in the order in which they were testified to, and substitute photographs therefor in the record.

There being no objection, the two pieces of polyethylene were admitted in evidence as Exhibits 89 and 90.

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REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Will you also, Captain Hinchey, perform an additional test as to the effect of sea water on this carbonipherous material, to see how it reacts so that you can testify to your own knowledge as to the fact that the intensity of the black diminishes with erosion from sea water?

A. I can do this; what it will involve is building another mockup and there is always the possibility that when I go through this the capillary action due to the mockup of the material, will not be the same. I feel somewhat fortunate that it came out this way in the first one. Whether the second one will duplicate it --

BY THE PRESIDENT: I think we have enough approximation here of the conditions which obtained in the case of Exhibit (57), with the exception of the tearing defect, and I don't think we ought to do anything that will further this.

Questions by counsel for the court continued:

Q. Have you been requested to make additional tests with reference to (57)?

A. I have been requested to make two additional tests, one of them had to do with a test to determine the velocity which a particle would have to have to become inbedded in this material, or the velocity that the sheet would have to have such as what it had when it struck the material to become in turn imbedded in the material. I have not run such a test. I have looked at the material in this sheet, and I think I know what the material is. I honestly don't know how to run a test to determine how it could become imbedded because of velocity of either the material or the exhibit itself. There are two types of material that I have seen or heard described as having been found in this particular sheet of poly, Exhibit (57). This was small wire particles; the other would appear to be welding slag, or chipped metal. The welders use a wire brush for final slag cleanup. It contains a wire, that in my opinion, is very similar to what I have seen in this. It is not at all surprising to me, despite the extremes we go to keep this area clean, that there would be little particles of that wind up in the poly. Likewise, I am not too surprised to see welding slag, and I believe there is a fairly good sized piece (the witness examined Exhibit (57). No I'm wrong; it was in another piece that I've seen.

Q. I show you Exhibit (21)?

A. Yes, there's that piece (pointing to a section of Exhibit 21), and there's a larger one over near the edge. In this Exhibit (21) there are two kinds of material; one which I just mentioned, which I feel is welding slag that got into it and was left there and the pressure of the canning plate put on it just pushed it in. There's another fact; if you take one of these wires, which I have done, from one of the brushes and you try to jab it in this material you can't do it, but if you take it and apply a steady slow pressure, so that it will work itself in; this just being the nature of the plastic. The other material, which appears to be foreign material, there is a threaded like shaft of a nail here. This is a nail that we used in making up our sandwiches, b(3) 10 USC 130

That is the kind of nail that we used, or that we were using at the time THRESHER was built.

Unclassified

Q. As a result of your tests, do you have an opinion as to whether the marks made on Exhibit (57) could have been made by an open flame or a burning process?

A. I very definitely feel that the gross marking on this was not due to a flame; in fact, could not have been made by a flame. If a flame had played on this sheet, I am sure that it would have made a much different pattern, a much different looking piece of material than you have here.

BY THE PRESIDENT: And the signature of the rolling, or other manufacturer's process, would have been interfered with?

WITNESS: Yes, sir.

BY THE PRESIDENT: And this is not the case in Exhibit (57)?

WITNESS: That's right.

Questioning by counsel for the court continued:

Q. With reference to the two holes in Exhibit (57), have you made any studies to determine from their size and relation to each other, and to the periphery of the sheet, where they could have been located in the ship?

A. I have had my people take a good look at the areas in which we used poly of this nature, where there are piping penetrations. There are piping penetrations of various sizes, some that come close to this size, as near as we can determine what this diameter probably was, in either the forward or after bulkhead of the reactor compartment, and also on the tunnel deck. They are three of the four places in which we use this particular kind of material. The fourth place is on a layer, but well down in the sandwich, on top of the shield tank, but there is no place that I know of on top of the shield tank where we have two holes, or more, like we do on the bulkheads, that would account for this sheet being present. The sheet could have come from either the forward or aft bulkheads, or it could have come from the tunnel deck. There are places in all three of those areas where there are two or more holes. Now to determine exactly where this sheet came from I think is virtually impossible. I feel that it either came from the forward bulkhead or from the tunnel deck. Now it could have come from the after bulkhead, just as well as the forward one, but the reason I would suspect the forward bulkhead is because I have happened, in the radiation survey of this material, I have happened to see other material that came from the ship and I understand that the bulk of it came from the forward side of the reactor compartment, and I would therefore be inclined to feel that this either came from the forward side, rather than the aft side, although it could have come from the tunnel deck. There are areas on the tunnel deck where there are holes of approximately this size that penetrate into the reactor compartment, but there are most of the holes in the bulkhead and I cannot really pin down what panel, as we do not control the sheets that closely.

Q. Have you any explanation to offer as to the tears in the area of the holes?

A. It appears that this sheet was ripped by the pipes staying in place and the sheet being forced out of position. What this specific force was that pulled it out, I do not know.

Q. Do you have anything further to offer with reference to the tests you made and which you have already described to us?

A. No, sir, I can't think of anything that would be pertinent.

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RE-EXAMINATION BY THE COURT

Questions by a member, CAPT NASH:

Q. Captain Hinchey, did any sil-brazed joints remain in the reactor plant or the reactor compartment at the end of the post shakedown availability?

A. Well, as I previously indicated. there are sil-brazed joints in the reactor plant air system, in the reactor plant fresh water system, and in the reactor plant sea water system. Even today, in some of our ships, we are converting some of those systems to welded systems, but those three systems are sil-brazed and have been. Now in the reactor plant system, in the reactor compartment, to the best of my knowledge, do contain some sil-brazed joints, but not salt water system. There are two piping systems in the reactor compartment, air and hydraulic, a fuel oil compensating system we converted to welding. There are some sil-brazed joints in the reactor compartment, but not in salt water systems.

Q. When the change was made from sil-brazed joints to welded joints in the salt water system; why was the change made?

A. I made the change because there was a Change Order issued by the Bureau of Ships on the 593 class and other classes, that called for the changing of these joints from sil-brazed to welded.

Q. I think I can short-cut here by asking the question to which I lead. Do you feel that the philosophy which caused the elimination of a great quantity of sil-brazed joints should be equally applied to other systems in the ship in the interest of improved safety?

A. Yes, sir, I have long since felt that it was better to have a welded system than sil-brazed.

Q. There is reason to believe that reactor power was lost about seven minutes before the final transmission from THRESHER. Would you state those casualties which in your opinion might have been the most probable cause of loss of reactor power?

A. Of course there are a multitude of events which could lead to the loss of reactor power. As you probably know, we have had SCRAMS in our operating plants due to salt water flooding incidents; we have had them due to personnel errors; we have had them due, indirectly, to salt water flooding incidents which in themselves would not have necessarily shut the plant down, but in trying to rectify the particular situation and in the confusion, the ship's force -- not necessarily in the confusion, but in the uncertainties that existed, the ship's force shut down systems that it was not necessary to shut down, but they did not know it at the time, but with the pump running in fast, any casualty that would cause the loss of the b(3) 10 USC 130

b(3) 10 USC 130

Q. Can you think of any others that you would like to suggest as possibilities?

A. Offhand it is pretty hard to visualize a single incident which would cause the loss of all electrical power, other than some sort of flooding. I do recall one situation where a rather small salt water leak, at fairly deep depth, but nowhere near the depth at which THRESHER might have been, although it was a small hole, due to the large amount of spray and the bouncing around of the salt water, there were b(3) 10 USC 130 put out of commission, so it can happen. It has happened when relatively small salt water leaks and high pressure

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will knock out a number of switchboards, and this is the kind of thing that it would take, if you are going to knock a plant off the line due to flooding, because you do have to lose b(3) 10 switchboards, and to lose b(3) 10 switchboards I have another fault. If you happen to lose b(3) 10 switchboard and you had a fault b(3) 10 USC 130 in the breakers, you would be in the same shape.

Question by a member, RADM Daspit:

Q. To what b(3) 1 switchboards are you referring?
A. Well, if you lost b(3) 10 USC 130 which are the TG boards, this would knock you off the line. If you lost the b(3) 10 USC 130 I think this would also knock you off.

Questions by a member, CAPT Hushing:

Q. How many people do you have in the Nuclear Power Division?
A. In the total Nuclear Power Division, I have close to two hundred people. This varies somewhat with the workload, particularly in the inspector and radiation monitoring area. Our radiation monitoring area fluctuates quite violently with the overhaul via the new construction. If I have an overhaul I have to have forty or fifty monitors; today I can get by with a dozen.

Q. How many people do you have in your total Quality Assurance group, including the inspectors and engineers that you have there?
A. This number will vary from eighty to a hundred and ten.

Q. Relating back to the number two hundred, which you gave, would eighty be the number of QA people relative to this two hundred?
A. Yes.

Q. And in the other divisions you might have a hundred and twenty people, approximately?
A. Right. (QA means quality assurance.)

Q. Did you prescribe any reactor plant tests to be performed on the deep dives of THRESHER after the post shakedown availability?
A. No, sir.

Q. Do you know whether the ship intended to test ~~release~~ relief valves or any significant portions of the reactor plant on the deep dive or deep dives?
A. There were no specific tests that I know of, that they intended to operate, to perform, with respect to the reactor plant in the deep dives.

Q. Turning to Exhibit (57), can you tell which side of Exhibit (57) was against the canning plates?
A. I think so, yes, sir. This surface was against the canning plate, I feel quite sure, because of the indication of this one short run here (indicating a portion of the exhibit) which I think is due to the little bit of poly that was between it and the canning plate, and it picked up the weld pattern.
b(3) 10 USC 130

Q. That is the side with the marking of "A" on it?
A. Yes, sir.

Q. Now turning to that mark "A", do you see the groove which is cut into the mark?
A. Yes, sir.

Q. Would it be possible that that mark had been put on the polyethelene in the Shipyard?

A. You are speaking of the groove; not the letter "A"?

Q. No, the letter "A."

A. The letter "A," it would have been possible; however, I happened to see this sheet when it came into the Shipyard, and it is not my recollection that that letter was on there at that time.

Q. Does the groove appear to be the kind of mark that would be made by chemists removing samples?

A. It could have been. It's not too unlike one I noticed on the other side. It's smaller but it's a similar groove to the one on the other side which I have been told was made for that purpose.

Questions by a member, CAPT Osborn:

Q. Captain Hinchey, do you think that the supporting reactor piping systems, for instance, the ASW system, have the same standard of inspection as the primary reactor plant system?

A. Frankly, I'm not too familiar with the details of the inspection procedures used in ASW systems. All I know is, is that the system has not been on the Shipyard target system, and some of the non-reactor plant systems were carried on the target system; main steam piping; for example, in the engine room is handled on the Shipyard target system. I do not think that the ASW system was.

Q. In operations, in the last analysis, are these systems just as important? In other words, could you run your reactor without them?

A. I couldn't run the reactor without the ASW system very long. That's what supplies salt water cooling to the fresh water coolant b(3) 10 USC 130

Q. How long could you operate the reactor plant critical, generating power, without the ASW system, before reaching designated temperature limits?

A. First, let me point out operating procedures under which the ship operates. They do not have--if they do not have, and if they lose salt water to the fresh water coolant and cannot restore it, there is a shutdown. Those are the operating instructions. If the engineering officer, or the commanding officer knew, under the circumstances, that here was a situation where he had to forget the operating instructions and take the bull by the horns and do what he had to do, he might stay on the line for b(3) 10 USC 130 but I doubt if he could stay much longer before he would do damage to the b(3) 10 USC 130 This is not a figure that is based on any calculations; this is intuition, more than anything else, based on what I know of the design of those b(3) 10 U they are dependent on fresh water coolant.

Q. I know for a fact, under operating conditions involving a casualty at sea, that the ASW system has been secured for as long as b(3) 10 USC 130 without reaching designated temperature limits, or any damage to the ship or to its systems. Don't you think, in terms of the critical condition, where we rely upon power as our primary safety item, that this subject should be a matter of detailed investigation?

A. There is no question about it but that we should take a real good look at the whole picture in that area.

Q. What reactor plant operationsin response to test memoranda were conducted prior to sea trials on THRESHER?

A. We ran a modified cold and hot operation. When I say modified, modified new construction cold and hot operations on the plant, put the plant critical alongside the dock and ran a power operation, a short power operation where we went up to a b(3) 10 USC 130 alongside the dock. In fact, operated at b(3) 10 USC 130 after completing all work on the plant, we operated at b(3) 10 USC 130 at least three or four times.

Q. Does the b(3) 10 USC 130 as to nails in the borated polyethelene, a process not being used today, more or less pinpoint poly observed in Exhibit 21 as coming from THRESHER?

A. Well, if it came from a ship that the Portsmouth Naval Shipyard built, then, it had to either come from THRESHER or from the ABRAHAM LINCOLN, because we have no other submarine operating in which these nails were used, that is, operating on this coast. Now, these nails were also used in the SEA DRAGON and SWORDFISH, I think. I was not here at the Yard, but I think at that time they were also used on those boats, but they are both on the West Coast and have been for some time.

Q. Is this process used at any other private or naval shipyard?

A. I honestly don't know what process the other yards are using for obtaining b(3) 10 USC 130 or were using. There is a high probability that Electric Boat might have used this at one time, because a lot of my people got their early training at EB.

Questions by RADM Daspit:

Q. Captain Hinchey, referring to welded lines; is there a lower limit to the size of lines which are welded instead of being sil-brazed?

A. I know of no fundamental reason for such a limitation, Admiral. We weld half and three-eighths inch stainless steel and carbon steel piping. Now, whether there is some practical limitation on small carbon steel--copper nickel piping--I do not know, but we don't use any of that in our area that is that small.

Q. Do you know whether it's necessary to substitute thicker wall piping in the smaller sizes if you are going to weld instead of sil-brazing?

A. Well, there is a practical limitation from the standpoint of being able to weld very thin wall piping. The existing BUSHIPS standards on the welding of pipe requires that no piping be welded aboard ship with a wall thickness of less than a hundred and twenty thousandths, and no piping be welded in the ship with less than ninety thousandths, except on a special case basis, and the reason for this, and BUSHIPS found this out by sad experience, the welder is either afraid of the thin wall or he isn't. If he is afraid of it, he isn't going to get a good weld; and if he isn't afraid of it, he is going to burn through and you have an awful lot of trouble.

(b) (6) relieved (b) (6) as reporter at this point.

Questions by a court member, RADM DASPIT:

Q. Referring to Job Order 15-939-21509 which, I recall, was replacing valves that had been Teflon-coated, I think you stated that these valves were tested to full submergence pressure?
A. Yes, sir.

Q. By this, did you mean 150 per cent of test pressure?
A. No, sir. This test was to full submergence pressure.

Q. Isn't it required that a safety factor be used on test piping?
A. We test to one and a half times from the boat out. What I was making reference to was testing from outboard in, and this is not a normal test. In fact, there are some sea valves on which this is almost impossible to do, but in these particular valves it was possible; by blanking the hull we could test back in. This is why--

Q. Then, do I understand that there are valves in sea water systems which were subjected only to a pressure equal to the test depth of the ship?
A. No, sir. I think there are some sea valves which you cannot test even to full submergence pressure from the sea in, but all sea valves are tested to at least sea pressure. They are tested one or more times to one and a half times in pressure from inside the ship out to that valve.

Q. Did you indicate that the valve is expected to be tight both ways, because the pressures we are concerned about are outside in?
A. I think, in the case of ball valves, this is a pretty good assumption. A ball valve, by its very nature, is not like a globe valve or a gate valve, and it doesn't know whether the pressure is coming from one side or the other. The test is good on either side. This is not necessarily true in the case of a globe valve. If you get the pressure on top of the disc, it will help you in one case; whereas, if you get it on the bottom side, it is fighting you.

Q. To shift to another subject, sir, you said that no design work on the reactor system was done here. Referring to the foundations for the b(3) 10 USC 130 which was affected by the shock test, was that design work done by the nuclear people away from the Yard.
A. This design work was done by Electric Boat Division as part of that over-all change order affecting shock hardening. b(3) 10 USC 130 was the only foundation that we changed. We changed a number of foundations in the reactor plant area as a result of the shock test.

Q. This was not a design, though, for which the nuclear code was responsible?
A. When you say the "nuclear code," you mean my division here at the Shipyard?

Q. I mean in the Bureau of Ships.

A. Bureau of Ships, Code 1500, was responsible for it, yes, sir. That is why it was done by Electric Boat. The Electric Boat Division is the lead yard, the planning yard for all reactor plant work, even on the 593, which was designed at Portsmouth.

Q. We have had earlier testimony that the high-pressure air system of this ship suffered quite a bit from contamination and, in developing the reasons for this, some people explained there was a lot of work to be done to cut into the system and, when you cut into the system, inherently, contamination sometimes results in areas of the ship. You also had to cut into your nuclear system, and you say you couldn't afford the time to go through and clean it out. What is the difference between the technique that you use and that which the pipe people use on the high-pressure air system, if you are aware of their methods?

A. Admiral, really all I can tell you about, sir, is what we do. If we are going to cut into a primary coolant system, we handle the job from start to finish in a clean area. We establish clean conditions before we cut into the pipe, and we will grind to within a very thin membrane, and before breaking the pipe, we will establish a grade A area. We do not cut all the way through the pipe. We go down to this thin membrane and then rap it and she breaks clean. The first thing we do after that is to put a plug in the open end of the pipe, clean it out, and the shop, with an inspector present, puts a plug into the pipe. The inspector is responsible for seeing that the plug gets out of the pipe when the job is finished, and until the root pass of a weld is reinstalled, that pipe is maintained Grade A clean.

Q. Another subject: You indicated in reply to a question as to what instructions you give the nuclear operating people, and you indicated that you considered the instructions given at Bettis far superior than the instructions which are given them here. Does Bettis have an S5W plant where they can get instructions on the operating equipment which they can get here?

A. They don't have an S5W operating plant at Bettis, but by the same token, I seldom have an S5W plant that is available here.

Q. Another question: You talked about a case in which a small salt water leak caused b(3) 1(switchboards to fail. Can you tell us what ship was involved at that time?

A. I can't, Admiral, because I actually do not have the information. I merely get resumes, but it is the type of information which I'm sure Admiral Rickover could make available. I get, periodically, for my own use, summaries of what kind of troubles to look out for. These summaries are incident reports prepared by ships. When the question was asked this morning, it rang a bell, and I remember reading about this particular incident as part of a group of incidents involving salt water leaks. This one was a b(3) 10 USC 130 in the trim line which let go, and it cut out b(3) 1(switchboards.

Q. One final question: You indicated that you had, I think you said, 14,000 man days of work?

A. Yes, sir.

Unclassified

Q. And that this was comparable in hours, outside the reactor operation, to 56,000 man hours of work? I don't know whether I have those figures correct or not.

A. That was 5,000 or 6,000 man hours, Admiral.

Q. Oh, I see.

A. The point being that in working in a contaminated area, it takes a man a little bit longer than it should, but at best it would take him a half hour or so to get dressed and properly rigged to go into the contaminated area. He loses similar time in leaving the area in getting undressed, monitored, and checked out. We found that if we could get a man, in an eight-hour day, 100 per cent efficient, six hours in the reactor compartment, we would be doing real well. An hour and a half to two hours are lost just getting ready to go in and getting in and getting out.

Unclassified

Q. Do you have a system where, if a man reaches his tolerance dosage, you can transfer him to jobs where he would not suffer from radiation?

A. Yes, sir. We keep an IBM system to keep tabs on all the people working in the reactor area.

Questions by the president, VADM Austin:

Q. Captain Hinchey, you have different standards for not only joints in piping but for methods of conducting work in the reactor part of the ship from those used by the Shipyard in the rest of the ship. You have testified that these standards are higher than those used in the rest of the ship. You have a separate inspection division, or branch, to insure this higher quality assurance which you seek in the reactor division. Would it be practicable to apply the same standards of performance of work and inspection for assurance of high quality to the entire submarine which is applied to that part of it that is under your responsibility?

A. Admiral, I can only give you my opinion on that matter. Yes, I think it would be practicable.

Q. I believe that you said that, in getting your welding done, you've got the best people in the Yard assigned to do it so as to meet these high standards. Would we run into some difficulty as to what to do with those people who aren't the best people in the Yard, and would we be able to train, recruit, and keep employed only the best people?

A. Well, when I said I thought it was practicable to do what you suggested, Admiral, I did not mean it would be practical to do it overnight. There would be a big training program required; there would have to be a big change in philosophy amongst a lot of people; but I think with the proper philosophy and the proper approach of things, I think it could be done. I have no reason to say that the run-of-the-mill welder, if properly trained, could not do a lot better welding job than they are doing today.

Q. Isn't that true of any man in any line of work, he can no doubt do better than he does today?

A. Yes, sir, and he is going to do that only to the extent that he is required to do it.

Q. Isn't there a limit, though, of what can be required of any one individual? In other words, are there not different levels of competence for different individuals of different mentalities, different backgrounds, different standards of personal conduct and pride of execution?

A. There certainly are, but I just can't believe that the people that we have in this area, or in any part of the Yard, can't be jacked up to the point where they can do a lot better work in most of the areas than they are presently doing. In the copper-nickel welding, for example, it is a tough problem. It is a difficult matter to handle, but I think with the proper emphasis, that the problem can be solved. I don't think that the copper-nickel area, for example, has really reached that percentage of efficiency which is desirable. We have less trouble welding stainless steel than material which we've been welding for years. When we first got into the reactor area, we said, "Gee, where are we going to get the people which we require for this type of welding?" I think that you would find from Admiral Rickover that we have people in this country who can weld Inconel repeatedly far more successfully than some can weld copper-nickel.

Q. Isn't it true that the field of metallurgy is repeatedly changing and that partially explains the facts that you have just cited?

A. Yes, sir.

Q. Well, now, Captain, we have often heard the expression that a fleet is no faster than its slowest ship. By the same token, a ship is no better than its weakest part, especially in a submarine. Is there any possibility that by concentrating on all of the best talent, all of the best available workmanship in one part of the ship, we might have contributed to a failure in that part of the ship that did in fact fail?

A. No, sir, I really don't think so, for two reasons: 1. When I say I get the best people, the number of welders I get out of the welder's shop - and they have perhaps 800 to a thousand people in there - the number of welders I have working on my staff will run somewhere between 50 and 75 people. Now, of those people, the bulk of them are qualified to weld stainless steel, nickel-copper, and carbon steel. The materials that you are probably most concerned about are copper-nickel. I have very little copper-nickel. I use very few of the people that have been trained and qualified in the copper-nickel area, and I don't think that my having the availability of some 50 to 75 welders out of a total of 800 or 1,000 would have that kind of a bearing on this question.

Q. It is fully recognized that the reactor part of the ship is a very important part, and I am sure that the court would not have your standards lowered in any way, but I do wonder if there is any wisdom in building a ship in which we have a standard of a factor of safety of, shall we say, for example, 2 in one section of the ship, 1½ in another section of the ship, and only 1.1 in another section of the ship when, in fact, the failure of any section of the ship will cause the loss of the whole? Would you have any comment on that.

A. Well, as you point out, Admiral, a ship, or any other entity, is only as good as its weakest link. By that same token, if we have any part of the ship which is pertinent to its life that has a factor of safety of 1.1, whereas the rest of the ship is 1½ or 2, or whatever, it might be, there would be only one excuse that I could think of for leaving it this way, and that is the state of the art and technology today is such that we can't do any better than that. If that is the situation, then I think we ought to have a lot of people trying to upgrade the state of art in that particular area.

Q. It might even be advisable to share the best welders with those parts of the ship that are not designed with as much safety factor as the one that has a high safety factor.

A. Well, as I say, I don't think that in this particular case in this particular Shipyard my having this particular group of welders, I can't quite see that this situation downgrades the rest of the people. In fact, I would like to see the people I have up-graded, although I was satisfied that I had the best people I could get. I am not at all completely satisfied with my people. I would like to bring them all up to better standards.

Q. I would have been disappointed in you , Captain, if you were satisfied. No one should ever be happy with anything less than perfect.

A. There is another consideration in this particular case that is over and above the matter you discussed with respect to the integrity and safety factor. One other thing we have to consider in the reactor area over and

above the safety of the ship is that we are playing with radiation and this is not just when the ship runs at high speed or at deep depths; it is a consideration which we must bear in mind day in and day out; when the ship is in the Yard, or when she is operating. We are fooling with contamination, and we've got to be sure we have the highest quality workmanship available.

Q. The court fully recognizes this, and the court also recognizes the fact that you have to be concerned with the prevention of radiation hazards even after the ship is lost, if it be lost, and apparently in this case your part of the ship has stood the test because we have had no indication of radiation emanating from this lost ship. I am not saying that you should not have high standards. I am merely trying to elicit information which would have a bearing on raising the standards of the entire Yard and the ship's standards rather than lowering yours; but there are inter-relations between these two, as I am sure you appreciate.

A. Certainly, sir.

Questions by a court member, CAPT OSBORN:

Q. As you have probably surmised, the power distribution and selected tripping of various breakers, particularly with respect to the main coolant pump, is of extreme interest to this court. Who, in your estimation, is the best qualified to answer this question?

A. I can't give you the name of an individual, because I don't know who that individual would be, but it seems to me either the electrical people in the Shipyard's Design Division or the electrical people in the Bureau of Ships would be the one to answer your questions with respect to those breakers.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. With reference to your stated opinion that it could one day be practical to use the same standards in the rest of the ship as are used now in the reactor compartment, practically speaking, could the same "clean area" requirements and techniques that you described in cutting the reactor piping be used in cutting into air and hydraulic piping in other areas of the ship for alterations and changes?

A. There is no fundamental reason why it could not be done. It obviously would increase the cost of building and repairing our ships, but the thing that would be hard to determine is to what extent this would be off-set by the reduced maintenance and the reduced repairing and the reduced amount of work you would have to do on the plant because of contamination that might have been brought about by other conditions.

Q. You have told us that twelve joints in salt water systems were changed in the reactor compartment from sil-braze to welded type joints and what problems were encountered in welding those joints. Can you estimate the number of joints which would be involved if this change were invoked throughout the whole ship?

A. This change-order applied to salt water piping that saw few submergence pressures. It is just a guess, but I would guess that it would run into somewhere between 100 and 150 joints.

Neither counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

Unclassified

The president informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

THE WITNESS: Well, Admiral, to tell the truth, I really haven't given too much thought to answering that question. The day after the THRESHER was lost, we went critical on one of our plants, and we've had our fair share of problems right up to the present moment. About all I was prepared for was the subjects I knew were to be discussed here in my testimony.

The witness indicated that his testimony was ~~confidential~~. Unclassified

The witness was duly warned concerning his testimony, and withdrew from the courtroom.

PRESIDENT: We'll have a ten-minute recess.

The court recessed at 1130 hours, 26 April 1963.

Unclassified

The court opened at 1150 hours, 26 April 1963.

All persons connected with the inquiry who were present when the court recessed were again present in court with the exception of (b) (6), who was relieved as reporter at this point by (b) (6).

William D. Roseborough, Captain, U. S. Navy, a former witness for the court, was recalled as a witness for the court and reminded that the oath he had previously taken was still binding.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Captain, you have previously stated for the record your duties in the Planning Department. It was a simple statement without any elaboration. Can you now explain in greater detail the nature of the duties which you perform?
A. Yes. The nature of my duties is to carry out the responsibilities of the Planning Officer, and I would like to enumerate those: first, organization, administration and supervision of the Planning Department; second, development of design for shipboard applications and for new ship designs and conversions assigned to Portsmouth Naval Shipyard; third, approval, issue and transfer of work instructions and plans; fourth, and lastly, initiation of procurement of material and funds necessary for all work performed by Production Department shops and as required by BUSHIPS for follow shipyards.

Q. To what extent has the execution of those duties been applicable in the case of THRESHER?
A. In other words, Counsel, what part did I play in the THRESHER PSA?

Q. Or you could go farther back and include part of her construction period?
A. I think probably if you would let me summarize my professional background and experience, that would answer itself.

Q. Please do so?
A. I have been intimately and continuously associated with all phases of submarines, including design, construction, conversion, overhaul, alterations, maintenance, and operation for the last eighteen years, since I completed my post-graduate education in Naval Construction and Engineering at MIT. My duties during that time are summarized briefly, as follows: Portsmouth Naval Shipyard, as Assistant Shipbuilding and Repair Superintendent, for two years; followed by Assistant Design Superintendent for new development, for one year. This was at the close of the second World War and for the three years succeeding during that time. I then went to BUSHIPS as the Assistant to the Head of the Submarine Branch, where I stayed for two years. I then went back to MIT for a second post-graduate course, this time in Advanced Nuclear Engineering, to better qualify me to pursue the nuclear submarine program which was only then beginning to be initiated. Then back to the Bureau of Ships for two years as the Submarine Preliminary Design Officer in the Design Division; and followed by one year as the Submarine Design Officer for the BUSHIPS Contract Design Division. Following that I was transferred to SUPSHIPS, Groton, and was the Inspection Officer for two years; followed by a one year tour at the same office as Design and Planning Officer. Following that I transferred up the river as ComSubLant's Force Material Officer for a two year normal tour. Following that I reported back to BUSHIPS as the Head of the Submarine Branch for a three year tour. At the completion of that tour I reported here at Portsmouth last summer and I have been here since that time. During my

first tour at Portsmouth I participated in design and coordinated the testing and trials of the first five guppy-snorkel conversions of our World War II fleet submarines. During my first tour in BUSHIPS I participated in the design and specifications of the TANG class, our first post-war design. I also coordinated the initial full-scale stability and control trials of the guppy conversions -- the ODAX being the first of that class. During my second tour in BUSHIPS I was Assistant for Submarines to the Head of the Preliminary Design Branch and later to the Head of the Contract Design Branch. In Preliminary Design I was the Project Officer for the design and specifications for NAUTILUS, SEA WOLF, GRAYBACK and GROWLER. I was also the author of the Submarine Stability and Control chapter of the Guppy Manual which the Bureau of Ships prepared for the Submarine School at New London. My main purpose in the Contract Design Branch was to get the Bureau of Ships back into the submarine contract design business after an absence of many years. Contract designs for both the GRAYBACK and DARTER, improved TANG Class submarines, were accomplished during my tour. During my tour at SUPSHIPS, Groton, I was Inspection Officer for the construction, testing and trials of both NAUTILUS and SEA WOLF, and Design Officer for the SKATE Class and SKIPJACK. My tour as ComSubLant Material Officer was highlighted by the multitudinous new problems associated with the initiation of forces afloat maintenance of the new nuclear Navy. This involved many facets, including technical, radiological safety, fiscal, and psychological. I literally had to live with my sins of omission and commission of my previous two tours. During this time I also participated in all of the initial and INSURV sea trials of all these new submarines. My third tour in BUSHIPS, as Head of the Submarine Branch, was primarily occupied with management of our rapidly growing nuclear submarine building program, both attack and Polaris. Two collateral assignments were as BUSHIP's representative in CNO's Submarine Silencing Program Committee, and BUSHIP's representative on the Polaris Program's Steering Task Group, which is comparable, to the Director of SP, much as the SCB is to CNO. I continued to spend many days operating at sea during initial and INSURV acceptance trials in all of our new submarines. Included in those trials were the initial, and subsequent deep dives in both THRESHER (SS(N)-593) and ETHAN ALLEN (SSB(N)-608), the prototypes of the two new deep-diving classes. My return to Portsmouth Naval Shipyard last summer was at my own request for it was obvious that the next generation of submarine development was already under way with the very deep-diving new experimental DOLPHIN (AGSS-555).

Q. What part did you play in THRESHER's post shakedown availability period?

A. I became Planning Officer at Portsmouth on 10 August 1962, almost one month after the start of THRESHER's PSA; therefore, I had no or little opportunity to participate in the pre-planning phase nor in the arrival conference. Because of THRESHER's importance as a prototype of our latest type class of nuclear submarines, and because of the large number of them to which the Navy was committed, THRESHER assumed first place on my priority list. My senior Assistant Planning and Estimating Officer, Lieutenant Commander Billings, and my only Assistant Design Officer, Lieutenant Commander Allen, were already assigned to THRESHER. I continued that assignment in order to insure that the best management talent available to me was assigned to THRESHER. Both of those outstanding Engineering Duty Officers were qualified to command submarines before they became EDO's. Both had become fully qualified as submarine EDO's by their engineering experience. Both participated to the fullest in the solution of the many urgent design and material investigations and problems. Both participated as full time members, along with THRESHER's representative and the Production Department Ship Superintendent, of the Joint Task Team to determine the scope and scheduling of all system tests and dock trials. Both worked many late nights and weekends because they loved THRESHER and knew her

importance. Both were on board for her sea trials. Both were lost. I met informally with them almost daily to discuss THRESHER problems and schedules. In addition, I met formally with them and their civilian assistants twice a week to discuss the over-all status of THRESHER in every aspect. About the first of January I persuaded the Shipyard Commander to assign to me one of the student officers then nearing completion of his indoctrination course. That officer was assigned to the Planning and Estimating Division as Project Manager for DOLPHIN (AGSS-555), Project GLAUCUS, and the new SS(N)-646.

Q. What is a student officer, and what is the indoctrination course to which you are referring?

A. The coordinator of that course is Captain Heronemus, who I understand is to be your next witness and is far better qualified than I to give you the facts on this, sir.

The witness continued his answer as follows:

A. The assignment of this new officer to me permitted me to thereby relieve Lieutenant Commander Billings to the extent that he could devote almost full time to THRESHER, along with one of his civilian assistants. The Planning Officer personally took charge of several investigations which gave indications they might become controlling in the length of the availability. One such example is the modification of the acoustic barrier associated with the AN/BQS-6 active sonar, which gave strong indications of becoming a fire hazard. As a result of pushing that investigation "around the clock", the potential fire hazard was eliminated. The problem was immediately reported to BUSHIPS, who, in turn, alerted all follow shipbuilders to it. The solution was also reported, as soon as available, and was immediately made a Category "A" Change Order for all ships of the 593 Class.

Q. What is a Category "A" Change?

A. Mandatory before completion of the ship.

b(1)

The Planning Officer also exerted continuous effort to turn down late job requests which might jeopardize the timely completion of the PSA, unless I considered them mandatory for safety or to permit THRESHER to leave this post shakedown availability fully ready for unrestricted service. The first such instance, I recall, occurred on 5 October 1962, with respect to a BUSHIPS modification requested for which neither the design was complete nor the material available. I have many others in the file. The Planning Officer monitored the job orders issued continuously, and after about 1 January 1963 personally reviewed every job order before issue to determine that it was both necessary and complete. The Planning Officer inspected the status and the quality of the work on THRESHER periodically and held several discussions with Lieutenant Commander Harvey as well as with his Engineer Officer.

Q. Various witnesses have testified as to the elongations and delays and extensions of THRESHER's period of post shakedown availability. Will you give us a complete account of this and reference any documents which authorized the extensions or delays?

A. THRESHER's construction was completed by Portsmouth Naval Shipyard and she was accepted for restricted service on 1 August 1961. In order to achieve maximum operational evaluation of the many new features in this prototype of a

new class of submarine at the earliest, including comprehensive acoustic trials and underwater explosion shock trials, the previously scheduled start of its PSA was delayed for about one year after completion. Portsmouth Naval Shipyard advised the Bureau of Ships on 25 May 1962 that the large number of INSURV Preliminary Acceptance Trial items, BUSHIP's Change Orders, and THRESHER ship's force work requests, were estimated at thirty-five thousand man-days. Since Portsmouth Planning and Estimating estimates at this time totalled only twenty-nine thousand one hundred and sixty-six man-days, this thirty-five thousand man-day estimate included an estimated six thousand man days, or approximately twenty percent, for the inevitable growth of scope. Portsmouth Naval Shipyard also requested, at that time, authorization of seven hundred man-days of overtime in excess of the BUSHIPS limitation of two percent in order to provide orderly and timely prefabrication prior to arrival of THRESHER to start her PSA.

Q. What is this limitation of two percent for overtime to which you refer?
A. The Shipyard is normally limited by BUSHIPS policy and instructions to a maximum of two percent of the regular work expenditure without special permission from the Bureau of Ships; and we are not reluctant to ask that exception where the need justifies.

Q. Please proceed.
A. Portsmouth Naval Shipyard, on 7 June 1962, requested that the THRESHER PSA be placed on a RECOMP basis because of the unknowns resulting from shock trials and the incomplete state of the Naval Ordnance Laboratory development and Portsmouth Naval Shipyard planning work for the reconfigured PUFFS installation. BUSHIPS, on 12 June, concurred in Portsmouth Naval Shipyard's request to place the PSA on a RECOMP basis.

Q. What is a RECOMP basis?
A. We will recompute after we know, or have a reasonable opportunity to compute, the scope of the availability based upon known availability of plans and materials.

Q. Please continue.
A. Deputy ComSubLant, on 18 June 1962, told Portsmouth Naval Shipyard"that changing the PSA to a RECOMP basis because of shock test unknowns, is not considered necessary since this would be done 'after-the-fact' if shock test results indicated need therefor. Delaying start to preclude delay caused by PUFFS installation is also not worthwhile since the ship will need upkeep time after shock tests in any case, so that, except for delaying the PSA start two to three months, little net gain in operating time will result." Portsmouth Naval Shipyard advised Deputy ComSubLant, CinCLantFleet, CNO, BUSHIPS and others on 26 June 1962 that the reconfigured PUFFS installation requested by Deputy ComSubLant in the message just referred to would control the length of THRESHER PSA if started before 24 August 1962 because of incomplete plan development and material procurement. ComSubLant, on 2 July 1962 stated that the need to install and test the reconfigured PUFFS in THRESHER Class was urgent, as was the need to conduct shock effects inspection as soon as possible following the tests just completed. In view thereof, ComSubLant recommended to CinCLantFleet that THRESHER PSA be scheduled from arrival at Portsmouth Naval Shipyard about 16 July 1962 through 18 January 1963, a full six months period. CinCLantFleet, on 11 July 1962 recommended to CNO that, for the reasons just cited by ComSubLant, the THRESHER PSA be scheduled from 16 July 1962 to 18 January 1963. CNO, on 12 July 1962 approved

CinCLantFleet's recommendation and established the THRESHER PSA of 16 July 1962 to 18 January 1963.

Q. That was the first time the period of the post-shakedown availability was ever officially set?

A. Firmly, officially established, 12 July, by the Chief of Naval Operations.

Q. Proceed, please.

A. The work to be accomplished during THRESHER PSA consisted primarily of the following: one, correction of Preliminary Acceptance Trials items: deficiencies subsequently reported by THRESHER during the shakedown period; and also the sizable job of converting the entire hydraulics system from phosphate ester to petroleum based fluid. The scope of this work was quite well known and planned and was estimated at thirty-five thousand man-days, as discussed previously. This, or course, contained our twenty percent growth contingency. Two, the deficiencies revealed by the underwater explosion shock trials just then completed. The scope of this work was unknown and was not planned. Three, the installation of the reconfigured PUFFS. The scope of this work was uncertain due to the incomplete development of plans and the unknown availability of materials. It was still under development at the Naval Ordnance Lab, White Oak, Maryland. Portsmouth Naval Shipyard, on 17 October 1962, advised COMSUBLANT, Deputy COMSUBLANT, BUSHIPS and THRESHER that accomplishment of the silencing modifications requested by BUSHIPS letter of 7 September 1962 would require an extension of the PSA by four weeks, and that an immediate decision was required. The scope and length of this job was grossly underestimated at that time. BUSHIPS, on 17 October, the same day, strongly recommended to Deputy COMSUBLANT that the silencing modifications be accomplished during the current PSA to permit earliest evaluation and determination of corrective action required for follow ships of the THRESHER class. Deputy COMSUBLANT, on 19 October 1962, concurred in BUSHIP's recommendations. CINCLANTFLEET, on 24 October 1962, approved the extension of the PSA from 18 January 1963 to 15 February 1963, based upon Deputy COMSUBLANT recommendations of 19 October cited before. Portsmouth Naval Shipyard, on 3 January 1963, advised Deputy COMSUBLANT, BUSHIPS, and others, that the scope of the structural alterations required by BUSHIPS Change Order 232, the PUFFS installation, and the extensive silencing modifications, indicated at that time a thirteen day potential delay in completion of the PSA, and requested an extension from 15 February '63 to 28 February '63. This request was approved by CINCLANTFLEET on 4 January, based upon Deputy CONSUBLANT recommendation. Portsmouth Naval Shipyard, on 18 January 1963, advised Deputy COMSUBLANT, BUSHIPS, and others, that under-estimation of the effects of interaction of major work discussed in the previously mentioned 3 January 1963 message, plus additional rework and re-test, indicated that further delay was necessary, and requested an extension to 30 March 1963. Deputy COMSUBLANT, on 19 January, recommended approval of extension of PSA to the 30 March date, and stated that he recognized that some additional work and other difficulties might have been unforeseeable and beyond Shipyard control. However, he also requested that Portsmouth Naval Shipyard be instructed to expedite THRESHER work all possible that would contribute to the earliest possible completion. CINCLANTFLEET, ten days later, on 29 January, approved the extension of the PSA completion date to 30 March, based upon Bureau of Ships confirmation of this requirement on 25 January. Portsmouth Naval Shipyard, on 7 February 1963, advised that radiography of the CD4MCU torpedo tube breech doors, requested by BUSHIPS telephone conversation, would delay THRESHER completion by three days, to 2 April 1963. BUSHIPS, on 20 February 1963, stated that the breech door radiography was considered mandatory before acceptance of THRESHER for unrestricted service, and requested Portsmouth Naval Shipyard report its ability to accomplish during the present PSA, or the delay in PSA completion required and the reasons therefor; and also to estimate the time required to accomplish any separate restricted availability for type commander action. Portsmouth Naval Shipyard, on the following day, 21 February, reiterated a three day delay required to accomplish within the PSA, and also estimated that a fourteen day restricted availability would be required to accomplish after the completion of PSA.

Deputy COMSUBLANT, on 25 February 1963, recommended that the completion of the PSA be extended to 2 April, vice 30 March, to accomplish the radiography of the breech doors. CINCLANTFLEET, on 27 February '63, approved the extended completion date to 2 April '63. Portsmouth Naval Shipyard, on 11 March, 1963, reported that during the preceding two weeks two major casualties requiring redesign and rebuilding, and one additional casualty requiring rebuilding, had occurred; that these casualties had delayed the start of the alongside training cruise by nine days; and that, therefore, the 2 April completion date was in serious jeopardy. Portsmouth Naval Shipyard further stated that maximum effort to hold the present completion date would be continued, but that completion date was dependent upon the success of the Alongside Training Cruise, formerly called "Fast Cruise" and the Sea Trials. Portsmouth Naval Shipyard, on 21 March '63, advised of the discovery on 17 March of a misaligned starboard torpedo ejection cylinder, apparently caused during the shock trials, had gone undetected, and that correction of this latest deficiency had prevented recouping any of the nine days previously lost as reported on 11 March; estimated the earliest practicable completion date as 11 April; and requested extension of the PSA completion date accordingly. Deputy COMSUBLANT, on 22 March, stated confidence that Portsmouth Naval Shipyard was applying every possible effort to minimize and avoid delay, and recommended completion of PSA be extended to 11 April. Extension was approved by CINCLANTFLEET on 23 March 1963. The Commanding Officer, USS THRESHER, on 8 April, reported to COMSUBLANTADMIN-PORTSMOUTH and the Commander, Portsmouth Naval Shipyard, that the Dock Trials and the Alongside Training Cruise had been satisfactorily completed. The first "Fast Cruise", or Alongside Training Cruise, had been conducted from 2000 on the 23rd of March to 1200 on the 26th of March. A second "Fast Cruise" was conducted from 0800 on the 31st of March to 0800 on the first of April. Commanding Officer, THRESHER, on 2 April 1963, promulgated his Sea Trial Agenda. This included: one, it listed the items to be completed during sea trials and provided a sequencing to prevent conflicts between trials; two, it stated that the record of the THRESHER Builder's Sea Trials contained information on the requirements for satisfactory completion of Builder's Trials, and also provided a source of comparative data for the present Sea Trial agenda; three, it designated the Executive Officer as the Sea Trial Coordinator; and four, it directed his department heads to inform the Sea Trial Coordinator when each test was satisfactorily completed, the inability to complete any test, or any evidence that a test must be repeated, rescheduled, or changed in sequence. THRESHER departed Portsmouth Naval Shipyard for PSA trials at 0800 on 9 April 1963. I would like to go ahead and discuss a little background of this, if I may.

Q. Of the sea trials?
A. No, of the PSA.

Q. What is the nature of the matter you wish to cover?
A. The scope of the growth and the things that caused it.

Q. My next question to you, Captain, was going to be -- and I put it to you now -- will you discuss the source and scope of the major work items which were performed on THRESHER during her PSA?

A. Yes, sir. Based upon the chronology of THRESHER PSA, which I have just given you, it should be obvious that the PSA was started with inadequate advance planning time for the many unknown work items, such as those resulting from shock trials, and the extensive number and scope of alterations still under research,

development and design, such as the completely reconfigured PUFFS at NOL --

Q. NOL means what?

A. Naval Ordnance Laboratory -- and the extensive silencing modifications still under development by the Bureau of Ships. This situation was made known officially before the start of the PSA and a deferred start date strongly recommended by the Shipyard. In addition to the above items which required extensive investigations and high priority design and material procurement efforts, many additional work items were added by both THRESHER and BUSHIPS throughout the duration of the PSA. In addition, the scope of many items accepted on the basis of estimates based on partial information or inadequate time to investigate, increased excessively in all areas except those for which adequate advance planning time was available, as, for example, the Preliminary Acceptance Trial items. A known PSA work package of twenty-nine thousand one hundred and sixty-six man-days at the time the availability was assigned, grew continuously throughout the PSA to one hundred and three thousand two hundred forty-eight man-days, an increase of over three hundred and fifty percent in scope.

Q. Is that an unusual increase to be experienced in a situation like this where the ship is a lead ship of its class?

A. Very unusual. I ask, is it unreasonable to expect any availability which increases over 350% in scope to also increase almost fifty percent in time? I have been considerably dismayed by the rather loose reference of many witnesses to the THRESHER post shakedown availability as an overhaul. THRESHER was a new ship, having been operating on an extended shakedown for less than a year. The bulk of the work assigned was new and developmental. The urgency was to design, develop, manufacture and install all of the latest components and systems required or desired by the Operational Requirements in order to obtain the earliest possible at-sea evaluation of them to permit earliest incorporation in the largest possible number of follow ships. By contrast, submarine overhauls can be adequately planned because the BUSHIPS alterations are authorized at least one hundred twenty days before the start of the availability; material required for them has been determined by previous SHIPALT analyses; and shipments to the Shipyard are initiated shortly after the hundred twenty day authorization letter. A ship's force work list is available at least two months before the start of the availability and the Type Commander's authorization is received shortly thereafter. And most of the jobs will be routine or repeaters. I have further had the PSA items arranged by categories and by phases. The categories are: INSURV Preliminary Acceptance Trial items; "N" items-BUSHIPS Change Orders and Directives; "S" items-ship's force work requests submitted prior to the restricted availability of THRESHER at Portsmouth from 4 December '61 to 8 February '62, but which were not accomplished during that availability; "M" Items-ship's force work requests submitted subsequent to that restricted availability; Underwater Shock Trial items; and miscellaneous items not fitting into any of those categories. The phases are: (a) the initial work list, that is, the work known at the time the Portsmouth Naval Shipyard recommended the 18 January '63 completion date; (b) the pre-arrival conference work list dated 3 July '62; (c) the post-arrival conference work list dated 3 August '62; (d) the final work list dated 15 January 1963; and (e), supplementary work list - those items assigned after the final work list, or what we thought was the final work list.

Q. Do you have such lists with you now, Captain Roseborough?

A. Yes, I do.

Q. Can you produce them?
A. Yes, sir, I can.

Q. Are they described as "A", "B", "C", "D", as you have described them in your testimony?
A. Yes, they are.

A list of PSA items arranged by categories and by phases was submitted to the party and to the court and was offered in evidence by counsel for the court. There being no objection, it was received in evidence as Exhibit 91.

Q. Do you have a list of work items pertinent to hull integrity, piping system integrity, ship control and main propulsion power, which, in your judgment, are most likely to have been related to a possible casualty in THRESHER?
A. Yes, I have reviewed the entire PSA work list as thoroughly as the available time would permit and have segregated those items which I consider could possibly have affected hull integrity.

Q. Will you produce it?
A. I make no claim that this is complete and that, if I had more time, a further survey might not reveal some items which could be remotely connected. This list totals thirty-six job orders, of which I consider sixteen to have improved the safety of THRESHER directly, while most of the others, except for routine access openings, improved the safety by making THRESHER a quieter or more efficient submarine; and I have such a list so segregated.

Q. With reference to your remark that if you had more time you might add additional items to such a list, I will request you, if you think of any items, to get in touch with counsel for the court?
A. I have reviewed every item hastily on that seven or eight hundred item list, however many it is, and I may have overlooked one or two.

WITNESS: Mr. Counsel, all of the items I cited as effecting a delay, or problems in the PSA, I have specific references if the court would like to refer to them in the record.

Q. You have a list of the cited references which you gave us only by originator and date in your testimony?
A. Yes.

COUNSEL FOR THE COURT: I will ask you to produce it when the previous item is entered or excluded from evidence.

The list of thirty-six job orders most likely in the opinion of the witness to have been related to a possible casualty in THRESHER was submitted to the party and to the court and was offered in evidence by the counsel for the court. There being no objection, it was received in evidence as Exhibit 92.

Q. Produce the item to which you just referred?
A. (The witness did so.)

A list of specific references cited by the witness in his testimony as affecting a delay or problem with respect to THRESHER's PSA was submitted to the party and

to the court and was offered in evidence by the counsel for the court. There being no objection, it was received in evidence as Exhibit 93.

Q. Do you have any other papers with you, Captain, which you think would be pertinent at this point?
A. I don't believe so, no.

Q. Did you have any discussion with the Commanding Officer of THRESHER or his Executive Officer with regard to the agenda to be carried out during the sea trials?
A. I did not. In fact, I did not receive the agenda until I requested it after the ship had left on sea trials.

Q. Towards the end of the period of post shakedown availability, within the matter of the last four weeks or so, did you have any discussions with the Commanding Officer of THRESHER with respect to the urgency of finishing the ship at the scheduled time?
A. I remember no specific discussions. It was always raised at the weekly meetings of the Commanding Officers with the Shipyard Commander, and we jointly arrived at what we thought was the most reasonable and likely date of starting "fast cruise", going to sea, and thereby completing the availability.

Q. Can you say whether, when the question was raised at these conferences, it was raised in a way which would put pressure on the Commanding Officer to hasten his departure from the yard?
A. I do not believe so. The Commanding Officer was a very strong and deliberate and forthright individual, and the Shipyard Commander and I, I know, were as concerned and determined as he was that safety and completeness came first. We wanted this ship to be the first one ready for unrestricted service.

Q. When the ship departed for her sea trials were you wholly satisfied in your own mind and conscience that the ship's safety and completeness had achieved that degree which you mentioned a moment before?
A. I felt that she was far safer at the end of this availability than she had been the previous several times that I had been with her to test depth and full power trials, including the first, second and third full depth test dives. As I indicated in the list there, almost all of the critical items I consider as having enhanced her safety.

Q. Turning to a new subject. We have heard that during THRESHER's period of post shakedown availability twelve joints in the reactor plant systems were changed from sil-brazed to welded joints. Inquiry as to the estimated number of joints in vital submarine systems, other than the reactor systems, which would be involved if the change from brazed to welded joints were required, evoked an answer that from one hundred to one hundred and fifty joints in the sea water system would have to be changed in that way. Do you agree with that estimate?
A. No, sir, I do not.

Q. What would be your estimate of the number required to be changed from sil-brazed to welded joints?
A. In those systems which would normally be, or could be, by operational requirements, subject to submergence pressure; my estimate, based on periodically reviewing this and consulting with my Design Superintendent and his best

civilian experts, is about fifteen hundred. I would say this was within plus or minus twenty percent.

Question by a member, CAPT Osborn:

Q. Captain Roseborough, by any stretch of the imagination, do you think the previous witness and you could be talking about the same thing?
A. I think he misunderstood the question. I think he is fully cognizant, or more cognizant than his answer would indicate, of what is going on outside the reactor compartment.

Questions by counsel for the court:

Q. Does the estimate which you just gave us include joints in the vital hydraulic and air systems?
A. I restricted this to sea water systems, which would normally, or could, for operational reasons, be opened at deep depths.

Q. By what factor then would you increase your estimate to include the two systems included in my question?
A. For hydraulic systems, the estimate is four thousand, plus or minus ten percent; and for the air system, for the 700 psi and higher, about twelve hundred, plus or minus ten percent.

Q. What would your estimate be of the feasibility of welding all such joints in the three categories I have mentioned?
A. In what ship?

Q. In THRESHER. I would like our questions and answers to relate to THRESHER unless I indicate otherwise.
A. If we were to bring in a completed THRESHER and attempt to do this as an alteration it would mean, essentially, redesign to a large extent of all of the systems, remaking of the vast number of piping plans, essentially gutting the ship in this area; and, after the plans were ready, I would think it could easily approach a year.

Q. In the construction of THRESHER, what would be the effect of requiring such joints to be welded?
A. It would increase the construction time and cost of these systems probably between fifty and one hundred percent. This is based on the amount of work we have done in this area.

Q. Would THRESHER's internal volume be adequate to accommodate all-welded systems?
A. THRESHER's volume would be made considerably, in my opinion, less habitable, and probably less maintainable, because of the additional space that is required to make some welded joints and radiograph them, over the space required to make the generally smaller, streamlined silver-brazed joint.

Q. Bearing in mind all of your training and background in this field, I would ask you whether you have any mental reservations as to the use of silbrazed joints in THRESHER?

A. Yes, I have some mental reservations, because I have some mental reservations about the complete competence of every sil-brazer, just as I do about every welder; and I also have some reservations about the ability of every man we are able to hire to conduct non-destructive testing, whether he is taking and reading X-Rays or operating an oscilloscope, with the ultrasonic test techniques which have been developed within the last two years and perhaps are a little far from being perfected yet.

Q. Do you believe that the Shipyard's training, quality control, and work performance in the area of fabrication of vital systems using sil-brazed joints provides adequate assurance that all joints have an adequate factor of safety for unlimited operations to test depths? In your answer, first consider THRESHER as delivered when first constructed.

A. That's a rather long question and I --

Q. I shall repeat it. Do you believe that the Shipyard's training, quality control, and work performance in the area of fabrication of vital systems using sil-brazed joints provides adequate assurance that all joints have an adequate factor of safety for an unlimited operation to test depths; and I relate that question, first, to the period when she was first constructed and delivered to the fleet?

A. From the design standpoint, yes; from the production standpoint, I wasn't here, it's not my job, and I would only be hazarding opinion based on hearsay and I don't think the court wants that.

Q. Then relate my question, if you still have it firmly in mind, to any change in the degree of reliability of safety of the sil-brazed system that you consider might have occurred as a result of the PSA work and inspection?

A. If you would give me back my exhibit -- the one on the critical, so-called critical -- (The witness was handed Exhibit 92). Well, for instance there was one job here requested by the Bureau of Ships to visually and ultrasonically inspect, two inch and above, all silver-brazed joints subject to sea pressure and replace defective fittings. The total expenditure of doing that inspection work came to four hundred and thirty-five man days. That's a substantial amount of inspection.

Q. I didn't put the question to you as to the extent of the inspection, but whether you feel confident when the ship left here after her post-shakedown availability that her safety was in no way endangered by the amount of silver-brazed joints she was carrying on board at that time?

A. I can only answer that by saying I considered her safety improved by the PSA in this area.

Q. Now I would like to ask you about the state of your confidence in silver-brazed joints in THRESHER -- not whether it was improved or less, but were you confident that it didn't affect her safety adversely?

A. I don't feel that I'm qualified to answer that. I can elaborate a little bit. A couple of months ago I initiated the start of a series of comparative tests because of my, I guess, impatience with the length of time it takes things to get done through normal channels, in which I had set up three set-ups of four inch pipe, one with a butt welded joint, one with a socket welded joint -- which incidentally is two sizes or maybe three above what is currently permitted in

this area by the Specifications -- and a sil-brazed joint; and these were made by randomly picked welders and sil-brazers, to the usual, average standard workmanship. These were then simultaneously pressurized to -- I don't recall now -- test depth or collapse depth -- I guess it was to one hundred and fifty percent of operating pressure, and this was cycled to try to determine the relative effectiveness of the three types of joints under service, simulating a submarine going deep. We were trying to give an accelerated life test, and this was primarily to try to produce sufficient evidence of what we thought was the reliability of the socket welding joint so that that could then become an authorized procedure which would permit us to get on with construction without the undue delay and cost which has been plaguing us in our new construction in connection with butt welding; and, as I have mentioned previously, this business of the welding of piping systems has delayed our entire submarine construction program for months and months.

Q. One last question, Captain Roseborough, on this subject. On the date THRESHER put to sea for her sea trials, did you have any misgivings as to the adequacy of the safety factor of any sil-brazed joint on board her?

A. I did not, or I would have taken steps to not permit her to go to sea.

The witness was duly cautioned concerning his testimony.

The court recessed at 1258 hours, 26 April 1963.

The court met at 1400 with open doors, Friday, 26 April 1963.

All persons connected with the court who were present when the court recessed were again present in the court with the exception of (b) (6), who was relieved by (b) (6) as reporter.

John J. Hinchey, Captain, U. S. Navy, was recalled as a witness for the court, was reminded that his previous oath was still binding, also of his rights under Article 31 of the Uniform Code of Military Justice, and was examined as follows:

COUNSEL FOR THE COURT: Captain, as this is an open session of the court, classified information may not be divulged. You are, therefore, not to volunteer any classified information. If the answer to a question put to you by counsel or the court should, in your judgement, necessitate divulging classified information, you will not answer the question but will so indicate instead.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Please state your name, rank, organization and present duty station.
A. John J. Hinchey, Captain, U. S. Navy, Portsmouth Naval Shipyard.

Q. What is the nature of your duties at this Shipyard, Captain Hinchey?
A. I am the Nuclear Power Superintendent in this Yard.

Q. What do those duties entail?
A. As Nuclear Power Superintendent, I am head of the Nuclear Power Division which functions in both the Production Department and Planning Departments, and as such am responsible for all aspects of all work that has to do with reactor plant areas.

Q. Will you state your educational and professional background?
A. I was graduated from the Naval Academy in December of 1941. I stayed on duty there at the Naval Academy as an instructor until May of 1942, at which time I went directly into the submarine service. I spent from May of 1942 until April of 1945 in submarines; the bulk of that time was in the USS HALIBUT in the Pacific. In May of 1945 I reported to MIT in Cambridge, Massachusetts, for a course in naval construction and marine engineering. Upon completion of that course in 1948, I reported at Portsmouth Naval Shipyard. I spent about two and a half years in the Portsmouth Yard at that time, split just about 50/50 between the Production Department as a Ship Superintendent, and the Planning Department as an assistant P & E Superintendent. In May of 1950 I returned to Cambridge to take an advance course in nuclear physics which I completed in July of 1951. Upon completion of that course, I reported to Code 390 in the Bureau of Ships,--Code 390 in the Bureau of Ships is today Code 1500. I spent from July of 1951 until late December of 1953 in that organization. In January of--

Q. Excuse me. That Code 1500 to which you are referring, can you describe the general nature of its cognizance?
A. Code 1500 is the organization in the Bureau of Ships that is responsible for all nuclear power matters in the ships. In January of 1954, I reported to Schenectady, New York to the Schenectady Operations office of the Atomic

Energy Commission and spent from that time until August of 1959 as assistant manager of operations, assistant manager of operations on the AEC Staff there and was responsible for all of the Navy's work that was being done by the Noyes Atomic Power Laboratory under contract of the AEC at that time. In August of 1959, I returned to the Portsmouth Naval Shipyard and took over as Nuclear Power Superintendent and have been in that billet until the present day.

Q. Your duties, of course, in the Shipyard, then took you into contact with the work being performed on THRESHER, is that right?

A. Yes, sir. All the reactor plant work on THRESHER was done under my cognizance.

Q. I show you Exhibit 57. Will you take a look at it. (Hands exhibit to witness) Can you identify Exhibit 57 as being of a material used in submarine construction?

A. It appears to be a type of plastic material that we use with our shielding materials in the construction of nuclear powered submarines.

Q. Was similar material, to your knowledge, used in the construction of THRESHER?

A. Material similar to this was used in the construction of the THRESHER.

Q. It has been testified before this court that the exhibit has the appearance of charring. Can you help us to understand this appearance, particularly the dark areas which you see on it?

A. Yes, sir, I believe I can. When I heard the report that it had been testified that this sheet appeared to have been burned by a rush of flame, I decided to build a little mockup through which I could demonstrate for the court's and my own satisfaction that it was not the result of a flame.

Q. Actually, the testimony before this court was not that it was burned by a rush of flame, but that it was charred, appeared to be charred.

A. All I had to go on was what I had read and heard over the radio and this was the point I wanted to clear up in my own mind and felt, had it been testified exactly as I read it, that I could clear up the point for the court, and we did build such a mockup and just yesterday the mockup was completed and I ripped it apart and have the samples here with me.

Q. Please describe the steps you took in attempting to clear up this point?

A. In the fabrication of the complete shield--

Q. Let the record show that the witness has uncovered Exhibit 89.

A. --the shielding material is stacked up and canned and then any penetration for piping is machined through the completed shield. In that machining process, we use a lubricant in which there is a heavy concentration of graphite or carbon. Simulating the conditions under which we normally install shielding in the boats, we built a mockup and went through these specific steps. This is the sheet of plastic, similar to Exhibit 57, which came out of that mockup. (Holds up piece of material) These two holes were drilled in the material using the same lubricating materials that were used at the time that we were building the THRESHER, and if you will note on both faces of this piece of material, there is a heavy concentration of graphite material which came from the lubricant that was used. In addition to that, on the side that is adjacent to the canning plate, you can see the welding,

the contour of the welding bead, in the plastic very similar to the contact that shows on Exhibit 57. Is there any other question on this particular piece?

Q. Not at this point. Please proceed.

A. In a further attempt to show that it could not have been a flame that caused the discoloration of the material identified as Exhibit 57, we took another piece of the similar material--

Q. Let the record show that the witness is now referring to Exhibit 90.

A. --and played on this particular sheet, three different flames. The lighter of the darkened areas, is one on which we played a hot flame long enough to ignite the material. The very dark area is one on which we played a reduced flame for just a matter of fifteen or 20 seconds, and in between those two area, there is a very light area on which we played a fairly hot flame held about four or five inches from the sheet for 15 or 20 seconds. And it is obvious to me that none of these types of flames could have been played, or anything like it, played on Exhibit 57, particularly in view of the fact that even this one area which did not ignite, while we did play a fairly heavy flame, appears on this sheet very definitely different than the normal appearance of the sheet as it came out of its manufacturing process; and I think an examination of Exhibit 57 will show that even under that darkened area, you still have the markings that were on the sheet when it was delivered from the manufacturer.

Q. Did you ascertain the source of the dark edge on the top edge of Exhibit 90?

A. Yes. This particular sheet also came from the mockup. In order to fully demonstrate how this material was made, we mocked up a large enough area so that I could try to duplicate this b(3) 10 which is similar to the b(3) 10 on Exhibit 57. In order to slip that in underneath the particular key bar, we made it large enough so that we would have additional sheets. This sheet happened to be down at the other end of the mockup. It was available, so we burned it.

Q. As a result of those tests, and taking into consideration all of your own background and experience in this area, is it your judgment that Exhibit 57 then was not charred?

A. Very definitely so. I'm completely convinced that this is the remnants of the product of a machining operation.

Q. How do you account for the dark areas which appear upon it?

A. Well as I have tried to indicate, I think those areas appear on there for the same very same reasons that dark areas appear on this sheet here.

Q. Exhibit 89?

A. Yes.

Q. The ones on Exhibit 89 appear darker to me, Captain, can you explain that?

A. I think that can be explained in two ways. One, this particular sheet as I indicated, was machined yesterday. The material is fresh on there. This sheet (indicating Exhibit 57), if it came from the THRESHER, was machined probably three years or more ago. In addition to that, if this sheet came from the THRESHER, it had a good salt water bath before we picked it up, and it is those two things, I am sure, which account for the lightening up of the color on that sheet.

EXAMINATION BY THE COURT

Questions by a court member, RADM Daspit:

Q. From which side of your sample was the hole drilled?
A. The hole was drilled from this side, Admiral. (indicating) This is the top side of the backing.

Questions by the court president:

Q. Captain Hinchey, you said if Exhibit 57 came from the THRESHER, if you were here during the building period and had to do with the part of the ship from which this came--if it did come from the THRESHER--are there any indications in this exhibit that would lead you to believe that this did in fact come from the THRESHER, other than the fact that it is the same type of material?
A. No, sir. There are no other clear indications that this came from the THRESHER. It certainly appears that it came from--that material like this used in the construction of THRESHER.

Q. Will counsel show the witness Exhibit 21. You are reminded, Captain, not to divulge any classified information, but is there anything about that piece of plastic that would lead you to believe that it came from THRESHER? (Counsel for the court showed the witness Exhibit 21)
A. No more so than Exhibit 57, Admiral.

Neither counsel for the court, the court, nor counsel for RADM Palmer, a party, desire to further examine this witness.

The president informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry or in connection therewith, which had not been fully brought out by the previous questioning. The witness stated he had nothing further to add.

The witness was duly warned concerning his testimony, and withdrew from the courtroom.

The president then announced that the court would, at this point, meet with closed doors and all persons not otherwise connected with the inquiry then withdrew from the courtroom.

William D. Roseborough, Captain, U. S. Navy, was recalled as a witness for the court and reminded that the oath he had previously taken was still binding.

DIRECT EXAMINATION

COUNSEL FOR THE COURT: I should remind you, sir, that at the close of your testimony we will ask you to ascribe what classification you would put on your classification as a whole.

Unclassified

WITNESS: I intend to say nothing above ~~confidential~~, I hope.

Q. The court has been informed that it is practicable from the point of view of ship construction and repair techniques to utilize the same clean

area requirements and cleanliness standards in work on ship systems, such as high pressure air and hydraulic systems, as are used in the reactor system work. Would you please give us your opinion as to the practicality of using reactor systems cleanliness standards in other vital systems of a submarine?

A. Yes. It's practicable for a price. We do exactly the same sort of thing when we rig a clean area when we open the reduction gears to examine the reduction gears, and occasionally-well a turbine would be the same way, where anything drifting in there would be very serious. The passages and accesses in a submarine are extremely--as all of the court I am sure is aware--are extremely narrow and restricted and crowded. One of the reasons why it takes so long to do an overhaul or a PSA or finish off a submarine now is because you can get only so many men in the same place at the same time. Whenever you rig a clean area you, in essence, erect a tent sufficiently large, around the components that you intend to work on, to permit men to get inside of it. You thereby exclude those passageways in other areas where other men might be working, from thereby working during the time that this was going on. And if this were carried to the extreme that it is done in the reactor compartment itself - which by comparison to any of the rest of the machinery spaces in the submarine has extremely generous accessibility - if you were to implement it as completely in the rest of the ship, I would be willing to predict that the THRESHER PSA could probably have taken at least twice as long and maybe longer.

Q. Is it your judgment that the cleanliness standards for non-reactor systems used during post shakedown availability period for THRESHER, were adequate to insure that the ship's safety was not endangered?

A. The cleanliness standards as they may have been specified on the job orders and plans, transmitted to the Production Department by the Planning Department, I consider completely adequate. To what extent they were implemented I will have to defer to the man most knowledgeable of supervising the PSA, the work on the waterfront.

Q. Can you state to us whether you regard the performance of actual shipboard work on THRESHER as adequate, for cleanliness, and did it meet shipyard standards?

A. On those occasions when I went through the ship, I observed the cleanliness standard on THRESHER as about average for this Shipyard, and would say not significantly different from the average of any other shipyard that I have gone through - and I have gone through all of them many times, and many ships.

EXAMINATION BY THE COURT

Questions by a court member, Captain Hushing:

Q. Do you know the approximate date when THRESHER first went to sea?

A. It was approximately May of '61. I don't remember the exact date. I was there. It is readily available from the record.

Q. Well from this, can you estimate about when the piping systems were built in THRESHER's construction?

A. I would say that the piping systems started being installed as soon as the hull was sufficiently complete in any compartment to permit them to get on with it, because the piping systems are and long have been, the most controlling system in the entire submarine.

Q. Now the approximate date?
A. Oh, '59 perhaps, sometime in '59. Again I'm guessing from my background of experience and not any research or intimate knowledge of THRESHER at that time.

Q. Was there an incident involving BARREL and a subsequent investigation at this Shipyard in about April or May of 1961?
A. Yes, there was.

Q. Was there some criticism of the quality of silver-brazing at Portsmouth during the period preceding this investigation?
A. Well I think there was considerable criticism of sil-brazing at all shipbuilding yards about this time. I contributed my share of that criticism.

Q. Since that time, have there been a number of measures instituted by the Bureau of Ships to tighten up the silver brazing process?
A. Yes, there have.

Q. Have they been implemented at this Shipyard?
A. To the best of my knowledge, they have been fully implemented to the extent that they have been implemented by the Bureau of Ships by Change Order and in some cases even beyond that. One of the differences between a naval shipyard and a private shipyard is that a naval shipyard will do a lot more toward doing the best they can than a private shipyard who seldom does anything more than they get a change-order for and get paid for.

Q. Going back to the time of construction of the piping systems which you placed sometime between 1959 and April or May of 1961, were there approved weldable fittings available during this time for making welded pipe systems?
A. To the best of my knowledge, there were not then nor are they readily available now.

Q. Is there a program by the Bureau of Ships to develop such weldable pipe fittings?
A. I believe there is. I cannot say to my certain knowledge. I certainly pushed it when I was in the Bureau of Ships.

Q. Are there problems relative to piping systems and their accessibility for welding on board submarines?
A. I am sorry; I missed that.

Q. Let me rephrase the question. For proper welding of systems, one normally would require good accessibility to the joints is this correct?
A. Yes, yes.

Q. Are there areas on submarines such as THRESHER which are very difficult of welding access?
A. Yes, there are. You can minimize it by the proper layout of your piping to make your joints come in the most accessible places in many cases. There will always be some cases that will be reasonably difficult to get at.

Q. Turning to welded pipe systems and joints, is there a zone next to the weld in such a joint in which there is generally a heat affected area, normally called a heat affected zone?

A. I am reasonably sure there is. That is characteristic of the welding process. My personal knowledge extends a great deal more in the area of structural hull welding because of my participation in the HY80 problem. I'm sure there is - by the very nature of the welding process - a heat affected zone where the weld is deposited. You are in essence joining a forged, extruded or rolled material by casting. Weld metal is nothing but a deposit. It bears every indication of the properties of a casting. It's puddled in.

Q. Where repairs must be made to a welded joint, is there a further increased heat affected zone over and above the initial heat affected zone?

A. I would say that there would be some. It would depend upon how carefully the previous joint that you are repairing had been prepared. The more heat you put there, at a temperature associated with welding, the longer you apply it, you could expect some growth in the area of the heat affected zone. Please, I am no expert in pipe welding and the metallurgical processes that go with it.

Q. If this zone were confined to a relatively small sector of the pipe, say 60 degrees of its circumference, would the lack of symmetry tend to be a strength reducing factor?

A. I would think it would act to some degree as a stress concentration point, a difference of material, and I would think that it would tend to introduce some reduction in the capability of that material as compared with uniformally distributed material. Yes, I would say so.

Q. Do you know of any limitation on the number of repairs which can be made to any welded piping joint?

A. I have no knowledge of such specifications.

Q. Do you know whether there are any reheats allowed in silver brazed joints?

A. I cannot say.

Q. Now to another subject, have you reviewed or reconsidered the basic design of the ASW system in THRESHER since its loss?

A. I am not sure to what extent it has been done. I have requested my Design Division to do many, many things in order to best prepare the evidence to get at the facts for this court. I do know that the redesign of the ASW system and many, many other systems were done in the form of re-engineering studies over a year ago which studies I primarily helped instigate in the Bureau of Ships, at which we got together all of the leading submarine design agencies - almost all of them - with their best talent and assembled the best experienced talent that we could, and had one or more of our submarine design agencies make studies on how they would go about increasing the reliability of the ASW system, and all other systems, toward the end of increasing the reliability, reducing maintenance, reducing costs, and reducing time to build our submarines. Many of those results--in fact I would say that practically all of them that were possible of implementation--were incorporated in the Specifications of the contracts for all the submarines that were let last summer and this fall. Those detailed Specifications and Contract Plans for both the THRESHER class and LAFAYETTE class were completely done over by the Bureau of Ships, incorporating as many as possible of these very extensive re-engineering studies which were carried to the point of feasibility to permit them to be required. These were accomplished and the detailed designs are going on right now and have been going on since the contract design was turned over to the Design agent last summer.

Q. How about your personal, professional opinion as to an ASW system for a ship like THRESHER. Do you have ideas as to how it could be improved?

A. Yes. I participated in those studies which were concentrated on eliminating joints to the maximum extent possible, and I concurred fully with the findings of them which resulted in a substantial reduction in number of joints in the ASW system. Each joint removed eliminates that much chance for leak hazard and cuts down the cost and the time to build.

Q. How about the damage control features of the ASW system, the isolation features, say?

A. The engineering studies--and I have not reviewed them recently--did take that into account, and one of the premises was to reduce the number of hull inlets as well as the number of joint components to the maximum extent that was considered to have reasonable backup in case of a failure of any single pump in any single system.

Q. But how about the isolation feature so that all or part of the system could be closed off quickly in case of a flooding casualty?

A. All of the main sea valves, the main sea water and ASW sea water in THRESHER itself, as in all of that class, do have quick closing remote-operated devices on their sea valves, yes.

Q. Is it easy to isolate portions of the THRESHER ASW system?

A. I witnessed the various valve closing tests that we went through on THRESHER's deep dive. The ease with which it is done depends upon the familiarity of the crew with the system and the controls. Ease is a relative sort of thing that is directly related to operational training as well as to the design and accessibility of the equipment.

Q. Let's take the specific case of THRESHER. As I understand it, to close b(3) 10 USC 130 the ASW system b(3) 10 USC 130 requires a closure in the engine room and in the auxiliary machinery space, is this true?

A. I don't know. My Design Superintendent could probably tell you, or I could look it up and tell you.

Q. Do you consider that this would be a satisfactory design feature from a damage control standpoint?

A. What?

Q. To require a closure in both the engine room and the auxiliary machinery space in order to close off b(3) 10 USC 13(the ASW system.

A. I don't think I could answer that question categorically "yes" or "no" without doing a little more study on the system, just how it is actually laid out and how it is operated.

Questions by a court member, Captain Osborn:

Q. On the ASW system, during this past PSA of THRESHER, 33 mechanical valves were placed in the particular ASW system in order to assist in isolation. Based on this fact, would you say that the primary ideas of the ship's personnel were directed toward isolation of the system itself, or complete isolation and then cutting the system in again?

A. I would say that I did not know the exact number of check valves that were installed, but the reason they were installed was as a result of this re-engineering study and the issuance of a change order by the Bureau to put check valves in the discharge side so that, in the event you did have a failed joint, you would thereby flood only from the suction side until you could isolate and not from both sides, so you would cut the flooding in half and reduce the number of closures that you had to make.

Q. I am interested in translating the responsibility for these damage control studies with respect to flooding as they affect operational characteristics and operational procedures as to the responsibility of: (1) preliminary design (2) contract design or the design agency itself.

A. I don't think I can answer that one.

Q. Well, who would be responsible for making damage control studies with respect to flooding and translating those into information and curves supplied to operational forces, not only the ship itself, but the operational command itself in order to get the operational procedures and techniques in consonance with the design philosophy?

A. I think it is the joint responsibility of everybody that has anything to do with it, starting with the Ship's Characteristics Board of CNO spelling out what they want in Characteristics, the Preliminary Design in the Bureau of Ships cranking in the things they know, the Contract Design agent cranking in the things that they know from experience and feel, and detailed design and shipbuilder further reviewing those, and if they see any things that are omitted from the Specifications or the Contract Plan or the detailed plans, that they further raise the issue, and it is equally important, in my mind, that the ship's force who is, in the case of nuclear submarines, invariably in the Shipyard for six months and sometimes up to two years, while the ship is building, to raise those questions also.

Q. I have no question about whose responsibility it is with respect to seeing after the fact, Captain Roseborough. I am more interested in seeing who has the capability of seeing them before the fact. Who do you think has this capability?

A. Well, I can only repeat that I think it is a joint responsibility of everybody associated with the design, building, and operation of the ships to try to arrive at the best, safest, most reliable ships we can produce in this Navy.

Q. In retrospect, do you consider the flooding operational procedures in the documents calculations and curves furnished the THRESHER, adequate to prepare proper procedures with the necessary operational safety?

A. In retrospect, certainly more could be done; more is being done; more will be done.

Q. Since no safety modifications as to air capacity and blow rate were undertaken during this post shakedown availability, do I understand you had no question as to the blowing margin?

A. No, sir. You don't understand that. I became concerned about the amount of air installed in submarines prior to my first going to sea on THRESHER and on ETHAN ALLEN, and I questioned the design criteria on which these were based. I also initiated immediate studies to determine as quickly as possible how many additional air bottles could be crammed into the greatly reduced main ballast tanks that nuclear submarines have over diesel submarines which require a much higher reserve buoyancy for other reasons. What I am talking about, at the time THRESHER was approaching her readiness to go on her initial deep dive, and I was going on it, and I took occasion to carefully examine this sort of thing. This was April-May of 1961. I further initiated action to the maximum extent of my capability in my then job, of insisting that the maximum number of high-pressure air bottles that could possibly be physically installed in the THRESHER class, the 608 class and the 616 class, be written into the Specifications for the ships which were just then about to be awarded, and you will find in the Specifications for the THRESHER class of fiscal '62, which was awarded in the summer of '61, a substantially larger--I might say double the capacity of the air bottles installed in the THRESHER and the rest of the ships up to fiscal '62. I made repeated attempts to gather enough information. I inquired about the cost and the time, and cost and time to have done these was such that it was not considered sufficiently mandatory to take the delay that would result in the ships then coming down the line because, as you probably realize, that when you put out a change order of this magnitude for a ship that is in an advance stage of construction, the cost involved becomes quite excessive. At that particular time, we were, the Bureau of Ships was, in danger of not being able to build as many ships as had been authorized because of the cost of accumulative change orders for those already built and I bring this out only at your questioning as to what I have done about it and trying to implement it. I almost singlehandedly forced through the retention of the Polaris air launch flasks and ordered their being connected into the main ballast capacity on the SSB(N) 623 and subsequent at the time they became surplus SP equipment when they went to the gas eject. So I think that beyond the 623, you have a substantially larger installed main ballast tank blowing capacity. I did, to the maximum of my capability, stimulate action to make studies on blowing rates, not only capacity, but blowing rate. The first five seconds-ten seconds-thirty seconds-one minute, like a fire, is wirth more than the next two or three or four. Blowing rates were the subject. I think they were under study--before I left the Bureau and I believe they have also been incorporated in the later Specifications. Upon my arrival at Portsmouth, one of the first things I did was a critical examination in this area of the deep dive, knowing that here we were taking not just double the test depth but quadrupling it and again the reserve buoyance is even less than it is on the THRESHER class. I immediately took steps; I directed that studies be made by my own design people and prove to my satisfaction that the installed air capacity could be doubled and then I made those recommendations to the Bureau of Ships and I didn't let them rest until they approved them and right now she has got more than twice the capacity that she had specified and incorporated in her plans last summer.

Q. I refer to the fact that the THRESHER had a reputation of being the fastest and quietest of submarines of advanced type. Neither of these particular characteristics were, by no stretch of the imagination, true in this particular ship when she came in to PSA. Do you think that sometimes our dreams and our hopes are sometimes translated in operational quotations.

A. I have heard that. I have heard it more since this recent catastrophe, being quoted in the paper. I don't know where this generated. I certainly didn't generate it. To answer your question specifically, hopes and aspirations, to the best of my knowledge, have never affected my judgment where anything involved with safety was concerned.

Q. We have focused much of our attention on the quality of work, the inspection of work, and the design. Which of these features, if you do have a failure, and you undoubtedly do in this particular case, do you think is more suspect?

A. Workmanship. I think the design of the THRESHER itself is probably the best designed submarine up until her time and it has been subsequently improved with every fiscal year's re-issue or purchase of that particular class.

Q. Have the subsequent improvements become common knowledge among submarine officers--say of an officer of Lieutenant Commander Harvey's case reporting rapidly to the Shipyard?

A. They are promulgated first, generally as change orders, of which every PCO of a ship of that class then building gets a copy. They are subsequently in the Specifications which govern the construction of that ship each year when the new Specifications for that year are re-issued for that year's purchase of submarines, and if they read the documents that are put out to all of the ship builders, their supervisors and the ship's company there fitting out the submarine, they are certainly available, and I believe understandable and I have, on several occasions, also had discussions on them.

Q. I was referring particularly to Lieutenant Commander Cowhill's testimony in which he said he had no curves with respect to a~~n exploding~~ flooding casualty available to him on THRESHER at New London in order to independently make an assessment of the casualty.

A. I would think that the submarine school at New London would have either made them or have requested somebody else to make them as part of the curriculum of damage control training in submarines.

Q. Then I take it that you think that the damage control studies and flooding control casualties of a new particular type ship should be the function of the submarine school?

A. I think it is the function of everybody, everybody that is involved in the design, construction and operation. I think it is an all-hands responsibility and I have never known any of the hard-headed bunch of submarine designers, ship builders or operators who were reluctant to ask such questions and demand such answers.

Q. There's no doubt in my mind that they asked plenty of questions. I think there had to be a certain amount of education in the area to intelligently ask a question. I think in this particular case we were in an area where our design assumptions basically affected a lot of our operational procedures. I don't think these were brought to people's attention--or do you think these were brought to the people's attention sufficiently to make them a real, sound operating procedure based on design assumptions?

A. The extent of my personal knowledge of these is in promulgating substantial amounts in change orders to each shipbuilder to conduct a complete set of lectures with respect to the design and operation of each system and component in the submarine, and when I say "substantial," I am talking about somewhere between seventy-five thousand and a quarter of a million dollars that some of these change orders have amounted to. And I think, as one previous witness said who was talking about the lectures here, they had been worked up by the designer who had in turn consulted with the ship's force, to try to determine from them the phases that they were most interested in so that most concentration could be given in that direction.

Q. You should know better than anyone else the history and the reasons for the b(1) reducer in the air system. Will you please describe the matter in detail?

A. I know of no reasons for the change. I was the Material Officer on SUBLANT staff at the time it took place. It was many months later before I was even aware of what had taken place. I was concerned at the time with the maintenance of NAUTILUS, SEA WOLF and SKATE and numerous others, as well as a hundred and ten other conventional ones.

Q. On the basis of the information, your learning with respect to the operation of the THRESHER, operating at deep depths, do you think we had the proper instructions promulgated with respect to handling these things in the operating forces from a tender?

A. I would only be guessing; I don't know.

Q. Make a guess.

A. I don't know. That has not been in my area of experience and I don't think guesses will help the situation here.

Questions by a court member, RADM Daspit:

Q. Do you in the Shipyard have available the Characteristics of THRESHER as approved and prepared by the Ships Characteristics Board and approved by CNO?

A. Yes, we do, Admiral, and a copy has been furnished to the court.

Q. What method of cutting high pressure air piping was prescribed by the Planning Department in order to make alterations or repairs?

A. I'm sorry; I don't know.

(b) (6) was relieved as reporter by (b) (6) at this point.

Q. Assuming that the auxiliary salt water system of THRESHER had piping which ran through both the engine room and the auxiliary machinery space, and required closing of valves in the engine room and the auxiliary machinery space both, to stop a leak in the engine room. Would you consider this the best arrangement if you were designing a new ship?

A. Admiral, again, I would have to see the various aspects of the design. I do know that in the early days I reviewed the very sketchy design history of the THRESHER, several years ago, and I do know that the earliest phase of the detailed design by the Shipyard had a fairly, a more simple system, than was finally developed. I vaguely recall that that system was directed to be made more complicated from the standpoint of damage control, to make sure that no matter if you had a failure in one room or the other, you would still

have ASW available for the vital components in that room. Now this I'm sure, is a matter of record. I'm racking my memory for several years now as to -- well, design histories are usually kept from the initial concept of the preliminary design and of the significant changes that are made along the way. The ASW system, as I recall, was one of those which was increased in complexity, probably in the guise of increased reliability, like having the split fire fighting main on surface ships, where you lose one pump on one side you don't lose the entire capability, but I couldn't sit here and from memory say categorically yes or no to your specific question.

Q. Could you give us the name of the officer who would be best qualified to give us the history of design, the thesis of THRESHER?

A. Yes, sir. Commander Woolston was the Portsmouth Design Project Officer on this ship, I believe, from its inception until it was finally completed, at which time I insisted that he come to the Bureau of Ships as my 525 project officer, to manage for me the 593 class building program. Who participated in the early studies that went on between the Bureau of Ships and the Ships Characteristics Board, and who supervised the preliminary design and the contract design, I'm a little hazy on now. The detailed design done here, there is no better expert or knowledgeable person on what happened and why, than Commander Woolston.

Q. New subject. You mentioned the increased air capacity. I have some figures here which I copies from a document whose accuracy I cannot vouch for, but it indicated that the 608 class did increase to 1162 cubic feet, but that the 616 class went down to 1083. Was there anything else in the 616 class which provided less space for air bottles to your knowledge?

A. That was just one incident, Admiral, and you go away for a week or two on a trip and sometimes things take place, and when you get transferred you lose contact also. I don't know.

Questions by the President:

Q. Captain Roseborough, I believe that you said, with respect to promulgating and insuring that this new type of submarine, which had quite different operating characteristics, quite different factors of safety at deep depths, from an operational viewpoint, should be handled at the Submarine School. You seemed to feel that it was not the responsibility of the building yard, as it were; is that correct?

A. No, sir. I believe you misunderstood the question, or at least my answer, Admiral. First, I would like to say that the handling characteristics of THRESHER were not significantly different from the preceding class, the SKIPJACK class. Those handling characteristics, maneuvering and control characteristics, are determined and tested by the experts that we have developed in the Navy, who are attached to the David Taylor Model Basin, who run extensive tests on models and then install on each prototype expensive recording instrumentation, and run full scale tests that take up to two or three weeks.

Q. You are not getting my point. I am not speaking to the material factors of safety; I am speaking to the operational factors of safety. You are familiar, I am sure, with the short time interval available to the operating personnel to correct the influx of water at test depths in this type of submarine. It would seem that this time interval is much shorter than in the case of previous classes of submarines. It would seem to the c

court that this fact should be first known by those concerned with the design of the ship, and the determination of its characteristics as a result of the various changes in design during building. Therefore, it would seem, if these were in fact less safe than previous operating characteristics, of previous types of submarines, that there would be a feeling of obligation to pass this information on, not in a sort of general way, or in a very scientific way, or to put it in a file cabinet some place, but to see and insure that the operating personnel were in fact fully cognizant of the thin margin in the event a flooding casualty comes up. Now that is the area to which I am now addressing myself, and to which I wish you to direct your answer.

A. Yes, sir.

Q. Did I understand you correctly, then, when you said that responsibility, in your opinion, was the New London Submarine School's responsibility?

A. No, sir, I'm afraid you misunderstood me, and I believe my answer was, I certainly intended to state that I felt it was the responsibility of everyone who had anything to do with the design, construction or the operation of the submarine to exert his utmost to either accomplish this or to require it.

Q. Yes, I would agree, and I'm sure most people would agree--

A. Admiral, may I expand on this?

Q. May I finish my statement first? I would agree and I'm sure most people would agree that anyone having anything to do with a design, construction or operation of a submarine should feel a sense of responsibility to do all possible to insure the safe operation of that submarine. Now will you go ahead?

A. Perhaps I was having reference to something that I discussed earlier, as one of the things which I have done in my earlier career as a Preliminary Design Assistant at BUSHIPS, was that I had supervised the preparation of the Stability and Control chapter in the Guppy Manual for the Submarine School at the Submarine School request, so that information which had been obtained by these rather complicated series of trials which had been run by the Model Basin engineers under the supervision and direction of the Bureau of Ships, were made available to the maximum number of officers going through Submarine School, so I perhaps alluded, or was thinking of that, in my reference to information that should be included in the Submarine School's curricula. I would like to say one other thing, there were long and many deliberations in Washington in the development of the Characteristics of this class, and several subsequent, rather high-level conferences, to insure that we were, in fact, on sound and safe ground in going to this increased depth, and by like token, the Characteristics are very specific, in that maximum attention shall be given to maximum submerged speed and maximum maneuverability, which really you achieve only by having the minimum sized submarine that will contain the weapons and the machinery and the people to operate them that you can. With this continual emphasis on high submerged performance, there has been a continuous and gradual deterioration in such things as reserve buoyancy and the ability to physically stow high pressure air for obtaining buoyancy at deeper and deeper depths. I can't help but believe that it must have been recognized by the people at that level when they were considering going to the deeper depths, that any casualty of a given size would have an increased flooding rate, roughly proportional to the pressure in which you were operating, so I can only assume, not having been there, that this must have been at least taken into some consideration

when deciding to achieve the advantages of greater maneuvering space in the third dimension to, for instance, recover from a damaged or jammed control surface. A submarine is a compromise; all ships are compromises, and I guess the submarine is the most compromising of all.

Q. Captain, I now direct your attention to the capacity for blowing main ballast tanks in THRESHER. As you have several times told to this court, you had much to do with THRESHER, in many capacities, both in the Bureau and in the Shipyard, and you have said to this court that you questioned the design criteria for the air capacity of the ship --

A. Yes, I did.

Q. before the initial deep dive of THRESHER, on which you were scheduled to go. Now if you questioned the air capacity of the THRESHER at that time, did you change your mind between that time and the time you, as the Plans Officer in this Yard, took care of the responsibilities of the Planning Officer with respect to her post shakedown availability, or are you of the same opinion that her air capacity was not adequate?

A. I am still of the opinion. I am of the opinion, as I was at the time that I first took the opportunity to question it, that all of the air that can physically be crammed into the available space, and the highest blowing rate that we can safely achieve is of utmost importance, and I have not changed my opinion from the earliest time I started trying to do something about it.

Q. Recognizing, then, that you were not satisfied with the ability of the ship to divest itself of additional negative buoyancy at test depths by blowing, and mindful of the fact that the ASW system on this ship was worked on extensively in this overhaul, did you make any suggestions which would bring to the attention of those in higher authority the need, either to do something about increasing the amount of capability of expelling ballast by blowing, or for reducing the probabilities of a flooding casualty while at test depths?

A. I had made every approach that I know how, in my position as the Head of Code 525, to get increased capacity and increased blowing rate, and studies concerning them incorporated, while I was in the Bureau. I had achieved apparently, as far as I could go, by getting it incorporated in every ship which had not yet been contracted for. I was unsuccessful in getting it incorporated as a backfit Change Order, apparently because of the cost and the delay it would inevitably have caused in delivery of the ships. Since I have been here, as to reopening that thing, which I had just previously spent so much time trying to sell, to attempt to achieve from this end what I had been unable to achieve in-house, was, I guess, so remote a fruition that I did not specifically attempt to reopen the issue on THRESHER itself. It would have been such an extensive job, that her six month's availability, as I mentioned earlier, would have become at least a year's availability.

Q. Are there not ways and means for providing emergency capability for expelling ballast, such as JATO, in the ballast tanks?

A. I understand these have been part of the studies which have been initiated within the past year by the Bureau of Ships.

Q. Do you know what the progress is on those studies?

A. No, sir, I do not; they would either be in the Design Division of the Bureau of Ships or perhaps in the Research and Development Division of the

Bureau of Ships. I know that we have received no request at this Shipyard to do any such studies or investigations.

Q. New subject. Are you qualified to testify on the cycling of THRESHER type hulls by repeated emergencies?
A. I am not nearly so well qualified as many other people would be, Admiral. You have many better experts than I.

PRESIDENT: We will seek your experts then on that point.

Questions by a member, CAPT Osborn:

Q. In retrospect, in looking over the capacity of the air banks, and the susceptibility of the ship to flooding, certain pump combinations and thoughts thereof with respect to intelligently employing the ASW system and water isolation you do have, do you think by competent operating procedures that we could improve considerably over the procedures that were probably used on the THERSHER during her deep dives?
A. May I ask what you mean by "competent operating procedures"?

Q. I mean change competent operating procedures to those operating procedures in effect?
A. I'm afraid I don't understand the question.

Q. Let me put it another way. Sometimes we have to play with gasoline. Sometimes we have to play with things that are dangerous, but we have to learn to use them. Do you think, with the existing system that we have on board, the existing installation, as it is right now, we could, by ideas of the design element put into the ship, improve on our present operating procedures?
A. Are you talking about ship operating?

Q. Ship operating.
A. Well, I don't consider myself really qualified on ship operating.

PRESIDENT: I think you would have to tell the witness what the present procedures are.

A. I have been on many, many operations, but as an observer, representing the Bureau of Ships, or the Force Commander, or the Shipyard. I don't set myself up as an operating expert at all. I've witnessed an awful lot of operating experts.

Q. In my estimation it's impossible to divorce design philosophy in concept from operating procedures. I am not at all sure in this case that the design philosophy and concept were in the minds of the operators. Is there any way you think we can improve our existing ships with respect to operating procedures, taking into account those features designed into them right now, with respect to safety?
A. I am sure that there are. No matter how well you do something, design something the first time, almost invariably you can improve on it to some degree. You can make it better, smaller, cheaper, lighter or more reliable, by redesigning. By like token, to answer your question, where we are tying in the designer and the operator, the link that really does this are your submarine designers and engineers and constructors in uniform. Those are rapidly becoming a vanishing race. There are less now and have been

increasingly less year by year, for the last several years, and there aren't many experienced ones left in a position to do much about what you were just asking. It's going to get worse before it gets better. To cite only an example, I have billets for four Assistant Design Superintendents; I had only one here and he was the one I assigned to THRESHER. I have none now; I have civilians in each of these positions, but they haven't been operating at sea, they don't wear the pin, they're not qualified for command. They can work a formula but what experience they get is very seldom and very remote, and the operational tie-in that you're talking about is discouragingly scarce and it's getting worse all the time.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Did your concern with the limited deballasting capability of THRESHER at test depths, which you have previously expressed, lead you to discuss this subject with her commanding officer, LCDR Harvey?
A. No, it did not.

Q. Are you familiar with the change in method of conducting of builder's trials which occurred when our first deep diving submarine went to sea; the change to which I refer split the trials into two groups to provide for main propulsion trials and deep depth trials?
A. Yes, I am.

Q. In previous builder's trials, is it true that both the full power main propulsion trials and the deep depth trials were included on the occasion of the first sea trial?
A. Generally, yes.

Q. What was the purpose for this split?
A. With the advent of the deep diving ship, it took generally a ten to fifteen hour transit to get to water deep enough to take her to her test depth. As I think all of us know here, the Director of the Nuclear Power Division of the Bureau of Ships supervises the first trials, which are the propulsion trials. In order to, I suppose, primarily prevent from having to tie him up for an extra day, or two or three, to get out and accomplish a successful deep dive, they were divided into the two phases; going out and making a partial deep dive, or half test-depth dive, to insure that there was reliable integrity, coming back up to roughly half of that depth; conducting the full power propulsion trials, and then returning, in the case of Portsmouth, to the lower harbor, where he, Admiral Rickover, was met and certain of his advisers and engineers went with him, and another group, primarily concerned with the deep dive itself, came aboard. Then the ship turned around without ever coming back to the Shipyard and proceeded out far enough to make a deep dive.

Q. Why was the propulsion trial run first instead of the deep dives?
A. I'm afraid this has been pretty well dictated by Admiral Rickover from the first time.

Q. Did concern over the capacity of air banks and the main ballast tanks, pumping capabilities, enter into the decision to split the trials into two groups?
A. No, I don't think so, because I believe, if my memory serves me, that Admiral Rickover stayed aboard for the first deep dive of THRESHER. That is the one that almost went there, but, because of some faulty strain gauge recorders, was terminated. I'm reasonably sure that he did not make the second one that went all the way.

Q. I show you these documents; do you recognize them?
A. No, I don't know that I have necessarily seen them. They are typical of the sort of thing that I insisted on putting out on every ship as soon as this information was available. I can't say that I have seen this one before.

Q. Do you consider them pertinent to your testimony?
A. I don't know; I would have to read them.

Q. Please take the time to examine them more carefully.
A. This was at my insistence that these go out, and I insisted that every Commanding Officer be given a letter of what to expect before he went on his first trial.

Q. Was it the policy of the Bureau of Ships, while you were there, to issue information of this type to the forces afloat?
A. I inaugurated that policy. Admiral, I'm also reasonably sure that if the files were searched, you would find that a letter similar to that, based on model test data, was sent to the skipper of the THRESHER and the skipper of the ETHAN ALLen prior--and to others, the last half dozen built, prior to their ever going on their first sea trials.

Bureau of Ships letter, dated 8 March 1962, addressed to Commander Submarine Forces, Atlantic and Pacific Fleets, and Commanding Officer and Director, David Taylor Model Basin letter to Chief, Bureau of Ships (Code 255) dated 14 December 1962, were offered in evidence, and there being no objection, they were so received as Exhibits 94 and 95.

Neither the counsel for the court, the court, nor the counsel for RADM Palmer desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

I was asked this morning certain questions having to do with welding versus sil-brazing in piping. I looked into the files to determine the Portsmouth estimate when they were actually proceeding with the plans as the lead yard for the THRESHER, Fiscal '62 class, which in fact I had directed them to proceed on an all-welded salt water system design, and they were so doing, and the estimate was 2500 man days' time and four and a half calendar months, by utilization of maximum farm-out design talent. This design was continuing on the basis of an all-welded salt water system at the time the design contract was canceled and awarded to the Electric Boat Company last fall. I also mentioned, very briefly, that about six weeks ago we had initiated some tests here at this Shipyard to attempt to obtain some comparative data between the performance and strength and fatigue life of the three types of ways we have of making salt water system joints, namely, butt welded, sil-brazed, and socket welded. The present limit, as I mentioned in socket welding, is, I believe, two and a half inches. Our tests were being run on the basis of four inches, because it appeared to us that the socket weld of that size was probably the ideal solution between the occasional or

always the questionable "How good is your sil-braze" and the time limits and cost of the butt welding. I have the first report of that project here and I think that it's very pertinent to this testimony, and I can read extracts very briefly, if I may.

BY THE PRESIDENT: Please do.

The witness continued with his statement:

I would like to read the description of the comparison test and then give you the results to date. "(1) A vibratory bending fatigue test with the presence of internal pressure is currently being conducted simultaneously on butt-welded, sil-brazed and socket-welded joints in four inch ips, copper-nickel pipe." This type of test was selected to be representative of shipboard conditions experienced by copper nickel piping systems. (2) An MB vibration machine is driving the free ends of the cantilever test assemblies at a calculated stress level at each joint approximately equal to the yield strength of the base material of the pipe. The internal pressure is equal to the test depth pressure of the 593 class submarines. The assemblies will be tested to failure and SN curves plotted to determine whether there is any significant difference in reliability between socket-welded, butt-welded and sil-brazed joints. These assemblies were fabricated to current non-nuclear standards from class 700 copper-nickel piping. We have completed three tests to date. In the first test, sil-brazed joints developed a stress of 17,500 psi and failed at 1.6 million cycles. The butt-welded joint developed a stress of 21,000 psi and failed at 1.9 million cycles. The socket-welded joint developed a stress of 21,000 psi; and, when it still had not failed at five million cycles, the stress was increased to 35,000 psi, at which point it failed at 5.2 million cycles. Test No. 2--Socket-welded joint was tested to develop a stress level, or did develop a stress level, of 27,500 psi and failed at 160,000 cycles. Remember, this is a much higher stress level. The butt-welded joint developed a stress of 27,500 psi and failed at 270,000 cycles. The sil-brazed joint developed a stress of 18,500 psi and did not fail until 860,000 cycles. Test No. 3--The sil-brazed joint was the first one to be reported. For the first 60,000 cycles developed a stress level of 30,800 psi and went to 204,000 cycles. The socket-welded developed a stress of 37,400 psi for the first 60,000 cycles, then reduced to 30,000 psi, and failed at 373,000 cycles. The butt-welded joint was initially at a stress of 27,500 psi for the first 60,000 cycles, at which point the stress was reduced to 22,500 psi, and did not fail until 564,000 cycles. So, in three tests, we have each type of joint turning out best in one case. We are continuing our tests and we hope thereby to increase the state of the art. The preliminary conclusions I will read rapidly. The results to date could be considered contradictory. Although there is no trend established for comparison, there are some significant factors contributing to the mode of failures for the samples. The significant factors are as follows: The socket-welded joint failed at the tee of the weld on the coupling side nearest the fixed end. The failure occurred as circumferential cracks in the heat affected areas of the joints. The socket-welded joint failed through the weld as a circumferential crack, probably initiated by an internal weld defect.

The exact nature of the failures is currently being investigated to determine the point of inception and cause of failure. The butt-welded samples failed as circumferential cracks located approximately in line with the counterbore radius. The failures were apparently initiated by the notch effect of the counterbore. The sil-brazed samples failed as circumferential cracks through the pipe in the heat-affected area at the edge of the couplings nearest the fixed end. The sil-brazed sample failed as a loss of pressure at the end of 1.5 million cycles, as mentioned previously. The exact nature of failure has not been established at this time, but is currently being investigated. It is interesting to note that, for the earliest failure, the stress on the joint was above the yield strength of the material, and the number of cycles to failure exceeded the estimated life of piping in a shipboard installed system. The estimated total dives for a submarine during its commissioned life is estimated as a total of 25.000 dives, of which 2,500 are to test depths. This opinion is expressed in the Portsmouth Naval Shipyard Report of Test No. C-9415, dated 29 October 1962, "Butt-weld Joints for sea water piping." The supervisor of the project engineer, who was conducting this test, is Mr. Remick, and he is the witness that is scheduled sometime to talk to you about design of salt water systems, so I thought this would set the stage for him. I have a photograph of the test setup if any of you are interested to see what we are doing, and I'm willing to make this a part of the record, if you so desire.

BY THE PRESIDENT: I think we've got enough in the record.

WITNESS: It's preliminary and we are continuing work on it.

COUNSEL FOR THE COURT: Captain, you may possibly have inadvertently committed an error in speech in the opening sentence of your statement, in which, I believe, you said, "All welded sil-brazed system." Did you mean an all welded salt water system?

WITNESS: I probably did.

COUNSEL FOR THE COURT: The reporter is directed to correct that portion of the witness' testimony.

COUNSEL FOR THE COURT: You also referred at the beginning of your statement to certain estimates given for welding. Were those estimates for welding all joints, or for welding joints above a certain size?

WITNESS: When I talked about 2500 man days, this was only for design; this had nothing to do with the work on the ship. This was to prepare, or modify the existing design calling for sil-braze to permit it to be given to the waterfront in order to do the welding.

Q. But even so, did the estimate relate to all joints, or to joints above a certain size?

A. It was to do whatever the specifications required at that time, and I would have to check. What I asked the Design Superintendent for was what was the estimate to accomplish, what you are supposed to do in the specifications for the Fiscal '62 THRESHER Class, and we can certainly break out those specifications and read them.

WITNESS: Admiral, I would like to make another statement, if I may. This is my statement to the court. On Saturday, 13 April 1963, I was requested by the court to hold a press interview immediately to explain how strain gauges--

BY THE PRESIDENT: Not by the court; I think you were requested by an Aide of the court to handle public relations, but not by the court.

WITNESS: I was told it was by the court, Admiral, and that's all I know. I was requested by an Aide of the court to hold a press interview to explain how strain gauges were used to determine the structural adequacy of a submarine hull design. Since I had not been present at the court hearings that morning, I was not aware of what testimony might have prompted such a request, but since I previously had had experience with strain gauges and their use in initial deep dives, I did not object, although it did seem that I should have been allowed a little bit more notice. At the interview, I explained the scope of our experience with using strain gauges for determining the performance of submarine structure, including the reported difficulty with strain gauges during THRESHER's initial deep dive. The press then launched into the possibilities of a flooding casualty, as apparently discussed by Commander Axene in his testimony that morning. Since the Public Information Officer for the court, Commander J. H. Gormsen, who was coordinating the interview, did not object, I proceeded to explain how the sea water system was designed and the extent of testing of components and systems which was done before the ship was permitted to go to sea. I was then asked the question, "If it is not a structural failure, that only leaves a human failure; is that what you are saying, Captain?" I made the following reply, and I quote: "For some reason, THRESHER exceeded her collapse depth. It was either out of control from either the flooding or human error, yes." This reply was both misquoted and taken out of context by several of the news media. In an attempt to correct the misrepresentation being broadcast, the Shipyard Commander made a news release about two hours after the interview. I would like to be permitted to read that news release into the record of this court.

BY THE PRESIDENT: What pertinence does that news release, or your present statement, have on the investigation before this court? The record of this court is already nearing a half thousand pages, plus exhibits, and the court does not wish to burden the record with an argument as to whether or not you or any other individual is misquoted in the newspapers. This court, and the people who have testified before this court, have been misquoted in the newspapers. I see no purpose to be served in obtaining the permission of this court by introducing this long statement and the statement which you now request to introduce into the record of this court. Is there objection to this ruling?

No member indicated that he had objection.

BY THE PRESIDENT: I regret, therefore, Captain, that we can't burden the record with this sort of thing.

Unclassified

WITNESS: Well, Admiral, my whole feeling was that I've been in the submarine business for an awful long time, and practically all of my friends are submariners, and I felt--

PRESIDENT: Didn't they see you on television the other night; I did.

WITNESS: I don't know, Admiral.

PRESIDENT: You explained it on television. The Shipyard explained it in the release. I think that this record is no place to further worry the subject.

WITNESS: Then, I will withdraw the request and I have no further statement.

The witness was warned concerning his testimony and withdrew from the courtroom.

The court recessed at 1610 hours 26 April 1963.

Unclassified

The court opened at 1623 hours, 26 April 1963.

All persons connected with the inquiry who were present when the court recessed were again present in court, except (b) (6), who was relieved by (b) (6) as reporter.

No witnesses not otherwise connected with the inquiry were present.

Harley Remick, a civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: Mr. Remick, this is a closed session of the court, and you may divulge classified information here. At the end of your testimony I shall ask you what classification you would accord the entire testimony which you give.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Please state your name, address, and present occupation.
A. My name is Harley Remick. I live in Lamplighter Lane in Kittery, Maine. I am the head of the Marine Machinery Propulsion Service, Pipe Section, of the Design Division, Portsmouth Naval Shipyard.

Q. What is your code number?
A. 261-B.

Q. What is the nature of the duties which you perform as head of that section?
A. I have charge of the design of salt water and lubricating oil systems for the main propulsion machinery on submarines.

Q. Did you perform those duties in connection with the design of THRESHER?
A. Yes, sir, I did.

Q. What is your background and professional experience in this respect?
A. You want my schooling background?

Q. Yes, schooling and experience in this field.
A. I graduated from the University of Maine as a Mechanical Engineer. I was hired in the Shipyard as a Mechanical Engineer and subsequently changed to Marine Engineer, at which time I became in charge of the design of these systems, and I have been working in this field since.

Q. Since when?
A. I came to work here in 1952.

Q. At this Shipyard?
A. Yes.

Q. In the same capacity that you are now?

A. No, sir. I was in the Service Piping Section at that time. I came to work as a GS-5 engineer. I went to GS-7 and GS-9 ratings in the Service Piping Section. In those sections, I was working on the design of air systems, hydraulic cystems, and other service systems, plumbing and fresh water. In 1955, I became a GS-11, at which time I took over the design work of salt water and lubricating oil systems.

Q. Will you please give us an explanation of the contract plan, detail specifications, design philosophy, and concept, including damage control, that led to the design of THRESHER's auxiliary salt water system:

A. That led to the design of it?

Q. Yes. Please refresh your recollection with whatever notes you need.

A. (The witness examined papers in his possession.) I got involved, if you will, with the design of the auxiliary salt water system of THRESHER when the Bureau of Ships was in the process of drawing up these specifications and the contract guidance drawings, at which time the Shipyard was asked to assist the Bureau of Ships personnel in studies which would lead to the ultimate issue of the contract guidance drawings, and also to assist in the drawing up of the specifications for the ship. We, through a series of conferences, both here at the Shipyard and at the Bureau of Ships, developed some two or three on a continuing basis concept of design of the different parts of the system, and submitted them to the Bureau of Ships design codes for approval. This led to the ultimate issue, as I say, of the contract guidance drawings and the issue of the specifications, themselves. From then, we at the Shipyard drew our system working drawings, from which the ultimate system working plans, from which the ship was built, would be drawn. The concept that we followed was that this system was to service the heat exchangers for all of the auxiliary machinery for the main propulsion plant, the main lube oil coolers, the shift lube oil coolers, the air ejector condensers, plus furnishing salt water to some of the other components that were not directly associated with the plan but because of their location in the ship, it was most expedient to provide water for these, such as the distilling plants, and we furnished water to the compensating water system. Actually, the contract guide drawings called for this to be done through two major headers--what we call a supply header and a discharge header. Each header is, in effect, two pipes that b(3) 10 USC 130 of the machinery spaces and the engine room, b(3) 10 USC 130 , and are joined together by an isolation valve. These headers are b(3) 10 USC 1 pipe. The supply header is furnished by b(3) 1 pumps. The pumps are sized such that b(3) 10 USC of these pumps will furnish all of the cooling requirements for the system. The b(3) 10 USC 130 pump was to be used as a standby pump so that if any one of the other b(3) 10 USC 130 pumps fouled, stopped, b(3) 10 USC could be turned on immediately to take its place. These pumps were furnished by b(3) 10 sea chests, or sea suction. Each pump had its own sea suction. These were arranged so that we had a sea suction for each pump--pardon me. We had b(3) 1 sea suctions in the machinery space area, b(3) 1 on each side of the keel of the ship, and in the engine room area, b(3) on each side of the keel, so that if one side of the ship b(3) 10 USC 130 should become damaged, b(3) 10 USC sea suction would still be free to operate.

Q. Can you clarify "machinery space area" and "engine room area" for us?

A. Yes. From the Reactor Compartment bulkhead aft to Frame b(3) at which there was another holding bulkhead, was considered the auxiliary machinery space, and from Frame b(3) aft to the after end of the structure was considered the engine room area.

Q. When you say "machinery space," you mean the auxiliary machinery space, is that correct?

A. Yes. I'm sorry.

Q. Very well, proceed.

A. Also, our pumps are arranged so that we had b(3) 1 pumps on the starboard side and b(3) 1 pumps on the port side. We did this because it was felt in the event of attack, attack would come most likely from one side of the ship; therefore, you would have at least b(3) 1 pumps operable. As I mentioned, these pumps would supply water to the supply header. Water would go from the supply header through the components, the heat exchangers, to the discharge header, from whence it would be discharged overboard. All of these components between the two headers are in parallel, they run parallel between the two headers. These components then are fed through a root connection valve, an isolation valve on the supply side, and as water goes through the pipe to the discharge header, it goes through another valve that is used for balancing the system. This valve could also be closed down tight to isolate the component in the event of casualty to the component. Also, between the two headers there was--to facilitate balancing of the system, there was a line directly connected between the two headers with an isolation throttling valve, which could be closed down tight for isolation. The system was set up such that you had b(3) 1 hull valves and back-up valves on the sea suction, on the suction side of the pump, b(3) 1 hull valves and back-up valves at the overboard discharge. All hull valves were hydraulically operated hull valves, and any back-up valves that could not be reached for manual operation, because they were possibly outboard behind equipment, were also hydraulically operated. The hydraulic operation of these valves--all of the valves were such that immediate hydraulic control of the hull valves in the engine room were controlled from one station. They had a manifold in the maneuvering area. This is a manual hydraulic control. They had manually operated hydraulic valves in a manifold in the maneuvering area, and in the auxiliary machinery spaces. All hull valves and the back-up valves that were hydraulically operated were operated from a manifold at a station on the starboard side of the ship in the upper level approximately midway of the compartment. In addition to the control valves for the hull and back-ups, it was deemed wise to put swing-check valves in the overboard discharge lines. We had to design a line especially in order to get these valves in a horizontal position so that with a line rupture inboard, the ship's force would only have to concentrate at first on getting the hull valve on the suction side closed, and then they could concentrate on the discharges. The swing checks would close and keep the hull integrity while closing the discharges. Also, on this system it was decided that, in the interest of keeping the hull penetrations to a minimum, if they could vent all of the high points in the system, particularly water boxes on the heat exchangers, to one hull connection, they could keep a better casualty control concept. So, all of the continuous vents from these different components lead to one header, which was

taken up to one overboard discharge line, which was a combined overboard discharge for the auxiliary sea water system, the main sea water system, and the air conditioning sea water system. However, each of these systems could be isolated from the others by a hydraulically-operated isolation valve at the junction of the three systems, and each component vent connection had a root valve on it so that if that component were to be isolated from the system, the continuous system, it could be isolated from the continuous feed system also. That is the basic system design, the concept that went into the choosing of components to go into the system. All pumps, fittings, and components, such as strainers and inboard valves, were designed and tested to 593 class requirements for hydrostatic test and high-impact shock testing, and all hull and back-up valves were designed and tested to 593 class hydrostatic shock requirements. We did have one concept on this design which I feel really came out in the design development of this system. We felt that in an effort to cut down on a number of welded joints in this b(3) 10 US pipe, if we could extrude side branches from the pipe, we would cut three joints to one every time we came off one of these headers to go to a component. So, instead of procuring Class 500 pipe for these headers, we procured Class b(3) 10 USC working pipe so that we could extrude side branches from this. This extrusion process was tested to the hydrostatic, high-impact shock requirements of the 593 class.

Another concept that we followed here locally was that at that time the specifications allowed sil-brazing up to 6-inch IPS pipe. Our system was designed to have silver brazing through 2-1/2 inch pipe and butt-welding above that. We felt that, inasmuch as butt-welding would allow for radiograph inspection, this would insure the quality of the joint. It was worth the extra work. For safety features on the ship, we had all of the hydraulically-operated valves in any one compartment operated from the same station, and at that station we had indicator lights showing the position of the valve, open or closed, and a hand pump for back-up operation with a separate supply tank in the event that the hydraulic system was inoperable.

Also, we had differential pressure gauges around the pumps, each of the pumps, and these were located--we had low-pressure arrangement around these pumps, one gauge and one alarm per pump, and start-stop controls are on this board. We had an arrangement for each pump on the steam propulsion control panel. This was based on the idea that the pumps were controlled from the steam plant gauge board, but the components that they served had to be serviced while the main propulsion plant was running, so that if anything went wrong with the system, the operator in the steam control panel should be alerted.

Subsequent to that, we also installed check valves in the continuous vent line so that in the event one of those should rupture, it would prevent the sea from coming into the ship from these lines.

I think that is a rather brief rundown of the concept of the design.

Q. Were any major changes made in the auxiliary sea water system of THRESHER during her post shakedown availability period?

A. One change was the installation of these check valves in the continuous vent system. Another change was the installation of b(1) pumps under the b(1) . This did not actually require them to break into the auxiliary sea water system as such, but because of the configuration of the motor, we had to relocate the motor slightly and put spaces

to match up with the relocated nozzles on the pumps. We also had to rerun some pipe to the shaft seal.

Q. What indoctrination or training did you provide to the ship's force during the post shakedown availability period with regard to the operation of the system, isolation of the system, and casualty control procedures?
A. During the post shakedown availability?

Q. Yes.
A. To my knowledge, we did not have any formal sessions with them.

Q. Do you recall whether training of the nature I have described was given to the ship's company during the period of her construction?
A. We gave the ship's company training lectures to familiarize them with the system operation and casualty control features. Also, prior to her PSA, prior to her departure, this installation of check valves was worked out with ship's force and given to her Engineering Officer.

Q. Were you aware of any casualty to the No. 2 reserve feed water tank during the post shakedown availability due to over-pressurization?
A. No, sir. I was not.

Q. From your intimate knowledge of the auxiliary sea water system in THRESHER, can you think of any weaknesses in its design which may have affected its quick response to casualty control action taken by the ship in the event of a casualty to it?
A. Affecting its quick response?

Q. Yes.
A. No, I can't.

EXAMINATION BY THE COURT

Questions by a court member, CAPT NASH:

Q. Do I understand correctly that for isolation of the entire system, it would be necessary to have operation from both the engine room and from the auxiliary machinery spaces?
A. Yes.

Q. There is no way that from either space you could isolate the entire system?
A. No.

Q. Is there any way that a man on watch in one space would know that a casualty had occurred in the other space?
A. Only from a drop in the differential pressure across his pumps.

Questions by a court member, CAPT HUSHING:

Q. Can you think of any single casualty in the ASW system which would prevent isolation of the system, complete isolation?
A. No, I can't.

Q. Suppose we had a casualty in the vicinity of the control station in the Maneuvering Room--that is, the valve control stop--so that the deck plates in that vicinity were deranged. What would you do if you were in that circumstance?
A. I would check to see if the deranging of the deck plates had affected the hydraulic lines.

Q. Let's postulate that it had prevented you from getting to this?
A. To the hydraulic lines?

Q. Yes.
A. I'm not sure I understand your question, but I would say that I would work the hydraulic control valves and see if they closed the hull valves. May I ask a question?

Q. Yes.
A. Is this assuming that you have flooding as well as having these things deranged?

Q. Assuming you have a flooding and a derangement in the control station in the Maneuvering Room; how would you isolate the system?
A. Somebody would have to go down and close the back-up valve.

Q. Manually go down and close the back-up valves?
A. Yes, sir.

Q. You mentioned, I believe, the header being a b(3) 10 USC 1 size?
A. That is correct.

Q. Were these headers welded or brazed as finally installed in the ship?
A. Welded.

Q. They were all welded?
A. Yes, sir.

Q. At what point in the auxiliary salt water system as installed in THRESHER did you have brazed joints?
A. I would say 4-inch IPS brazed.

Q. Four-inch IPS brazed. And at what locations would you find this in the auxiliary salt water system?
A. The b(1) . There are b(3) 1 b(1) that go into the b(3) 10 U header. Those are the only 4-inch pipes in the ASW system.

Q. How about smaller size piping, take-offs from the header leading to your various components?
A. These would have been brazed.

Q. Those would have been brazed?
A. Yes.

Q. So that from the b(3) 10 U header to the components you would have brazed connections?
A. Yes, sir.

Q. Did you have items in Project Pressure?
A. Yes.

Q. Can you tell us what items they were?
A. We had valves - all of the representative valves for the hull valves. We had the same isolation valves internally, inside the ship, as we had for hull valves. These were given hydrostatic, high-impact and hydrostatic shock tests. Angle valves designed for the ship were tested for hydrostatic and high-impact

shock. Our strainers, we have some double-barreled Macombe type strainers. These were given a hydrostatic and high-impact shock test. Our fittings were given a hydrostatic test, except the welded fittings, in an effort to qualify these copper-nickel fittings. They were given a hydrostatic and high-impact shock test. The heat exchangers and pumps were given a hydrostatic test. I believe the pumps were given a high-impact shock test in a shock-testing facility at UERD.

Q. (By counsel for the court) What does that mean?
A. That's the Underwater Engineering Research and Development facility.

Q. (By counsel for the court) Is that Explosive Research?
A. Yes.

Q. (By counsel for the court) Where is that?
A. That's in Norfolk, Virginia.

Q. (By court member, CAPT HUSHING) Were check valves included in this project?
A. Yes, sir, they were.

(b) (6) relieved (b) (6) as reporter at this point.

Q. Were check valves included in this PROJECT PRESSURE?
A. I'm sorry, yes, they were.

Q. Do I understand you right that you installed check valves in the continuous vent system during the PSA?
A. Yes.

Q. Were there check valves in the discharge side of the ASW system from the initial construction of the ship?
A. Yes, there were.

Q. Did you have any difficulty during PROJECT PRESSURE with the check valves failing to work?
A. No, we did not.

Q. Did you check subject valves to hydraulic shock tests as well as hydrostatic tests?
A. Not hydraulic. High impact.

Q. But not hydraulic?
A. No, sir. The concept for hydraulic shock was that each ship would be subjected to hydraulic shock waves through the, or up to and including the inboard flange of the back-up valve, and this was the hull integrity concept that we took on hydraulic shock.

Q. Suppose there were a rupture of an ASW line inboard, a check valve outside of the rupture, a varying degree of pressure would rise up to and including what we normally consider for hydraulic shock, would it not?
A. You mean if it closed rapidly enough it could have a water hammer?

Q. Were there any tests made which applied pressure to the check valves very rapidly?

A. I don't believe so, no. To my knowledge it was just a matter of hydrostatically testing them to see if they would hold against pressure, high impact shock testing them, and then hydrostatically testing them again to make sure that they still were capable of holding the pressure.

Q. Have you reviewed the design of the ASW system since the THRESHER casualty?
A. I reviewed it for this board, yes.

Q. If you were not restricted in any way by contract design or by specifications, would you now design an ASW system for a THRESHER class submarine in exactly the same way as THRESHER was designed?
A. Yes, I believe I would.

Q. Did you ever attend any drills conducted by the Shipyard or the ship's force in attempting to isolate leaks or flooding casualties simulated in the ASW system?
A. No, I did not.

Q. Do you consider that the damage control isolation features of a system are a part of your responsibilities for design?
A. Yes, I do.

Q. Do you think you exercised those responsibilities in the absence of experience as to how the system operated under damage control situations?
A. I'm sorry, say that again, please?

Q. Do you think you exercised your damage control design responsibilities properly in the absence of direct knowledge of how the actual system in THRESHER operated under damage control situations?
A. I believe I would have preferred to have seen these drills.

Q. Did you make an effort to see the drills?
A. No, I can't really say I did.

Questions by a member, CAPT Osborn:

Q. With respect to your instructions during the construction period as to casualty control, was the ship ordinarily run cross-connected?
A. My instructions during construction were that it would not be run cross-connected.

Q. Did you check with the ship to see whether they did run cross-connected or not?
A. Yes, I did.

Q. Did they?
A. Yes, they did.

Q. They did run cross-connected?
A. This was reported to me.

Q. You didn't really go down and take a check on it?
A. No, sir.

Q. Were you familiar with respect to the seriousness of two inch line and above casualties with respect to the ship and its impact on being able to survive?

A. Yes.

Q. Did I understand you to say, "Yes"?
A. Yes.

Q. Did you discuss this in detail with crew members during construction periods?
A. I did not, no.

Q. In your opinion, did the crew rely too much upon individual leak isolation rather than system isolation?
A. No, sir. They were very conscious of being able to isolate the whole system.

Q. In your opinion, would they have isolated their whole system and cut it in a valve at a time, or would they have attempted to isolate the individual leaks?
A. I really feel that it would have depended on their mode of operation and, as I term it, how dangerous the situation was. I do feel that their first thought would be to isolate the whole system, yes, but I don't think they would have jumped to do this.

Q. You don't think they would have jumped to do this?
A. No.

Q. Would you jump to do it?
A. Isolating the whole system can shut down the whole ship.

Q. How fast?
A. Well, I don't really know. It would take --

Q. Well, I'm just talking in terms of generalities, Mr. Remick, with respect to seconds, a few minutes, several minutes?
A. b(3) 10 USC 130

Q. b(3) 10 USC 130
A. Possibly, yes.

Q. With respect to shutting down the whole ship if you were at deep depth, what would you be concerned with first with respect to shutting the system, down?
A. If we were at deep depth I would be concerned first with insuring that we didn't get so much water in the ship that it went below its depth capabilities.

Q. I understand this, but what would be the piece of machinery that you would be most concerned with?
A. I would think it would be the machinery that's associated with the main propulsion turbines -- the aft ring gland seal condensors, and the main lube oil coolers.

Q. In your design, the loops were designed for fore and aft operation; that is, operation in the engine room and the auxiliary machinery space of the loop, with no isolation valves in between the engine room and the auxiliary machinery space. In the contract drawings these isolation valves are present. Will you give me an idea of why you decided to go this way in design?
A. Yes. Subsequent discussions brought out the fact that if the components

in the engine room were not operable, it wouldn't do enough good to operate the components in the machinery space. It was from a system operation standpoint that this was considered. The piping was already capable of greater pressures than the bulkhead was, so from a compartment isolation standpoint it wasn't considered necessary to put isolation valves in these lines; therefore it was determined that if we would design a system so that they could operate one side of the ship, either the port side or the starboard side, the ship could operate at reduced power this way.

Q. In retrospect do you think it was a good idea to have two different stations have to operate in order to isolate the system?
A. In retrospect I do not; I think it would have been better to have had one station.

Q. Was any consideration in the initial design of this system considered with respect to automatic isolation of this system; that is, a system similar to the SCRAM system in the reactor plant with respect to shutting the auxiliary sea water system valves?
A. This was considered; however, it was considered or discussed along with this, that if you got into a situation where closing of all these valves would put you in an untenable situation, this would be a bad feature rather than a good feature; therefore, it was decided that rapid operation by some person was the better concept.

Q. But this was a subject of considerable discussion?
A. Yes, sir.

Q. Again, in retrospect, what would be your opinion at the present time?
A. I still think they came up with the right answer on that one.

Q. You still think individual isolation --
A. I still think that giving some person the opportunity to decide whether he wants to shut that system down or try to isolate some portion of it is better than having something automatically just shut the whole thing down.

Q. With respect to the general order of sound insulation required on THRESHER design from the very start, was there any consideration given to a low pressure cooling system?
A. Yes, sir, we ran a study whereby we would take salt water into the one major system, put it through enough heating exchanges to cool all of the fresh water required to then cool the main propulsion auxiliary components. Our report on this study was reviewed by both the Shipyard here and the Bureau of Ships personnel and it was determined that the extra weight and space consumption of these heat exchanges, in addition to having all the other heat exchanges, though they might be somewhat smaller, would be a disadvantage in having a low pressure system.

Q. But you did make a definite study in this area?
A. Yes, we did.

Questions by a member, RADM Daspit:

Q. Could you give us some idea of the extra weight and space that would be required by the low pressure cooling system?
A. I can't remember the exact figures, but I would say that weight-wise we

are talking in the order of magnitude of an extra twenty-five percent of weight added to the ship. The space consumption, you'd have to have some three heat exchanges about the size of the main condensers in order to exchange this heat to take it out to sea.

Questions by a member, CAPT Hushing:

Q. Do you have this study available in your files?
A. Yes, sir, I do.

Q. Would you make it available for us to review, please?
A. Yes.

Questions by the president, VADM Austin:

Q. Mr. Remick, you remarked in answer to a question, that isolating the whole system would shut down the whole ship. Did this consideration have a great influence on the design of the ASW system for the ship?
A. Yes, I would say it was one of the major factors.

Q. Would it not be practicable to have that cooling water required just for continued operation of the propulsion plant separate from the other requirements of the ASW system, and would not such a separate system permit a higher quality of inspection for that system which is vital to the operation of the plant and a less rigid inspection for the other parts of the system?
A. May I ask one question? You say, "would it not permit it." Permit it in what way? I personally can't conceive of any salt water system being subjected to any less inspection than any other salt water system if it's inspected at sea pressure at full submergence of a ship.

Q. That's correct. It must be tested to stand the full submergence depth of the ship. But if you had one part of your system which supplies the salt water necessary for cooling those parts required to continue operation of the propulsion machinery, and another one to take care of such things as air conditioning, etcetera, etcetera, then if your leak or flooding occured in the part that was not concerned with the continued operation of the ship, you wouldn't have any hesitation in shutting that part, would you?
A. Correct.

Q. But you would be freed of the concern that you now have of denying your ship propulsion power by immediately closing your outboard valve, and such a system would probably permit a more rapid closure from one location instead of the present system of two locations?
A. (the witness nodded his head in agreement.)

Q. Was such a system considered when this design was being developed?
A. Yes, it was considered. As I recall, the major component that is now being serviced by this system that possibly could be taken off to make a major difference to the system would be the 8,000 GPD still. We are furnishing small amounts of water to such things as trim pump gland seals, and we have a normally closed take out on the plumbing system. We cool the CO_2 scrubber --

Q. Those are very minute demands, are they not, as compared to --
A. IG air cooler or something like this; yes, that's right.

Q. As presently designed, the system does have so many valves and lines and is in so many compartments that it is difficult to determine where one is getting flooding from at deep depths, isn't it; in view of the fact that any flooding would cause a showerbath effect and it would be not easy to determine what was causing it?
A. That's correct.

Q. You have so many choices, you mean, it would be difficult to pick which one?
A. I agree, yes.

Q. Therefore, anything that makes you hesitate to take action which would shut down, and, as you expressed it, "stop the whole ship", would tend to increase the time before flooding of any part of the ASW system was brought under control, would it not?
A. I would think so, yes.

Questions by a member, CAPT Osborn:

Q. Mr. Remick, have you ever made a study of how long various components could go without the ASW system and their order of importance with respect to maintaining propulsion on the ship?
A. No, I have not.

Q. I think in retrospect with respect to our thinking as to this system is cross-connection for ease of operation and protection in shallow depth contrasted with isolation that comes with deep depths. Can you think of any design feature you would put into a system that would give you this additional flexibility?
A. I'm not sure I understand what you mean by this cross-connection concept.

Q. Well, what you run into from the standpoint of operating a system it's very easy to have many loops with maximum flexibility at shallow depths in order to insure that you have a flow of cooling water or a source from multiple sources. As you go down in depth then you want to get away from this particular concept and have rapid, fast isolation with degrees of cutting back in. Were you designing the system over again, what would you do about this?
A. You mean would I have more hull penetrations, more individual services?

Q. Yes.
A. No.

Q. The number of hull penetrations then was a major item in your design?
A. Yes, sir.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

WITNESS: I'm not too sure this is too appropriate, but I would like to mention that I really feel that the Shipyard was behind me one hundred percent in insuring that we designed joints into these systems that, even though they were

always in excess of what was required by the specification, I felt were needed for the integrity of the ship. In other words, we were welding when the specifications only required silver brazing, etcetera.

Questions by the president, VADM Austin:

Q. I take it you had a high confidence in the system?
A. Yes, sir, I did.

The witness was duly cautioned concerning his testimony.

COUNSEL FOR THE COURT: What classification would you accord to your testimony, Mr. Remick?

WITNESS: ~~Confidential.~~ Unclassified

The witness withdrew from the courtroom.

PRESIDENT: Let's clear the court for deliberation for a few minutes.

The court cleared at 1725 hours, 26 April 1963.

The court opened at 1738 hours, 26 April 1963.

PRESIDENT: The court adjourns until tomorrow morning at 8:30.

The court adjourned at 1738 hours, 26 April 1963.

THIRTEENTH DAY

Portsmouth Naval Shipyard
Portsmouth, New Hampshire
Saturday, 27 April 1963

The court met with closed doors at 0830.

All persons connected with the court who were present when the court adjourned were again present in court, with the exception of (b) (6), who was relieved by (b) (6) as reporter. RADM Palmer, LCDR Hecker and his counsel waived their right to be present. Counsel for RADM Palmer was present.

No witnesses not otherwise connected with the inquiry were present.

The court was then cleared and met in closed session.

The court was opened at 0930 hours, 27 April 1963.

All persons connected with the court who were present when the court closed were again present.

No persons not otherwise connected with the inquiry were present.

Captain William E. Heronemus, U. S. Navy, was recalled as a witness for the court, was reminded that his previous oath was still binding and was examined as follows:

COUNSEL FOR THE COURT: Captain Heronemus, this is a closed session of the court and classified information may be given here. At the conclusion of your testimony, I shall ask you what classification you would assign to your testimony as a whole.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Would you review in some greater detail please, the nature of your duties at the Portsmouth Naval Shipyard?

A. I'd like to refer to the standard organizational chart, if I might. My title is that of Shipbuilding and Repair Superintendent. I am responsible to the Production Officer for the satisfactory, timely and economical accomplishment of all ship and shop work, for ships and craft constructed at the Shipyard, or assigned to the Shipyard for repair, overhaul or for conversion, and for special projects as assigned, except for work under the cognizance of the Nuclear Power Superintendent and work under the cognizance of the Combat Weapons Superintendent. I am responsible for the organization, administration, training and supervision of personnel assigned to work for me. I have Yard-wide responsiblity for coordination and guidance of assigned work,aimed at orderly progress, effective use of man power, conformance with safe practices and job specifications and maintenance of accepted engineering standards. I am responsible for the determination and reporting of physical progress of work assigned to the Production Department; for the maintenance of cleanliness, good order and discipline of personnel in spaces used by my divisions. Assisting the Production Engineering Officer in the preparation of schedules for the work of my division. I have duties as a gas-free engineer. That's about it.

Q. Outline your naval and professional background?

A. I'm a graduate of the U. S. Naval Academy, class of '42. Upon graduation, I first went to sea in the destroyer Navy, served in the destroyers for the first

two and a half years of the war. I was then transferred to the battleship NORTH CAROLINA in preparation for assignment to postgraduate training to become a constructor. In 1945, I went to MIT, completed, in March of '48, the three-year combined CE postgraduate course. Since that time, my first tour of duty as ED was at this Shipyard.

Q. That is an engineering duty officer?
A. Yes. I was designated an engineering duty officer in February 1948. Since February of '48, I have worked on nothing other than submarines -- the design, repair, construction and conversion of submarines at this Shipyard; the Bureau of Ships, and at the Mare Island Naval Shipyard, as Forces Material Officer for COMSUBPAC, and now back at this Shipyard.

Q. When did your present tour of duty at this Shipyard commence?
A. August of 1960.

Q. Since that date, have you been closely associated with the work accomplished in THRESHER at this Shipyard?
A. I have.

Q. Referring specifically to her post shakedown availability, describe the general scope of the Shipyard work accomplished in THRESHER and significant problems encountered in the course of that work?
A. Well, as you all probably know now, the THRESHER PSA started out in July as an availability of at least six months' duration. At the start of the planning for this job, the total time was controlled by the requirement to remove the cellulube hydraulic fluid and convert back to petroleum base fluid. During this initial finding though, we were overhauling SKIPJACK and as our experience in correcting SKIPJACK shock trial deficiencies increased, we realized that the over-all volume of the very many small jobs which we had to do in the THRESHER would become more controling than the cellulube job. There was considerable debate as to whether or not this new version of the PUFFS sonar would be controlling if it were authorized. The Shipyard made the determination that PUFFS would not be controlling, rather that the aggregate of all the other work would become controlling and this PUFFS job was authorized. Then, in October and November, renewed emphasis was placed on accomplishment of several prototype noise-reduction items, whose estimated time called for an extension of the availability. At that time we felt compelled to ask for more time, and in December, additional work items to support the forthcoming evaluation of SUBROC plus a new antenna system, the floating wire antenna, were accepted and at that time I accepted that work without asking for further delay, and this really proved to be my undoing later on insofar as length of abailability was concerned.

We ended up with a sizeable work package and one of the best ways of summarizing that, if I may, - I believe this document has been made available to the court - but the Planning Officer has prepared this index of job orders, which contains all of the work under my cognizance and all of the work under Commander Rust's cognizance and several support jobs under Captain Hinchey's cognizance. The exact title of this document is USS THRESHER SSN 593 Post Shakedown Overhaul Index of Job Orders, dated 16 April 1963. Now within that booklet, I believe you've been working from a document which sorts out what was labeled as more important jobs. There is a brief review of this. Changeover of the hydraulic fluid was one of those. Conduct extensive hull surveillance inspection was one. Stiffening of the flat plate structure in the variable tanks, sanitaries, ejection plenums,

emergency heat exchanger tank, and adjacent normal fluid fuel oil tanks was one of them. Install a new version of the PUFFS sonar. Alter the communications system, masts and equipment. Accomplish all of the regular submarine overhaul routines on systems and components and conduct an inspection of silver-brazed joints in the sea water systems using the "UT" technique that had really just been developed in the last few months. Install a new version of the garbage disposal unit. This was a sizeable structural job because we had to change the size of the sea chest in which the outer door fitted in order to put this thing in. Correct all shock deficiencies, and they were broken down into four major categories by books. Replace all of the auxiliary power, electrical controllers. The GE controllers which went to sea in this ship were labeled as "unsat" and we substituted 57 Cutler-Hammer controllers. for all the GE controllers. May I correct that. They were Ward-Leonard's. Accomplish numerous pump alterations and piping alteration jobs associated with the noise reduction. Accomplish numerous sound dampening and hull smoothing jobs associated with noise. We made an extensive installation of a new material called Chemford, which is a sound dampening material, and it went on all of the outer shell, on the inside of the outer shell up in the free flooding and main ballast tank areas and up in the sail area.

Now as this availability progressed, it became more apparent to me that the stiffening of the flat plate structure would finally become controlling for undocking. This same job later remained controlling because it prevented early use of the WRT tanks for checkout and testing of the torpedo batteries until much later than I had wanted. I could not get the stiffening done in these tanks. Therefore, I could not paint the tanks. I could not use them for water and I got hung up on testing out those torpedo water batteries and that finally caused-- was one of three problems that caused-- a little more delay. It also became apparent that the interlocking step by step sequence forced upon us by many jobs, originally thought to be independent of each other, was now causing delay. We were going from the inside of one surface of the outer shell, to the outside of the outer shell, and things had to be done step by step. Back in November and December we thought we could do all this at the same time. It just didn't work. It had to be done step by step and I hadn't been smart enough to realize it. It was all new work; we had never done it before. It was all pioneering. But about the time of undocking I had to face up to two weeks delay to accomodate the delays which this inter-relation among jobs, particularly those authorized late in the availability, had forced on the hull and tank work. And here was where I guess I came under the most severe criticism, because the two weeks delay was not enough and I had not taken the time- though I had asked for the time to study this further- but I had not yet taken the time to analyze all of the work. I just re-analyzed the docking work and the tank work, and the two weeks delay was adequate for that, but at the same time, the stuff inside the ship was hopelessly snarled and shortly thereafter we had to ask for four more weeks. And this was done with great reluctance. I think you people understand that our reputation in the Shipyard, and our reputation is greatly touched by the manner in which we do our work, are able to plan our work and accomplish it without affecting operational schedules, but we goofed it. We asked for the time and considerable criticism came down on our shoulders.

We also ran into financial difficulty. We had to ask for a sizeable increase in funds. One of the things I tried to do during this availability was to force my shop supervision to stay within the planned manning curves which were tied to the number of dollars which had been estimated, which in turn had been

tied to the number of dollars made available, and I didn't want to have a financial failure. Well, I had a financial failure and it was a sizeable one, and in my opinion the principal reason was I tried too hard to stay within limitations which we couldn't stay within. They were not realistic in last analysis. So instead of manning the boat a little heavier when maybe we could have saved some time, we kept our manning down to what we could afford, and consequently had to work longer with fewer people. We ended up, as a Shipyard, having to absorb certain of these costs within our NIF operating capital.

Q. What is "NIF"--for the record?

A. Naval Industrial Fund. This is the Admiral's capital fund within which he operates this Shipyard as a self-liquidating financial establishment. Now as the work was finished up, it became more clear each day that we and ship's force had nearly the equivalent of the finishing up of a "new construction" ship on our hands to bring this entire ship back to life. Literally every system and every component had to be checked out, groomed as necessary, and brought back to peak performance. Systems and components that had lain idle were now found to require some repairs. This is a long time. Valves in the main and auxiliary steam systems in particular, which had been tight during a special post-arrival hydro test at the start of the availability, were now found to leak. There was a coating of rust on some of the valves and we couldn't get off our hydro for about a week, and this delayed our steam-ops. Ship's force was responsible for making those valves tight. I had made them tight once and in reality I had not been hired to make other than MS-3 tight. So it ended up in a sizeable amount of work here opening traps and grinding in traps and all manner of small MS and AS valves. We took on and helped them with a tremendous amount of this. We had to get going but in final analysis it was really their responsibility.

As a result of this post overhaul test and trial period, I then found myself beset by numerous requests by ship's force to do work for which I'd never had any responsiblity and at times these discussions as to our responsiblity would would get down to opinion as to whether or not the Yard might have damaged an item on which we had not worked, and you all know what kind of an argument this can be. Here we had been crawling around inside this entire ship for seven months, and I didn't win any of these arguments. In every such instance the Yard gave way to the ship and we went to work, except for one thing. We held the line on certain items, replacement of pilferable items which by long-standing submarine tradition, they could jolly well hold themselves responsible for safe-keeping, such items as soap dishes and chrome-plated toilet paper holders which had become lost. I refused right up to the day of sea trials to go buy some new ones. But even here, normally ship's force holds themselves accountable for handwheels, but we could not find the valve handwheels and during the last two or three weeks I replaced well over three hundred valve wheels and handles, all newly plastisoled and all newly labeled.

Now late in the availability we suffered four casualties which set us back about nine more days, which we never could recover. The first of these involved a special electronic cooling pump in which we had great faith and it failed, and no replacement of the same type was available nor were there any special parts for this pump. It had a new type of bearing in it which was one of a type so, we had to take this pump out and rebuild the old pump, and to put back that old pump, we had to start from scratch with new foundations and all new piping and this was a sizeable job.

The second thing that happened to us at this late date, after we got WPT's available and started firing the torpedo tubes, we discovered that our early analysis with the trouble with the torpedo tubes was faulty. It had been reported, and we had a work list item, that neither battery had operated correctly after shock trials. The engineers had gone down and analyzed the situation as well as they could without actually firing those batteries, and decided that the firing valves were bad. We overhauled both firing valves; in fact, we literally rebuilt both firing valves. It turned out on the port side this was fine, but on the starboard side this was not so, and very late in the game we discovered the torpedo battery air gun on the starboard side had actually torn loose during the shock trials--must have--it suffered some kind of a tremendous acceleration and bowed up at the mid-point and then came back down again, but it wasn't perfectly straight and the ram would only run half way out. So we--it had not suffered plastic deformation; it was all elastic--were able to realign this ram and get perfect run-out and got the battery back on the line. This in turn, delayed the extensive grooming required of the torpedo battery hydraulics and pneumatics, all of which had been disrupted by the cellulube changeover job. Now why was this?-- The hydraulic piping goes onto these tubes first and the air piping goes outside of it, and while we were delayed in getting this firing ram back to battery so that it would work, we were delayed in working around the tube and because we had changed from a fluid of one viscosity characteristic to a fluid of another viscosity characteristic, we had to work for days in the torpedo battery to make this complicated hydraulic and pneumatic system operable. It was just one big spring system as you know, and the time factors of each portion have to be timed with respect to each other, and the grooming-out took a long time.

The next thing that happened to us was the main condenser b(3) 10 USC 130 on steam operations. We were able to overcome this problem. It took General Electric and Bureau Assistance and concurrence. We had to redesign and install different b(3) 10 USC 130 . The passageways in the b(3) 10 USC that we replaced were just too fine for the probable particles of very, very fine rouge-type rust that could be found in the condensate system. We overcame that one all right.

And then the last one, for which we had no excuse at all, we bowed up the top of this Number 2 reserve feedwater tank This delayed us getting on with steam-ops for three days. This was a definite error in procedure on the part of the Shipyard and resulted in rework of the tank top structure, plus a careful check of the foundationing of the distilling plant above the tank top, and caused us three days delay in getting on with steam operations.

Now at the same time we found that the Number 3 torpedo tube shutter and outer door jammed partially open during one water slug firing. We sent a diver down and he found that a shutter stop strut--which is a piece of channel bar about four inches long--had broken off of the back side of the shutter and had lodged between the shutter and the outer shell. We assumed that this stop came from that particular tube. It was later shown that this was a false assumption; it had come from number one tube up above it. So we agreed to fire only three water slugs more from that tube prior to sea trials and to operate the door in hand power only. The tube was perfectly all right, provided you did not give it a shot of hydraulic oil which would accelerate the shutter and likely make the thing rack at the end of its travel, and it was decided that this mode of operation would be completely acceptable through the end of sea trials, at which

time we would go back into dock for repairs.

We reached that point where the Yard wanted the Fast Cruise to start. Ship's force would not start until all remaining ship's force work had been completed and until all Yard personnel had been off the ship for at least 48 hours. I never have held a listing of ship's force work; I do not know if such a listing ever existed other than in the department work books, but the commanding officer and I had numerous discussions from that point on and we were both in complete agreement that we weren't going to start Fast Cruise until I was through with my work and he was through with his; and in addition he wanter his ship to himself for 48 hours to clean out and to load his gear and get ready for Fast Cruise.

So I started turning compartments over to him area by area, and turned them over formally by written memoranda, and they were able to do this. This was a hard row to hoe. We had the ship quite clean, but shipyards never really clean a ship the way sailors want it cleaned, so he required every bit of paint work to be scrubbed with soap and water before they moved their bedding aboard and before they started filling up the lockers. We did this and we moved all the stores aboard and we started eating aboard and we moved spare parts aboard, moved the bedding aboard and, finally, at 2000 on Saturday, the 23rd of March, the ship was self-sustaining and had started a Fast Cruise. We stood by in our field shack and we received no deficiency chits from the ship for the next two and a half days, and I had a ship's superintendent standing watch down there around the clock. Lieutenant Biederman, Ensign Lucas and Chief Warrant Officer Karetnuk took turns on this watch. We were under the impression that all was going very well until noon on Tuesday, 26 March. Now at that time, the commanding officer called me on the phone and said that he had just signed a letter stating that he was aborting Fast Cruise and this letter is Serial 146 of 26 March, and he was aborting Fast Cruise because he had 456 deficiency items, and in his letter he cited 19 specific items.

I was upset by this; I have to be very honest about it.

Q. Do you have that report of deficiencies with you, Captain Heronemus?
A. Yes, sir. A copy went to DEPCOMSUBLANT. (Hands document to counsel)

The cited document, letter from CO THRESHER to Commander, Portsmouth Naval Shipyard, Ser, 146, dated March 26, 1963, was then offered in evidence by counsel for the court. Neither the court, nor counsel for RADM Palmer, having any objection, the document was received in evidence and marked as Exhibit 96. Counsel for the party RADM Palmer waived the reading of the exhibit at this time.

Q. Refer to Exhibit 96 and read it please and explain the markings which appear in the left hand column marked "C" as you go along.
A. Do you want me to read the whole thing?

PRESIDENT: It is not necessary. The court has already read it.

A. All right, sir. "As of the time of this letter the ship considers that 456 deficiency items are incomplete and that 186 of these are required to be completed before sea trials. The list below is composed of some of the more significant of the latter: "G-98 - After Escape Hatch will not shut hydraulically. "G-144 - Number 3 torpedo tube breech door will not shut hydraulically. Number 2 torpedo tube breech door electrical indicator does not operate." In the case of these two weeps we were able to have that door working within three minutes, and we found a bayonet-type light in the torpedo tube console had moved out of its socket, and the other thing wrong here, as I recall, had to do with operating a switch in the wrong direction. "G-152 - the Mark 8 Bearing Position indicator transmission is inoperative." It took us three minutes to replace a fuse in that circuit.

"OPS-41 - An/ARC-27 radio receiver is inoperative." This was an actual statement of falsehood. The radio was perfectly operable, but about a three-foot length of spliced-in cable had been put in the antenna lead which we had given to the Chief Radioman deliberately and told him we would replace it later. Apparently, a sheetmetal man had drilled up into the ceiling and touched the fixed cable, and just before the start of fast cruise we pulled this down and jumpered it. That radio was perfectly operative.

"E-83 - Battery hatch will not dog shut." I was able to dog the battery hatch shut by the simple expedient of standing on it while I turned the handle.

b(3) 10 USC 130

This turned out to be one of our largest problems. This b(3) 10 tank low level alarm mechanism had to be completely renewed. It is a device made by the Gem Switch people. It is susceptible to flooding out. This whole electrical mechanism is b(3) 10 USC 130 and it was inoperable.

"Engine order telegraph is inoperative." This was an old one. This ship, from the first time we started a fast cruise had always wanted this engine order telegraph bell to ring in accordance with what the present officer of the watch wanted. One guy would like it to strike as a gong; another man wanted it to sound as a bell. On this particular occasion we had it rigged to strike as a gong. The man who wrote this chit was one who wanted it to ring as a bell. I never did anything about this. I just got tired of changing that particular bell.

"Magnesyn compass is inoperative." The yard had no responsibility at all for the Magnesyn compass and ship's force ended up having to put it back into operational condition.

"After Group MBT high pressure air blow is inoperative." That is not true. The after group MBT high pressure air blow actually had a slight leak on one of the "O" ring packings and we replaced it very shortly, but it was working and could have been used.

"Shaft revolution counter transmits loud thumps to hull." This job I took on as a personal project-engineer-type job and about three days later had redesigned it. The cogged-type belt drive that drives this thing is such that it could be cut and spliced. In order to put the belt on, it had to be cut. To put it back together again you really needed a jig to very positively hold the belt while you brazed the wire. We had no jig. We designed and built a jig and put it back together and everything was fine.

"Unable to obtain flow of water through Battery Water and Electronics Cooling fill line." This required about ten minutes work of putting a snake through this particular line. We had had no work whatsoever to do on that during the availability.

"UHF/IFF mast does not operate properly." Here is a problem that faces us with these ships alongside the pier. On these particular masts, if you continue to operate them above the waterline without any water splashing on them, they begin to bind up because of the tightness of the dual ring bearing. We went down, poured two buckets of water into the sail and the mast worked beautifully.

"New depth sensor not installed leaving single ball valve protection from sea." This is correct. This depth sensor had not been hooked up. We hooked that up; it took about two days to do that.

"Chief Petty Officer water closet flapper valve is inoperative." This is an old submarine problem with these plug cocks. This one had sat idle during the entire availability and hadn't been used until the fast cruise and now we found that the lubricant had hardened up on it so we relubricated it.

"Hull ventilation exhaust valve will not remain open hydraulically." We corrected this by replacing a control valve poppet which had lost its mirror finish and this valve would drift very, very slowly, but that was corrected in about a day.

"Crew's and Officers' water closets are periodically inoperative because sanitary drains clog easily in horizontal pipe runs." It turned out that these pipe runs were not horizontal, though it was very difficult to determine that they were pitched. They were pitched correctly, but we had a sizeable buildup of hardened material in these runs that we had to scrape out with what looked like a Roto-rooter device. This was a serious problem, no doubt about it.

"Negative tank flood valve is inoperative." This is another one we corrected in three minutes or less with a fuse.

Then there is a category of "various" - and this is the thing that bothered Captain Harvey more than anything else; the ballast control panel showed spurious alarms. "Torpedo shipping hatch, bridge hatch, after escape trunk and outboard inductive valve indications are erroneous on Ballast Control Panel." All of the

indications on these outboard openings in the THRESHER class are made with a very, very critically set micro-switch and all of these hatches were new. The rubber gaskets in them were brand new and we had adjusted these hatch openings a number of times, and after they worked the ship over for another two days we had taken a little bit of permanent set in the rubber, maybe as little as three thousandths. Another three thousandths movement and these gaskets threw these micro-switches off so you had a hatch that went shut, and down at BCP, the indicator would show wrong.

Our records showed that a maximum number of 442 deficiencies existed at that time rather than 456, and of those there were 112 that ship's force had labeled as "No Go sea trials." I have a complete listing of these deficiencies and I have broken them down into categories which I think tend to indicate their significance.

The first category--of which there were 95--were items involving leak packings, inoperative machinery, frozen hull fittings, and several missing drain pipes. Every one of those items had, at one time operated correctly and had been accepted by ship's force, but with this additional operation they now leaked a little bit or didn't move quite the way they should have.

These were 65 items involving electronics gear, and again, every one of those pieces of electronics gear had been sold to ship's force and had been accepted prior to this fast cruise. These were items of electrical fuses and switches, switch adjustments, electrical lights and associated hardware and some cable markings that they wanted changed.

Fourteen of these items requested additional pipe hangers. Thirty-eight of the items involved missing valve hand wheels, desired extension rods and color coding and labeling.

Eleven of the items involved spots of paint or minute leaks on flexible hoses and rubber mounts.

Twenty of the items were asking for completely new design concepts. They wanted something that was entirely different from what we had ever had before. This had to be referred to the Design Division.

Thirty-eight of the items involved clips and brackets to hold portable gear which had just been moved back aboard by ship's force. Many of these items were now wanted in locations different from their pre-PSA locations--waste cans, seats, tool boxes. They had been off the ship until they loaded for fast cruise. Thirty-eight different sets of clips.

Twenty items requested new material only--mostly pilferable hardware; and two items reminded me that there were two compartments that were yet undone.

139 items were asking for additional lockers, sheet-metal work, paint work, additional deck tile, repairs to pipe lagging, replacement of deck plates and kick plates and new upholstery.

At this point our schedule had actually made provision for five full working days, from the end of the four days' fast cruise until movement over to the noise basin, for the correction of such discrepancies as would be found during the fast cruise.

We went to work and corrected these deficiencies, working from 1600 on Tuesday the 26th of March until 1600 on Saturday the 30th of March, four full days, and we expended a total of 720 man days to do this work. I had actually budgeted 2000 man days to correct post fast cruise deficiencies. Of those 720 man days, 275 involved sheet metal, cork, cleaners, painters and upholsterers. I am not trying to give the impression that this work should not have been done. It should have been done and was going to be done. The only impression I would like to point out here is that I did not concur, personally, in the seriousness of this situation insofar as having to abort fast cruise is concerned, but I offered no objection to the commanding officer. This is his drill; it is his prerogative and the man said he couldn't train his people because his BCP was indicating incorrectly--well fine; that's fine--we offered no objection. But I couldn't help but feel just a little bit disturbed that my schedule--or that our schedule--had been disturbed by this.

Now starting on Friday the 29th of March, I began inquiring as to when we would resume the fast cruise. We were down to where all but 60 of those 442 items had been corrected, finished up, and there were about 60 of them that required a little more time. There were some of these lockers that were going to take more than a week or so in the shop to build and I asked the commanding officer when the ship would resume fast cruise; the Production Officer asked him and the Shipyard Commander asked him, and we had a few discussions about this. He had already granted liberty for that weekend and he agreed to cancel liberty as of 0700 on Sunday morning the 31st of March and be back on board to resume fast cruise at 0800. This was done. The crew mustered at 0730 and they were back aboard and resumed their fast cruise at eight o'clock.

Now at about 0800 on the 1st of April I went aboard. The fast cruise had been terminated and Captain Harvey asked me to come back into the engine room with him. Lieutenant Biederman was with me. We went back and contacted John Lyman the engineer. He wanted to point out a casualty, which had occurred during this 24-hour operating period, down in the lower level of the engine room. He showed me where the shaft which pushed open and shut b(3) 10 USC 130 valve, had been bent outboard. The valve operating gear could move the valve only about a half-inch of travel toward the open position. This situation could best be explained to people by looking at this drawing, if the court is interested. (Witness unfolds blueprint)

PRESIDENT: I think it would be best if we put that on the board and Captain Heronemus pointed out the pertinent information.

(A blueprint was then attached to the blackboard in the rear of the courtroom).

WITNESS: There are b(3) 10 of these valves in the ship and they are really a pair of valves, all purchased from Atwood-Morrill. The outboard and inboard are back to back and fastened into the b(3) 10 USC in this manner. The outboard valve is a slide valve, and its seat is actually a cylindrical flat surface which comes up against a flat rubber gasket. The inboard valve is not pertinent to this discussion. The operating mechanism is through this device right here which is made by the Flow-Torque people. This shaft rotates and then this curved arm is supposed to give you nothing but a motion up and down. It comes on around and the push of this is to give you an over-center lock in a shut position and give you an over-center lock in the open position. It was considered a pretty brilliant idea by somebody. It

is a vertical equivalent of a Rapson slide, is what is amounts to. Well, everything is real fine except that the desire of this operating mechanism to go straight down, when you first put pressure on it is nil. And this shaft had not--well it didn't move freely enough and there was not enough grease in it and there was not enough grease up here--I say that, although I guess I shouldn't because it had operated any number of times during steam-ops and prior to that point, but at this particular point the thing went like that (indicating) and bowed the shaft, and we went down and tried to straighten this shaft. We worked about four hours. The commanding officer and the engineer were right with us. By casting loose the shaft we were able to operate at 180° and it would work perfectly all right, though it had as much as a three-inch bend in it, but we could bring it back and it would work fine. We wanted to get over to the noise basin for sound tests, and to do that you have to move to Berth 6 first. You can't go directly from 11 to the noise basin on one tide. So Captain Harvey was perfectly willing to move over to Berth 6 and we did, and continued to try to straighten this shaft. We got this thing so it worked very well except that we lost our adjustment in the process. We lost the length of the link, so we could not demonstrate that that valve was actually shut. We straightened the shaft and were able to hold our b(3) 10 U with pressure tending to unseat the valve. We continued to work on this for the next several days and we could not prove that the valve was tight and that controlled the next movement.

Q. Would you identify, for the record, the paper from which you have spoken and the shaft in question.

A. This is BUSHIPS drawing b(3) 10 USC 130 . The title is Submarine SSN-593, b(3) 10 USC 130 Valves Operating Gear and Assembly, and the particular shaft to which I have been referring is identified as--it appears to be- Piece Number 42, drawing reference 1.

By 1000 that morning the valve shaft had been turned and straightened such that it would open and shut by power and at a hydraulic pressure only slightly greater than that in the port side. At noon it was decided to move over to Berth 6 so that we could move to PARMB on the next high tide. As of 1600 the valve was still working freely, but we were not able to demonstrate that it was closing tightly. It was decided to go over to PARMB, start the noise tests and continue to adjust the valve waterborne, thus permitting us to go to sea on Thursday, 4 April on the early morning high tide.

Now the commanding officer was in complete accord with this. In fact, this was his proposed scheme of events and I was in complete accord with it.

The noise tests at PARMB actually moved more rapidly than expected, but we were unable to prove that this valve was seating. On the third of April it was decided that the boat had to go back into drydock prior to sea trials. The portion of the noise tests utilizing reactor power were accelerated by about two hours and the ship moved out of PARMB and all the way around into Drydock 3 at about noon on Thursday the fourth of April.

It was then decided also that an earlier construction-phase decision to leave off the guide rollers from the upper ends of the b(3) 10 USC 130 valve operating shafts had to be reversed, and we started a maximum effort to redesign, rebuild, fabricate and install good roller guides that would fit this particular ship. And this actually became a controlling job for the next few days.

It was also decided that we would not attempt to undock earlier than 9 April. Now this was done primarly out of consideration of ship movements that would have been required over Palm Sunday. It was agreed by the CO and his officers that the ship was now in such a high state of readiness that we had a very fine chance of returning from sea at noon on the 11th and announcing our completion date at midnight that same day. The schedule was proposed by the commanding officer and I went along with it. I thought it was perfectly all right.

Examination of this valve b(3) 10 in dock, showed nothing wrong other than misadjustment of the throw of the valve as a result of our shaft-straightening efforts. We renewed the shaft, the two bushings in which it operated, its packing, and installed the roller guides. We started this period in dock with the 60 partially completed items left from the fast cruise deficiency, plus 43 more added while at PARMβ. I have a listing of those 103 items and they can be categorized as follows:

Items involving leaky packings, inoperative machinery and inoperative hull fittings--27.

Items involving electronic gear maintenance, electrical fuses, switches, switch adjustments, electrical lights and cables--3.

Items involving additional desired pipe hangers--4.

Items involving missing valve hand wheels, extension rods, color coding and labeling--15.

Items involving flexible hoses and rubber mounts--zero.

Items asking for completely new design concepts--there were nine more.

Items asking for clips and brackets to hold portable gear and repair to ship's portable gear--17.

Items requesting new material only--there were three.

Items reminding us of an incomplete test memo--and this item actually required operation at sea--one.

Items asking for new lockers, other sheet metal, cork, paint, deck tile, deck plates, deck plates and upholstery--there were thirty-one more.

This was a total of 110 items of which seven were later canceled by the commanding officer as inappropriate, for a net total of 103.

Now the man power expended during this period, immediately prior to going on sea trials, reflects primarily a large scale effort on the part of the machinists to install the roller guides, and on the part of the cleaners and painters to do that painting which had earlier been planned for accomplishment after sea trials and before completion. We expended 101 man days of sheet metal and structural assistance. We expended 201 man days of cleaners' and painters' time, and a grand total of 607 man days.

The torpedo shutter stop job was completed on the sixth of April and it was discovered at this time that that stop had broken from Number 1 shutter rather than

from Number 3, and all of the shutter stops were examined by ship's force, including the commanding officer, who personally examined each one of these shutters along with my ship superintendent. Ship's force asked permission to use a crane to polish the propeller and they did so. All b(3) 10 USC 130 valves were demonstrated able to hold Yard water pressure tending to unseat them. This was at b(3) 10 U and the required test is b(3) 10 U

The new shaft for b(3) 10 was tight in its bushings compared with the shaft on b(3) 10 on the port side. We worked it out for quite a few cycles and each ten cycles or so it seemed to be requiring less hydraulic pressure to break open. At no time did it require excessive hydraulic pressure to start the stroke. The new roller guide prevented repetition of the outboard bending of the shaft which had caused the casualty, but now there was a new movement between the shaft and center of inertia of the actuator which tended to rotate the shaft mechanism aft about 1/8" at the start of each opening stroke. The shaft itself was no longer free to bend; the foundation bent. I watched this for a number of cycles and was convinced that this motion was entirely proper and well within the elastic springiness of the existing foundation and that no harm could come from it. The commanding officer, the engineer and two leading chiefs accepted my judgment in this case and we continued to cycle that valve.

At 0730 on the 8th of April, I reported to the commanding officer that we still had ten discrepancies remaining, three of which I knew the work was done but had not yet been signed off--one of which I was never going to do because it required a class design change. They kept resubmitting a request to provide two air pipes to their two whistles. This was in the original work list and it was turned down by Design. This class has two whistles and they feed from one pipe, and both whistles do not sound with repeatability from this one line. They are working off 100 PSI, which again is a little marginal. This ship wanted two separate air lines to their whistles. They were turned down on five different occasions. They kept giving me a weep chit saying the whistle did not operate properly. It got to be a little bit of a game, and I finally told them I was unable to accomplish this and disapproved a design change, and that was the end of that.

Now the commanding officer stated his displeasure that I still had to work on six items. I rated this; I told him we would be off the boat. He directed the Exec and his Engineer, in my presence, to allow no one individual on board without his personal approval. We came out of dock and tried to fire a dummy torpedo that had been left aboard, but we cancelled it because the pilot was nervous about the current. We came around to 11 Bravo.

At about 1400 on that day, I was again aboard to discuss the possibility of working on the remaining items and to try to find out exactly what the skipper meant by two of them.

(b) (6) was relieved as reporter by (b) (6), at this point.

The two items involved the periscope. We had been trying to increase dash-pot action on the scope for the past twenty-four hours, but we weren't quite sure this was what he wanted, and I wanted to find out personally just what the problem was, so the periscope really lies in Commander Rust's cognizance. We went up to the control room with the Skipper and we demonstrated what his two items were. He didn't like the rattles which the scope made when the first section of the telescoping hoist comes up to the end of travel and picks up the second phase of the hoist. In this class of ship on account of the long scale, the periscope is raised with a telescopic hoist cylinder. Now I explained to him that this rattle, this jolt, was inherent in the design; it had always been there and I couldn't cure it in anything less than another year or so, by re-design or by adding another ten feet of height of the sail and installing single hoist rods. The other weep had to do with allegedly the scope frame noise leak. We trained the scope and it framed beautifully. It had the power safe and there was nothing wrong with it. He tore up those two chits, and we then agreed that he did not want me to work on anything else before he came back from sea. I was left at that point with about two hours worth of work to do, and I mentioned these jobs once before. The first one was to scribe the marks on the torpedo tracks to assist them in aligning the cradles. Replace and seal-weld nine plugs in the condensate system, and check further on the static field in the hydraulic actuator to ABT-16, which was said to have a very slight hydraulic weep. At about 1715 that afternoon we fired the dummies from No. 3 tube. At 0630 the morning of the 9th of April I proceeded to the ship and was met by Lieutenant Biederman, Mr. Critchley and the rest of my trial crew. They reported that all was ready except that the stern diving decelleration valve was showing high internal leakage. Mr. Frank Palmer proceeded up to the marine machine shop and drew out the valve which he happened to know we were just about to install in the 605; it was an identical Bendix valve. He took it below and swapped it for the ship's valve, and the stern diving was checked out before the ship got underway and was reported as unsatisfactory. In the meantime I had a minor problem. I had been unable to obtain blankets for my trial crew because ship's force had no spares, and I went up to the office and called Captain Holmes and he was able to get me some blankets. They were taken aboard and my men all went below at 0730. Lieutenant Commander ~~Craig~~ KRAG was the last man to go below. The tugs were alongside and they tested main engines at about 0745 and they were actually underway at about 0810.

Q. What function does the stern diving decelleration valve perform?

A. The decelleration valve assists in dash plotting at the end of a stroke, to minimize violent action as you come to the desired angle. Now that's my personal recollection of the last few days of the availability, and I had prepared and had given to Captain Woodall a graphic schedule, or chart, showing how this schedule had changed from January on. The times and events which I have spoken about are those which are mentioned on that particular chart. I'm afraid that I've gone into an awful lot of detail on the events of the last few days, but I had to, because the work which we did was no longer described by job orders at that point. The work is described by these discrepancy chits. All the job orders were done.

The court recessed at 1035 hours, 27 April 1963.

The court opened at 1040 hours, 27 April 1963.

All parties to the inquiry who were present when the court recessed were again

present in the court. The witness continued his testimony.

Questions by counsel for the court continued:

Q. Captain Heronemus, from the account you have given us, I judge that you held many conversations with Lieutenant Commander Harvey in the final weeks before the sea trials; is that correct?
A. That is affirmative.

Q. Did you speak to him almost every day?
A. I'm sure I spoke to him more than once each day.

Q. Can you describe for us his state of mind that final week; did he seem to convey confidence in the essential reliability of his ship and its systems, or not?
A. Well, I can give you my impressions of my relationship with Captain Harvey, and perhaps from that you can deduce what may be an answer to your question. I've asked myself many, many times in the last few days, just what my relationship with this man was. I have, in this job and in my other jobs, but this job particularly, I have always taken great pains to try to get to know the Skipper and the entire wardroom in each of these ships, which are entrusted to our care. I did not get to know Wes Harvey that well. There was nothing about him in our relationship that I would label as antagonistic; in fact I sort of thought we might -- were a little bit too much alike. I was trying real hard to force the idea in the yard that I wanted this ship completed before fast cruise. He was selling the same thing and he was selling it hard. I think he actually felt a little embarrassed towards me, and sorry, because of the official notice that was taken all up and down the East Coast of my trouble with time and money. I was disciplined for this, to put it very bluntly. I, in turn, as a result of this, tried to maintain an attitude of still being the leader and not being a sorehead in front of my own people, but at times my words were a little bit sharp. The Skipper desperately wanted that ship to be in good shape before he took it to sea. He talked about it. We talked about it. I wanted it to be in good shape. I am perfectly satisfied in my own mind that he did feel that way. Now whether that indicates that he had confidence in the ship, I don't know, but I am sure that he felt that he had a ship ready to go to sea and I'm sure that he wouldn't have moved her if he hadn't, and I'm sure that he knew that if he felt that way and came to me, she would still be here.

Q. That's exactly the point of my question; thank you. In the broad sense, do you feel that the civilian supervisors, shop tradesmen and quality assurance people who worked on THRESHER during during her post shakedown availability, were competent and reliable enough, that when they were assigned a task they could be depended upon to carry it through to completion in a way that provided the ship with safe reliable systems and components?
A. I am confident that we ended up that way. I wouldn't tell anybody that I was happy about how much it cost or how long it took. This shipyard has its troubles just like any other industrial organization, but we ended up, the people who did the work did it right; the people who tested and inspected did it right, and those of us who managed this overhaul knew that it was done right. We took no chances.

Q. Were there any areas of work where you felt that you could not rely upon the people I mentioned? That is, areas of work in THRESHER which you might have felt required your personal attention to insure the end results?

A. There was only one job where I took on the task of project officer myself, and that had to do with that confounded sea circuit aft. I did this almost to amuse myself, because it involved three departments of the yard, and every so often I like to make a "run" to see what's required; how many stripes are required to this whole outfit heaving around in the right direction, but other than that, no.

Q. That was the only instance?

A. That was the only instance. My personal interest in this matter was in the details of the matter, because this is the way I believe submarine work should be done. You can't fiddle around in generalities; if a man has to be in charge he has to know the details and he has to spread the details all the way down the line.

Q. What impressions did you derive concerning the competence of the ship's officers in their various fields?

A. I thought John Lyman, as engineer, was one of the finest young men I have ever known; a very good friend. Mike DiNola, who started off as gunnery officer, and was Ops Officer at this point, also I have known for a long time. He is a nit-picker, but a real good officer. We used to get more weeps generated by Mike DiNola than all the others combined. John Smarz was extremely ~~compenent~~ competent and hard working. Now the other younger fellows in that wardroom I didn't really get to know too well; they were all pretty new.

Q. What judgment did you form in that same area with respect to the ship's crew?

A. The two leading chiefs that John Lyman had back in the engineroom, Wise and Arsenault, were outstanding. They could do anything and would do anything. The two leading auxiliarymen, with whom I had most to do, Gaynor and Johnson, were similarly extremely competent men, and you would find them down there at all hours of the day and night. I did not get to know people in the operations department or electronics very well. In the torpedo gang, the chief down there was a very fine man. The chief of the boat was all over the place all of the time.

Q. During the course of the post shakedown availability period, did you happen to discuss with anyone in ship's company the operation of the main coolant pumps? Now my question relates to the mode of operation, high speed or low speed for optimum reliability and casualty recovery operations.

A. This is negative. The only specific knowledge that I have of main coolant pump operations, other than sort of bootleg knowledge, is that I have to provide b(3) 10 USC of power where there isn't room for any more than b(3) 10 USC of power so often to make things run, but other than that I don't know.

Q. We have been informed of difficulties encountered during the course of the post shakedown availability in the following areas; first is the hydraulics system. We heard that some valves were installed incorrectly; valves by-passing fluid, accumulators discharging frequently. That is, the main accumulator discharged within five minutes with no system or component being operated. Can you give us your views of these problems and the corrective action which you took?

A. I'll be very happy to. I have read some of the stuff in the paper and of course didn't know whether it was true or false. Cellulube changeover job required us to take out of the ship every valve, fitting or actuator which had a packing in it, and replace the existing packings with new packings. We ended up removing from the ship overhauling and replacing 866 hydraulic valves of various sorts. There were 155 other components, such as manifold, filter strainers, etc.

and there were 56 actuators, for a total of 1.777 different things which had to be removed from that ship and completely disassembled, washed, rebuilt and put back again. Now I know of one instance where we did install a valve backwards; we did it deliberately in the hydraulic system because the plan called for us to do it, and it turned out in the case of electro-hydraulic systems we had two different design branches working on the same thing. We had had an error in the 593 class plans which involved the fact that the electrical plant did not match the hydraulic plan Prior to the start of the PSA the hydraulic people corrected their plan and the electrical people corrected their plan, so we ended up with the same problem, only to the opposite hand. This was a serious matter, because it cost me about ten days worth of ripout and rebuilding of piping, but it was what I call a deliberate installation of the valve backwards. Now I know of one other situation where we installed at least seven valves backwards, but this had to do with the new continuous vents in the ASW system, and the reason we did this was because we used the valves themselves as a fit-up box to braze the end pieces, the tail pieces into the pipe. The valves arrived in the yard late. This job was done late, and the first time we put these valves in the ship the ship's force was waiting for them. They had been watching these pipe ends for a long time and they were waiting for these valves. My men were instructed to get those valves put in the brazed up in as efficient a way as they could, and they paid no attention to the fact that they had the flow line correct or not, and they used them as a fitting box, and the ship's force, I don't remember who it was, but someone some officer made a point of the fact that "You guys are all fouled up; you've got seven of those valves in backwards," and it was totally insignificant because the packings weren't in and we were using them as fit-up boxes. With the permission of the court I would like to show you one of these valves. It's perfectly symetrical and to a pipefitter, until he is the pipefitter, the lead mechanic who is installing the valves for the last time with its packings, it has no frontwards or backwards. (The court viewed a valve presented by the witness.) This is actually backed off at this point to show the internal packing. Now to the pipefitter who made this initial installation, his job is to take off this tape, back off the union end nuts, take the tailpipe out of there, fit it to the pipe, then put it back together without packings, and then braze the tailpipe. There is a flow arrow, but the men were instructed not to pay attention to that first time through.

EXAMINATION BY THE COURT

Questions by the President:

Q. Why would you put them in with no attention to the flow?
A. Simply as a matter of efficiency, Admiral. The men who installed these valves to begin with are not the men who worry about flow.

Q. But did you then have to remove them and reinstall them?
A. Yes, sir, they had to be anyway.

Q. They had to be taken out and reinstalled in any event?
A. Yes, sir.

Q. Why?
A. Because there was no packing in here while it was silver brazed.

Q. It was so necessary to get these in the line that you installed them, knowing that you would have to later take them out of the line and reinstall them?

A. Yes, sir. You see, when this valve was first issued to a pipefitter, he did not have this plastic ring, known as an "O" ring. His job is to go down and fit this tailpipe onto the end of a piece of pipe so that this lines up correctly and back the union nut back up, secure it and call the brazer and braze this, and because it has to be brazed is the primary reason why this ring is not allowed to be in at this time. You have to go back; you have to send installation men back later to check these things out.

Q. But the brazing doesn't have to be broken; it's only the mechanical part of the connector?
A. That is correct.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. In some instances do they make dummy blocks for the same purpose?
A. That is affirmative. We wanted fitting blocks for these valves but we could not get them in time; now just why I don't remember the details, but we ended up using these valves as fitting blocks. Now that's a backward valve.

RE-EXAMINATION BY THE COURT

Questions by the President:

Q. It's regrettable that in open court testimony was put into the record which was not clarified as you have now clarified this point, because putting valves in backwards is a statement that even the most unitiated in the field of engineering think they understand, and they are inclined to latch upon this as the cause of the accident. Your explanation makes quite clear that this need not have had one iota of influence on the tragedy.
A. Admiral, I appreciate your saying that and I just wish something could be done about those headlines in the Boston Herald, which have caused considerable concern. There is a third incident where we installed valves backwards and this was a deliberate thing. Having put these check valves into the ASW system, we wanted to check the system split; we wanted to test the b(3) 10 USC 130 so how do you do it, you go down and you take the check valves from the b(3) 10 USC 130 out, turn them around and put them back in while you test the b(3) 10 USC 130 and that was done.

Q. How many valves were so installed; do you know?
A. There were thirty-three of these valves added to the ship. In this particular system, with new continuous vents on the ASW system. Now there is one other situation, with your permission, I would like to show to you as it also has to do with this "valves in backwards" business.

Q. This court seeks all the ~~truht~~ TRUTH we can find, so don't worry about taking our time. We seek all the facts.
A. Of these 866 valves that we had to take out of the hydraulic system and put back in again, 307 were ball valves and 160 were check valves. Now I have a sample of each of these, and once again the valve is perfectly symetrical around an axis. Here is a hydraulic check valve. Now in this instance --

Q. Union nuts and with the same indication of flow?

A. That is correct. Now, we did not have a requirement for putting them in backwards, because the union ends were all on, and I have no recorded instance of any of these valves being reported in backwards. That's 307 attempts to goof and I have no instance of their having goofed. I'm sure we did, but I have no record of it. By the time we were all through grooming these systems, I'm confident that every one of them was feeding in the right direction.

The first valve which was the subject of the witness' testimony and the second valve concerning which he testified were offered as exhibits in evidence, with permission requested to photograph them and substitute the photographs therefor in the record. There being no objection, the two valves presented by the witness were accepted in evidence as Exhibits 97 and 98.

A. There were 307 of those valves (the witness handed a ball valve to the president); it is a hydraulic ball valve. Now, there's something very interesting about that valve; that stem can go into the ball at any one of four locations; the locking piece can go onto the stem in any one of four locations. There are sixteen opportunities to have that valve incorrect.

Unclassified

RE-EXAMINATION BY THE COURT

Questions by the President:

Q. Why is that valve not designed to remove these sixteen opportunities to goof on each ~~weld~~? VALVE

A. Probably to save money. The broaching of the ball could perhaps have been made with a mark like in an electrical connector, where we learned early in the game that you had to put a dummy in for alignment or you would kill yourself. But that costs money. The broach in there is a straight broach and I would imagine that if someone put enough desire on this and wanted to spend the money we could make this impossible, but right now they can all be assembled -- there are sixteen opportunities for alteration. In this last package of weeps I did have two instances where they recorded the handles were backwards, and I would like at this time to tell the court that Lieutenant McCoole came and read my records the day before he appeared before this court. He had no knowledge, to the best of my knowledge, of anything other than these two instances in which the handles were backwards when he made his statement about the valves being backwards. Now the handle being backwards, this gets down to a point of preference, and it was. One of these valves was the anchor windlass stop valve. It perhaps had the handle down like this (the witness demonstrated with his hands) the man decided he wanted it up here (again demonstrating). They're oriented by clockwise or counterclockwise. The other was up on another valve. At one time we tried to orient open in the line, shut across the line, and you can't do it, not in submarines.

Q. No, if you do you will have something poking people's eyes out or something of that nature.

A. Yes, sir.

A ball valve with handle, which was the subject of the witness's testimony was offered as an exhibit in evidence, with permission requested to photograph it and substitute the photograph therefor in the record. There being no objection, it was received in evidence as Exhibit (99).

The witness continued:

A. To indicate the possible difficulties that you can have in installing and assembling and operating these symetrical valves, on the 30th of October 1962, Bureau of Ships published their Notice 9480, serial 6484-1759, bringing to the attention of all hands that you've got to be careful in disassembling one of these, to be sure that you reassemble it with the right geometry.

Q. Are you referring to Exhibit (99)?

A. I am referring to this type of valve (indicating Exhibit (99)). Now you talked about the accumulator cycling in five minutes.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Now before you get to that; I'm not sure that the record shows that there were sixteen opportunities for error in the installation of one valve, so I will ask you a question. Referring to Exhibit (99), and bearing in mind the nature of its construction, how difficult would it be to install this; how much attention does it require in order that it be installed correctly?

A. There are sixteen different possible orientations from the ball itself out to the handle, and since each of these installations must finally have the

Unclassified

handle where the operator wants it to be, and the ball where the system requires it to be, I would say that it takes considerable attention to detail to have to put back 307 of these things without having any recorded instances of goofing.

Q. Thank you. Can you tell us in some detail the difficulties experienced with the accumulator and the action taken to correct it?

A. Yes, sir, I can. One of the most highly possible sources of leakoff of accumulated hydraulic potential in this class of ship is in any one of three servo valves, the fairwater main servo, the stern diving servo, and the steering servo. On this particular ship these valves were manufactured by the Vickers Company. They are a very complicated valve. There is a large number of packings on a single spool, which has to be fed into the valve interior with great precision, and each of these packings becomes blind after it has passed a certain point as you continue to feed these stems in. The stem itself, the size and exterior finish of the stem itself must be mirror bright with respect to the body with which it operates. We had considerable difficulty with these servo valves and the difficulty was always that of an internal leak which would leak down in the accumulator. In this b(1) system with one small leak on one of these rings in this valve, it is possible, and was demonstrated, that you could have everything else isolated other than one of these servos and bleed down a charge accumulator in about five minutes. We had the steering servo out of the ship seven different times because of this problem, and each time the Vickers Corporation took it apart, overhauled it and reassembled it for us in our shop and gave it back to us to put back in the ship. The lack of reliability of this thing has been the source of considerable worry to me, but it is one of the things inherent in this type of system. I think I should point out that this type of reliability in no way decreases the operability of the planes or the rudder. If it happened to you at sea, what it would mean is that you would have that much less hydraulic storage capacity available, but it could in no way make your planes flip-flop or your rudder flip-flop in the wrong direction.

Q. Could you correct such a leakage problem by switching from emergency to normal on the planes?

A. If you had this problem you could isolate the servo and shift, and from then on operate on the other mode of operation.

Q. Proceed.

A. I am confident that the accumulators in THRESHER at the time of her departure for sea trail were able to hold their charge in or above spec. because of the great attention that was placed on this item by ship's force and the Yard.

Q. The next area concerning which I wish to question you, relates to the information received by the court as to dirt problem in the high pressure air system, to mal-functions and leakage in the b(1) air reducers, and lastly, to the report that a spike was found in an air filter; can you give us the details of these?

A. Well to speak of that last statement first; I know of no air filter that had any spike in it. I read about this in the paper. I know the name of the man who reported it. I know that this man was not allowed to initiate weeps or to sign off weeps. I don't know anything more about it. In fact, the paper said that it was a reactor plant air filter, and I don't know what that is. Now insofar as dirt in air systems. We had our difficulties with the high pressure air system, and the intermediate and low pressure air systems in THRESHER. The amount of difficulty we had toward the end of this availability, this PSA, however, was less than that which we had experienced before the ship first went to sea. A system which operates at this high a pressure

becomes extremely sensitive to the presence of foreign material. Great attempts were made to construct these systems under process instructions which would minimize the amount of foreign material that could accumulate in these systems. We used flushing and wash-down procedures, which were approved, but which I, as a professional engineer, considered to be inadequate. I have never understood how I could wash minute particles of dirt off the walls of an air system pipe by pushing water through it. These systems, as you know, are all cul-de-sac; the far end is denied to you as a place on which to hook on and circulate. They all terminate in air bottles which have only one connection. Any crud of any kind which accumulates in those air bottles is supposedly capable of being vented off. I think we would be fooling ourselves to say that this happens. Those bottles are made of ferrous material. We went to great pains, and always go to great pains now to keep moisture out of our air system. We know there is moisture in our air system. I know that the interior of any of those air bottles is rusting. The best way to clean one of these air systems that we have found is to blast it clean, and we did just this. After the WRT tanks were available to me we charged the banks any number of times and by-passed or took out the reducers and blasted the pipes at full pressure, right down into WRT. The ship's force had adopted this as an operating procedure while they were at sea. In fact, they encouraged us to do this. Now these systems are particularly susceptible to small particles of foreign materials, in the reducing valve, and we had great difficulty in getting these reducing valves to work and to stay tight. I shouldn't have used the word "work", because these reducing valves do have a great capability of working, even when they leak. The fact that they will leak does not prevent them from working but it does allow you to lose your air charge which no submariner wants to have happen. The details of these valves could better be discussed by other people who know more about them, but they are essentially a floating balance piston type valve whereby oscillating seats open and shut determines how much pressure is on one side of the floating piston and how much is on the other side, and you come out to where you have the desired pressure down to being in the reducer. If you build up any more than that a little vent poppet lifts and you lose some air. The vent poppet leakage was our greatest problem. We would get something back in and these vent poppets would fail. Now this was not always because of dirt in the system either, I would like the court to know. The coating on which these poppets depended the very nature of these poppets -- just last week in the TINOSA I found my ship superintendent telling me that two brand new poppets when looked at under a miscroscopic glass had minute imperfections on the seat, and you can't stand any imperfection; you have to have mirror bright to mirror bright and that's all there is to it or you are going to have a leak. Now the same thing appears to be true of the b(1) -- what we call the b(1) pound reducers in the ballast tank blow control of the BCT. They had to be overhauled in the shop several times. They were subject to leakage, but before this fast cruise was started, every one of these valves was working and working well.

Q. What is your judgement as to the practicality of instituting reactor plant cleanliness requirements when working on air or hydraulic systems which require cutting into the system?

A. I'm not sure that I understand the full implication of "reactor plant cleanliness" instructions; if it means construction of clean area --

Q. Clean or sanitary, yes.

A. Clean or sanitary area.

Q. Also, we heard testimony that the pipe is ground and broken rather than cut through.

A. I might point out that at this availability we cut through no air piping. The changes we made in the THRESHER's high pressure piping during this availability in the ballast tank blow were really localized and extemely limited nature, and the job orders concerned are all in this book. I could point some out, and it was particularly worked on down in the area generating room where we installed a new manifold to take the place of an old manifold. I'm sure that each one of those pipes that was cut at that point was cut with clean grinding techniques. We didn't go through all the witchcraft that Nuclear goes through, but for all intents and purposes the end result was every bit as good.

Q. You feel that your present procedures are adequate; is that correct?

A. Our present procedures will not prohibit the introduction of these minute particles; a certain number enter the system when we build it or when we repair it. Therefore, I can't say that they are completely adequate.

Q. And what would be the impact of changing over to the procedures used in the reactor plant?

A. If we had to go through the complete procedures they go through we would never get a ship built. Now with all humility, I don't intend to be smart-alecky about that, because maybe it would have been just as well, but it wouldn't work.

Q. Would you describe in detail the corrective action taken in connection with the over-pressurization of the number 2 reserve fuel tank, including the reporting of the incident, to begin with, etc?

A. I can describe in general what was done. There are other people prepared who could give you better detailed discussions of it. There was a Yard investigation of this problem, and since the work was fundamentally of a structural nature, my hull superintendent has re-acquainted himself with the details (generally speaking, we got into this trouble because we started off with b(3) reserve sea water tanks and as a design improvement they wanted them broke to b(3) 10 l so we changed them into b(3) 10 l tanks. These tanks are low pressure tanks: the bottoms of them are the inner hull and the framing of the forward engineroom, and the tank tops is a low pressure tank top, but rather rugged because it serves as a walking platform. After we had converted these tanks and painted them out and had installed the level indication equipment, we had to flush them. We had to use yard water. We used Yard water and ended up using purewater. Flushing through these tanks to get down to a point where a repeated sample over thirty minutes had a conductivity of no more than 3.5 microhmos. This job was holding up getting started on steam ops, and we were trying to move it along; it was a critical job. b(3) 1(tanks had been sold and we were flushing the b(3) 10 l tank. The release valve on this b(3) 10 l tank acted up, so the pipe fitter who was working on this job succeeded in ending up where we had no release valve on the tank, and moving the Yard pressure, at Yard pressure through this tank, we allowed the tank to become too full. It thrust up and we had what amounted to a b(3) PSI in a b(3) PSI tank, and the tank top bowed up, plastically deformed, tore itself around a rather sizeable structural foundation which penetrates down into the shell and ended up. Maximum defection of this tank top was about one and one-quarter inches above its normal location. My first concern on this particular casualty had to do not so much with the structural work itself but the fact that the distiller was moved up in the air. The foundation for the distillers is on this tank and I gave orders to the chief quarterman machinist, Mr. (b) (6)

(b) (6) relieved (b) (6) at this point as reporter.

Q. Would you use names?

A. Mr. (b) (6), to obtain the services of his optical men and design assistants, as necessary, to find out where that distiller was and how we were going to know, when we got it back in, whether it was where it should be. In addition, Mr. Leon Valley is the Hull Superintendent; Mr. Bogrett, the Quarterman Shipfitter, investigated the structural damage and worked out procedures for restoring this tank top. The tank top had to be positioned down and fastened back to the stays, which are solid stanchions that keep the tank top up and keep it from moving up. The structural repairs were accomplished quite rapidly, though it didn't go as easily as we would like to have it gone. A very exacting examination of all the structures was made, particularly where it fastened to the HY-80 hull framing, and the gentlemen from Design, along with Mr. (b) (6), assured him he knew where the distiller had been located and that they could assure me when it went back that it went back where it was supposed to be. I was assured that it was back in the proper position.

Q. Was there a magnetic particle inspection conducted at that time?

A. That is affirmative. The attachments were laid bare and MT'd where we had to make a couple of gusset welds that went through this tank, and that examination was made in exact accordance with our procedures.

Q. And was there a visual check made of the inside of the tank?

A. There was a visual check made of the entire interior of the tank as well as of the entire exterior of the tank by the structural people. On the 9th of March there was a complete inspection made of the interior of that tank by Mr. Poor, the Group Master, on whose back the responsibility for this incident was laid. He conducted an investigation to find out who had done this.

Q. Was there a check of the tank penetrations visually and by a magnetic particle inspection?

A. That is affirmative, and we checked it out.

Q. And was that checked for possible damage?

A. That is affirmative. The tank was thrown free of the drain pump foundation, and that had not moved a bit.

Q. Did they check the drain pump foundation inside of the tank for possible damage, both visually and by magnetic particle inspection at the point of attachment to the pressure hull?

A. I cannot verify that it was checked with MT at that point, but it was checked visually.

Q. Who would be the man to ask about that?

A. Mr. Valley.

Q. Did they pull the tank top down to its former geometry?

A. That is affirmative.

Q. Did they re-weld all cracks after grinding out the cracks?

A. There was a waiver granted on the length of time of wait required for one crack-- I should not say that. There was no crack there. We granted a waiver on the length of time of wait required before we made our final MT inspection of the gusset plate parts of the tank top which fasten on to the pressure hull flanges.

Q. Was that a magnetic particle inspection?
A. A magnetic particle inspection, that is affirmative.

Q. Did they make such inspections of new welds where they attached to the HY-80 pressure hull 16 inches or so from the new welds?
A. They did.

Q. Was there a hydrostatic test of the tank to a pressure of b(3) pounds per square inch for strength factor?
A. There was a hydrostatic test of the tank, and it was at least b(3) pounds PSI. I do not recall the exact number.

Q. Do you know whether they cleaned the tank, buttoned it up, and hydrostatic tested it b(3) pounds per square inch?
A. That was not a hydrostatic test. That was a tightness test to b(3) PSI. It was buttoned up, repainted, buttoned up, inspected, given a b(3) pounds PSI tightness for welding test, and we proceeded again to flush it.

Q. In doing the corrective work upon not only the reserve feed tank but also on the main steam stop valves was a conference called to review the damage and to determine what corrective action would be required?
A. There was no conference of which I am aware. This damage was reported to me, and I went to the field office and discussed exactly what we were going to do as a group. The determination of the method of making the structural repairs was given to Mr. Valley. The determination of what had happened to the distiller and how we were going to know it was back where it belonged was given to Mr. (b) (6); and Mr. Valley, in turn, asked for and was given assistance from the Design Division. Mr. Jensen and Mr. Marcotte were present at that time.

Q. In the course of determining what corrective action was taken, were any of the following consulted: The Planning and Estimating Superintendent?
A. The Planning and Estimating Superintendent was consulted, and he gave us a job order to do the work.

Q. What was his name, please?
A. Lieutenant Commander Billings. He was the Type Desk Officer.

Q. The Type Desk Officer was consulted?
A. He was.

Q. The Repair Superintendent?
A. Yes.

Q. The Quality Assurance Superintendent?
A. Whether or not Commander Rule was personally consulted, I don't know, but I don't see how he could avoid being aware of this through his subordinates.

Q. His subordinates were consulted?
A. That is affirmative.

Q. The Welding Engineer?
A. He was in the act because we had to ask him for this waiver.

Q. What is his name, please?
A. The particular men involved were Mr. Gary Adams and Mr. Ferrazzano.

Q. The Production Officer?
A. The Production Officer was acquainted with this by me within a half hour after it happened.

Q. And what is his name?
A. Captain John B. Guerry, Jr.

Q. The Planning Officer?
A. I would assume that the Planning Officer was notified by the Production Officer or by the Type Desk Officer, and I know he knew about it, because we discussed it at the Wednesday work conference.

Q. The Metallurgist?
A. I have no knowledge of a metallurgist being brought into this picture.

Q. The Chief Design Engineer?
A. I would not know whether he was informed or not. I know his working subordinates were informed.

Q. And the names of his subordinates?
A. Mr. Jenson, Mr. Marcotte, and Mr. Watts.

Q. Can you tell us now about the repairs accomplished to the still and associated piping?
A. The still was moved back down where it should have been. I was assured by the people whom I had placed in a position of responsibility for knowing where it had to go, that indeed it had been moved back there. The associated piping was inspected visually once, to the best of my knowledge.

Q. Who did that?
A. The piping inside the tank was inspected by Mr. Poor, and the piping outside of the tank was inspected by a Pipefitting Leadingman by the name of Rowell, and he had been asked to do this by Quarterman (b) (6), who was the Pipefitter Quarterman in charge at the scene at that time.

Q. Was the foundation of the still checked on the outside to be sure it was re-aligned, if necessary?
A. The position of the distiller on its foundation was checked with respect to one witness to assure us that the distiller was back where it belonged.

Q. Were the sound isolation mounts checked?
A. They were checked very carefully. They were checked to see that there were no tears or undue cork tipping.

Q. Who did that?
A. This was performed under the direction of the Marine Machinist.

Q. And his name?
A. Mr. (b) (6), again. Whether or not he personally did it, I doubt that, but he was the man responsible for this to me.

Q. And the piping alignment and the rebending of the piping, if necessary, would have been the responsibility of whom?
A. The checking of the piping in this area would have been the responsibility of Mr. (b) (6) as Quarterman Pipefitter at that time, and he discharged that responsibility. There was no bending of piping required.

Q. Was any definite damage observed in the piping?
A. None, whatsoever.

Q. Was all piping hydrostatically tested to 1.5 times the working pressure and, then, visually inspected at the joints?
A. There was no retest of the salt water piping beyond the stop valves between it and the ASW system, to the best of my knowledge, after this incident occurred. It never even occurred to me to ask for such a retesting, because the motion of this distiller as observed and as thought of, at the time, was well within the limits of the deliberately resiliently attached piping, in my opinion. It never even occurred to me to retest that piping.

Q. Was there any ultrasonic testing of the pipe joints conducted?
A. Not at that time or as a result of that incident.

Q. Was the operation of the distiller checked?
A. The operation of the distiller was checked, but only for a relatively short period of time, because of two things: We did not want to operate the distiller using river water, and we did not want to operate the distiller for any great length of time using the reactor steam, because it costs too much to maintain reactor steam.

Q. Who checked the still?
A. Ship's force checked the operation of the still. The completion of this test memo was set into the sea trial agenda.

Q. Were there any repairs to the drain pump and associated piping?
A. After this incident?

Q. Yes.
A. None at all.

Q. Did they check the alignment of the pump?
A. There was no check of the alignment of the pump. There was no indication that such a check should be made.

Q. Was there any hydrostatic testing of the piping and joints in connection with the drain pump and associated piping?
A. Negative.

Q. Would there have been any ultrasonic inspection made of the sil-braze piping joints in the drain pump system?
A. None, whatsoever, as a result of this incident.

Q. Is there anything more that you can tell us concerning that incident?
A. Yes. I would like to suggest that the court avail itself of a mock-up, a one-quarter scale mock-up which has been put together to describe the exact motions. In addition, the Design Division has calculated the maximum position excursions of each piece of pipe and the maximum torsional and bending stress placed on any of the joints, and I think it might be pertinent. In fact, I would very much desire that you confirm my judgment that nothing of a deleterious nature could happen to that piping, which happens to be the case based on calculations.

COUNSEL FOR THE COURT: Mr. President, counsel is prepared to offer full evidence of these facts.

Questions by counsel for the court:

Q. The court desires facts from those persons who are most knowledgeable of "on the job" work accomplished on THRESHER during her post shakedown availability in this Shipyard in the areas of air systems, sea water systems, hydraulic systems, and structural integrity. Can you now furnish the names of such men and their positions in those four categories?
A. Yes. I would like to provide the names of members of my project team who would be most knowledgeable of these details. First of all, as far as structural work is concerned, I would suggest you ask my Hull Superintendent, Mr. Leon Valley, to tell you in detail everything we did to the hull. If you want to go further than that, the two men who worked principally on the hull were Mr. Bogrett, the Quarterman Shipfitter, and Mr. Robert Hardy, the Quarterman Welder. Insofar as sea water systems are concerned, I would suggest that you talk to Mr. Joseph R. Smith, Pipefitter Quarterman; Mr. Cornelius J. Collins, Pipefitter Quarterman; Mr. (b) (6) , Pipefitter Leadingman; and Mr. Renaldo D. DiPietrantonio, who is a pipefitter in Shop 56, and who is the leading mechanic on the tests of all sea water systems and who, to the best of my knowledge, is the best first-hand witness we have in this area. Now, insofar as Hydraulics are concerned, the best man left to talk about this is Mr. Thomas R. West, a Leadingman in Shop 56, and who had the special title of Cellulube Change-Over Central Control Group Leader. We worked on this business for well over a year before THRESHER got here, and Mr. West was right in on it from the beginning. Mr. (b) (6) , a Leadingman Marine Machinist, was one of the two team captains that I organized to groom out and retime and seal the hydraulic systems; the other being Mr. Palmer. There are several machinists who worked on these hydraulic systems: a Mr. William Ladderbush, who is a machinist in Shop 38; Mr. (b) (6) , who is a machinist in Shop 38; Mr. Richard V. Cluff, a machinist in Shop 38; and possibly one of the best persons in this whole area would be my first Ship Superintendent, Lieutenant Frank J. Cima, now attached to the U.S.S. HARDHEAD. And if you want to hear in detail what we did on this sil-braze inspection of piping, your best man is Mr. Robert C. Arnold, Jr., of Code 303. His supervisor, Mr. (b) (6) , I believe, has

already testified. If you want to hear in great detail what we did on the 851 hose connections, the best man is Mr. (b) (6) , of Code 303, who is responsible for checking off the hose inspection list, which amounted to about six steps on each of these 851 hoses. That is something that had never been done anywhere before, to my knowledge, in such great detail. If you want to talk to the people who had to make these reducing valves work, there are four different machinists who work in the Inside Machine Shop, who repaired them for us: They are Walter A. Miner, a machinist in Shop 31; William W. Moore, a machinist in Shop 31; Mr. (b) (6) , a machinist in Shop 31; and Mr. (b) (6) , a machinist in Shop 31. Now, I believe I have covered structural integrity, sea water systems, hydraulic systems, and air systems. Mr. (b) (6) and Mr. Collins and Mr. (b) (6) , whom I previously named, are the Shop 56 supervisors who can talk about work on air systems. Mr. Henry Jutras, a leadingman in Shop 56, also played a very vital part in the hydraulic system work; and our principal Marine Machinist involved at that time was Mr. Franklin Jackson, a Quarterman in Shop 38. He was the Shop 38 Project Team member. I had three other Ship Superintendents: Mr. (b) (6) , a Chief Machinist, U. S. Navy, Retired. He left me on the first day of January. I have already mentioned Lieutenant Cima. Ensign (b) (6) joined this project team in December; and Chief Warrant Officer Anthony Karetnuk, who joined this project team in December. I have asked these people during the last couple of weeks to try to coordinate and arrange their records in readily presentable form to assist the court in finding out what they want to talk about, and I think they are prepared.

EXAMINATION BY THE COURT

Questions by a court member, CAPT NASH:

Q. I refer to the ship's force work. Did I understand correctly that a complete list of the ship's force work was not made known to the Yard?

A. I have never had a record of the required ship's force work. I do not know whether such a list was ever made available to the Yard. It may be appropriate to point out that, since this was a post shakedown availability, at the start of this availability, the amount of ship's force work was almost nothing. In fact, there were a few of them who had a stated intention of doing nothing. The ship was back here for us to rebuild or accomplish PSA work on her, but as we got going, and particularly after we organized and got their assistance in organizing this overhaul, test and trial program, they then became very much involved in carrying out the titivation and grooming of the things on which we had worked and tested, so that we finally ended up and reached that day where we said that the secondary system and everything had been tested out and was ready to go. The other big area involved the reactor plant, where they had work to do also, but you would have to ask someone else about the exact nature of their responsibility. They were held responsible for the things inside the reactor plant.

Q. As a result of your discussion and liaison with the officers on board, do you recall if there was one officer who might have been designated as the coordinator of the ship's work?

A. That is affirmative. The Chief Engineer was identified to me as the Shipyard Overhaul Officer. Then, later on in the game, they appointed an officer that they called the Progress Officer, who was not the Ship's Engineer.

They changed periodically. His principal job was keeping track of the deficiency chits. The last one during the last week, as I recall, was John Smarz. I can't state that positively, however.

Q. I understand the statements you have just made to refer to Yard work?
A. This is affirmative. I have no knowledge as to who was held responsible for doing what of the ship's force work. It appeared that it was broken down at a departmental level.

Q. After you received the abort letter from the Commanding Officer when he aborted the fast cruise, did you have any contact with representatives of Deputy COMSUBLANT or Development Group TWO in connection with the list of "unsat" items?
A. None at all.

Q. Your relations were entirely with the ship?
A. Throughout this entire availability I personally discussed this work on the THRESHER on two occasions by telephone with the Force Material Officer, and that was specifically in connection with hydroing of the main steam line, and I had no dealings with anyone, other than that, in the Type Commander chain of command, other than the skipper.

Q. As a result of your discussions with the Commanding Officer in connection with this deficiency list, are you aware of any discussions that he had with the representatives of Deputy COMSUBLANT or Development Group TWO in connection with the deficiency list?
A. I have read in the paper that he talked to Captain Zurcher and assured him by telephone that he was indeed ready to go to sea.

Q. Testimony that I have heard previously indicates that all requests which the Shipyard made for an extension of the overhaul date were granted. Do you agree with this conclusion I have made?
A. They were granted, yes.

Questions by a court member, CAPT Hushing:

Q. I believe early in your testimony you said that the PSA, particularly during the latter period, resembled a new construction effort in many ways. Is this true?
A. I made that statement.

Q. Do you have a new construction trial and test procedure or series of procedures, particularly in connection with sea operations?
A. For a new construction ship it is the responsibility of the Shipyard to take the lead in preparing the agenda for sea trials, for submitting it to Washington and the Type Commander, obtaining their approval, and executing the sea trial agenda. When you get out to sea, though, there is never any doubt as to who is in charge of that ship. There isn't any Shipyard officer standing around saying, "You're going to do this or you're going to do that." This is quite a different matter from what we did for this PSA. Insofar as arranging the sea trial agenda for the PSA, we did not have this responsibility, nor did we play an active part in arranging the agenda other than asking that four test memos be accomplished; and those four were integrated by the Commanding Officer into his sea trial agenda. There was discussion, I know, concerning the agenda; but its preparation, the laying out of time, determination of special areas, was

all done by the Commanding Officer, and I was told what we were going to do, and I looked it over, and it was perfectly fine by me. I had no reason to carry it further.

Q. Suppose we could put aside the present assignment of the responsibility to forces afloat to arrange trials after overhauls, and let us postulate a very extensive post shakedown availability or overhaul, such as THRESHER ended up with; do you believe that it would be worthwhile to have the Shipyard participate in laying out what tests and trials were to be conducted and to require that certain test forms be conducted during these trials?

A. Captain, I may have misunderstood you. Insofar as tests prior to sea trials are concerned, we took a very strong part--

Q. I'm talking about the sea trials.

A. The sea trials? I don't know. Anybody who is competent to take command of one of these ships and take her to sea is competent to figure out an agenda for sea trials. About the only feature I can think of where Shipyard management ought to play a part is to state the requirements which we feel ought to be met and to be sure they are integrated into the schedule. If you are suggesting that perhaps we ought to take a more active part in determining an appropriate agenda for sea trials following so much work, I honestly think that ought to be deferred to the Type Commander. He has done so in his regulations right now. He is very demanding in his regulations to state that such and such shall be done. My relationships with the operational submarine forces have been such that I would think that responsibility ought to still rest with him.

Q. I believe you have stated that this was a very extensive post shakedown, extensive in magnitude and in complexity?

A. That is affirmative.

Q. With your background, then, considering the number of deficiencies which you have testified to, do you consider that they were large in number?

A. Negative. I think that the number of deficiencies which I mentioned here today, though they sound large, it was very small, particularly compared to other work. I know in finishing up SEA DRAGON, they were writing weeps in the 8,000 series, and I recall at Mare Island some figures like that. This number of deficiencies, though it is nothing to be proud of, was not large.

Q. Were the deficiencies large in magnitude?

A. No. I think my testimony to the effect that we were able to hack all but 60 of the 442 deficiencies in four working days connotes the fact that they were quite small.

Q. Would you say that they were unusual for a post shakedown availability of this size and complexity?

A. I would say they were in no way unusual.

Q. Were there any single, or any several jobs, which had any unusual connotations as regards ship's safety?

A. There is only one deficiency that had a connotation of ship's safety, and that is the fact that they pointed out we had not finished hooking up that depth sensor pipe line. That, in my opinion is the only weep, or deficiency, which really suggests that we hadn't done everything we should insofar as safety of the ship was concerned.

Q. Was that corrected before the ship went to sea?
A. It was corrected before the Fast Cruise was resumed.

Q. You have indicated that the ship's force work grew during the PSA, from your observation. We have had other testimony that the ship's force had a lot to do during the time immediately preceding both Fast Cruises and, to some extent, [illegible] before going to sea. From your observation of the ship's force, would you say that, at the start of the sea trials, that the ship's force was excessively tired?
A. No. In fact, I have to say just the opposite. In fact, I think it is appropriate to say that amongst my friends, that particular week end was the first time that several of those officers had been together with their families for many, many weeks.

Q. So that from your standpoint, it appeared that the crew and the officers had a sufficient amount of rest before the trials to be able to perform their duties effectively on the trials?
A. I would say yes.

Q. I would now like to turn to some specific job orders, and ask for your opinion and certain information regarding those job orders. Specifically, Job Order 15-930-10016. stiffen flat plate structure. As I understand, this job involved many of the so-called "hard" tanks in the ship?
A. That is affirmative.

Q. What was the nature of the work done, the nature of inspections, and the results of the inspections, and quality assurance effort?

A. The nature of this job was the addition of intermittent stiffeners on the flat plate structure which made up the boundaries of these tanks. The purpose was to reduce the bending stress in any of these plates and, hopefully, therefore, to reduce their propensity toward low-cycle fatigue cracking. The exact work comprised making up of these stiffeners, most of which were haunched tees, and the installation of these stiffeners on the flat plate structure. This job became very difficult to do because of the lack of access. The WRT's in this class of ship are almost impossible to get into. The sanitary tanks are not particularly commodious, and the impulse tanks are even worse. We ended up having to put in a large number of stiffeners with a single-bevel weld against a backing plate, because it was impossible to weld with a double-bevel weld from both sides. As a consequence of this kind of operational environment, it took a long time to get sound welds. We had to demonstrate the soundness of our welds with MT inspection in accordance with NAVSHIPS 250-637-2. As I indicated earlier, this job was the principal cause of missing my undocking, and later on delayed my torpedo tube trials. We spent 316 per cent as much money as had been originally estimated on this job. It was a rough job to do, but it was done right, and it was inspected correctly. By the time we got through with it, it was done well.

Q. Does the 316 per cent indicate the difficulty of the job, the underestimating of the job, or that additional work was added?

A. It indicates the difficulty and underestimating of the job. The original estimate was based on the ability to make a good double-bevel weld out in the open on a flat plate structure. This was a rather foolish way to estimate it.

Q. Did these modifications to these tanks affect operating equipment in any of the compartments of the ship?

A. In two of the WRT's we were concerned that the stiffening of the WRT itself may have caused misalignment of the torpedo rails. It did not, however. In the 605 we had experience where it did. All the way aft in the after trim tank, because we were working in there, we had to hold off cleaning and re-lubing the ship because of the proximity of the shaft lube oil tank. There was nothing sitting on any of these tanks other than the ejection rails that I can think of that could have been moved by this job. There was nothing concerned with the impulse tanks. Have I answered your question?

Q. Does the accomplishment of this job on THRESHER, in your opinion, increase the safety of the ship throughout its operating depth range?

A. That is affirmative. It could do nothing but strengthen the ship.

Q. Turning now to Job Order 15-930-10051, accomplish routine hull surveillance. I have information which indicates a preliminary man-day estimate of about 318 man-days, and a preliminary expended man-day figure of 1030, approximately a three-to-one increase of expenditure over estimate. Is that correct?

A. That is about correct.

Q. Can you advise why there was such a sharp difference between the estimate and the cost of performing this job?
A. The scope of this hull surveillance was changed after the job was started, and it was changed as a result of shock trials. This is the principal reason.

Q. So that it was actually a larger coverage in the hull surveillance than was originally intended?
A. That is affirmative.

Q. Did you tend to increase your confidence in the safety of the ship operating at sea at its test depth range?
A. I think I knew more about the HY-80 structure of the U.S.S. THRESHER than anyone has ever known about an HY-80 hull before.

Q. Since you knew so much about it, will you please state your opinion as to the hull integrity of THRESHER at the time she went to sea on the 9th of April?
A. I think she had as stout a hull as she could have, without reservation.

Q. Was it adequate for the purpose intended?
A. It was entirely adequate for the purpose intended.

Q. Job Order 15-930-11414, pipe removal at Bulkhead 51, and I also would like to include in this question the modification to Bulkhead 51, Job Order 2190. This job showed an initial man-day estimate of 349 man-days, and an expenditure of 832 man-days. Is this approximately correct?
A. That is approximately correct.

Q. Can you indicate the growth of this job or the reasons for the difference between the preliminary estimate and the man-days actually expended?
A. I am really not in a position to comment as to the validity of the original estimate. I do know, though, that this job required far more piping renewal and relocating than apparently the planner had thought was necessary. We had to literally clear out the air regenerating room way in from the centerline to the starboard corner because they could not get the shielding put up properly. I don't think the planner acknowledged the fact that this piping was going to be so extensive when he put out that estimate.

Q. During the progress of this work, was there burning and welding on the canning plates of the reactor compartment shielding?
A. I am quite sure there was, although it was not under my cognizance.

Q. To the best of your knowledge, there was some work done on the bulkhead itself?
A. Yes, to the best of my knowledge.

Q. And there was piping work done in connection with this bulkhead?
A. Extensive piping work done.

Q. Job Order 15-930-11403, strengthen the impact resistance of the elliptical bulkheads. Are these the bulkheads at the forward and after end of the ship?
A. That is affirmative.

Q. Will you describe this Job Order in a little more detail as to what was done?
A. These two elliptical heads were manufactured by the Lukens Steel Company, and to make them, two steel plates had to be butt-welded together before the opening operation. The type of electrode which they used to join these two plates suffered a small but definite degradation of its physical properties in subsequent heat-treating. To overcome this considered lack of property, we put what really amounted to a "T" or "I" beam stiffener right across the weld. That was the purpose of this job.

Q. Did it involve extensive interference removal?
A. It involved discharging and interference. The principal reason why this cost went up was because the stiffener could not go exactly true and straight, and there were a couple of penetrations that had to be discharged. It required re-design, but by the time we got through with it, considerable re-work was involved.

Q. Would you say that the accomplishment of this job improved THRESHER's safety margin while operating at or near test depth?
A. Affirmative.

Q. Job Order 15-930-12304, replace hatch covers to increase impact resistance. Are these the outer hatch covers?
A. That is correct.

Q. Do you know whether they are hatch covers which have been subjected to approval by shock tests?
A. That is correct. These covers were built to a design which was proved by shock tests at UERD, and the reason we put on the new hatch covers was because the ones we had on there did not do as well for the shock tests as the prototype.

Q. Were these stronger hatch covers than the ones which they replaced?
A. They were stronger, yes.

Q. Did that, in your opinion, increase the safety of the ship while operating at or near test depth?
A. Affirmative.

Q. Job Order 15-930-20329, replace the main propulsion shaft seal. Can you describe this job? Was it a replacement of internals or a re-design of the seal?
A. It was replacement of internals plus changes in the piping. It was not a re-design of the seal.

Q. So that as far as the seal was concerned, there would be no change in the margin of safety of operations while operating at or near test depth as far as the hull valve is concerned?
A. There would be no difference.

Q. How about mechanical efficiency as a result of the shaft seal change?
A. The new seals were tighter than what she had when she came in the Yard.

Q. There were a number of jobs on which patches were cut into the hull to remove items of equipment, I believe, were there not?
A. That is affirmative.

Q. Was each of these patches cut in previously determined areas for access patches?
A. They were cut in exact accordance with the design document applicable to the cutting of that patch and issued by the Design Division.

Q. Were the full instructions of the Design Division carried out, or was it necessary to obtain waivers in any respect?
A. There was no waiver of any kind involved.

Q. Were the full series of magnetic particle and radiographic inspections made after replacement of the patches?
A. That is affirmative.

Q. Have the records of these inspections been reviewed to insure that there are records for each one of these patches?
A. These records were reviewed by Mr. Valley, by Captain Guerry, by Commander Rule, and by myself to personally verify that everything was completely covered in all respects, and we have a complete set of records. The radiographs have been reviewed by Mr. Harrison Sayre of the Bureau of Ships. Each radiograph was re-read.

Q. Were there any defects found which would be cause for rejection or which would require a waiver being granted?
A. Mr. Sayre told me before he left the Yard that the radiography was in accordance with standards, and the weld tests were perfectly acceptable.

Q. So that the review of the records by the Portsmouth Naval Shipyard personnel and a Bureau of Ships representative indicates that these patches were installed in the ship correctly and that there were no defects?
A. That is correct.

(b) (6) relieved (b) (6) as reporter at this point.

Q. Job Order 15-930-20935 - Replace all flexible hoses. Initial man-day estimate was 313 man-days, and man-days expended were 811, according to the information I have. Is this approximately correct?
A. I believe it is approximately correct.

Q. Can you indicate the reason for the large expenditure compared to the estimate?
A. It ties in with the fact that we re-worked this job at least once. When we started this job, there was no Hose List, as such, which could be used as a document to prove what we had done. The requirement for such a Hose List is a corrected working plan and had somehow or other gone by the board some time in the past. Ship's force took a very strong stand in this matter. They had a requirement from their Type Commander that they had to

certify that every hose in their ship had been replaced and was of the correct material, that each piece of each end fitting was of the correct material and had been replaced; and this is a recurring requirement; and they asked, "How can I handle this tremendous administrative task unless I have a check-off list?" So we generated a check-off list, and I believe Mr. French has told you about that check-off list. By the time we had gone back through with this check-off list, it amounted to going through the hoses a second time, and we did that. We checked off every detail on all but about twenty-two hoses, and that drawing was then certified as a corrected working plan and was sent to the Bureau of Ships. It was a very large effort.

Q. So that the effort grew during the post shakedown availability?
A. Yes.

Q. Were any reports of twisted hoses or misaligned hoses made to you during the post shakedown availability?
A. Yes, indeed. As we checked off these hoses I kept getting daily reports as to the status of things and there were days when there were so many allegedly misaligned hoses, so many allegedly twisted hoses, and on each one of these reports the inspector, the shop, ship's force and design went and beat them out, one by one by one. Where they were twisted, or allegedly twisted, we decided whether or not they were, and if they were we'd straighten them. If they were too short, in most instances it was agreed that they would have to remain too short because THRESHER was built to a spec which did not require nine inches of free length in a hose. This is a recent requirement. To provide nine inches of free length in any of these hoses would have required repiping. The decision had been made very early in the game, and concurred in I'm sure by the Bureau, that we would not repipe THRESHER to provide nine inches of free length.

Q. Relative to the twisted hoses, did this indicate poor workmanship, lack of accessibility, or a combination; or what, in your opinion, might have caused the twisted hoses?
A. I think the principal thing that might have caused these allegations is the fact that the outer surface of the hose cannot be used, as people say, in all instances to prove that it hasn't or does not have a twist in it. Certainly there were instances where our first installations were not as good as they should have been. I'd be a fool to say that my mechanics were without sin in this area. Where their deficiencies were pointed out to them, we corrected them. A lack of accessibility played a part in this too. Many of these THRESHER hoses go behind sheetmetal work, particularly up in the cocoon area, and it's difficult -- the hoses, you know, are used to go from floating structure to fixed structure, and it's not too easy to get to those hoses. But, essentially, all of those are low pressure systems and it doesn't matter much anyhow.

Q. Did you find it necessary to establish training schools or training sessions for hose installation men in the ship?
A. We have a brand new process instruction which we generated to teach our people how to make those installations. We run a hose school in Shop 56; in fact, forces afloat send people to our hose school to learn how to make these hoses. We have a continuing training program in this area.

Q. How about the installation of these hoses; do you have a school to advise mechanics how to install them?
A. Yes, we do.

Q. Are there any documents which result from these training courses -- cards, or diplomas?
A. I can't answer. I do not believe there is.

Q. Relative to misaligned piping, which you indicated there were some possibilities of, did you investigate any cases specifically of misaligned piping yourself?
A. I personally did not investigate any in these alleged cases. I did not have to. I, in this instance, was able to use my subordinates to resolve all problems.

Q. Did you find it necessary to discipline any Yard workers as a result of twisted hoses or misalignment or any other problems connected with piping?
A. I have not disciplined any Yard workmen as a result of hose or piping problems during this availability, no.

Q. As a result of the efforts made by the Shipyard, such as the process instruction, Hose List, the quality assurance, and so on, do you feel that when the ship left, the flexible hose aspects of this installation were in good shape, poor shape? How would you describe them?
A. I think that the flexible hose installation in the THRESHER was the best and most expensive installation in any ship in our fleet.

Q. Considering the fact that there are a few boats which operate to a test depth of b(1) and many which operate at lesser depths, would you consider that the flexible hose systems, as designed in THRESHER, are adequate for the purpose?
A. All I can do is give you an opinion on this because I have not participated in this particular effort of design. I feel that the hose installation was adequate. I think it is of even greater significance to state that without a hose installation we don't have a THRESHER.

Q. Turning to Job Order 15-930-20928 - ASW Pump Motors. Was there any modification to the ASW system as the result of the work on these motors?
A. Yes, there was. b(3) 10 ASW pump, when remounted with this new motor and on its new sub-plate, which is four points vice a three points support, would not match up with the installed suction piping. We had to cut the installed suction piping, re-orient it, and make at least four new silver-brazed joints before this entire installation met our process instruction requirements.

Q. Was there a full record made of the inspection of these joints?
A. That is affirmative.

Q. Has it been reviewed since the completion of the work?
A. I personally have sighted the UT cards used when these new joints were added. They can be introduced as evidence if you so desire.

Q. They are available for the court?
A. They are available. Mr. Collins or Mr. Smith will have them in his possession.

Q. Job Order 15-930-20813 - Install New Hamel Dahl Valve and Piping in the Condensating System. Did this job involve the ASW system in any way, removal or interference?
A. Would you repeat that, please?

Q. 15-930-20813 - Install New Hamel Dahl Valve and Piping in the Condensating System.
A. Captain, you have a mistake there. The Hamel Dahl valve had nothing to do with the condensate system.

Q. Is it in the air condition system, the lithium-bromide air-conditioning?
A. It's a connection to the lithium-bromide.

Q. It did, then, have a connection to the ASW system?
A. That is affirmative.

Q. Would you describe this work in a little more detail?
A. This was a large job and it was a disappointing job. The original lithium-bromide plant installation would not regulate itself automatically on the seawater side because the Metrix valve that had been put in there was too small. It couldn't accommodate itself to the different depths at which the ship would operate; so it was decided to increase the size of the feed to this plant and it was increased to four-inch feed and this very, very large Hamel Dahl sea water control valve was substituted for the Metrix valve. There were a large number of welded copper nickel joints involved here, as I recall about nineteen. We had to buy new copper nickel elbows and other copper nickel fittings. This is hard work, making welded joints in copper nickel pipes in sea water systems. We had the job entirely done, all of the joints in place, and we started our final radiography. This was way back in January. The radiography showed that our joints were now acceptable, but they picked up the fact that the manufacturer who had made these four elbows had welded them and that the welds in the elbows were no good. We had to cut out all of this work. We tried to repair the elbows; we failed on four of them. We had to buy new elbows, re-do all these joints, and it was identified as a controlling job at the time we asked for our next to the last extension. The job was finally finished. Everything was in fine shape. Here again, all these records are available. The radiographs, in turn, have been reviewed by Mr. Harrison Sayre, of the Bureau of Ships, and he gave us a clean bill of health on them.

Q. You have a full set of radiographs for all of the welds involved?
A. I do not, but the Quality Assurance Superintendent does; that is affirmative.

Q. Job Order 15-930-50607 - Inspect all inlet hull ball valves. Was that involved with this or is this a separate job?
A. That was a separate job.

Q. Would you describe this job in some more detail, please?
A. The elbow inlet hull ball valves used as sea valves in the THRESHER Class are made essentially of a copper nickel forging. One end of this forging is a flange which is fastened to the liner in the pressure hull, and the elbow comes around and provides the water passage. It's really an

internal sea chest, and you move about eight to nine inches and you come to the ball valve. It had been noticed in some ship that erosion was taking place in this copper nickel elbow inlet. Copper nickel is a fairly soft material, as you know; it's susceptible to erosion in sea water systems if the flow is not kept down below a very relatively low number. As a consequence, we had to inspect every one of these and see if we had any trouble. We inspected every one of these and we had no trouble, so we put them back.

Q. Job Order 15-930-50612 and associated job 90393. The first job had a preliminary man-day estimate of fourteen hundred and fifty-one, from my figures, and an expenditure of thirty-one; and the second job had a man-day estimate of thirty-four and an expenditure of four hundred and four. The summation of the two indicates less than half of the estimated man-days were used for the ultrasonic tests of silver-brazed joints in the salt water system. Would you indicate how this happened, or why, please?

A. I am not quite sure I follow you there. Indicated less than half of what?

Q. The expenditure was less than half of the original estimate for the work. Does this indicate that only half the work was done?

A. No, this does not. This job was an open end contract, an ~~NTB~~ NDU job, and the original estimate was just pulled out of the air.

Q. So that the original estimate really, in your opinion, has no bearing on the final accomplishment?

A. In my opinion, no.

Q. Did you accomplish all of the intended work in ultrasonic testing of the silver-brazed joints in the salt water system?

A. We did everything that we could without it becoming controlling, which was exactly what we were asked to do.

Q. Do you have a list of the joints which were ultrasonically tested?

A. The Yard has a complete list of these and Mr. Arnold, who I named earlier, is the best man to describe joint by joint what was done on this job order.

Q. Job Order #15-930-50819 - Ball valves on the salt water system. Would you describe this job in a little more detail, please?

A. The ball valves used in the saltwater system were subject to a siezing with time, and it was postulated that Teflon coating of the balls would remove this problem. So we took all the ball valves out and took out the balls and Teflon-coated them and put them back in again.

Q. Were there any modifications made to the piping system as a result of this job order?

A. None, whatsoever, other than taking down and replacing the mechanical joints.

Questions by a member, CAPT Osborn:

Q. I note that considerable noise reduction items were received as late as November when the trials were conducted late in the spring. Can you explain this?

A. No.

Q. Or were the modifications you made the subject of design studies on which the plans arrived to you late in November; is that the case?

A. The modifications were the subject of very extensive design studies and engineering effort and that's probably why it was so late getting to us.

Q. With respect to the replacement of the GE controllers, were any of these connected with the main power plant?

A. Negative. I cannot give the best testimony on this point. It is my opinion that none of them were, but the exact controllers, a list of them is available and I am sure you can settle that.

Q. It's your opinion they were associated mainly with auxiliary machinery?

A. That is correct, because the work was all done under my cognizance. I do not know of Captain Hinchey changing any controllers.

Q. Do you know whether all the breakers were checked with respect to satisfactory trip setting?

A. I know that that was done after the replacement of these controllers; affirmative.

Q. How would you describe the time from the beginning of shipboard tests to sea trials on THRESHER and the compacting of the schedule with that of a new construction ship?

A. We had less time to do what had to be done than we have in a typical new construction ship. The way we attempted to accommodate this, and the way we did accommodate this though, was to tune the Test Memo requirements to the fact that it was not in all instances a new construction ship. This post overhaul test and trial program really comprised three distinct pieces which were all melted together. First of all, I had a large number of formal Test Memoranda which I had to accomplish because of new work. All of those Test Memoranda were generated by our own Design Division and they were just as complete as for a new construction ship. Second of all, for those things which weren't tested out by this kind of a Test Memo, we utilized abridged versions of the appropriate new construction Test Memo and the abridgement of this was done by agreement between ship's force and Ship's Superintendent. The third part of this program was the execution of those specific requirements as called for in Force Regulations, and this was done by

ship's force under the title of Dock Trials, Salvage Inspections, and so forth; and, as you know, the Salvage Inspection for overhaul is every bit as demanding in time and effort as it is for a new construction ship. In Dock Trials, though they do not apply in the case of a new construction ship, to the best of my knowledge one of these commanding officers has to answer the question: "Is the secondary plant completely operable, tested and reliable?" before he can obtain permission to go critical; and this is a pretty doggoned hard question to answer unless you have indeed tested and tried and proved out everything -- everything in the ship, and this is pretty much what we did.

Q. Did you ever receive any explanation of the flashing lights or ground problem in your ballast control panel?

A. Several indications -- the first one was this explanation that I gave you about the hatch covers, actually, with operation, decreased their at rest location with respect to the microswitch, and these microswitches, the adjustments are thousandths; and this sort of thing had changed some of the indications. There was at least one other instance I believe I believe I mentioned where a dial light, a light was out of its socket.

Q. Was there any occasion where you had an indication of electrical malfunction, say something like a ground, in the BCP?

A. There were none whatsoever. I am aware of none whatsoever.

Q. There was no indication on any of the tests where a simulated casualty in the BCP could simulate a ground close to that of being a power failure, was there?

A. I know of none, no.

Q. I have known you very personally over a period of over twenty-five years as one of the most highest principled officers in the Navy with a reputation of the highest personal integrity. In the last month prior to completion did you feel that you were forced by pressure from either the operational forces or forces generated in this yard to sacrifice those personal standards of excellence of longstanding?

A. I did not sacrifice any of these characteristics. The pressure was great. The pressure is always great. I doubt that very many people outside of this ED crowd ever really understand that each one of these overhauls is damned near like fighting a battle. In fact, this kind of a job makes my World War II experience look like a picnic by comparison. You are under the pressure of financial pressure. You're under the pressure to try to maintain the reputation and goodstanding of the Shipyard. You're under the pressure to try to maintain integrity in all respects. And -- it's great -- but. We took a hazing because we were late, but I was fully prepared to delay that ship again; in fact, I asked for a recomp on one occasion about three weeks before because I simply had to go to my boss and say, "I do not know what is wrong and I do not know how long it's going to take to fix it." Admiral Palmer was, at no time, in any way, desirous that we take a short cut on the ship. In fact, when we finally faced up to the fact that we couldn't get that b(3) 10 USC 130 valve to shut so that it would hold waterborne, and he had questioned this precedure -- in fact, he came down to the drydock later because of his personal interest in this -- he distinctly, and I recall, complimented us on finally having decided to get into drydock and find out what was wrong with this thing. We took no shortcut on this boat and I don't think anybody around here ever would.

Q. Did you have many discussions with Lieutenant Commander ~~Craig~~ KRAG with respect to the THRESHER?

A. Frankly, I don't recall ever talking to Bob about THRESHER during this entire PSA. We talked about NAUTILUS on several occasions during the last few months, but not about THRESHER.

Q. Do you think Lieutenant Commander ~~Craig,~~ KRAG as the primary officer concerned at Deputy ComSubLant with respect to individual interests in the THRESHER, had an adequate picture of the completion of the ship?

A. I can only conjecture as to that. He arrived up here about, I believe, about twelve hours before he departed on sea trials. My conversation with him that morning certainly indicated that he was not disturbed about anything. In fact, it was a very friendly and very jovial conversation.

The witness was duly warned concerning his testimony.

The court recessed at 1258 hours, 27 April 1963.

The court opened at 1340 hours, 27 April 1963.

All persons connected with the inquiry who were present when the court recessed were again present in court.

The witness was reminded that the oath he had previously taken was still binding.

Questions by a member, RADM Daspit:

Q. Captain, from the testimony to date I have gathered that the plan for "fast trials" was to have a seventy-two hour "fast trial", followed by a period in which the yard could fix deficiencies, and then a twenty-four hour "fast trial"?

A. No, sir, the original plan was to run four full days, to be followed by a five day correction period, four week correction, and then to proceed.

Q. You testified that the first that you knew that the "fast trial" had been aborted was at noon on Tuesday when you received this letter?

A. Telephone call.

Q. Earlier testimony indicated that a decision had been made to abort around one or two o'clock in the morning, and the skipper's letter indicating a sixty hour trial would indicate that the trial was aborted at eight o'clock. Did the Yard receive any notification prior to your telephone call?

A. Not that I know of. I was made aware of this by a telephone call -- I said about noon; as I recall, it was eleven o'clock in the morning. And the Captain told me that he had just signed this letter. And I asked, "When can we come back on board?" He said, "After lunch."

Q. This was the point I wanted to make, that you did not get your men back on until the second shift that day?

A. I was not able to get any substantial number of men back until after 1600, yes, sir.

Q. Now, referring to the procedure for the sea trials, the present procedure for new construction deep dive is that the ship will level off at certain depths to make sure that it operates before they proceed deeper. I noticed in THRESHER's trials this procedure was not followed. He expected to go down very quickly without testing equipment, then to come back up, and then to make a

second deep dive, at which he tested equipment at each depth. Did you have any conversations with anybody as to why he used this procedure?

A. No, sir, I did not. In reality I thought he was taking three full hours for that first deep dive, and to go from periscope to test depth in three hours would have indicated a considerable number of steps in between.

Q. I think the trial was made in about three steps, but it was not required that he check operating equipment at each depth?

A. That is not in the trial agenda, no, sir; just total length of time that they planned to take.

Questions by the president, VADM Austin:

Q. Captain Heronemus, ~~amoung~~ AMONG your duties is that of insuring satisfactory completion of work, final completion of work, and economical completion of work. Does not the timely completion militate against both the satisfactory completion and the economical completion at times?

A. Admiral, I guess at times it would. But there is hardly any job which, if dragged out, does not end up costing more than a job done in a timely manner, though there are jobs which have tried to be done on a "CRASH" basis, like, for instance, our initial construction of the ABRAHAM LINCOLN, which was just a flagrant example of how you could pour manpower down the drain to try to get something done five minutes earlier. Definitely there, timeliness is entirely antagonistic towards cost. Insofar as quality is concerned, I have always interpreted this requirement as meaning that the timeliness shall be the least amount of time required to do things right.

Q. You spoke of having been disciplined for not completing in the estimated time. What was the nature of this disciplinary action?

A. The Shipyard Commander and I were required to go to Washington and explain to four of our admirals in succession why we had fouled this up; and then about three weeks later we were required to go to Norfolk and explain to Admiral Grenfell and to Admiral Beakley and Admiral Dennison why we had missed this date as badly as we had.

Q. Then no real disciplinary action was taken; you merely were "put on the carpet", as it were, to explain the necessity for the extensions?

A. Yes, sir.

Q. Did this interrogation by higher authority in any way place upon you pressure to complete, timewise, which conduced towards short cuts on quality of work performed on THRESHER?

A. No, sir.

Q. Going back now to the steam valves which were not tight because of rust. These valves were the responsibility of the ship's force; is that right?

A. That is affirmative.

Q. Did they take the normal precautions insofar as you know to prevent this last minute tightening of these valves; in other words, did they operate them at regular intervals, or were they able to operate them at regular intervals, to your knowledge?

A. I cannot answer factually to that question, Admiral. I am not aware though of any real good lay-up procedure for those valves.

Q. That was going to be my next question. It would have helped had they started a little earlier to insure that these valves would function properly; it would have avoided you delay in going critical on the steam plant, I believe?

A. Yes, sir.

Q. These three hundred valve wheels that were missing; was there any explanation for this mystery ever determined?

A. I have no satisfactory explanation for this. I don't know where those valve wheels are, and I wouldn't think anyone would want any of those valve wheels.

Unclassified

I know that as a result of this though, I have required of the Commanding Officer of the DOGFISH that he take charge of his valve handwheels, -- which is something that I recall we always used to do anyhow, because during the overhaul and the post-overhaul operations it's always easier to use a crescent than it is a valve handle wheel -- and then bring the handle wheels back when the time comes.

Q. Now you spoke again of rust --
A. Yes, sir.

Q. -- in connection with the b(3) 10 USC 130 . Was there any lay-up procedure to prevent this kind of difficulty?

A. In this sytem the only kind of lay-up procedure that would prevent this kind of rust would be almost an application of a dynamic dehumidification maintenance thereof, because this rust was stuff that would go through a five micron filter. It was very, very fine red rouge, and you couldn't keep that from forming on the inside of a steel steam system unless you used something like positive dehumidification. Incidentally, we do have it on the reduction gear in the ships, which you may or may not know.

Unclassified

Q. You mentioned several times that Mr. Sayre of the Bureau of Ships gave a clean bill of health to some job that had been inspected by radiograph. When was this done?

A. Mr. Sayre arrived here the Monday morning after the loss of THRESHER. He had been sent here, I believe, by Captain Kern.

Q. All of these examinations by Mr. Sayre were subsequent to the loss of THRESHER?

A. Yes, sir. They were in the nature of an audit.

Q. It is noted from your testimony that a number of jobs were underestimated originally as to cost and time. Did this in any way cause less work to be done on such jobs as the sil-brazing, which were open ending type jobs?

A. No, sir.

Q. In order to conserve money one way?

A. No, sir. In fact, this lack of estimate, or lack of issued money, to our great detriment in the eyes of the comptroller, never deterred us from going ahead and spending more money.

Q. Did the extension of the PSA timewise result in more sil-brazed joints being tested than would have been tested perhaps had you been able to meet the original schedule?

A. Yes. At least four more weeks worth of sil-braze inspection was done as a result of that first four weeks extension.

Q. Captain, your testimony leaves little doubt as to the thorough manner in which you addressed yourself to the difficult task of seeing that PSA of the THRESHER was done as well and as expeditiously as was practicable to do it well. I am sure though that, having been responsible on the production side, the waterfront side as it were, of this overhaul from beginning to end, you have asked yourself many questions since the loss of THRESHER. Have any of these questions which you have addressed to yourself resulted in any light that could be shed on the real cause of the loss of this ship?

A. Admiral, I spent hours asking this question. I have been unable to come up with anything, anything at all.

Unclassified

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Do you consider that you have sufficient disciplinary authority to insure that the quality of production at the Portsmouth Naval Shipyard is adequate?

A. I have to answer that first by explaining that I, personally, have no disciplinary authority over anyone other than four civil servants and my officers -- that is, direct authority. I am, however, capable of being quite influential in seeing to it that other people in the chain of command do what they need to do. This situation of holding people responsible for what they do, holding them responsible for what they don't do, trying to require people to do what we pay them to do, is a matter of great concern to all of us in this Shipyard; and I am quite sure extends to other Shipyards. Our personnel situation is quite entirely different from that which people who operate at sea are acquainted with. One of the most important jobs I have here is running a school for new Ship Supts, and one of the most difficult jobs I have is to convince these officers that they are no longer in a position where they can demand that something be done and have it happen; that just doesn't follow. You have to decide what has to be done, and then you demand that it be done, and then you demand again, and then you keep on "pinging" until finally it gets done. I do not like many of the limitations that are placed upon us insofar as our ability to exact performance is concerned; but rather than my talking about this, I would suggest that when you interrogate the supervisors of mine, you ask them how they feel about their ability to make their workmen work. I think one of the greatest faults with this Yard is that over a period of time we have generated a group of toothless supervisors -- not through their own fault. Any man around here who decides to take a guy to Mast knows right then and there that he is likely to end up facing the smartest lawyer in the country, and that he will be on trial; that's the way it will end up. As a consequence, I don't think my supervisors are anywhere near as demanding and as forceful as they may have been twenty or thirty years ago. There is no place in our organization for anger. You know, in the operating Navy anger is a real good reaction upon occasions, and it's surprising what can happen when a man in charge, a man responsible, a leader, every so often just "blows his stack," and something happens there. No one around here can get angry; it's forbidden. Insofar as my officers are concerned, there has been no problem of discipline. Quite the contrary, in the three years I've been here I've had one officer, only one officer of about sixty different officers, who has given me any difficulty at all, and he got into trouble because of his problems. As far as my Chief Progressman and Manufacturing Assistant and my two secretaries, the four people whom I supervise directly, we have no disciplinary problems.

Q. What additional authority would you like to see the supervisor in line over civilian efforts obtain?

Q. Well, I'd like to see these people get back a little bit to where we used to be where you hold a man responsible for what those people working for him do, and then you allow him to select the people who work for him. You allow him to have some freedom of exercising his own opinion as to whether or not they get a raise, or whether they get hired, or whether they get fired. These supervisors have virtually no control over who comes to

Unclassified

work for them, or how long he stays, or whether he gets a pay raise. In fact, the quartermen have virtually no control over who is selected to be a leadingman. And it goes right on up the chain.

Q. When the Quality Assurance people discover from their own reports that a specific worker has had an unduly large number of rejects in the work on which he was employed, what steps can be taken in your department to correct the man?

A. Definite steps have been taken. In fact, this is one area of which I am quite proud in the case of silver-brazing. We monitor the performance of each man. Every joint that is made is associated with a man, and each week we review the results of what that man has done and when we find a brazer who has started to slough off, the first thing that happens is that he is relieved and taken back to school, and then we try to find out what has gone wrong. I am sure that we have actually taken a couple men off of the job of brazing. Similarly, in pipe welding, we've come along the same path of identifying the workmanship of individuals. But our first recourse is always that of retraining. This is required of us. You have to start off by assuming that the man has just had a lapse of memory or desire, and you have to rehabilitate him right there to keep going.

Q. To your knowledge, are men discharged for continued poor workmanship in their field?

A. I know of two men in the Welding Shop who were discharged because of continued poor workmanship; though I don't think the record shows it that way. We finally got rid of them on counts of extended unauthorized absences, or something like that. See, when you can convert something to arithmetic, then you can handle it in court; but when it's a matter of opinion, like adequacy of workmanship, that's pretty hard to prove.

RE-EXAMINATION BY THE COURT

Questions by the president, VADM Austin:

Q. Captain Heronemus, I would deduce from what you have said that it is not easy to separate a workman who either does not have the ability to do the work required or who lacks the motivation to do the work required in a proper manner; is that correct?

A. I think that's a fair statement, yes, sir.

Q. Has this resulted in a significant number of workmen in this yard who are not producing at the rate for which they are being paid?

A. It is my opinion that we are lugging on our backs at least ten percent of the people, without whom we could get along very nicely.

Q. Is there among this element of workers in the yard any indication of subversive or other non-patriotic activity?

A. No, I am aware of nothing of that sort. No, sir.

Q. Is there a sort of self-protecting association apparent in this yard among the workers?

A. I am not too sure I know what you mean by that. The entire Civil Service personnel set-up, officially, is a self-protective association. One way I have explained this or described it to myself is that it appears that as the years have gone on, it seems that more and more of those people who are willing to work, and we have some wonderful men in this yard -- we have some tremendously capable people -- they become more and more willing to carry the others on their shoulders. Whether they do this from some kind of a feeling that this is the ultimate in Christian ethics or something, I don't know; or whether they just do it because they've decided, "Well, what the Hell, I can't do anything about it anyhow." But if this is your idea of what you mean by a self-protective association, I think the entire Yard has a strong tendency to accept the organization as it is and make do, which, in reality, you know, is what you have to do day by day, hour by hour.

Q. But such an attitude would militate against raising the levels of cleanliness in the ship while work is underway, thoroughness of inspections, and that sort of thing; would it not?

A. It would against cleanliness. Insofar as thoroughness of inspections is concerned, if you're speaking about those done by the inspectors, I don't think we're in any trouble with our inspectors.

Q. In other words, a workman who fails to perform well in the more demanding areas generally drifts into the clean-up gang, does he?

A. No, sir. He drifts into -- unless by clean-up gang you mean those mechanics who are sorted out as not being trustworthy to take on lead mechanic

jobs--if that's what you mean, the answer is yes. Yes, there is a definite stratification of the workmen within each trade and, like when I mentioned about putting these valves in--the men who set up those valves and raised tail pipes were not considered the men who would even be allowed to decide whether or not the "O" rings were in place and the valve was installed correctly last time. A more trusted lead mechanic would have been assigned to that kind of job. We have definite stratification and this made itself very apparent when THRESHER and ABRAHAM LINCOLN were being finished and the quality of the workmen assigned to start the construction of TINOSA was such that our productivity was very, very low.

Q. Doesn't this general condition which we have just been discussing conduce towards a high probability of jeopardizing safety unless great effort is expended in the inspection and supervising field?

A. I think this is true, and that is perhaps why we have the highest ratio of inspectors of any Shipyard and why we have the highest supervisory ratio in any Shipyard.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. During the post shakedown period of availability, was there any report of, or indication of, sabotage in THRESHER?

A. None, whatsoever.

At this point (b) (6) relieved (b) (6) as reporter.

Questions by a court member, Captain Hushing:

Q. Do you think that condition that you have described relative to the workmen, that all of them do not put in a full day's effort, is substantially different than the conditions in other shipyards with which you are familiar?
A. I know that it is different from Mare Island. We do not work as hard as Mare Island.

Q. How about the private shipyards. Are you familiar with them?
A. I am not familiar enough except by knowing the numbers, and based on the numbers, they must work harder than we do or somebody is subsidizing them.

Q. So then you do feel there is a problem here which is peculiar to this Shipyard?
A. I would be anything but honest not to admit that. It has been one of my biggest concerns for three years.

Q. Do you think the Naval Civilian Personnel Instructions have contributed to this problem?
A. They can't have done anything but that.

Q. Is that what you meant by indicating that there is not sufficient authority to discipline, or is it a local management failure to exercise its prerogative?
A. Well, my comments were that it is my impression that my supervisors have grown toothless and they have been made that way. It has been made that way by the system.

Q. Which system?
A. The Naval Civilian Personnel system.

Q. As exemplified by the Naval Civilian Personnel Instructions?
A. Yes, sir.

Q. And that these are forced on the Shipyard from outside?
A. We have never volunteered for any of them to the best of my knowledge.

Neither the court, counsel for the court, nor counsel for the Party, RADM Palmer, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

WITNESS: Well there is one other matter I would like to mention, though it is really not directly related.

PRESIDENT: Well even if it is indirectly related, we would be glad to have it.

WITNESS: It ties in with the same question we've just discussed, the problems of the civilian supervisors. In the three years I have been here I have been faced with an ever-increasing problem- and I am not unusual-in this job, that is, a drastic reduction in the number of qualified and competent officers made available to me to help discharge my responsibilities. This isn't a Shipyard problem and I guess it's not a Bureau of Ships problem by themselves. But somebody has got to do something about this and got to do it darn soon. If we are indeed in this Shipyard going to overhaul Polaris submarines, and if we are indeed going to do it at the rate at which our strategic plans will require us to do it, we are going to have to have a large number of competent, trained officers to help run this show. Now I have tried hard to substitute anything and everything for an officer, and it is our official Bureau policy to do this, and I think we have tried honestly; we have got to continue to try, but I don't think it is going to work. The first year I was here, I had six fewer officers than my predecessor. At the same time, the rolls of the Shipyard increased. The second year, I lost four more. This year I lost two more. Now in THRESHER we have lost three more. We keep talking about just what is our authority and just what is our responsibility, this coordinating type of responsibility, and in the last analysis we are the guys that get the job done, and I don't think it is going to be any other way. And if we are going to get the job done, we have got to have people to do it.

Now one thing I admired greatly in my three years with COMSUBPAC is that when he or anyone else in that operating Navy, had something that really had to be done, there was a lot of difficulty about it, but they managed somehow or other to figure out an organization to do it, the people to put in the organization, and then they went and got the people. It wasn't easy but it happened. And having come back here from that sort of experience, and talking about that, I find it doesn't do much other than amuse people. I'd like to see something done. The inflow of new ED's was all but stopped for awhile so this isn't the answer. The young fellows who should have come along aren't there. Now we've got to find some young fellows somewhere else. The way this manifests itself right now, to me, as a leader, I have to impose - week after week, month after month - 72 and 80 hour work weeks on my people. This is not right - this is not right, and if anybody afloat thinks that we are not working as hard or harder than they do at sea, they are wrong, because we never come ashore; we're there. And I just thank you for the opportunity to say this.

PRESIDENT: Captain, have you made your feelings in this regard known to those in the chain of command above you?

WITNESS: Yes, sir, and my Admiral has written letters on this subject and there will be at least one more letter on this subject before I am detached.

Unclassified

I would classify my testimony as ~~confidential~~. Unclassified

The witness having nothing further to state, was duly cautioned concerning his testimony and withdrew from the courtroom.

COUNSEL FOR THE COURT: Mr. President, at this point may counsel for the court and assistant counsel meet with the court in closed session?

PRESIDENT: Very well. The court will be closed.

The court then closed at 1440 hours, Saturday, 27 April 1963.

The court opened at 1500 hours, Saturday, 27 April 1963.

PRESIDENT: At this time the court will adjourn until ten o'clock on Monday morning.

The court then adjourned at 1500 hours, Saturday, 27 April 1963.

Unclassified

FOURTEENTH DAY

Portsmouth Naval Shipyard,
Portsmouth, New Hampshire
Monday, 29 April 1963.

The court met at 1000 hours.

All persons connected with the court who were present when the court adjourned were again present in court, except (b) (6), who was relieved as reporter by (b) (6). The interested parties, RADM Palmer and LCDR Hecker, and LCDR Hecker's counsel waived their right to be present during this session. RADM Palmer's counsel was present.

The court closed at 1003 hours, 29 April 1963.

The court recessed at 1100 hours, 29 April 1963.

The court reopened at 1115 hours, 29 April 1963.

All persons connected with the court who were present when the court closed are again present in court.

VADM Hyman George Rickover, U. S. Navy, was called as a witness for the court, was advised of his rights under Article 31 of the Uniform Code of Military Justice, was duly sworn, informed of the subject matter of the inquiry and examined as follows:

The witness was informed that the court was sitting with open doors and that classified information could not be divulged.

DIRECT EXAMINATION

Questions by counsel fot the court:

Q. State your name, rank, organization and present duty station.
A. My name is Hyman George Rickover; I am a Vice Admiral in the United States Navy. I am responsible to the Atomic Energy Commission and in the Navy for the design, development, manufacture, installation and maintenance of nuclear plants and their controls in naval surface ships and submarines. With the first application of new reactor plant to a ship, I am also responsible for the associated steam propulsion plant and its auxiliaries. Although the THRESHER was a new design ship, her reactor plant was of a design which had been used in previous nuclear submarines, so on the THRESHER I was responsible for the reactor plant and its controls. I am also responsible for the training of the officers and crews who operate the propulsion plants of all our nuclear-powered ships. I participate in the selection of the officers and the men who are so trained. I am also responsible for the Shippingport Atomic Station, the first nuclear powered atomic station in the United States.

Q. What is your present duty station, sir?
A. My present duty station is Washington, D. C., both in the Atomic Energy Commission and in the Navy; because of the considerable number of activities which participate under my direction in doing this work, I visit in all parts of the country, both in shipbuilding and nuclear plant design and the manufacture of nuclear and various other components; I am frequently at these plants.

Q. State briefly your naval background and experience.

A. I graduated from the Naval Academy in 1922, and I served in various duties, including command of a ship, until 1937, at which time I became an Engineering Duty Officer. I was in the Bureau of Ships during the greater part of World War II; I had charge of the Design, Procurement and Installation of the electrical lighting and power equipment for all our ships. After that I served on Okinawa during the war. Then I asked for and was assigned to Oak Ridge to get into the nuclear power field. Since that time I have been in the nuclear power field, with my duties as I enumerated earlier.

Q. So far there would seem to be no evidence that the reactor plant of THRESHER had any direct causal connection with her loss. Also, this court has found no evidence of any radiological contamination resulting from the loss of THRESHER at sea. Can you tell us what the radiological risk would be, considering that she was lost in about 8400 feet of water?

A. Before answering that question, if I may, Mr. President, I would like to say something about the crew. I'm sure that everyone in this room knows how I feel about the men who were on the THRESHER. I and members of my Group knew many of them personally. We had selected them, trained them, encouraged them. We knew their problems. We can only hope that in giving their lives for their country they have contributed to our greater safety. It is a personal loss to me. I feel for their wives, their children, their fathers and their mothers.

Having said this, I will now reply to your question. This merely is a restatement of what I have previously said in connection with the radiological effects of the THRESHER loss. There is no reason to believe that any radiological problem has been created or will be created by the loss of the THRESHER. It might be useful to the court to have me put into its record the public statements I made on April 11th and 12th, 1963, in that regard. These statements were cleared by the United States Atomic Energy Commission. I have not had any evidence or hypothesis that would lead me to change these statements. Let me now quote for the record my public statement of April 11th, 1963: "The reactors used in United States submarines and surface warships are designed to minimize potential hazards to the environment, even under the most severe casualty conditions, such as actual sinking of a ship. First, the reactor core is so designed that it is physically impossible for it to explode like a bomb. Second, the reactor fuel elements are made of materials that are extremely corrosion resistant, even in sea water; thus, in the event of a serious accident, where the reactor is completely submerged in sea water, the fuel elements will remain intact for an indefinite period of time, and the radio-active materials contained in these fuel elements will not be released. Radioactive material could be released from this type of reactor only if the fuel elements were actually to melt, and in addition, the high strength all-welded reactor boundary were to rupture. The reactor's many protective devices and self-regulating features are designed to prevent automatically any melting of the fuel elements. Flooding of a reactor with sea water furnishes additional cooling for the fuel elements, and so provides added protection against the release of radioactive material." On April 12, 1963, I released the following statement: "Measurements for radioactivity and samples of debris recovered from the scene of the THRESHER has shown no radioactivity. Samples of the ocean bottom which have also been obtained by the Oceanography Ship, ATLANTIS II in the vicinity of the incident have likewise shown no radioactivity. Additional samples will be obtained and measured." Since April 12th, there have been a number of other tests and samples conducted and in the latest one of which I am informed as of yesterday afternoon, we have found no evidence of radioactivity.

Q. Is there any other information concerning radioactivity which you have to give this court, either in open or closed session?

A. No, sir, I have no other information of any kind about radioactivity either unclassified or secret. The statements I have just made are absolutely

all the information there is; I have no other information to give you.

Q. Can you describe the elements of design which built this factor of safety into the THRESHER reactor plant?

A. You are now getting into a classified area. Some information, of course, is available in the public domain, because much has been written about nuclear power in the Navy and for civilian power plants. If the court wishes I can furnish it two unclassified documents, one of which involves the selection and training of the officers and men for our nuclear ships, and of course this is an important part in the safety, and the other concerns itself with various questions which the Joint Congressional Committees asked during an underway tour of the polaris submarine WASHINGTON, when CAPT Osborn, who is a member of this court, was Commanding Officer. I can furnish these documents to the court for their future perusal if they so desire. I understand that additional copies of these documents are available right here in the Yard for anyone who might wish to have them.

Q. They are unclassified?

A. They are unclassified.

Q. Please produce them.

A. I can only give you one at the moment; I will deliver the other one to the court later. The one is titled "Tour of the U.S.S. ENTERPRISE and report on the Atomic Energy Commission Naval Reactor Program." It is the record of the Hearing conducted by the Joint Committee on Atomic Energy on March 31, 1962. As I say, copies of this are available. As far as any other aspects, I would have to, necessarily, get into classified areas which I am not at liberty to divulge, not only because of your admonition, sir, but because it is classified information under the Atomic Energy Act of 1954.

PRESIDENT: The court appreciates Admiral Rickover's furnishing these documents for their information, and will examine them, but does not choose to make them exhibits, because to do so would complicate the press' having access to them. If they want to have them we want them to be able to.

COUNSEL FOR THE COURT: I have no further questions, then, sir.

PRESIDENT: Admiral Rickover, we would desire to have in closed court that classified information which you advised Counsel in response to his question that you were unable to give in open court, so the court is closed. Just before you go. Admiral Rickover, you are informed that you are now privileged to make any further statement in open court concerning anything related to the subject matter of this inquiry, that you think should be a matter of record in connection therewith, which has not been fully brought out by questioning, and which is, of course, unclassified.

WITNESS: Mr. President, I have no additional statement to make in open court at this time.

PRESIDENT: The court is closed.

Everyone not directly associated with the court withdrew from the courtroom.

Unclassified

COUNSEL FOR THE COURT: Admiral, at the conclusion of your testimony in closed court, I shall ask you what classification you would assign to your testimony taken as a whole.

WITNESS: Of course the testimony I have given up to the present time is unclassified.

COUNSEL FOR THE COURT: This will be at the conclusion, sir.

WITNESS: I will start now with classified information.

PRESIDENT: Will you rephrase your question, Counsel, which made it necessary to go into closed court?

DIRECT EXAMINATION CONTINUED

Q. Can you describe the elements of design which built the factor of safety into THRESHER's reactor plant?

A. I believe it would serve the interests of the court better if in a statement which I have prepared, that item is included. This will serve to make my testimony a more connected whole and with the permission of the court I would like to read my statement into the record. Thereupon the court may wish to ask me questions.

PRESIDENT: The court will be pleased to hear your statement.

WITNESS: Admiral Austin has asked me to appear before this court to tell what I know, which might be pertinent to the loss of the THRESHER. I believe I can be of most help if I am specific. I will give examples, but it should not be concluded that the particular examples I mention are unique. Rather they are illustrative of practices which have grown up in the naval shipbuilding industry over many years. In fact, the major point I want to make is that the conditions which possibly led to the loss of THRESHER exist throughout the submarine design and construction program. We may never learn the specific failure which was the immediate cause of the THRESHER's sinking, but we may be able to reach an understanding of the underlying conditions which made such failure possible, and then do everything possible to prevent recurrences. I will read my statement and hand it to the court afterwards.

The first item I will take up is silver brazed joints; the problems associated with silver brazing of sea water systems provide a specific example of what I am talking about. Over the last several years several submarines, both nuclear and conventional, came close to being lost, due to failures in silver brazed salt water systems, resulting from design, workmanship, improper use of materials, and inadequate quality controls.

I understand that the Bureau of Ships has calculated that in a THRESHER class submarine at test depth the ballast tanks blow system can only compensate for a leak about b(1) inches in diameter. I believe this calculation is based on the assumption that the ship is leveled off at test depth and has no downward motion. Thus, in a THRESHER class ship, the quality of each of the several hundred silver brazed joints in sea water systems is of critical importance. Each of these joints is part of the hull and should, therefore, have high integrity.

In assessing integrity of silver brazed systems now installed in our submarines, it should be borne in mind that the large diameter silver brazed joint which failed in a salt water system in the BARBEL, did not fail until after two years of

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operation, despite the fact the joint had been made with the wrong material and had been assembled incorrectly. There have been other cases of silver brazed joints which have passed many hydrostatic tests and diving cycles, yet subsequently failed completely and without warning. Following the failure of a four inch silver brazed joint in the trim system of the THRESHER in May, 1961, I decided I could no longer depend on silver brazing for high-pressure systems.

I therefore took the following action for systems under my cognizance:

(1) All systems exposed to salt water would be fully welded, regardless of pipe size. Welding and its inspection would be in accordance with established reactor plant welding and non-destructive testing standards.

(2) Salt water systems would be fabricated to the same standards and quality control as the rest of the reactor plant.

(3) In addition, I required that joints and sea water pipings passing through the reactor compartment also be welded, even though this piping was not under my cognizance.

In the THRESHER, this work was all completed before she last went to sea.

The operating forces have also been concerned over failures in submarine sea water systems. The Deputy Commander Submarines, Atlantic Fleet, sent a message to the Bureau of Ships in September of 1961, with copies to the Chief of Naval Operations, the Commander in Chief of the Atlantic Fleet, and Commanders of the Atlantic and Pacific Submarine Forces. The subject was "Submarines salt water piping systems". This message referred to the BARBEL, THRESHER, SKATE, SNOOK, ETHAN ALLEN, ARGONAUT and CAIMAN flooding incidents of 1960 and 1961, and said in part:

"Recent instances of flooding in submarines because of defective sea water piping or flexible hoses, are cause for grave concern -- We have been fortunate thus far in that casualties have been handled promptly and correctly, and that, except in the case of ETHAN ALLEN, electrical apparatus has not been involved. Continued dependence upon such tenuous and unfortunate circumstances, particularly when considering additional hazards imposed under wartime conditions, is obviously unacceptable -- It is considered that urgency of problem and inherent danger of disaster must be brought more forcibly to the attention of all concerned, and that corrective preventive action must be pursued, even more aggressively than has been done--".

I do not know what action is planned for silver brazed joints in systems not under my cognizance. I do know, however, that inspection of a small percentage of these silver brazed joints in several operating nuclear submarines, built by different yards, has shown a number of them to be defective. For example, last week a survey of but thirty-six silver brazed joints in one submarine revealed that seven joints had less than forty percent bond. Two of these five inch joints had ten percent bond or less. Do you wish me to repeat this?

PRESIDENT: No, we have that in the record. Continue.

The witness continued:

I have just learned that during the recent stay of THRESHER at Portsmouth about five percent of her silver brazed joints were ultrasonically inspected. These joints were in critical piping systems, two inch diameter or larger. The inspection revealed that about ten percent of those checked required repair or replacement. If the quality of the joints so inspected was representative of all the THRESHER's silver brazed joints, this would mean that the ship had several hundred sub-standard joints when she last went to sea.

The next item I will discuss is welding. Another source of concern to me is the situation that has become evident in our yards over the last few years in the areas of pipe welding, radiography and quality control.

When I first started in nuclear power, I had no reason to assume that welding and the associated non-destructive testing used in our yards was other than adequate. My reason was that since these yards had been building and repairing ships for a long time they must have developed the skills to the required degree, and that the necessary specifications had been established and were being met. When I use the word "yard" I mean both private shipyards and Navy yards. However, I have found from experience that the Bureau's pipe welding and non-destructive standards and specifications, while of good quality, were incomplete. Further, I gradually came to realize that these standards and specifications were not generally complied with. As a result, for nuclear propulsion work I had to prepare comprehensive welding and non-destructive testing specifications, and to make sure that the yards met these requirements. These specifications, while more complete -- by these I mean the ones I just referred to as those I had prepared -- these specifications, while more complete than existing specifications, required essentially the same quality of work the yards were supposed to be doing all along.

It has been difficult and time consuming to insure that shipyards met the specification requirements in the area of pipe welding under my cognizance. In many instances we had to overcome the prevalent attitude that specifications were merely a goal to shoot for, and did not need to be taken literally. This was aggravated by the opinion, also prevalent, that the quality of welding and inspection required by the specifications was unnecessarily stringent. Therefore, in order to insure satisfactory welding in areas under my cognizance, I found it necessary to set up my own welding and radiography inspection teams. These teams audited all yards doing nuclear work, to determine if our specifications were being complied with. Weaknesses and non-compliance were found in practically all yards, although some yards were better than others. Defective welds, poor radiography and incomplete inspection records were typical. Following each inspection the management of the shipyard and the Chief of the Bureau of Ships were advised of the deficiencies found. I took corrective action for work in my areas.

I also found it necessary to set up schools to train my own radiographers to monitor the reactor plant welding of the shipyards. Further, I assisted the Bureau in training some of the personnel in naval shipyards and Supervisor of Shipbuilding offices. In addition, I established requirements for the qualification of inspectors for non-destructive testing. Also, I set up a special group in our naval reactor laboratories to guide and monitor all phases of the reactor plant welding in the yards.

As a consequence of what we found I have been inspecting and correcting, as necessary, welds under my cognizance in all nuclear plants built before we learned that specification requirements were not being met. This is being done by reviewing radiographs and repairing sub-standard welds as the ships become available. In those instances where the inspection records are not adequate, or where satisfactory radiographs are not available, new radiographs of the welds in question have been and are being taken.

In the case of the TINOSA, being built here at Portsmouth, the number of sub-standard welds and radiographs were so great that correction of the defects led to a delay in the scheduled completion of the ship. This delay was reported by the Chief of the Bureau of Ships to the Chief of Naval Operations as being due to the need for repairs to reactor plant welding. I was concerned that the full

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implications of these defects was not recognized; therefore, I sent a memorandum to the Chief of the Bureau of Ships. This memorandum stated that I could not understand how in the same yard, using the same specifications, the same welders, the same radiographers, and the same film readers, the welds under my cognizance could be in poor condition while the welds in the rest of the ship, in areas equally critical, such as the hull, the salt water and steam systems were considered to be satisfactory. About six months after this event the Bureau relaxed pipe welding specifications for the non-nuclear portions of the TINOSA, and all other nuclear submarines.

The next item I will discuss is HY-80 hull steel. Cracking of welds in the HY-80 hull has long been of concern to me. I know this is a controversial statement, but in light of the loss of the THRESHER, I believe that this bears further investigation. The primary structural material of our submarines is susceptible to considerable weld cracking. It is also more susceptible to fatigue failure than the more ductile submarine steels with which we have had many years of experience.

It has been argued that if a submarine is to go deep we must use HY-80 steel. It has been reported that the THRESHER would have been b(1) tons heavier, b(1) longer and b(1) knots slower, if she had been built of high tensile steel, HTS instead of HY-80, but perhaps b(1) foot submergence submarine hull made of material in which we have a higher degree of confidence would provide a more acceptable ship than one in which we must, on a regular basis, bring the ship back, inspect welds, where accessible, and repair the cracks we find. What about the areas of the hull that are completely inaccessible due to the installation of equipment, tankage, cableways, etc.? What sort of situation is developing in these areas of the hull as the years go by? What about the cracks we cannot see? I am not implying that greater depth is not necessary, or that we should not work at it, but it seems to me that until we know more about HY-80, and why it cracks, and until we can definitely determine whether it is suitable for its intended application, we cannot have full confidence in the reliability of this material.

The cracking susceptibility of welds in HY-80, make it especially important that submarine structures using this material be welded in accordance with approved welding procedures, the welds radiographed in accordance with Bureau requirements, and accepted only if they fully meet Bureau specifications.

In 1959 the nuclear power superintendent of the Mare Island Naval Shipyard, discovered, and with my assistance, brought out a condition of unsatisfactory hull welding on the THEODORE ROOSEVELT. The ensuing review uncovered inadequate radiography and quality control practices at Mare Island. It also raised the basic issue of the acceptability of HY-80 as a hull material, including the question of fatigue effects. I insisted on complete inspections of that part of the THEODORE ROOSEVELT hull that surrounded the reactor plant. This inspection involved partial dismantling of the reactor plant, since many of the hull welds would otherwise have been inaccessible. It was found necessary to replace all the reactor compartment frame-to-hull welding. Faulty butt welds in the hull in this compartment also required repair. In the rest of the ship the welding was only sampled, and only those defects found by the sampling were repaired. I consider that when sampling techniques are used to ascertain if flaws exist, the finding of such flaws should be followed by extensive additional inspections.

One of the symptoms that led to the findings of cracks in the HY-80 frame-to-hull welds in the reactor compartment of the THEODORE ROOSEVELT, occurred during air tests on the canning plates over the shielding lead covering these welds. The air, in some cases, was leaking out through cracks in the HY-80

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welds under the lead. When he learned of this situation at Mare Island, the nuclear power superintendent at Portsmouth looked for and found similar symptoms in the conduct of canning plates air tests in the THRESHER reactor compartment. He reported this to the production officer of the Yard. Recognizing the potential seriousness, the nuclear power superintendent asked that he be given written affirmation of the reactor compartment hull integrity. This was given him by the shipbuilding superintendent.

The Bureau of Ships, faced with this situation at Mare Island, sent a representative to Portsmouth to review the adequacy of their HY-80 welding radiography. He reported that there were many deficiencies in the THRESHER hull radiographs. His report indicated that the quality of the radiography was such as to raise the question of whether there existed an adequate basis for determining integrity of the THRESHER's hull. I do not know what action was subsequently taken.

Another example: Recent inspections of two nuclear submarines built by Ingalls at Pascagoula, Mississippi, revealed that in each ship a significant amount of weld metal had been omitted in the circumference of the pressure hull at a highly stressed transition joint.

Now, I will get into new submarine design. In the design of our newest submarine nuclear propulsion plant, I am doing everything possible to overcome the types of problems I have discussed. This was not prompted by the loss of THRESHER; but was begun some time ago in response to lessons learned in building, testing and operating our nuclear submarines; specifically, in the b(1) nuclear propulsion plant now under development I have taken the following action:

(1) Only welded joints will be used in salt water systems, regardless of pipe size. All such welds will be made and inspected to established reactor plant welding specifications. I have also extended welding to nearly all of the other propulsion plant systems.

(2) The amount of salt water piping in a propulsion plant has been drastically reduced. Most of the equipment previously cooled by salt water will now be cooled with fresh water. This will be accomplished with use of an engine room salt-water - fresh-water heat exchanger system, b(3) 10 USC 130 Further, all machinery and equipment under my cognizance, which is exposed to sea pressure, is being designed and built to the same standards used for the reactor plant. This means that all the equipment will be analyzed, under fatigue conditions, to insure adequacy under fluctuations of sea pressure, changes and temperature, and varying hull deflections.

(3) Remote high pressure salt water gauge lines, presently used in our control panels, have been eliminated.

(4) The number of salt water hull openings for the propulsion plant has been reduced close to one-half.

(5) Major valves have been grouped together for plant simplification, and to ease damage control.

(6) Every pipe in the entire propulsion plant is mocked-up. Every weld and every system has identification to insure that the number of welds is minimized, and that all are readily accessible, and easily weldable.

(7) The shipbuilders and the equipment manufacturers are being required to institute comprehensive quality control to insure that all systems and components are designed, built and installed to the same standards we use in the reactor plant.

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(9) In some cases, equipment manufacturers have proposed the use of HY-80 in the design of machinery, because this material had previously been accepted by the Bureau of Ships. I have not accepted HY-80 material in any machinery or structure for which I am responsible.

What I have said represents but a partial list of the steps which I am taking to assure that not only the reactor plant, but also the machinery, salt water systems, and engine room piping in our new submarine propulsion plants, will be of high integrity. Based on the operating experiences we have had to date, we must do no less.

The next item I will take up is reduced recovery time. I have received little information on the THRESHER loss. From the information I have, it appears the ship was lost in a few minutes. I understand that towards the very end, b(1) This could mean one of two things. Either the pumps stopped, or the crew had switched them to slow speed. If the pumps did stop, then the reactor would shut down automatically. If, however, the pumps were still running at slow speed b(1) the reactor might still have been operating at the time; but, even with the reactor operating, there would still have been a loss of steam propulsion. However, recognizing the importance of having reactor power available in emergencies of this kind, I am re-examining whether the time to get a shutdown reactor back in operation safely can be reduced.

Now I will conclude. I believe the loss of the THRESHER should not be viewed solely as the result of failure of a specific braze, weld, system or component, but rather should be considered a consequence of the philosophy of design, construction and inspection, that has been permitted in our naval shipbuilding programs. I think it is important that we re-evaluate our present practices where, in the desire to make advancements, we may have foresaken the fundamentals of good engineering.

Acceptance of a structural hull material which is prone to cracking, and which frequently must be inspected and repaired, as the price of being able to go deeper, is questionable.

The use of high pressure hydraulic systems, with their small clearances and delicate valves susceptible to malfunction by small particles of foreign matter, is another area which needs review.

The complexity and the gadgetry resulting from automatic depth control, automatic depth seeking equipment, and automatic steering should make us re-evaluate whether these features are really necessary. The fact that the ship's control systems are so designed that the ship's safety depends upon the reliability of a single rubber or plastic "O" ring, or that the ballast tank blowing system depends on a single remotely operated valve that needs electrical power, should be re-evaluated.

The lack of adequate specifications and quality control can result in questionable workmanship in brazed piping in salt water systems. These are an integral part of the ship's hull boundary and should be considered as such.

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It is, therefore, most important that we reappraise our approach in the design and building of submarines. In doing this it would be well to remember the words Admiral Carney, then the Chief of Naval Operations, wrote in July of 1955, and I will quote:

"It is realized that in the ships laid down in the last few years, and being delivered at this time, it was the desire of the Bureau to incorporate a number of advances and techniques and materials. Undoubtedly, some of these have contributed to the efficiency of the ship, but unfortunately, other items have proved faulty and have resulted in long delays in the delivery of the ships to the fleet, and in costly alterations or replacements--

The Chief of Naval Operations has supported the Bureau of Ships in the construction of ships for experimental and development purposes. Examples are U.S.S. TIMMERMAN, U.S.S. ALBACORE, experimental PT Boats, and the Miami hydrofoil boat. Each of these has made its contribution to the improvement of future designs. However, a large number of the ships which are enumerated in the 1956 shipbuilding and conversion program are for service in the fleet and are not to be considered as being built for experimental purposes. Neither the ships nor the appurtenances thereto.

The Chief of Naval Operations welcomes and encourages progress in the design of ships and their component parts, and in the use of new and improved materials, all of which should lead to improvements in efficiency and effectiveness. It is mandatory, however, that the traditional naval characteristics of ruggedness and reliability not be sacrificed or in any way impaired in future construction."

Now, I will come to my recommendation. As a first step, I would start with the following:

(1) For submarines that are operating, I recommend

(a) Limit, for the time being, the normal operating depths for both b(1) designs to 400 feet, unless the operations of the ship requires otherwise. In this case the depth should be left to the discretion of the commanding officer. Limiting the depth to 400 feet would enhance safety as follows:

(1) Reduce stresses on the hull and salt water piping systems.

(2) Reduce the amount of flooding for a given size of leak. Flooding at four hundred feet is about b(1) of that at b(1) and about three-quarters that at 700 feet.

(3) Give the ship greater buoyancy margin when blowing ballast tanks. The buoyancy attainable from blowing these tanks decreases with the depth.

(b) It is my opinion, from the many failures that we have had in silver brazed joints, that they should be eliminated in sea water and high pressure systems wherever possible. I do not consider such joints to have the integrity required of salt water systems in deep diving submarines.

(c) I would check, as soon as practicable, one operating ship from each building yard for integrity of the hull, the salt water systems, the hydraulic and high pressure air systems.

(d) In addition, I would institute a program to check all operating ships as they are made available. Here, I would give priority to ships from yards where

the workmanship is found to require it.

(2) For ships in design or early construction stages, the following should be considered:

(a) Modify the designs to specify welded salt water systems, high pressure air and hydraulic systems. If this cannot be done in the space or time available, then I would limit a submarine having brazed joints in its salt water system to 700 feet, or else make the changes necessary to accommodate welded systems.

(b) The question of whether applicable specifications are being complied with by the yard should be looked into. It is possible that the specifications have been waived from time to time. In the future waivers to specifications should be granted only by the Bureau of Ships.

(c) Standards comparable to those I have instituted for the reactor plants in welding, radiography, non-destructive testing and quality control, should be used for all systems and structures involving ship's safety, and training programs for welders and radiography personnel instituted to accomplish this. These personnel must meet prescribed standards with respect to competence and qualifications.

(3) The operating forces should be requested to reassess the need for deep operating depth. Account should be taken by them of the increased danger as the depth is increased. It is possible that insufficient consideration to increased hazards and reduced margins under casualty conditions has been given when decisions were made to increase the operating depth of our submarines.

This, sir, completes my formal testimony.

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(b) (6) relieved (b) (6) as reporter at this point.

EXAMINATION BY THE COURT

Questions by a court member, CAPT Osborn:

Q. Admiral Rickover, you have discussed the design of ships. Would you discuss in a little bit more detail how you think they should be designed and what precautions should be taken with certain systems before they are put into ships?

A. The difficulty in answering your questions is that every word I say here is under oath and is part of the record, and I am very much familiar with the Oppenheimer case, where they argued for days as to whether they could understand one word. It isn't a case that I don't want to answer the questions, and of course, I will, but I must make it clear that I have to be given some assurance, before it is made part of the official record, if I am to talk this way, that what I say is understood. I have read my prepared testimony, but I can talk casually now, and the record may be inexact and can be misinterpreted or interpreted in different ways.

PRESIDENT: The court has competent court stenographers and can assure you that nothing will be recorded that you do not say.

THE WITNESS: I don't mean that, sir. I wasn't implying that it wouldn't be recorded exactly as it was said, but when you get into a complex position such as this, you can make statements which will later on be misinterpreted. I don't mean the record will be inaccurate. If I am to answer your questions, I should be allowed to prepare an answer. Of course, I realize the seriousness of what additional questions, based on my testimony, may lead to.

PRESIDENT: If you don't feel you are prepared to answer the questions, then --

THE WITNESS: I am prepared to answer any question within my competence, sir.

PRESIDENT: Are you asking that an exception be made to the rules of recording the testimony?

THE WITNESS: I am not familiar with the precedure of courts of inquiry. Is it possible for a witness to review his testimony?

COUNSEL FOR THE COURT: Yes, but solely for the purpose of making sure that what is recorded is what was said.

THE WITNESS: I see. If I use certain expressions, that's it.

COUNSEL FOR THE COURT: A witness can be recalled to correct his testimony in open court.

PRESIDENT: You may be recalled to modify anything which you wish to modify.

THE WITNESS: Then may I have this opportunity to look at the record of any questions which I am not prepared to answer, and then let me go back in court and correct it?

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PRESIDENT: Yes, that will be quite all right.

THE WITNESS: I am not refusing to answer questions, but this is pretty serious business. I want to make sure I am recorded properly.

PRESIDENT: We will be certain that you are recorded properly and will get an opportunity to review what has been recorded. We will then entertain any modifying statement you may wish to make either in open or closed court.

THE WITNESS: I have to be certain that the evidence I give is recorded properly. All right, will you read that question?

(The reporter read the pending question.)

A. I can only answer your question by talking about my own experience in the design of reactor plants, because I am not responsible for the design of hulls and the non-reactor plant piping systems.

In the case of the design of the reactor plant, we get an idea; we work it up with competent scientific and engineering design people; it is then checked by the people in my own office; we then start building the developmental piece of equipment. We constantly re-analyze it as it is being built. We make mock-ups of it. We then actually try it out ashore before we place it in the ship. All of our plants are thoroughly mocked-up. I mentioned earlier that in the case of these new submarines, even the piping, even the type of weld on each pipe is indicated. We make sure by inspections conducted by my own people that it is accessible and that it can be properly welded. We found previously that many welds were difficult to get at, and in some instances, as a consequence, were not completely made. This is a very brief and general answer, and it could be elaborated upon to a great extent.

I might add here that, of course, we take great care in the selection and training of our people. We feel that the safety and quality of a ship depends on the design, its fabrication and its operation. That means that the people have to be trained properly. We actually train the people in the operation of our power plants before they get on a ship. I think the court is familiar with this fact, and this was covered more extensively in the documents I referred to earlier.

Also we adopted the system on all new ships of having the officers and crew report to the ship quite a few months before she was placed into commission, so that they could act as inspectors. They could act as inspectors for the testing of the various systems in the ship which they would take to sea. This was done for two reasons: (1) it would be absolutely impossible, in my opinion; to get a Yard to have the kind of people who could do the testing which we required. Furthermore, it was highly desirable to give this training with the plant to the very people who would have to operate this ship at sea.

I would add one thing: I instituted what we call a "fast cruise" or a "dry run." People refer to this in different ways. This was a case where, just prior to the ship's being declared ready to go to sea, we lock up the ship, and the crew runs it for approximately four days. During this time, any "bugs" which might develop - and we run the plant b(3) 10 USC 130 - are brought out and corrected. If they are not corrected, we don't go to sea.

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I do still another thing: Prior to a ship going critical - that is, the reactor becoming operable - a team of my people spends about two days interrogating every member of the engineering force to see that they know their job. If not, we don't let them bring the reactor critical. We had an example recently where our people found such a crew who were not up to our standards. We delayed bringing the reactor critical, and gave them time to learn more about it; and then we went back and examined them again. We will not let them go critical until we at Headquarters are satisfied they know their stuff and know how to handle the ship safely. I am sure that Admiral Daspit and Captain Osborn, and Captain Roseborough and Captain Kern are quite familiar with that procedure.

Q. (By a court member, CAPT Osborn) This is a rather technical question, and it may have a very vital effect on the actions taken in the case of THRESHER. You may have to run some tests on it to make a determination, but it has a very important bearing on this case. The automatic securing of the ASW system is almost a mandatory requirement in a ship of this type, particularly at deep depths. Can you give me an idea how long you could run the vital reactor systems, particularly the reactor fresh water system, with the sea water valves secured and coming up to temperature limits?

A. I think -- I am guessing now, because I am just using some very rough knowledge. You might run b(3) or so on the latent heat in the plant. Well, if the pumps were on slow, that means you could run b(3) You could run for a sufficient length of time certainly to get the ship to the surface. I think what you are getting at is the desirability of closing off all your sea valves. That is an operating problem, and I can't get into that. I don't know whether there are identical rules in all submarines for handling that type casualty, but that is an operating proposition. I think that some people do it in one way, and some in another. Have I answered your question?

Q. Well, I think we would have to have some specific tests to follow.

A. Well, I can make a note to furnish the court with more specific information in this regard.

Q. (By the president) The court would appreciate that. This is an area of very great importance and concern.

A. I recognize this, and I have thought about this, but I believe I have satisfied you that you can operate the plant for some period of time even though it is shut down; that is, there is enough latent heat in the system to run for a period of time. I mentioned before that I was going to look into faster scram recovery, and I will include this in my report, and I will give you such a report at an early date. We do have some information here. Let me read what I have now. I have some information which, with the court's permission, I will read into the record. The title of this is, "Loss of cooling water to Reactor Compartment Components." "Loss of cooling water to reactor plant components is only limiting in the case of rod drive motors and main coolant pumps. The occasion of loss of fresh water cooling would be more limiting than loss of salt water to the fresh water heat exchanger. In the case of loss of fresh water cooling, the Bettis Atomic Power Laboratory estimates that rod motors can be engaged for periods up to b(3) 10 USC 130 Running under those conditions would reduce the life but would not result in damage. Main coolant pumps have been tested and found to be operable following the loss of cooling b(3) 10 USC 130 Is this sufficient for the record?

PRESIDENT: That is most helpful.

Q. (By court member, CAPT Osborn) Yes, sir, this is the kind of idea I am interested in with respect to limitations on running the reactor system.

A. We have already got this under way. Does this satisfy the court?

PRESIDENT: It isn't a complete satisfaction of the court's curiosity and need to know in this area, but I would suggest that, if you can develop further detailed information in this area for us, perhaps you could send it to Captain Hinchey.

Questions by a court member, RADM DASPIT:

Q. The concern I have, Admiral Rickover, is an apparent reluctance to immediately secure the salt water hull valves and then look for the pipe that is broken and isolate that particular system, because if they do that, they are afraid they will lose the reactor. Instead, it may be that they are trying to isolate the particular leak, and the question is, isn't the best procedure to immediately secure salt water valves and then attempt to locate the leak?

A. You are really getting into an operating question, and I believe that the methods followed vary with different ships. I suppose a natural reaction for a man if he sees a large leak, particularly if there's a sheet of water coming in fast, his natural reaction would be to close valves. Again, the members of this court - most of the members of this court have had experience, considerable experience, on submarines, as have I, and I think you understand that if you are at great depths and a sheet of water is coming in at you, it is a difficult thing to decide. In the case of the BARBEL-- In the case of the THRESHER, when I was on her trials, a man was standing by when something happened, and in the BARBEL particularly, he was standing right there and was able to close a valve. Had a man not been adjacent to that area in the BARBEL, the ship could have been lost. This is a dilemma the operating people are facing. It requires a lot of cool nerve. I don't know whether you can tell what to do under these circumstances, but obviously if you could, it would be better to keep the propulsion plant on the line, particularly with THRESHER class ships, where they do not have adequate blowing capacity. The only chance you have, if you are down low and something like this happens, is to drive her up.

Q. This is the point I am trying to make, Admiral Rickover--

A. Just one moment. I am not finished. The worst thing you can do is to b(3) 10 USC 130 You probably can get by shutting off other things, but if you b(3) 10 USC 130 it limits your ability to drive yourself up. With the THRESHER class and its inadequate blowing capacity, you'd have to drive her up. I don't know the exact effect this driving has, but I think you can get this from the Bureau. It is quite an important factor.

Q. (By the president) We have had a number of studies made in this field, and we are having more made.

A. I see. In addition, that means also, if you do not close the b(3) 10 USC 130 and assuming that nothing has gone wrong, you must design the b(3) 10 USC 130 so that they are adequate. The b(3) 10 USC 13 on the THRESHER and on the POLLACK are only b(3) 10 USC 130 I recognized this, and reported it to the Bureau of Ships, and the other ships in that class have had their b(3) 10 USC 130 I think the board is aware of this. Have I answered your question?

Q. (By court member, CAPT OSBORN) Well, one of the things I wanted to look

at from a standpoint of standard operating procedures was that I think it is fairly obvious that if we had a main circulating water line carry away, it would be a miracle if we could save the ship, but I do think in terms of leak isolation, it is almost impossible to design the valve to shut off, and our normal reaction would be to shut down the ASW system, but I wanted to get an order of magnitude with respect to how long the system could run in this condition.

A. I have given you this information. In the NARWHAL design we will have b(1) which helps in this connection.

Q. Now, there is one other question I would like to ask you which we have been devoting a considerable amount of thought to, and that is in going to a deep condition - and you may have to make a study in this particular area - do you think it would be better in the case of the fast attack submarines to run your main coolant pumps in fast b(3) 10 USC 130 available to you with respect to speed, as contrasted with slow, when you have b(3) 10 USC 130 available to you in terms of speed?

A. My own inclination would be to run fast because of the momentum I have which I can use to get to the surface. This is why I have no fear when I run these trials at full power at 400 feet, because you can easily-- even if you have something happen, you are not deep enough that you cannot do something quickly. I would personally rather run faster. Outside of full power trials, in my opinion, fast speeds give you assurance. Of course, this is an operating question, depending upon conditions. You might hit a layer, for instance, and if you have high speed, you can easily overcome that.

Q. In answer to the question, you assume that the ship was at high speed, but in going to test depth, your biggest safety factor is speed. Would your answer be the same if you were at relatively slow speeds?

A. You mean to run the pumps fast?

Q. Yes, sir.

A. Running the pumps at slow speed, you get about b(3) 10 USC 1 ship speed anyway, so that with b(3) 10 USC 1 speed, going to high pump speed is not going to enhance your chances very much. Of course, there are areas of judgment involved here.

Q. (By the president) But you're only getting a small amount of increased speed with the pumps in fast; whereas with your pumps in fast you are using a much higher rate of electrical demand from the bus bars and a small leak casualty might cause your sinking.

A. Well, I will add this: At slow speed the pumps get their power from the most reliable power source, and you get enough speed so that you can use them.

Q. (By a court member, CAPT OSBORN) My particular opinion, Admiral, is the reliability of the b(3) 10 USC 130 and the real basic point of consideration I have asked about concerning the ASW system and the pumps is that the operation of these particular systems is intimately associated with the design and design assumptions and cannot, under any stretch of the word, be separated from them.

A. That is correct.

Questions by a court member, RADM DASPIT:

Q. Admiral, in yourearlier classified testimony you gave several instances and talked about a memorandum you had written to the Bureau of Ships, and you talked about a ship with 36 joints, of which a number had less than 40 percent bond, and so forth. I think it would help us to follow these things through if you can supply us with the specific case.

A. I will submit that at a later date.

Q. All the way through your testimony you talked about something and did not identify the ships or the dates. If you supplied us with this information, we can follow this up.

A. Let me make sure I understand which ones you refer to. I mentioned instances at several places in my testimony. I wish you would indicate which of those instances you have reference to. Is that the one where we found recently the instance of 36 joints?-- I can tell you this right now. That is the SNOOK at Mare Island.

Q. (By the president) That is the one on which seven joints had less than 40 percent bond out of 36?

A. Yes. I have no memorandum on that, but I've said it, and I stand by that.

Q. (By court member, RADM DASPIT) Perhaps we can take your statement later and indicate the areas in which we are interested.

A. On that particular one I have no further information than I have given you.

Q. Such things as when did you set up your own inspection systems . . .

A. I indicated that--

Q. And your memorandum to the Chief of the Bureau of Ships.

A. Wait a minute. One at a time, and I will make a note of them. Now, I told you I have this information. With respect to the first question you asked, I have no documents here, but the court can verify this information itself. I mentioned the name of the ship and where it was located. That is up to the court to verify. You have means to get this information. The second one you asked about was the TINOSA. I made statements about what was found on a few of the radiographs on the TINOSA.

Q. We would like to know the date of that, sir.

A. Yes, I will furnish you with a copy of that memorandum. The next one you asked about was where I had notified the Chief of the Bureau of Ships about this condition. I will furnish you with a copy of that memorandum.

Q. The last one I have is the date on which you found it necessary to set up your own inspection system.

A. We did many things besides establish an inspection system. We had an inspection system of our own from the very beginning, but not as extensively as we later found necessary, because, as I indicated in my testimony, when I started out, I had no idea about this general situation. As I found out, I took steps to set up my own systems to correct them. I will give you some key dates as close as I can. I did mention one date in my testimony.

COURT MEMBER, CAPT OSBORN: I would like, if we could get a description of the operating conditions with respect to Admiral Rickover and Mr. Panoff with respect to the available talent they have in this area of analysis, rather than technical

reports being gathered up from various places, if they are going to give us any help.

PRESIDENT: Well, the court naturally seeks as much help as you can give us in this area of your specialty and competence. We have before the court as of now information which would lead us to believe that the last message which was transmitted by the THRESHER and which stated that he was having a minor difficulty, that he had a positive up angle, and that he was attempting to blow; that message was received at approximately 9:13 local time. We do know from SOSUS and other sources that the break-up of the ship occurred, or appeared to occur, at about 9:18; b(1) - that is, they b(1)

Now, this has been analyzed from a sinkage rate basis postulating various size openings, and the parameters of these postulated analyses would indicate that it could not have been a hole much larger than four inches and probably was smaller.

THE WITNESS: You mean, I gather, it did not need to be a hole larger than that?

PRESIDENT: Well, it could not have been, and possibly from the depth at which he reported his minor difficulty to collapse depth in the time interval involved, there had been somewhere in the vicinity of a four-inch opening - or unless it were a larger hole that was secured immediately. This does not prove anything, but it does give us a sort of . . .

THE WITNESS: Bench mark?

PRESIDENT: . . . bench mark to limit our area of concentrated effort. So that anything that you could do in your studies that would help to focus our effort on, we would appreciate your doing so.

THE WITNESS: I think if the court has more detailed records, I suggest that if the court considers it necessary, you could furnish them to me. I will have to send the information to you. I would be happy to send you whatever hypothesis I can come up with.

PRESIDENT: Of course, all of this is scattered in that stack of records.

THE WITNESS: Most of what you say has been in the newspapers in some form or other. I would be happy to tell you what I think. Of course, it would be very inexact and it is just guessing. I feel pretty sure, as does the court, that an inherent part of this casualty was some leak.

PRESIDENT: There was a decrease in positive buoyancy during the period 9:13 to 9:18.

THE WITNESS: Yes, and as all seafaring people, we would assume that water entered.

PRESIDENT: Yes.

THE WITNESS: Now, there are several things which could have done this. There was the case of the SCAMP, with which the court may be familiar, where a shaft cracked. It was fortunate that the shaft cracked outside the hull rather than inside, because had the shaft cracked inside the hull, it would have pulled out. I

would count that out here. I have heard that shortly before the THRESHER went to sea - and the court must know this - there was some over-pressurization of a tank below the evaporators. Now, that in itself is not as important as the fact that there was sil-brazed salt water lines above that which, at expansion, may have been distorted. With this sil-braze the thing just doesn't go right away, but it can let go some time. I don't know what was done about those lines. Has the court looked into this?

PRESIDENT: The court has looked into this.

THE WITNESS: I am not talking about the tank itself.

PRESIDENT: We are going to have a mock-up of the whole thing.

THE WITNESS: Then excuse me. I don't know what you have been considering here. Probably a leak occurred. The leak must have appeared fairly large, so I would guess that the officer of the watch told the man to go into slow speed on his reactor pumps knowing that he would now get electrical power from some other source. This, of course, supposes that all the electrical systems weren't grounded out. If they were all grounded out, nothing would suffice. Assuming they weren't grounded out and the pumps went to low speed, he would shut all his valves. And maybe that leak was so great at that time -- Maybe he didn't know exactly where the leak was. I mentioned earlier, in the case of the THRESHER, when I was on board, a fitting blew out, but a man was right there at the time. Another time one was on the SNOOK at 700 feet, and a 1 ½" line went. But a man was right there, and had he not seen the thing, the ship could have been lost. On the other hand, there is one interesting thing about the THRESHER: that they were able to send a signal out later, which meant that some part of the ship - I believe it was the Auxiliary Machinery Space - probably was intact at that time, so this would lead to the idea that the leak was aft of the Auxiliary Machinery Space. There is another thing I have been thinking about, and I am not an expert on this. What happens if you lose electrical power where you can blow your forward tanks but you can't blow your after tanks? Has the court considered this question?

PRESIDENT: We have looked into the blowing situation.

THE WITNESS: I am not talking about the adequacy of blowing. I am talking about preferential discrimination, where it is possible merely to blow the forward tanks, which, in the case of accident, would have been the worst thing you could do and would merely have aggravated the situation. Outside of that, I can only sit here and conjecture, but with far less information and detailed study than has been available to the court. I don't think that any submariner will come up with any new idea other than what you are going to come up with.

PRESIDENT: I think Captain Osborn's request that you be given a synthesis of this analysis was with the hope that you might better focus your efforts.

THE WITNESS: I understand that, and I assure you, sir, we will. We have done this for several days now, and as I indicated before, as soon as we can, we will notify the proper operating forces and, if the court is still convening, we will notify the court also.

PRESIDENT: We would appreciate any help you can give us in this direction. The court appreciates your analysis and your background information. It appreciates also the suggestions which you have made, many of which have occurred to us already, and we do hope that this session together has increased your ability to help the court further in the reactor area. If there is anything further, Admiral Rickover, that you would like to say before you leave the stand, we would entertain any suggestions you may have.

THE WITNESS: I do have some further observations. As the court probably knows, I have been out on all first trials of all nuclear powered ships except two, when I was in the hospital, and some things have occurrred to me. I will try to relate them to the THRESHER as closely as possible. Prior to the THRESHER's trials in April, 1961, in connection with some casualty studies I had run with a new reactor plant design, I became aware that the blow capacity of THRESHER was small. I pointed this out to the officer in charge of the Bureau of Ships Submarine Type Desk at that time. During the THRESHER's trials I also pointed this out to the Navy Yard, to the Bureau of Ships, the Board of Inspection and Survey, and COMSUBLANT representatives who were on board. I think this is a point which should go in the record.

Another incident in connection with the THRESHER was about two weeks before the THRESHER's first sea trials. As I was to be in charge of these trials, I asked my people to look into the measurements and tests and proposed method of conducting this first dive to b(1) I found little thought had been given to the details of how this dive was to be conducted. Outside of measurements to be obtained by the usual Model Basin hull instruments, little else was to be done.

I arrived at Portsmouth the evening before the trials. I met with the following: The Deputy Chief of the Bureau of Ships, the head of the Bureau of Ships Submarine Type Desk, the Shipyard Commander, the Shipyard Planning Officer, the Shipyard Design Superintendent, the Commanding Officer of THRESHER, and others. I requested them, on a crash basis, to detail in writing the whole sequence to insure safety during the dive. Of course, all this was done during the night. The plan, as finally evolved, which I approved, provided for a slow, deliberate descent at given stages; at each stage there was to be cycling of all sea valves, flapper valves, and other items affected by pressure. At each valve station a man was present to observe and to act, if necessary. I did this to assure that, as the ship went deeper, our damage control devices were instantly operable. I also did this because of my concern at the lack of blowing margin. Also I considered all this would be necessary since this was the first time one of our submarines was to go to so great a depth, and particularly because of the large number of new development items, including sea valves and rubber piping.

The lack of planning for this dive was indicative to me of what I considered the casual way in which the Navy was going to those great depths. An indication of this casualness can be obtained by reading the minutes of the meeting held by the Ship's Characteristics Board and the Bureau of Ships in early 1959, at which the THRESHER's depth was discussed.

I did the best I could to bring the HY-80 situation to the highest level in the Navy. I took the matter up with the Chief of the Bureau of Ships and the Chief of Naval Operations early in 1959. Later that year, when cracks were discovered in the THEODORE ROOSEVELT at Mare Island, I again took it up with the Chief of Naval Operations. Submarine captains recommended to COMSUBLANT that more extensive use of welding be made instead of sil-braze. In one case a captain recommended full welding of all sea water lines on b(1) submarines. Despite this, the endorsement that came out of COMSUBLANT merely recommended that an economic

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assessment of this be made. Now, insofar as b(1) submarines, I did not object to having one ship do this and try it out. I did object to predicating a large number of ships until the THESHER design had been fully proved at sea. I went to the Chief of Naval Operations, who appointed the President of the Board of Inspection and Survey to conduct a study. He recommended to the Chief of Naval Operations that the Navy proceed as planned.

These are some observations that I had. Perhaps you want to ask me questions about these additional observations.

PRESIDENT: Do you have any other observations, Admiral?

THE WITNESS: I probably have some, but I think it appears to me, with the great deal of testimony this court has heard, that you might have more questions. I find it rather difficult to understand the lack of questions by this court.

PRESIDENT: This court is going to need to ask you more questions when we have gotten further into this part of the investigation, Admiral, and I warned you of that, and I think that accounts for the paucity of questions at this time. You have given us a full weight of your views on every pertinent area of consideration by this court, and I am sure that --

THE WITNESS: I will conclude by saying that at this time I have no more to say, since I am not familiar with the deliberations of the Court and what other subjects you may consider. I would appreciate, however, that if there are to be additional questions, they be propounded as soon as possible. It would help me a great deal in my planning. Of course, I have plans, and the Court cannot meet at my convenience, but I would appreciate it.

PRESIDENT: The court will certainly try not in inconvenience you.

THE WITNESS: It is not a case of inconvenience; just plans that have been made.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired to examine this witness further.

The president informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court recessed at 1320 hours, 29 April 1963.

Unclassified

The court opened at 1440 hours, 29 April 1963.

All persons connected with the court who were present when the court recessed were again present in court except (b) (6), who was relieved as reporter at this point by (b) (6).

Grant S. Jensen, (b) (6) was called as a witness for the court, was informed of the subject matter of the inquiry, advised of his rights against self-incrimination, was duly sworn, and examined as follows:

The witness was informed that the court was sitting with closed doors and that classified information could be divulged.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address, and present occupation?
A. Grant S. Jensen, (b) (6) Present occupation is Supervisory Naval Architect, Branch Head of the Foundation, Fittings and Hull Equipment Branch, Design Division, Planning Department, Portsmouth Naval Shipyard.

Q. What is your background and experience, Mr. Jensen?
A. I have a Bachelor of Science Degree in Mechanical Engineering, 1941, from Northeastern University. I attended Massachusetts Institute of Technology for four months, being converted to a Marine Engineer and Naval Architect. This was an Engineering Science Management Defense Training Course prior to World War II. I have worked in the Shipyard since 1942, except for time spent in the Navy. I have been in hull structures primarily since that time.

Q. Mr. Jensen, I understand that the Portsmouth Naval Shipyard has prepared a quarter scale mock-up of THRESHER's reserve feed water tank prop and the equipment which used the top as its foundation; is that correct?
A. That's right, sir.

Q. Would you go to the mock-up and explain for the information of the court the construction and lay-out of the various components?
A. This is a tank top of the reserve feed water tank. It probably could be seen better on this sketch for the location on the ship (the witness produced a diagram which was hung in the courtroom). This is located just after b(3) 10 USC 130 which is the forward bulkhead in the engine room compartment. It runs aft to b(3) 10 USC There's a divided tank with a bulkhead slightly to port of center line with a step -- this is the boundary of the tank as such. The tank top is three-eighths high tensile steel plate, the stanchions, solid round 1 3/8" diameter, going down to the ship's frame or shell. This is the exterior plating of the pressure hull. This model has the 8,000 gallons per day still showing some of the associated piping. b(3) 10 USC 130

Q. Would you please orient your words, like forward, aft, port, starboard, so it will go into the record that way.

A. The center line of the ship is in about this area. This is twenty-five inches off center line of the ship, which is in the vicinity of the bulkhead. This is the frame of bulkhead b(3) which is the compartment bulkhead at the b(3) 1(end of the engine room. This is the b(3) 1(side of the ship (pointing to the back of the model) over in this area, and then the transition cone reduces that area of the hull in this area here. The vertical bulkhead at the end of the tank is at this edge here, Frame b(3). As this tank top deflected under internal pressure, it moved, as near as we can determine, about one inch. You see this still moves as this lever is depressed. There are flex piping connections at the sea water side at the after outboard side of the still. These are a three-leg configuration. There are snubbers or buffers, at the top of this equipment which are tied to the under side of the next level, which is actually, primarily, the lithium bromide foundation; and these are normal clearances around these snubbers. As this tank top deflected, this still moved primarily aft and up so that the half inch clearance in the snubber had disappreared. The actual motion of the still was something less than the tank top motion and, from measuring the heights of the (b)(1) it appeared that this (b)(1) about one-quarter of an inch and this about three-sixteenths. Since these are higher (b)(1) with a high or low capability --

Q. Where did you get the information concerning the measurement changes?

A. I measured them myself -- except that we do not have an actual height of the (b)(1) . But the normal loading of these (b)(1) should be about two and seven-eighths inches, and was reduced to maybe about two and five-eighths on this one. After the tank was repaired, these members came back on center and the height came back to approximately two and seven-eighths inch height. I have a sample of a smaller (b)(1) here if anyone is interested. It's an (b)(1) (b)(1) (b)(1) , which has a (b)(1) . You can see they're quite (b)(1) . This happens to be a (b)(1) . The (b)(1) is slightly physically larger but the type of motion is similar. Anything I skipped or any questions?

Q. Was the drain pump located on this tank top and was the auxiliary salt water piping also on the tank top?

A. The drain pump is mounted approximately in this location.

Q. Would that be aft or forward?

A. That would be forward of the still (the witness indicated approximately b(3) 10 USC. The piping from this is through flex legs again, outboard and aft along the edge. Actually, this is out of my category. I am concerned with foundations primarily.

Q. And the auxiliary salt water area was on the tank top, was it?

A. As I say, someone else can explain this better than I can.

Q. Just the location?

A. They were off the tank top.

Q. The ASW piping also was in that location?

A. I don't know.

COUNSEL FOR THE COURT: The purpose of this witness was just to orient the court at this time; I have no further questions.

EXAMINATION BY THE COURT

Questions by a court member, CAPT Osborn:

Q. On your realignment of the foundations, Mr. Jensen, was the pulling of the deck back in position, which I understand was an internal movement, did you have to put any force on the still itself?
A. No, sir.

Q. All of the realignment then was really a realignment of the reserve feed water tank prop?
A. That is right.

Q. And all the forces put in position to realign it were from the internal side of the tank?
A. From within the tank, right. Again the shipfitters were more involved in this than I was.

Questions by a member, RADM Daspit:

Q. Mr. Jensen, there are some red marks up on the plan. Does this indicate where the damage occurred internally in the tank and are you prepared to talk on this damage?
A. That is the sketch that indicates the damaged areas.

Q. Are you prepared to describe this damage in detail?
A. Well, I am primarily involved in the foundation of the still.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly warned concerning his testimony and withdrew from the courtroom.

Leon H. Valley, (b) (6) was called as a witness for the court, was informed of the subject matter of the inquiry, advised of his rights against self-incrimination, was duly sworn and examined as follows:

The witness was informed that the court was sitting with closed doors and that classified information could be divulged.

DIRECT EXAMINATION

Q. State your name, address and present occupation?
A. I am Leon H. Valley; I live at (b) (6) I am presently the Structural Group Planning Supervisor.

Q. Can you describe briefly the duties of the Structural Group Planning Supervisor and state whether that is at the Portsmouth Naval Shipyard.

A. This is at the Portsmouth Naval Shipyard and I am the Head Supervisor in the Structural Group Planning Office, which comprises Shops 11, 26, 17 and 23.

Q. What is your background and experience in this field?

A. I have been in the shipfitting trade for twenty-three years. I have attained a Chief Quarterman Shipfitter's level; and I served as hull superintendent on the THRESHER for about nine months.

Q. When did you change over from your hull superintendent duties to your present duties?

A. It was effective 18 March.

Q. Of this year?

A. Of this year, '63; yes, sir.

Q. Directing your attention to the 8th of March of this year, can you describe structural difficulties encountered during the post shakedown availability of THRESHER with respect to the reserve feed tank capacity?

A. Yes, sir, I can. This is identified as reserve feed tank No. 2. I was notified moments after the commencement of the second shift on Friday, 8 March, that a casualty had occurred in the reserve feed water tank No. 2. I was also notified that the tank top had ruptured. The extent of the other damage was not known at this time.

Q. What time of the day was that?

A. This was approximately 1630 -- 1615 to 1630, as I remember.

Q. Tell us what happened next?

A. Well, I was assigned cognizance of repair of whatever structural damage had occurred by the casualty; and, consequently, I went down and observed the area with a Quarterman Shipfitter, a Mr. Bogrett from Shop 11. In observing the area, using a flashlight and foxtail and a few scrapers, I was able to see where the tank had ruptured. At that particular time it was most difficult to ascertain whether the tank top itself had bulged in any way, shape or manner, or what degree of deflection existed; you just couldn't see.

Q. What did you do?

A. Well, from that moment on I went back to the office, after determining that the thing actually had ruptured as they indicated, and I called for structural and design help. I called a Mr. Marcotte of Structural Design, and a Mr. Jensen of Foundations and Structures, and waited for their arrival. When they did arrive, we went back to the scene of the casualty in the lower level engine room of THRESHER and discussed possibilities of correction. It was decided at that time that the only way to ascertain the degree of damage was to open the tank, pump it dry, and get in the tank physically and find out what happened. which I directed to be done. At the same time we did observe that the 8,000 gallon per day still had moved slightly. To what degree we were not able to determine specifically at that time. I could see, approximately, from observing the buffer at the top, which is not indicated on that mock-up incidentally, that it appeared to be at about two hundred and twenty-five degrees bearing -- two hundred to two hundred and twenty-five degrees, and it had moved approximately a half an inch in that direction.

Q. Did you notice the auxiliary sea water piping off the tank top at that time?

A. I looked at the tank top with a flashlight, not necessarily to determine specifically the piping you are talking about. I did look to see if anything was hitting on the tank top.

Q. Hitting on the tank top?

A. To see if the tank top had actually come up and was hitting on any particular piece of equipment, piping, etcetera; yes, I did.

Q. What did you find?

A. I found nothing that it was hitting.

Q. What did you do after that?

A. Well, Mr. Jensen and I went all the way around this as well as we could crawl, measuring the deflection on the mounts of this particular piece of equipment, and also observed the buffer foundation at the time. It was decided at that time that the only thing we could do would be to get in the tank -- and this took some time -- and ascertain the remaining damage and go from there. So Mr. Jensen and Mr. Marcotte, I believe, at that time, left and I told them while they were leaving that as soon as we had reached a particular area for discussion I would call them back.

Q. Proceed with your account.

A. Some time elapsed before we got the tank opened and dry.

Q. When you did get it open and dry, what did you do?

A. Well, we entered the tank. We observed all the bulkheads inboard and aft, specifically bulkhead b(3) and the longitudinal bulkhead that separates reserve feed water tank #3 from #2. There was no apparent -- we even put a straight edge on this -- there was no apparent deflection on the bulkheads either inboard or aft. There were pull aways, some of the struts -- or I guess you'd call them stanchions -- were broken away; some were broken away from the basic structure, the face plate of a pressure hull frame, and one from a pad on the pressure hull itself.

Q. Do you have a diagram in your possession which can be used to explain specifically the damage that you saw at that time?

A. Yes, sir, I do. I have this marked-up plan.

A diagram illustrating the damage to reserve feed water tank 2 was submitted to the party and to the court and was offered in evidence by counsel for the court for the purpose of having the witness explain the damage. There being no objection, it was received in evidence as Exhibit 100. (Exhibit 100 was hung in the courtroom to permit the witness to point out areas of reference concerning which he was about to testify.)

Q. Proceed. Do you want to show us on the board what you found?

A. Yes, sir. This is the approximate area of rupture on the tank top and as later proven by a b(3) 10 U pound strength test of air, this was the only rupture found in the tank. It was about thirteen inches long, including the radius effect on the forward side. This was between frames b(3) 10 USC 1 at the toe of the weld just outboard of the air conditioning pump foundation, the support leg which runs to the pressure hull and is attached to it. Now the remaining damage that I will bring to the attention of the court is the collective memory of all of us who were in the tank. It may not be exactly what happened, but it's the best that we can remember of what happened.

Q. Account for who was in the tank at this time?

A. Well, I've accounted for a quarterman shipfitter, Mr. Bogrett; myself, two welders who did this welding, a Mr. Gahan and a Mr. Lemieux. This is the collective memory of what we actually did in the tank from those four people. Frame b(3) 1 there was a break from the pressure hull doubler pad on this one stanchion --

Q. Would you check the reference you gave to an air conditioning pump foundation and see if it wasn't a drain pump foundation?

A. It could have been; I'm sorry. If I'm wrong I will have it corrected. It would be a drain pump foundation. I'm sorry. Outboard of this stanchion here identified as the third one outboard of the center line of the ship. This was the stanchion rod. These were solid steel rods. This was broken away from the doubler pad, on the deck. That was the only damage we observed on Frame b(3) 1 On Frame b(3) there were two breaks at the tank top identified as the first rod outboard of the divisional bulkhead. The second rod to the deck-pad or doubler pad outboard of the divisional bulkhead, and there was a slight crack on this beam just above the toe of the HY-80 attachment to the hull, right in that area. On Frame b(3) the actual damage involved here is shown on the first rod outboard and the second rod outboard, which were both on the face plate of an HY-80 primary pressure hull frame. I would like to return to this frame after I give you the damage on this one. This section of Frame b(3) 1 there were three principal areas of damage and they are noted as 1, 2 and 3 stanchions running outboard. They were all on the light tank structure deck beams. There were other areas that had to be repaired, as a result of correcting this casualty, and they are identified as being about six inches outboard of the divisional bulkhead on both Frames b(3) 10 USC 1. This was the extent of the damage as best we can remember it.

Q. Can you tell us exactly what steps were taken thereafter in connection with the repairs to the damage?

A. Yes, sir. We took immediate corrective action. We started to clean the damaged areas by chipping and grinding. It was my opinion and the opinion of the quarterman shipfitter that this could be pulled back into position.

Q. How much of a distance had it moved; how much distance in all had it moved?

A. You mean the actual vertical deflection?

Q. Yes.

A. Well, I must guess at this from memory. I estimated it to be between an inch and an inch and a quarter at the most. Others have guessed it to be a little bit more, an inch and three-eighths or an inch and a half.

Q. Did you notice any lateral movement?

A. In the tank itself, no.

Q. All right, proceed.

A. So from that time on we spent cleaning the tank and preparing the attached pulling devices at Frames b(3) 10 USC 13 which we thought would pull this back into position, locating strategically inboard of that stanchion on b(3) and outbound of that one of b(3) the same on b(3) We attempted to do this with turnbuckles. They were not sufficiently strong to overcome the resistance of the bow in these beams. The quarterman shipfitter developed a jacking device, a series of them, four in number, and we applied these in the area where strong backs had been placed and used four fifty-ton jacks, one on each jacking assembly. When we pulled this down we actually fractured the beam. The points of greatest resistance in this tank were apparently centered at that point there, one on b(3) and one on b(3) 1 We fractured the lower flange of that beam. When we did, the whole tank top came down. At the time that this moved, I was standing on the ladder with my finger on the buffer foundation at the top and the still moved right over. back into position. I didn't have it, my finger, in the direction that the still would move. Once we got this back into position and there were only several areas that remained that didn't come down hard, there was perhaps some quarter or an inch from whatever was deflected, I called Mr. Marcotte back and also Mr. Jensen. They both came in and they observed the corrective action taken and agreed and concurred with what we had done, and they advised us from that point on.

Q. Did you make reports to anyone else besides those two?

A. Well, I'd like to make one point before I go any farther. I also attempted, on Friday evening, to call Mr. John Hale, Jr. I think he is Assistant Chief of Marine and Mechanical Engineering. I couldn't get him. The operator tried many times and finally told me the phone was out of order. I asked Mr. Jensen if he would talk to him as soon as he saw him the following day. He informed me that he did and informed him that he had noted this problem. There were other people I answered to. My supervisor was Lieutenant Biederman, the Senior Ship Superintendent. I also discussed all of these problems with him. At the conclusion of pulling this tank top back down we got the go ahead that it was all right. Minor corrective actions taken relative to putting possibly heavier pads in where we might have had a gap of a quarter or an inch or three-sixteenths, whatever it happened to be, these were concurred with by Mr. Marcotte of Design; and then we set the welders free and welded these areas up, which they did.

Q. Did you receive any advice from the Production Department as to repairs to be made?

A. Advice?

Q. Yes.

A. Yes, sir. Production Department or Planning Department?

Q. Production?

A. No, sir.

Q. From the Planning Department?

A. Yes, sir.

Q. Please tell us about this?

A. This is the advice I received and which was also concurred in by them; this was all oral, it was not written.

Q. You didn't go to the Production Department first and have them go to Design?

A. No, sir.

Q. When were the repairs completed?

A. The actual repairs versus getting the tank back into operating condition were completed on the 11th of March, a Monday.

Q. Were any requests made to the Design Department for assistance in conducting subsequent tests?

A. I requested assistance in determining what we would have to have or what would be required, whether we would apply b(3) 10 U of air, b(3) 10 U pounds of air, or b(3) 10 U pounds. I got a decision that they would require the tank strength tested again at b(3) 10 U pounds of air.

Q. Were there any tests included with regard to the piping adjacent to the tank area?

A. Was I advised of this? No, sir.

Q. Did you make any such requests?
A. No, sir.

Q. Do you recall the manner in which the repair was authorized so far as the structural work itself was concerned?
A. Actual authorization, I felt that I had the authority and I authorized it.

Q. Will you describe the tests that were made after the repairs were completed?
A. The actual test involved was a b(3) 10 U pound air test and this was conducted -- they put b(3) 10 U pounds of air into the tank. The entire tank top had been cleaned prior to this to make certain that we had no more fractures or no more breaks in the tank top, and the entire tank top was soaped while filled with b(3) 10 U pounds of air.

Q. Who were the tank people who conducted this?
A. I believe the test man on the job at that time was a Mr. Tanguay of Shop 11.

Q. Do you recall anyone inspecting any of the piping, both inside and adjacent to the reserve feed tank after the casualty?
A. Yes, Mr. Jensen and I discussed possibilities of deflection on the still piping, yes.

Q. But not any of the other piping at all?
A. No, although I did make an observation that I thought the piping on the tank top looked all right.

Q. Were the pipefitters responsible for the pipefitting in the way of the tank top notified of the casualty or present when you were reviewing the casualty?
A. Yes. I think a Mr. (b) (6) of the Pipe Shop was in the vicinity, a Mr. West of the Pipe Shop was in the vicinity, and a Mr. Joseph Smith was in the vicinity. Later on I observed a Mr. Poor --

Q. How do you spell that?
A. Poor, P-O-O-R, (outfitting groupmaster) in the area. A Mr. Charles Perry, also of the Pipe Shop, was in the area. And I also discussed this problem of the tank and the overpressurizing with all these people.

Q. Did any of them mention the associated piping in their discussions with you?
A. No, sir.

Q. The repairs were completed about the 11th of March; is that right?
A. Yes, sir.

Q. At what time of day, do you recall?
A. I can't remember, truthfully. It was sometime on the 11th. It could have been the end of the day shift or the beginning of the second shift; I really can't remember.

Q. Was there any sense of urgency connected with the conduct of the repairs; was there any pressure?
A. No, sir. We worked from Friday afternoon, when the casualty happened to Sunday morning at about 0530 before we actually got any corrective action on the tank top. We had people working in the tank and people working in the shop. We were allowed towork overtime on it.

Q. What non-destructive tests were conducted to determine whether cracks in the structure were present due to the casualty?

A. Well where HY-80 welding was involved, we required -- not only HY-80 welding but any welding -- we required a 303 inspection, which was taken. They inspected the actual welds on the high tensile steel structure and the welds on the HY-80 attached to the repair areas.

Q. But before the repairs were conducted?

A. They also MT'd these areas.

Q. Can you describe to the court the location of the auxiliary salt water piping with relation to the top of the feed tank?

A. No, sir, I can't.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly warned concerning his testimony and withdrew from the courtroom after stating that his testimony was not classified.

Cornelius J. Collins (b) (6) was called as a witness for the court, was informed of the subject matter of the inquiry, advised of his rights against self-incrimination, was duly sworn, and examined as follows?

The witness was informed that the court was sitting with closed doors and that classified information could be divulged.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address and present occupation?
A. Cornelius Collins (b) (6) Quarterman Pipefitter.

Q. You are employed at the Portsmouth Naval Shipyard?
A. Yes.

Q. Is your full name Cornelius J. Collins?
A. Cornelius J. Collins.

Q. What are your duties at the Portsmouth Naval Shipyard?
A. Quarterman Pipefitter.

Q. And with reference to THRESHER?
A. I was Project Quarterman.

Q. You were Project Quarterman for THRESHER in piping work?
A. Yes, sir.

Q. Until when?
A. Well, say, until approximately probably the 14th or fifteenth -- I went out sick and then I went on nights -- this was March. Then I went on nights in charge of the night shift.

Q. It was somewhere around the 15th of March before you went to become the night quarterman?
A. That's right.

Q. What is your background and experience in your field?
A. Well, I came to the Yard in 1938 as an apprentice pipefitter, and I've been here ever since with the exception of approximately eight months in the service.

Q. As Project Quarterman for THRESHER, what responsibility did you have for her piping work?
A. I am responsible for all piping with the possible exception of nuclear piping.

Q. Directing your attention then to the 8th of March of this year, were you aware of a casualty to the reserve feed water tank in THRESHER?
A. I was the next day, sir.

Q. The next day?
A. Yes.

Q. Can you describe the nature of the reserve feed plant casualty and how you heard about it?
A. When I came in the next morning they informed me that while blowing the tank dry in order to get a satisfactory reading on the water, that they induced too much pressure in the tank, causing it to bulge and split.

Q. What did you do about it at that time?
A. Well, we immediately went down and looked the area over for piping damages, and that's about all we could do at the time, sir.

Q. You said, "we went down,"; did someone go down with you, Mr. Collins?
A. Oh, yes.

Q. Can you tell us who?
A. Mr. (b)(6) was Quarterman Pipefitter --

Q. How do you spell his name?
A. (b)(6) . And he was more or less a quarterman in charge of the shop on that day.

Q. He went down with you?
A. Yes, he did.

Q. And what did you look at at that time?
A. Well, most that he did was go down and look inside the tank to see what damage was in the tank, and we looked in the area -- I don't think he looked at the pipes specifically, but he asked myself and Mr. Rowell to look it over to see if we could see any pipe damage.

Q. Would you indicate to the court where the piping was located at which you looked on that day?
A. Well, it was in the general area of the tank, sir. (Demonstrating on the mock-up used by the former witness, Mr. Jensen, in his testimony) In other words, this is the unit most affected. It was tipped back and then there was piping along here and in the back, which is the brine dilution piping and the heat dilution stills to the salt water feed, and that's what we were looking at mostly because the rest is shock mounted on the other side.

Q. Was any piping for which you were responsible deranged or damaged as a result of this casualty?
A. It wasn't noticeable.

Q. Are you saying that there was no derangement or damage to piping inside the tank as well as outside?
A. Well, the piping inside the tank is small; it is copper; and it didn't show any damage.

Q. And the piping outside?
A. It didn't show any damage.

Q. How did you examine it?
A. Visually.

Q. Well, how did you examine it visually, Mr. Collins? Can you give us some idea of exactly what procedures you went through?
A. Well, the only thing you could do was look at the pipe and see that there was no break in the pipe. It wasn't flattened in any way, or moved out in any way.

Q. Was there any lagging on the pipe at all?
A. Yes, there was, the piping around the stills themselves. I couldn't remember whether there was any on the salt water pipe right now. I'm not sure.

Q. When you examine piping like that, salt water piping, visually, how close to it do you get and what do you look for?
A. Well, as I say, the only thing we could look for would be the possible flattening of the pipe would be the most of the thing we were looking for, whether it would be bent causing it to lose the roundness of the pipe. And we seen none that we could actually see.

Q. Did you get right down on it?
A. Well, I don't believe I got within two or three feet of it. Most of it is right on the deck and it's a pretty hard area to get at.

Q. Did you know at that time how much the tank was reported to have moved from its previous position?
A. Well the only thing I can say is that we went in the tank and seen these stiffeners for the walking deck, and from that I assumed it was about an inch and a quarter, an inch and a half in one spot; that's in the higher spots.

Q. You had that information at the time you were looking?
A. Yes, sir.

Q. What was the pressure involved that was applied to the tank?
A. Well, I should say it was in the neighborhood of b(3) 10 USC 130 pounds.

Q. b(3) 10 USC 130 pounds per square inch?
A. Yes, sir.

Q. Were any tests conducted on either the drain line piping or the feed water piping to the 8,000 gallon per day still?
A. On the drain line piping none was done afterwards, but on the stills, this is included in our auxiliary circ att which we started testing the 7th and we didn't complete until, I should say, approximately a week later. So the still piping was tested as far as I could determine.

Q. What sort of test was performed, do you know?
A. b(1) hydro.

Q. b(1) pounds per square inch hydrostatic test?
A. That's right.

Q. What was the boundary of the test being conducted on the feed water piping?
A. It was to SD-7 on the still, which is equipment that comes with the stills, and also to the brine dilution.

Q. Do you have any sort of diagram that would show us these boundaries?
A. I have a diagram which would give the boundaries but the plants are not quite clear.

Q. Have you made a marking on the diagram to show the boundaries?
A. Yes, I have. Me, myself, and the leadingman that was with me.

Q. What was the name of the leadingman?
A. Well, I think it was Mr. (b) (6) , but I'm not sure. This was done afterwards, just in preparation for this.

A diagram illustrating the boundaries of the test conducted on the feed water piping was submitted to the party and to the court and was offered in evidence by counsel for the court. There being no objection, it was received in evidence as Exhibit 101. (Exhibit 101 was hung in the courtroom to permit the witness to point out areas of reference concerning which he was about to testify.)

Q. Proceed to explain the boundaries to us? Here is a pointer, Mr. Collins.
A. Well, testing the auxiliary circ aft on the job order requires that these two valves be opened. This is ASW 105 and 104. They will be open to test the auxiliary circ aft. ASW 104 and 105 will be open while testing auxiliary circ aft which includes the piping to the stills up as far as SD-7, which is actually a commercial valve that comes with the still. Also it includes the brine piping, which is in here, this area here. This here is shut off so as not to get back to the brine tank. This is all of the high pressure salt water on these stills.

Q. Have you concluded your testimony as to the boundaries?
A. Yes, sir.

COUNSEL FOR THE COURT: All right, won't you come back, please.

The witness resumed his seat in the witness chair.

(b) (6) relieved (b) (6) as reporter at this point.

Q. Were any tests made of the high pressure brine discharge piping and air conditioning salt water piping system to the reserve feed water tank?

A. The air conditioning is the same. It would be included in with the auxiliary circ aft and that was the entire system.

Q. And the high pressure brine system?

A. There was none tested.

Q. To your knowledge, was anyone in the Design Division consulted as to tests of the adjacent piping outside the reserve feed tank?

A. None I know of.

Q. There were, however, Design personnel present?

A. There were Design personnel there. I don't know whether they were with piping or not.

Q. Do you know their names?

A. No, I do not.

Q. Suppose a derangement of that piping had been apparent upon your inspection; what procedures would you have gone to?

A. We would have to write a condition report and submit it to P & E, and they would refer it to Design and write back and tell us what their procedure was.

Q. What types of joints were used to join the sea water piping for the still feed system and the drain piping?

A. The drain piping? You mean the brine drain, or drain?--The main drain was not connected.

Q. The main drain?

A. That is not connected with the stills at all.

Q. I see. Was it connected to the tank?

A. It runs across the top.

Q. What type of joints were used?

A. Flange joints and EB silencer joints.

Q. Were there any sil-brazed joints included?

A. I can't answer that. I do not know. That piping was not disturbed at this overhaul or availability.

Q. Was that line lagged so you couldn't see it?

A. I couldn't say that.

Q. You can't remember that?

A. No, I can't.

Q. What type of joints were used in the still feed system?
A. They was silver-solder mostly.

Q. What was the largest size of sea water piping involved in this casualty?
A. Including the drain pump?

Q. Yes.
A. I believe it would be five inches.

Q. Five inches?
A. I am not certain--no, I think it was three and a half.

Q. Were any ultra-sonic tests conducted of the joints?
A. On the drain piping?

Q. Sil-brazed joints?
A. I don't believe so.

Q. Well, on any of the piping associated with the tank top?
A. You mean after the casualty?

Q. Yes.
A. None whatsoever.

EXAMINATION BY THE COURT

Questions by a court member, Captain Hushing:

Q. I believe you indicated that a hydro test was made after the casualty?
A. Yes, on the stills.

Q. Is there a record of that hydro?
A. I have that with our salt water--auxiliary circ. It is the final test and the rest includes the entire system; and we started that, as I say, on the seventh, and to the best of my knowledge we didn't conclude that until approximately a week later.

Q. But can you tell from your records when the portion of the hydro test that we are talking about--that is, the still area--was actually conducted?
A. As I say, I have records when it started, the troubles we found which was valves leaking by on different components which took us approximately a week, but we have no date on the slip as to when exactly it was sold.

Questions by a court member, Captain Osborn:

Q. Do you have those records with you now?
A. No, I haven't.

COUNSEL FOR THE COURT: Can you obtain them?

WITNESS: Yes, sir.

COUNSEL FOR THE COURT: We will recall you later for that purpose.

WITNESS: Yes, sir.

Q. I want to get this straight in my mind with respect to the test we are talking about. Am I correct in assuming that when the casualty to the reserve feed tank Number 2 occurred, you were in the process of checking out the ASW system?
A. Yes, sir. We had started the test.

Q. You had started the test. Now, how is this test run?--Is this the complete system?
A. This is the final system, the entire system--the entire ASW aft, is what the title was.

Q. Are you familiar with the EB type coupling?
A. Somewhat.

Q. How restrictive are those in torsion or twist?
A. Well, I believe they can be turned enough--they have been turned to line up a bolt hole. The Portsmouth type you can't turn because they are vulcanized inside, but the EB type can be turned to line up. There is a setscrew in the side of each fitting itself.

Q. I'm talking about after they are assembled, how rigid are they?
A. Oh, I couldn't say that. I couldn't tell the distance they'd give.

Q. This would be a relatively simple test to test in the Yard?
A. I should say so.

Questions by court president:

Q. Mr. Collins, would you say that the Electric Boat type of flexible coupling, after being installed, would permit of a half-inch twist?
A. Well, I wouldn't say. They will permit twist. That is the purpose of them.

Q. I know that. but I was hoping you could give us a feel as to whether it is a half inch, or an eighth, or a sixteenth.
A. No, I don't have nothing to do with the assembly of them. I am not qualified to answer that.

Q. Well, if you are not able to answer, that is the best thing to do, say you don't know. Now. Mr. Collins, to the best of your memory, was this test on the after ASW system completed after this tank top was renewed?
A. Yes, sir.

Q. How much after--one day, two days, three days?
A. Well, I should say it probably run six days or better.

Q. Six days is your best remembrance?
A. Yes, sir.

CROSS-EXAMINATION

Questions by counsel for RADM Palmer, party:

Q. Mr. Collins, was the pressure applied to the entire ASW system just prior to the selling of the test?
A. You mean the final sale?

Q. Yes.
A. No, it had been on and off for a week. We started and it took us a week to complete.

Q. And it was prior to your final test to sell the system?
A. Well, the actual sale was after the casualty, yes.

Q. Do you know the date when your final test was sold?
A. Not actually, no.

Q. Can you help us on how many EB type joints are installed in each salt water line leading to the still?
A. Well, there's two at least on each line, but I'm not sure. In some instances there are three they have on the three mains.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Was any piping cast loose from the still or drain pump to check the alignment of the piping after the tank was pulled back in place?
A. No, sir.

Q. On the hydro test of the seawater piping, were all joints inspected to determine if any leakage developed?
A. Well, on the test they would have to be looked at.

Q. Were they?
A. Yes.

Q. Was lagging removed from the sea water piping to check for leaks?
A. No, sir.

Q. Then how did you establish that the sil-brazed joints were not disturbed by the casualty?
A. We couldn't actually know. There was nobody who really thought they would be to my knowledge. Everybody down there--nobody seemed to be concerned with the pipe. We did look at it, but there was nobody concerned whether anything was damaged or not. They didn't think there would be.

REEXAMINATION BY THE COURT

Questions by a court member, CAPT Osborn:

Q. I want to get squared away in my mind what this sale of the system is. Was the sale of the system, as you understand it, the final sale, the operational test prior to going critical?

A. No, sir. This was a hydrostatic test to one and a half times operating pressure, or depth.

Q. When do you think that was finished?
A. As I say, it was approximately around the 13th or 14th. I wouldn't say for sure. All we have is the starting date on that which is the 7th of March, and we know we ran into quite a little bit of trouble with valves leaking, drain valves leaking on coolers throughout the system, and these had to be replaced and we had to retest again.

Q. From your previous experience, how long do you think that had to be sold before the ship went critical?
A. Well, I don't know, sir. I wouldn't want to say that. Probably a day before--as long as it is sold, that is their interest only.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Without inspection of the joints, how did you determine with the hydrostatic test that there was no system leakage?
A. There was no drop on this after circ.

Q. No drop in pressure?
A. No drop in pressure.

Q. For how many hours was that applied?
A. I don't know exactly. The mechanic claims it was two to three hours. They looked it over.

Q. The record of the test will show this?
A. No, I don't believe it gives any specific times involved at all. The only thing we are allowed, on this job order calling for the test being put on, we are allowed b(3) 10 USC 130 drop. So this would be within that spec.

Q. Do you know anyone who could tell us for how long a time the pressure was applied?
A. Yes, the mechanic, Mr. DiPietranantonio.

Q. What is the requirement for recording these tests?
A. We have a Form 771 which we fill out and the inspectors, which in this case was the crew, they were the ones that were supposed to buy this and all they do is sign if they are satisfied.

Q. Well is this Form 771 available to us?
A. Yes, sir. I have this with the other diagram, the ASW diagram.

Q. Do you have it now?
A. No, I do not.

RECROSS-EXAMINATION

Questions by counsel for party RADM Palmer:

Q. Mr. Collins, perhaps this is repetitive, but it will help me if you will answer. Was test pressure applied to the ASW system at any time after the tank top repairs were completed?
A. Yes, sir.

Q. And the approximate date?
A. I should say it would be anywheres between the 7th and 14th.

Q. And did it pass this test?
A. Yes, it did, definitely.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness stated his testimony was not classified.

The witness was duly warned concerning his testimony and withdrew from the courtroom.

Thomas R. West, civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, advised of his rights against self-incrimination, was duly sworn, and examined as follows:

The witness was informed that the court was sitting with closed doors and that classified information could be divulged. Further, that at the conclusion of his testimony he would be asked to place the highest classification he thought applicable to his testimony.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address and present occupation?
A. Thomas Ross West, (b) (6) Leadingman Pipefitter.

Q. And you are a leadingman pipefitter at the Portsmouth Naval Shipyard?
A. Yes, sir.

Q. What are your duties as a leadingman pipefitter, and relate them please to the THRESHER if you will?
A. You want to refer to this incident?

Q. First just tell us what part you played as a leadingman pipefitter on the THRESHER's post shakedown availability?
A. When the THRESHER first came in, at that time I was hydraulic conversion coordinator, which was to see that the hydraulic system was flushed and that the components with packings and rings were changed, material that had to be returned to the vendors was returned to the vendors, and the same was replaced in the ship in an orderly manner.

Q. And when did you cease being the hydraulic coordinator?
A. January 19, 1963.

Q. What were your duties thereafter in connection with THRESHER?
A. Thereafter, I worked on the condensate system. I had a group of men I supervised on the condensate system and on the auxiliary sea water aft.

Q. On both of these jobs, did you work on the day shift?
A. On the condensate system, I worked part of the time on the day shift and part of the time on the afternoon shift.

Q. And on the ASW piping?
A. On the ASW piping the same. Part of it was on the afternoon shift and part of it was on the day shift, sir.

Q. Can you describe the chain of events leading up to the reserve feed tank casualty which occurred about the 8th of March, 1963?
A. We were in the process of selling the reserve feed water tank to the crew. This was a case of reducing the conductivity of the pure water. In Reserve Feed b(3) 10 USC and Number 2, we had lowered the conductivity to the satisfaction of the crew by dilution, using the water from pure water facilities. We were unable to lower the conductivity in Number 3 Reserve Feed Tank through dilution. At that time, we wanted to completely empty the tank. Normally, in completely emptying the tank we would pump-empty the water, into the engine room bilge and from there take it overboard. At the time, the crew didn't want us to use the engine room bilge so I got together with Chief Engineman Wise and the Engineering Officer Lieutenant Commander Lyman, and we determined that we would blow the water overboard by air induction putting the air in through the vents and blowing out through the fill or suction line. In the process of blowing this, at the same time we were filling b(3) 10 USC Reserve Feed Tank, and the mechanic that was filling this. - the mechanics that were working on this, - the relief blew on b(3) 10 USC Reserve Feed Tank and to expedite the work he took the relief off Number three tank and also the one off b(3) 10 USC 130 and replaced one with the other, and then proceeded filling and also blowing overboard. This went on for the remainder of the shift, this injection of air and water overboard. At the end of the shift this was turned over man to man, leadingman to leadingman and quarterman to quarterman, turned over on this blow on this tank.

Q. Were you the leadingman pipefitter on the shift that started the work?
A. This is correct, sir.

Q. To whom did you turn over the work?
A. To Mr. (b) (6) , sir.

Q. He was a leadingman pipefitter who followed you?
A. This is correct.

Q. What was the name of the man who shifted the relief valves?
A. I should know the gentleman's name -- I gave him a -- I wrote on him-- (b) (6) He was an apprentice pipefitter.

Q. How do you spell his last name?
A. (b) (6)

Q. Did I understand you took some action in connection with him?
A. This is correct. I wrote a letter on the gentleman.

Q. What sort of letter?
A. A letter.

Q. Of a disciplinary nature?
A. It was of a disciplinary nature, sir, a letter of admonishment.

Q. An admonishment?
A. Yes, sir.

Q. What was the nature of this failing of his which caused you to write the admonishment?
A. The fact that in setting it up, the blowing of the tank, he should have had a second relief valve as well as a gauge on the system, sir.

Q. Now you turned the work over to Mr. (b)(6), is that correct?
A. That is correct, sir.

Q. When did you return to that job?
A. The following Tuesday.

Q. Which was March the 12th?
A. The 12th, right.

Q. Tell us what you did then.
A. At that time I was told that the tank had been ruptured and at the time, Mr. Collins and I went down aboard the ship and went through all the associated piping, checking for misalignment, or possible misalignment, visually.

Q. Could you describe in great detail to us, exactly how you checked visually for misalignment and what piping you checked?
A. We checked--we started in by checking out the drain pump piping. The drain pump is suspended with shock mounts and the way we checked that was we had the EB silencers on this and we checked the EB silencers for possible misalignment.

Q. How do you do that?
A. On the EB silencers, we were checking for misalignment. There is a space in between. By checking the inside of this, the whole way around, you could determine whether there was misalignment or not. I would say you could check for misalignment. This is a normal way of checking whether you've got distortion, the difference between your dimensions as on your top and bottom and sides.

Q. Did you make this inspection before or after the tank top had been pulled back down?
A. The tank top was back down when I came back into the Shipyard.

Q. How did you inspect piping?
A. We checked the piping, sir, by hangers.

Q. How do you do that?
A. These hangers are the rubber type hangers and if there had been any distortion, you would be either against your cap or against the bottom of your hanger, sir, because there is only approximately--the average is a little better than quarter-of-an-inch clearance between your pipe and hanger anyway, sir.

Q. Was any piping broken loose to check its alignment?
A. I did not, to check its alignment.

Q. Do you know if anyone did?
A. I do not, no.

Q. What piping did you check at that time?--How much piping and what piping?
A. We checked the trim and drain piping, and also checked the salt water piping which is outboard of your stills.

Q. That tells me what piping. Now, how much of it did you check?
A. We checked the trim--your drain piping back to your filters which is back around Frame 78, I do believe; and the salt water piping which was outboard of the still back to where it went up.

Q. Was some of that piping lagged?
A. Some of the salt water piping was--yes, it was, sir.

Q. How do you check that piping which is lagged?
A. The part of the piping which is lagged, sir, you cannot check visually to see if there is any damage done to it.

Q. Were there any hydro test made thereafter then?
A. On the auxiliary salt water, the entire system was hydro'd. The piping around the still was hydro'd, sir.

Q. Was that after the visual inspection which you made?
A. Yes, sir.

Q. Do you know any of the details of that test?
A. No, sir.

Q. Can you recall what day it was made?
A. I recall that the test was started on the seventh. The date it was completed, I cannot honestly tell you.

Q. Except that it was after the casualty?
A. Yes, sir. I tried to find dates, the dates the testing had started, and I could not find the date that the test was sold.

Q. Was there a reserve feed piping line test?
A. Reserve Feed piping line test--piping in that tank was internal piping and was tested with the tank up to the first stops, sir.

Q. Do you know the type test made on the tank?
A. I do not know the type test on the tank, sir.

Q. When was the other test made for the reserve feed piping line?
A. The other test was made previous to the casualty, sir.

Q. Now after the casualty and after the tank top was brought down, were any joints checked for leakage during the hydrostatic test which you described to us?
A. On the reserve feed?

Q. Yes.
A. I would not know.

Q. And the drain system?
A. On the reserve feed I was not in on the tank test of that, sir, and I don't believe, to my knowledge, there was no test on the drain system.

Q. How would you determine that a sil-brazed joint in the sea water system had been disturbed by a casualty such as this?
A. Only through a hydrostatic or some visible misalignment that might have been there. That is the only way that you could determine this. Either that, or if you had pressure, through your hanger having been lifted or distorted.

Q. Would it require individual inspection of each joint to really ascertain it positively--to ascertain that it had not been disturbed?
A. I would say that it would, yes. You would have to look at every joint to find out whether you had had any fractures.

Q. This was not known, is that right?
A. Pardon?

Q. This was not known in this instance. You didn't look at each joint?
A. I personally did not look at each joint, no, sir.

Q. To whom did you make your reports as a result of the inspections which you made?
A. I was on the tail end of the inspection, sir. I was with my quarterman at the time and he had previously made the inspection with other leadingmen and I do believe with the foreman and the group master, sir, and I couldn't honestly tell you whether there was a written report to this or not.

Q. Had the lagging been removed at that time?
A. In the area of the salt water I don't recall if the lagging had been put on at that time, sir.

Q. There wasn't any evidence of lagging that had been taken off and was lying around?
A. I'd say negative.

Q. How long did it take you to make your inspection of that area?
A. I was down in the area, well, over two hours. Exactly how long it took me on that specific part, I would not dare say.

Q. Could you estimate it?
A. Well between talking and everything I would say I probably spent an hour and three-quarters at least in that area checking around.

Q. Checking piping?
A. Checking piping-between that and different ones asking me, "did you see this" and I mean this is why it is hard to determine the exact length of time you spent looking and checking against the time you were there.

Q. Was the illumination such that you feel you could make a good inspection of the piping?
A. I went down in there with flashlights, sir. Normally I carry a flashlight with me when I am aboard the boats anyway so that I can look in places that aren't properly lighted.

EXAMINATION BY THE COURT

Questions by a court member, Captain Osborn:

Q. If you are putting a test on an ASW system, what do you think would be the most important part of the system?
A. The entire system, sir, if you are putting the entire system on.

Q. You think that you have a specific knowledge of something in detail that is being tested, like a still?
A. Well, the still in this particular instance, the still was requested to be put on by the engineering officer.

Q. Who received that request?
A. Mr. Collins, I believe. I do believe in testing normally with a crew aboard, as it was there, that we were testing a portion of the system and the crew wanted another section of the system tested which was not included, and they requested this; we normally obliged the crew in order to get a test on anything that they wanted while we were in that particular system.

Q. I agree with this particular thing completely. I also say, Mr. Lyman was trying to go critical with a reactor plant, to run a reactor plant. He was very interested in getting a test off.

A. That is correct. That is why he wanted to make sure he included everything on this last, final hydro. This is the reason this came about, running the hydro the way it was, starting one day and stopping and then going back on, was partially due to the fact that they wanted their fresh water cooling forward, and this is why we were working around the crew, or with the crew--either way you want to say it. We wanted to get our tests on, yet we did not take the system until such time as they would give us the system, so we could put our hydro on.

Q. Where did you put the pressure on the system?
A. The pressure was put on the system through the b(3) SSTG b(3) 10 sir.

Q. The SSTG drains?
A. Yes, sir.

Q. Cooler drains?
A. Right, sir.

Neither counsel for the court, the court, nor counsel for the party RADM Palmer desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry which had not been fully brought out by the previous questioning.

The witness stated that he had noting further to say.

The witness stated he placed no classification on his testimony.

The witness was duly warned concerning his testimony and withdrew from the courtroom.

(b) (6), civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

The witness was informed that the court was sitting with closed doors and that classified information could be divulged. Further, that at the conclusion of his testimony he would be asked to place the highest classification thereon as he thought applicable to his testimony.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address, and present occupation.
A. (b) (6) (b) (6) Leadingman Pipefitter.

Q. At the Portsmouth Naval Shipyard
A. Yes, sir.

Q. You full name is (b) (6)
A. Yes, sir.

Q. What duties did you perform in connection with the THRESHER's post shakedown availability?

A. Well, I was night supervisor. We worked on jobs that were turned over to us from the day shift.

Q. What is your background and experience in your line of work?

A. Well, I started in Portsmouth here as a coppersmith and transferred over in 1947--I transferred over to a pipefitter, and I've been a pipefitter up until about seven years ago--six or seven years ago--when I made leadingman.

Q. In the latter stages of the THRESHER's post shakedown availability, you worked the night shift as leadingman pipefitter, except for the last two weeks of that availability, is that correct?

A. That is right, sir.

Q. Did you take over the work of flushing the reserve feed tank on your shift on Friday, the 8th of March?

A. Yes, sir, I did.

Q. Can you tell us what happened in connection with that during your shift?

A. Well, that evening, just after four o'clock, maybe quarter past--20 minutes past--somewheres in that vicinity, I went aboard the ship to inspect the different jobs we were working on, and I dropped down into the lower level in the engine room and I started to speak to my man I had on the job prior to checking the job over, and a piece of metal fell from the overhead and it seemed to come from the distilling unit. So, I immediately went up topside to get ahold of a sailor to see if they were running anything down there and we started back--the sailor was leading going down the ladderway and I was following him. I heard this air escape and quite a thud and, then, we started in to check to see what it was and I checked underneath the pump right at the side of the foundation. After searching for quite awhile, I come up with air leaking out of a seam where the tank had expanded and cracked open. I was looking for a pipe but there was no pipe there and, then, I realized what had happened. This tank had had excess pressure in it.

Q. Did you make a visual inspection of the outside piping around the tank?

A. Well, not at that particular time. At that time I went up and immediately got in touch with my quarterman, so he'd know what had happened, and then I went back aboard the ship and there was quite a few officers and crew personnel around there, and after things quieted down later on in the evening I checked around to see if there were any pipes damaged, anything that I could see other than just the tank.

Q. What was the name of the quarterman whom you notified?

A. Mr. Smith.

Q. Did you recognize any of the officers from the yard and the ship who were present?

A. Well Mr. Biederman, I am pretty sure, was the only one I recognized. There were other officers from the ship there but I didn't know them personally; Mr. Beiderman-I had worked with him on the 585 prior to this boat.

Q. You say you notified the quarterman and that you made an inspection of the piping. Can you tell us what piping you inspected and how you inspected it?

A. Just a visual inspection. I checked around to see if there were any pipes that had burst or were damaged in any way, mostly looking for a broken pipe, anything that would be broken.

Q. Where were the pipes located at which you were looking?
A. They were located on the outboard side on the port side--port side outboard

Q. Is this the auxiliary sea water system?
A. Yes, auxiliary sea water system.

Q. Do you recall if those pipes were lagged at any place or not?
A. Offhand, I couldn't say.

Q. How long a time did you spend checking the pipes?
A. Well maybe ten minutes or so, looking around to see if there was anything in the immediate area.

Q. Was the lighting such that you could observe them carefully?
A. Well I had a flashlight with me, sir.

Q. Were any of the joints that you observed, sil-brazed joints?
A. Yes, sir.

Q. Did you inspect them to see whether the sil-brazed connections had been distrubed in any way?
A. No, sir, I didn't.

Q. What were you looking for then?
A. I was looking for a pipe that would be damaged. I figured there might be something wrong.

Q. Or a joint?
A. Well I would notice a joint if it was broke, but I didn't look for a crack on the sil-braze because I figured any amount that it had been expanded, I would figure that your flexible joints would have taken care of it.
Q. How much did it expand to your knowledge at that time--not your knowledge today?
A. Well it was hard to say. You could see a rise in it but afterwards I went down in the tank and I could see.

Q. How much was that?
A. I would say between an inch and an inch and a half.

EXAMINATION BY THE COURT

Questions by a court member, Captain Osborn:

Q. Was this an inch and a half at the maximum point--how about close to the still foundation?
A. Well I didn't pay any particular attention to it because it was up in different places. I looked it over as a whole.

Q. How was the tank bowed--a gradual bow?
A. Yes, sir. Because when they pulled out the sockets there was a line of them maybe three or four that lifted up, pulled off the metal.

Q. Did the bowing occur from inboard out, large deflections gradually going down to the end or from fore and aft?
A. Well it would be inboard out. That's where it started, I would say from where your tank is tied together; there is a partition in there and it would start from that and go outboard.

Q. And the maximum deflections were then from center line of the ship outboard?
A. Right, sir.

Q. In which direction did you think the still moved?
A. I would say it moved up. I would say the inboard side of your still lifted up.

Questions by court president:

Q. Mr. (b) (6) , did you station the man on this job who was on it at the time of the casualty?
A. Yes, sir.

Q. What was his name?
A. (b) (6)

Q. (b) (6)
A. Yes, sir.

Q. What was his rate?
A. Pipefitter.

Q. Was (b) (6) held blameworthy in this case as a result of the accident?
A. Well we had to write a letter on the gentleman for not securing the system and coming to me and explaining to me that it had been set up in an improper manner.

Q. Was an apprentice pipefitter named (b) (6) involved?
A. Yes, sir. He was the one that had turned it over to my mechanic.

Q. Wouldn't such a distortion of a tank top to which piping is attached, cause you to be suspicious of sil-brazed joints that might have been subjected to a torsion on motion, that would result in such displacement as they experienced?
A. Well I would say that a flexible joint would have taken care of it, but it should have showed up on the test.

Q. Flexible joints in what, Mr. (b) (6) ?
A. In your auxiliary salt water system.

Q. In the system itself?
A. Yes, sir, and on this piece of equipment because that is shock mounted and all pipes coming off of that will have flexible joints inthem, otherwise you would have a solid piece of equipment which is illegal. We have got to have a flexible joint in it where it is shock mounted.

Questions by a court member, Captain Osborn:

Q. Don't you walk over those pipes very much when you are down there inspecting a still-didn't you stand on those pipes?
A. No, sir.

Q. Can you walk around behind the input of the still without walking on those ASW lines that feed into the still?
A. You have to crawl around, sir; there is no walking space there. It is more of a crawl space than it is a walking space, sir.

Q. Have you ever stood on the feed end of that still?
A. Well I wouldn't-

Q. The ASW line?
A. I wouldn't dare say whether I have or haven't. I don't recall.

Q. Have you ever seen a sailor stand on them?
A. No, sir.

Q. Well better than that, have you ever seen an officer stand on them?
A. No, sir.

Q. You know they are pretty rigid though?
A. Yes, sir, they are rigid pipes, yes, sir.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Do you have any knowledge of the hydrostatic test which was completed on the ASW piping thereafter?
A. No, sir, I don't. There was nothing on my shift that I know of that was turned over to us.

Q. Do you know whether on the TINOSA, the sea water piping lines are lagged?
A. TINOSA?

Q. In this area?
A. I don't know, sir. I haven't been aboard the ship.

Neither counsel for the court, the court, nor counsel for the party RADM Palmer desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry which had not been fully brought out by the previous questioning. The witness stated as follows:

WITNESS: There is nothing, absolutely nothing that I know of that was improperly done because I've always said that if they asked me to go, I'd ask what time she was leaving and go aboard. I have all the faith in my men and I make sure that everything is shipshape, myself.

The witness stated that his testimony was unclassified.

The witness was duly warned concerning his testimony and withdrew.

The court then recessed at 1503 hours, 29 April 1963.

(b) (6) was relieved by (b) (6), as reporter, at this point.

Edward Marcotte was called as a witness for the court, was advised of the subject matter of the inquiry, informed of his rights against self-incrimination, was duly sworn, and examined as follows:

The witness was advised that the court was sitting with closed doors and classified information could be indulged.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address and occupation.
A. My name is Edward Marcotte. I live in (b) (6) and I'm a naval architect.

Q. Are you employed at the Portsmouth Naval Shipyard?
A. Yes, sir.

Q. What is the nature of your duties?
A. I am in the Structural Group and in charge of design and structural components.

Q. What is your background and experience in this field?
A. I have a BS from the University of New Hampshire, and I took a course in naval architecture at the Massachusetts Institute of Technology, and I served in the Navy as a Ship's Superintendent, and I have a total of twenty-one years government service.

Q. Mr. Marcotte, in connection with the casualty to the reserve feed water tank on the U.S.S. THRESHER on the 8th of March, did you have any duties in connection with that casualty?
A. Yes, sir.

Q. Would you please tell us how you were connected with it?
A. Yes, sir. On Friday night I was called in by Mr. Leon Valley from Shop 11. They had had trouble on the reserve feed water tank and would I come in and look over the situation. I came on the Yard and went aboard the vessel and went into the reserve feed water tank and observed some damage to the tank.

Q. And what did you do?
A. I talked the job over with Mr. Valley and decided that we would try to pull this tank top down. However, at the time I found that the foundation for the main distilling plant had been picked up by the tank top and it was leaning aft somewhat. Then I called Mr. Grant Jensen in, because that was his particular foundation, and asked him to come in, which he did, and we observed -- there is a snubber at the top of the distilling plant and that was hard up against the stop in the aft direction, so we knew there had been some definite movement of the distilling pump. Then I went over the job, as I explained before, with Mr. Valley and we tried to pull the tank top down, and I stayed there just a short while, maybe an hour at the most. Then he asked me to come in Saturday morning, which I did. They hadn't progressed with the job too far because they had trouble pulling it down. They didn't have the right jacks in there to haul it down, and we talked the job over some more, very briefly. Then I came in again, I believe it was Sunday, Sunday morning,

and by that time they had the tank top pulled down, and it seemed that it was back in the proper position. They didn't get it all the way back, but very close to being right back where it should have been.

Q. Did you make any report to your superiors as a result of this?
A. Mr. Jensen was there. He is not my superior; he works for a foundation group, and we talked this over, and he told me he was going to call Mr. Frank Dunham, the head of Code 250, and tell him what he had done. This was on Friday night.

Q. What is Code 250?
A. That is the Structural Group.

Q. At that time you examined this damage, both on Friday night and thereafter, did you notice any derangement of the associated piping systems on top of the feed tank?
A. I couldn't say, sir.

Q. You couldn't say there wasn't any, or you didn't notice any?
A. I didn't notice any. The only thing I did notice on the tank top, there was a rip in the tank top; I believe in the air conditioning foundation that comes down through the tank top; there was a slight rip around that particular area, and I don't remember seeing any piping.

Q. Did you ever discuss the possibility of piping derangement with anybody?
A. No, sir.

Q. Do you know of any tests which were performed after the work was completed?
A. No, sir, I don't.

Q. What specifically were your recommendations with regard to this?
A. We talked over the method of pulling this down, the method of making some jacks, since it was very low overhead in this tank. I discussed this with Mr. Valley and also I believe there were two stiffeners that were cracked, and we discussed ways of welding those. I think that's about it.

Q. Did you notice any officers or other people from the Design Division there, besides the other member whom you called?
A. Mr. Jensen.

Q. Were there any other officers from the Design Division, or anybody else from the Design Division there?
A. No, sir.

Q. Do you know, of your own knowledge, whether anybody inspected the piping system on the tank top?
A. No, sir, to my knowledge I don't know about that.

EXAMINATION BY THE COURT

Questions by CAPT Hushing:

Q. Were you and Mr. Jensen, then, the engineering team that inspected this casualty?
A. Yes, sir.

Q. Would you, as engineers, expect to make a recommendation as to the kind and type of additional inspections and tests which might be required after a casualty of this sort?

A. I believe after any tank repair work it has to be tested anyway by another group, tank testing people. In fact this tank was being tested when this casualty happened, so I was informed.

Q. But nevertheless, as engineering personnel at the Portsmouth Naval Shipyard, wouldn't you consider that you and Mr. Jensen should have made some recommendations as regards to additional inspections and tests?

A. Not normally, we wouldn't do that, no, sir. At least I wouldn't, in the normal sequence of events like this.

Q. You mean that your efforts are so departmented and you consider only the immediate item that is within your jurisdiction?

A. Yes, sir.

Questions by CAPT Osborn:

Q. Had you had a piping derangement from the structural point of view, whose responsibility was it to make recommendations on what tests should be made after the derangement?

A. I don't know of any piping derangement that there was, sir. As I said I didn't notice. All I noticed was the tank top. In fact, from the outside of the tank, climbing down into that compartment, there wasn't much derangement evidence except a slight leaning of the distilling plant. It was inside the tank that these particular things had come apart.

Q. Disassociating yourself with respect to the tank itself, which is a b(3) 10 U pound tank in the first place, did it occur to you that you might have deranged any salt water piping by moving of the still?

A. No, sir.

Q. You obviously knew that you had quite a derangement in the still because the top snubber was against the stop.

A. Yes, sir, but that was the end of a long arm. In other words, a slight movement here would make a larger movement up there (the witness demonstrated with a pencil), at the most of an inch there, so the derangement at the bottom was slight.

Q. The angular movement, however, would be the same. It would not be a function of the lever arm. Did you investigate this?

A. No, sir.

Q. From a design point of view, how much freedom and tortion does an EB flexible coupling have?

A. I don't know, sir; I don't have foundations.

Q. What do you have?

A. I have the structural components, like the tanks and the hull. There's another group that specializes on foundations.

Q. Who in design in responsible for the piping associated with a structural job?

A. I believe Code 263, sir.

Q. What's the individual's name?
A. The head of that area is Mr. Langillo.

Q. I'm interested in getting into a procedural type thing, where a job starts out primarily as a structural job, or a job starts out primarily as a pipe stress job. Now what chain of events, or how the responsible people would get the information -- Do you people talk to each other?
A. Yes, sir, occasionally.

Q. Occasionally?
A. Yes, sir.

Q. Did you talk to anybody in piping about the ramifications of this particular casualty?
A. No, sir, I did not.

Q. Did anybody in piping ask you about your first-hand inspection to tell them the story on the casualty?
A. I don't believe so, sir.

Questions by the President:

Q. Mr. Marcotte, as a structural engineer, you can probably give us an estimate of the maximum displacement of the parts of that tank top that you observed when you went in. The displacement, we have been led to believe by previous testimony, was not uniform throughout the tank top.
A. That is correct.

Q. That is understandable, because there are places where the point of attachment is to the rigid part of the ship, and there are other places where it is kept in place against pressure from underneath by the weights about it. Do you recall where the maximum distortion occurred on that tank top?
A. I don't have a plan here.

Q. We just happen to have one back there on the bulkhead, underneath that top one. (The witness went to the bulkhead to look at a blueprint).
A. Frames b(3) 10 USC 1 I believe, were the two frames with the greatest distortion. (The witness indicated on the blueprint).

Q. Perhaps we could go to this model over here; the frames are indicated here.
A. b(3) is right under one corner of the foundation here, and b(3) is right under the distiller.

Q. Now were those the points of greatest distortion?
A. It seemed to arc from the shell to the center line bulkhead here. It seemed to have an arc.

Q. Was the maximum distortion outboard or inboard?
A. It would be somewhere near the center.

Q. A sort of an arch, then?
A. With an arch there at about the edge of the distiller.

Q. The point you indicated would be about four feet then?

A. I don't remember if the bulkhead is on the center line of the ship. I would say about mid-span from the bulkhead to the shell, with arc up. There was also some distortion in these, but it seems the greatest was in these two here (the witness demonstrated on the model).

Q. These frames are a little shorter due to the shape of the hull and as you recall it, these did not have as much distortion, at the maximum point of distortion, as this one?
A. It would be slightly less; that's right.

Q. Now what, in your opinion, was the maximum distortion, not as you saw it, but taking into account the fact that the metal expanded and has a certain amount of elastic limit and then settles back after the rip occurred. What would you say was the maximum distortion from the point of rest?
A. I think there was some weight on the tank top; it might have gone beyond that before it settled back. Oh, I would say at the most maybe 3/16 or something like that. That's guesswork.

Q. 3/16 of an inch. I thought it was 7/8 of an inch roughly in the state of rest; after it had come to rest after the rupture?
A. Yes, sir. Did I get your question correctly; maybe I misunderstood you.

Q. That's why I wondered. What I wondered, if you could tell us was how much more the distortion was perhaps from the state of rest distortion, which was measurable after the event itself?
A. What do you think I believe it went up and settled back? I think somewhere about 3/16 of an inch also.

Q. More than it was at rest?
A. Yes.

Questions by a member, CAPT Osborn:

Q. When you originally decided to repair this stuff you came up with a different rate than you finally used, those are the 5810 jacks?
A. Yes, sir.

Q. Did you have anything to do with the design of the original mechanism to bring the tank top back in place?
A. No, sir.

Q. It was a tougher job to bring it back to place than anyone surmised it to be; is that correct?
A. Yes, sir.

Neither the counsel for the court, the court, nor the counsel for RADM Palmer wished to examine this witness further.

PRESIDENT: Mr. Marcotte, we on this court are interested to find out as much of what is in the realm of fact as we can, so that we may arrive at true findings of what did happen, so if you have any further statement covering anything relating to the subject matter of the inquiry, you are informed at this time that we are ready to receive it. It doesn't have to apply to any line of questioning that has been given to you, but if our questions have not completely brought into the record what you have to offer to the court to help us solve this problem, we now ask you to give us any further statement that you may wish to give.

The witness made the following statement:

Briefly, in reviewing this in my mind, I believe that we have covered the particular area of reserve feed water tank.

The witness stated that his testimony was unclassified.

The witness was cautioned concerning his testimony and withdrew from the courtroom.

Grant S. Jensen, a former witness, was recalled as a witness by the court, and was informed that the oath previously taken by him was still binding, and was examined as follows:

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Referring to the casualty that occurred in the reserve feed tank in the THRESHER on 8 March 1963, would you tell us your part in the proceedings after the casualty was reported?

A. Yes, sir. Mr. Marcotte called me at home; I believe it was around, somewhere about nine o'clock. Friday evening, and mentioned that he thought I should come and look at the still foundation, because it had moved somewhat, and it was out of his category to judge on any damage to the foundation, as such. I promptly came into the yard, went down to the THRESHER and looked over the area in question. I measured some mount heights as best I could. As I previously stated, the forward end board was depressed about a quarter of an inch beyond what the normal loading would be. The after end board was about 3/16. The forward outboard was about 3/16 also, and the after outboard was slightly less than 3/16, depressed. I perused the area as best I could to see if there was any actual physical contact between any of the associated gear tied to the still and any solid structure around there, and there appeared to be plenty of clearance. Then in further discussions with the shipfitters and Mr. Marcotte, the shipfitters at that time were about to try to repair this or to pull the tank part back down, and we made a date to come in later on, either that night or the next morning, as required, to look over the situation again, as we tried to correct the tank top. The next afternoon, I believe it was afternoon, I came into the Shipyard again to look at the area, and they had not succeeded in pulling it down very much at that point. As I remember, they were going to change to different type of jacking down equipment than they had previously tried. Sunday, which was two days after the accident, I came back in again and they had at that time pulled it down and had succeeded in relieving the deck structure to the point where the (b)(1) were just about the right height they should be, under the circumstances, under normal loading conditions. The snubbers at the top had come back to center and everything appeared to be all right, as far as the foundation for the still -- Oh, I neglected to mention the first time I mentioned these, the snubbers at the top had deflected toward the after side, so that there was no clearance at all on the after side, but there was a larger clearance on the forward side. I estimated this deflection about 5/8 of an inch from where it normally might be. I believe that's the main part of it.

Q. Were you able to estimate how far it had traveled before it came to rest at a deflection of 5/8 of an inch?

A. No, these snubbers are made of a cylindrical piece of rubber, (b)(1) and it shows -- there's no paint on these so they show no excursions such as that. I

did look over the whole upper foundation, where we had the snubbers, and there was no evidence of paint flaking, or any excessive strain on the foundation.

Q. You testified that Mr. Marcotte called you because his observations of the casualty indicated that THRESHER's foundations might be affected; is that correct?
A. That's correct.

Q. Is it normal procedure for one member of the Design Division, who notices a questionable area in a casualty outside his own purview, to call in the cognizant member of the Design Section?
A. Yes, especially on a night like this, a weekend, Mr. Marcotte and I have worked together for quite a period of time. He was quite familiar with my field.

Q. Turning to a different sort of casualty; if you were called in and as a matter of regular procedure, you found something that caused you to be suspicious of an extention of the casualty into an area not within your purview, would it be regular procedure for you to call whoever in the Design Division was cognizant in that area?
A. Yes, sir.

Q. Are those the instructions under which you operate?
A. This is a matter of habit, I think, more than anything else. I presume there must be written instructions to this effect somewhere. Normal good sense.

Q. I'm trying to find out whether it was standard operating procedure for you to do anything like that; a matter of custom and practice?
A. Yes.

Q. Do you know if any tests were performed on any of the equipment after you inspected the damage and the damage was repaired?
A. No, but discussing it with Mr. Valley, and I think it was Commander Biederman, something was said about "They are going to light off the still before the ship goes to sea". Either one or the other of them said they probably would.

Q. Was there any discussion of the auxiliary salt water piping within your hearing in connection with this casualty?
A. No, sir, just from my own personal view of looking around the general area, I did see the three large pipes coming down the outboard side of the tank top, and I could not see any association with that to the tank top damage at all.

Q. Whom did you make your report in connection with your inspection of this casualty?
A. As soon as I got home that Friday night I called Mr. Dunham, Code 250, my immediate superior, and let him know that I had been in to see the job. Saturday afternoon, I guess it was, when I visited the ship the other time, I had mentioned it to Mr. Hale, Code 260, that their had been some damage on the tank top, the piece of equipment the still was sitting -- I still don't remember too well whether that was Saturday morning or Saturday afternoon. I could verify it.

Q. It was on Saturday?
A. Yes, it was on Saturday.

EXAMINATION BY THE COURT

Questions by a member, CAPT Hushing:

Q. Mr. Jensen, did you have any feeling of concern at all about the piping system in the vicinity of this derangement?
A. No, sir, because the motion of the still was well within its shock mount limitation. Under normal shock, these pieces of equipment are expected to move about an inch, or an inch and a quarter.

Q. What about the piping that was on the tank itself, supported by the tank top?
A. I'm afraid that's out of my category; I'm interested in the still foundation, as such. The other pipes I observed way outboard didn't seem to be associated with the area of damage.

Q. So you formed a judgment that there was no pipe damage, or that there was little liklihood of pipe damage?
A. My opinion was that there was little liklihood of pipe damage.

Q. Does this then account for your not advising anyone in piping design of this derangement?
A. Well, I mentioned it to Mr. Hale that there was damage in the area.

Q. You did mention it to Mr. Hale; and who is Mr. Hale?
A. Code 260.

Q. What is his job?
A. He is assistant chief of mechanical, I believe it is.

Questions by CAPT Osborn:

Q. Mr. Jensen, when you get into one of these design problems, that involves structure and piping and several other different systems, who is responsible for making an overall design pronouncement that the casualty is satisfactory, or from a design point of view?
A. Well, if it is primarily a structural damage area then the structural branch head would, I presume. In my area, the foundation area, I would probably judge whether there was any damage or not.

Q. Who takes structure and piping and makes this decision?
A. Then they would have to get together, I believe.

Q. Who would do this in the Portsmouth Naval Shipyard right now?
A. I don't know as I know the answer to that question.

Q. Who do you think it would be?
A. Well, where this was a production request to visually inspect this, I would think the Production Department would check out their area.

Q. Have you located the detailed calculations involving the shock mounts on this particular piece of equipment, and think they are within the design limitations?
A. Yes, sir.

Q. Do you have those calculations?
A. These are part of a report, usually. It usually gives you the limitations these shock mounts go through in an excursion, and since this 3/16 was well within the shock excursion allowed by the test report--

Q. What was the observed deflection we had on this equipment during the shock test?
A. I don't know, sir.

Q. But the basis of your judgment with respect to whether there was any derangement or not, was that when you jacked the foundation back into its original position there was no permanent derangement for shock?
A. That's right.

Q. Is that the extent of your technical evaluation?
A. Just about.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. I would like to get the line clear in my own mind. If the Production Department notes a casualty, and they form a judgment that they required design assistance in fixing it, making it right, they call personnel in Design who they think are involved; is that correct?
A. Yes, sir.

Q. When those design personnel come down and they note other areas that required additional personnel from Design, they send for them and ask for their assistance; is that correct?
A. Generally, yes.

CROSS EXAMINATION

Questions by counsel for a party, RADM Palmer:

Q. Mr. Jensen, with regard to two or three questions that have been asked of you about the normal course of action, or the standard operating procedure of reporting to other codes, a difficulty or a casualty; isn't the normal course of action whenever production shops encounter difficulties beyond their capabilities to solve, and where they need Design assistance, to write a Condition Report requesting such assistance?
A. There are several ways that these are reported. There is a Design Liaison Request is one form, there is a Code 303 Deficiency Report form, and there are always emergency telephone calls.

Q. Then, we can agree, can we, that there are procedures, there are methods by the Production Shop, to seek assistance of Design?
A. Yes, sir.

Q. And then doesn't the Design Project Engineer assign tasks to all the Design codes involved?
A. I think this varies, probably, with the extent of the job. If there is a job where more than one code is involved, then there will be a Project Engineer who will set up a meeting, or a discussion group, to handle this sort

of thing. If it's a minor job it may be just an individual code involved.

REEXAMINATION BY THE COURT

Questions by the President:

Q. Mr. Jensen, there would seem to be a considerable degree of flexibility and informality in handling matters such as this particular situation. You have answered questions put to you by the counsel for Admiral Palmer in a way to leave me with the feeling that there is a procedure but that it is variously interpreted and followed; is that correct?
A. You couldn't state that a little bit different, could you?

Q. You say that in some cases it was done by telephone calls, and others there were specified forms filled out in writing. Could you explain to the court a little better, or more concisely, just when one determines that this should be handled informally, and when it is determined that it will be more formal?
A. I don't think I'm qualified to answer that; I'm on the receiving end of these requests, and I'm not sure what Production people have been told to do on this. I know that we do have these two general forms, General Liaison Request and the Code 303 Design Deficiencies.

Q. The Design Liaison request; what color is that form?
A. Well, the copy we get is usually blue, I believe. I believe they are multi-colored, various copies.

Q. Multi-colored, and it is a printed form?
A. Yes.

Q. Which communicates to you, to your decision, the needs of another division for Design assistance; is that correct?
A. That's right.

Q. Now what is the other formal means of getting Design assistance?
A. Well, as I say, there's Code 303 Design Deficiency Report; the copy I get is usually yellow.

Q. That is usually submitted, not as the result of a distortion of a tank top, due to something like we have in this case, but rather to the failure of a test which in the opinion of Code 303 would be correctible by Design attention; is that generally correct?
A. That's generally correct. I believe they would rather have visual inspections to bring these about. Of course there are also ship weeps, which are sort of a combination of the two. Maybe something that the ship's crew or the ship's officers think ought to be changed.

Q. Mr. Jensen, when you receive a call, as you did in this case, do you feel that your responsibility is limited to just your particular part of this, or do you have a feeling of responsibility for associated deleterious affect on the safety of the ship?
A. I have a feeling of responsibility for the whole ship.

RECROSS EXAMINATION

Questions by counsel for RADM Palmer:

Q. Mr. Jensen, are Design Liaison Requests used in repair work or only in new construction?
A. They are used in both cases, to the best of my knowledge.

Q. Going back to an earlier question that I asked you, are you familiar with a Condition Report?
A. Yes.

Q. Is that something the Production Code shops might use to request Design assistance?
A. I believe so.

Q. You're not sure?
A. No. I think these Condition Reports are rewritten by the time we get them. They go through the Planning and Estimating Division.

Q. Well, then can we agree on this; if the Production Shop did ask for Design assistance, that the task of providing that assistance would become the responsibility of the Design Project Engineer?
A. Well, first I believe it would go through the Liaison Code, and they would then reassign it to the various codes they felt involved.

Q. But the responsibility for furnishing Design assistance, would that not fall on the Design Project Engineer, however it came to him?
A. Well, again, I think it depends upon the size of the task involved.

Q. I realize that in relatively minor situations one might resort to the telephone, but in the normal course of action, in the normal difficulties that the Production shops run into, would this be the procedure they would use to get Design assistance?
A. Yes, I believe so.

Neither the counsel for the court, the court, nor the counsel for RADM Palmer wished to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

There is one thing on the associated piping in this area. Most of the hangers are rubber block hangers. I appreciate that this is not in my category, but knowing these rubber block hangers will allow the pipe to deflect within the hanger is probably one of the reasons why I felt that there was no associated pipe damage.

RE-EXAMINATION BY THE COURT

Questions by the President:

Q. How much rubber is involved in these rubber mounted hangers?
A. This depends. I think, on the size of the pipe. It's a fairly large amount.

Q. For a three inch pipe it would probably be only about an eighth of an inch?

A. Oh, no, more than that.

Q. Approximately how much for a three inch pipe?

A. I hate to say an exact number on this; I would rather see the plan myself.

Q. You don't recall, but you think it would be greater than an eighth of an inch sheathing of rubber?

A. Yes, they are square blocks with a little hole in them.

The witness said that he had nothing further to state.

The witness was cautioned concerning his testimony and withdrew from the courtroom.

(b) (6) relieved (b) (6) at this point as reporter.

The court was cleared at 1725 hours, 29 April 1963.

The court was opened at 1735 hours, 29 April 1963.

All persons connected with the inquiry who were present when the court was cleared were again present, and the court continued to meet behind closed doors.

No witnesses not otherwise connected with the inquiry were present.

Alfred L. Rowell, a civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: This is a closed session of the court, Mr. Rowell, so classified information can be given here. At the end of your testimony, I will ask what classification you would assign to any of your testimony.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Will you state your name, address, and present occupation, please?
A. My name is Alfred L. Rowell. I live at (b) (6)
I am a Leadingman Pipefitter in Shop 56.

Q. Do you work at the Portsmouth Naval Shipyard?
A. Yes, sir.

Q. What is the nature of your duties?
A. I supervise the installation of piping systems, air, hydraulic, salt-water - whatever is assigned to me at the time.

Q. What is your background and experience in this field?
A. Well, I've been employed in the Yard here going on twenty-two years. Prior to my coming in here, I had fifteen years with the railroad, pipefitting, with the Boston and Maine. I've had varied experience on air, water, air conditioning, and what-have-you.

Q. Previous to the 8th of March of this year, you had been working as a Leadingman on other ships, had you not?
A. Yes, sir.

Q. Directing your attention to the 8th of March, were you assigned to THRESHER on that day to supervise piping work as leadingman?
A. I think it was the 9th. The 8th was on a Friday.

Q. The 8th was a Friday, yes.
A. I was assigned to the boat on the 9th.

Q. The 9th of March. As it turned out, then, you were the Leadingman for THRESHER piping work on that week end, is that right?
A. Yes.

Q. Were you aware of a casualty to the reserve feed tank on the THRESHER?

A. I was aware of it on the 9th.

Q. Tell us what happened and what was done.

A. When I came in the morning of the 9th, the report was that the feed water tank had been ruptured. How bad it was, I didn't know. There was nobody there that had been there prior to my 7:30 trek. So I went down on to the boat to see what the conditions were. I didn't have anybody there to find out or ask any questions of. When I got down there there was quite a few people around there. I looked the situation over. There wasn't much involved at the time for the piping itself. I did notice that the stills had been moved, that they were in -- well, not a vertical position, but they were at an angle. And there was so many other people around there, and knowing that we wouldn't be involved at least until they got things squared away, I went back and reported to the Quarterman that there was quite a bulge in the tank, and apparently the bulge that was in the tank had upset the vertical position of the stills.

Q. Which quarterman was that, Mr. Rowell?

A. Now, to be honest with you, I can't tell you whether it was Mr. Collins or Mr. (b) (6) I don't know whether -- I should say I am thinking at the moment, or should I wait for further questioning on that? What I mean by that, at a later time, as the day went on --

Q. You did go down again and look at the piping, didn't you?

A. Yes.

Q. But at this time you did not look at the pipe, is that correct?

A. Yes, sir. Later in the day Mr. (b) (6) , who, I assumed, was acting Chief Quarterman, asked me to go down and make a visual inspection of any damage that might be apparent. So I went down, and to the best of my ability, what I was actually looking for was a ruptured pipe that would be visible to any human eye. I couldn't swear that there wasn't any cracks in the pipe or that there wasn't any cracks in the flange or any adjacent pipe. I was looking for something that you could physically see.

Q. What piping did you examine at that time?

A. I didn't have any plans with me. What I did was, in the general area of the rupture, I crawled around and looked as best I could. As I said before, I was looking for a ruptured pipe, a pipe that would be visibly broken or bent or jammed. I couldn't see any cracks, something that would be visible. I realized I couldn't possibly see whether, let's say, that a flange was loose. I know it wasn't broken. With the thought perhaps in the back of my mind, knowing that the procedure of the Navy Yard would be a re-test of the tank, and if there was any fine ruptures that I couldn't possibly see, that it would be seen at that time.

Q. Did you look at the auxiliary sea water system at all?

A. Like I say, I didn't have any plans; therefore, I couldn't honestly say that I looked at the auxiliary system, or that I looked at the fresh water system, or the drain system. I looked at the pipe in the general area looking for something that could be broken.

Q. Did you make a report of this look-see of that piping?
A. When I came back I reported to Mr. (b)(6) that, as far as I could see, there was no actual visible breakage or rupture or dismantling of the pipe.

Q. You did not recommend any further inspection, is that right?
A. No, sir, because I figured, with the background of the Portsmouth Naval Shipyard here -- well, I'm not going to say that I assumed, but I really had it in the back of my mind that the general procedure would be a re-test of the tank involved, or the adjacent piping.

Q. Do you know of any re-test of the tank involved or any of the adjacent piping?
A. No, I do not.

Q. Why is that?
A. Because at the time I looked at the pipe, the pipe was still ruptured.

Q. The tank, or the pipe, was ruptured - which?
A. The tank. The still was still out of location. They didn't get the tank down into position until the following day, which, I believe, was on a Sunday. Sunday was when I was relieved of my responsibilities aboard the 593.

Q. You didn't go back to the job on THRESHER after Sunday, March 10th, is that right?
A. That's right.

Q. One last question: When you did look at that piping, did you notice whether any of the piping that you looked at was lagged?
A. As I say, I can't recall. I did look in the general area of the pipe, and I can't swear to it, but I would be almost certain to say that some of it was, especially around the still.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness indicated that his testimony was unclassified.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

(b)(6), a civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: This is a closed session of the court, Mr. (b)(6). Therefore, you can divulge classified information here. At the end of your testimony, I will ask you what classification you would attach to your testimony.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. State your name, address, and present occupation.
A. My name is (b) (6) My address is (b) (6)
My present occupation is Marine Engineer in the Propulsion Piping Section of the Design Division.

Q. Are you employed in the Portsmouth Naval Shipyard.
A. Yes, sir, I am.

Q. What is the nature of your duties in your present position?
A. In my present position, I am a Project Engineer, which duties include the salt water systems, main sea water design systems in the design of the AGSS555; pipe stress analysis; pipe stress problems which may arise, and including special pipe hanger problems.

Q. Describe briefly your background and experience in this field?
A. Well, I graduated from the University of Maine in 1956. I came to work here in the summer of 1958, and in September of 1958 I left for two years in the United States Army. I came back to work here in September, 1960, at which time I was rehired as a GS-7 engineer, and I worked in the Piping Stress Group. In the spring of 1961 I was in charge of the Pipe Stress Group and Special Pipe Hanger Group. In the fall of 1961, I took over sea water and fresh water systems on the AGSS555, and retained special hangers in the pipe stress group. Also since the fall of 1961 I have been working as project engineer, mainly on the 555.

Q. I direct your attention to the week end of 8 March 1963.
A. Yes, sir.

Q. The 8th of March was a Friday. Are you now aware that there was a casualty to the reserve feed water tank on the U.S.S. THRESHER?
A. At this time I am, yes, sir.

Q. Can you say whether any request was made for study and repairs to be made or for recommendations for tests of piping adjacent to the tank area after the casualty to the reserve feed tank?
A. To my knowledge, no, sir.

Q. Would such a request have reached you had it been made?
A. It might have, yes, sir. If it was suspected that some of the piping had become over-stressed or undue loads had been placed on the pipe, it may have, yes, sir.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

WITNESS: The only thing I would like to say is that I have studied this matter to the best of my ability on the casualty to the feed tank, from what I could learn, to determine whether or not the movements that were expected could be absorbed by the distilling unit. I have tried to put them into engineering calculations to find out whether or not we would expect any damage might be done to the attached sea water piping. From these calculations I have concluded that there would have been very little effect on the attached piping.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Can you tell us what the maximum stress levels would have been in the trim and drain piping which you might have concluded from your calculations?

A. Yes, sir, I can. First of all, we have to make a couple of assumptions. I looked at the piping arrangement plans for the trim and drain system and tried to calculate what excursions, if you will, this piping would have undergone. I calculated from the maximum excursion of three-quarters of an inch to a minimum of one-quarter of an inch, and assuming I have no way of knowing whether this pipe was actually bent or forced through this range of distances, but assuming that--

Q. Where was this excursion assumed to have occurred?

A. There is a check valve on the drain pump discharge, and at this point there are flanges on the check valve, which is the closest point that any piping comes to the top of the tank. This is the point at which I calculated the excursion, and assuming a displacement of this check valve in the vertical position. I have calculated that this could have been displaced three-quarters of an inch vertically and still have seen a total stress range of only 7,380 pounds per square inch. This is out of an allowable 11,000 pounds per square inch for this material, which the ship's specifications allow. As far as the maximum yield strength of this material, which is 18,000 pounds, we could say that even at the three-quarters of an inch displacement, it did not approach the yield strength.

Q. What kind of end fixity did you assume?

A. I assumed a fixed position-- Well, I have a diagram here, if I may. This is a fore and aft run of pipe as it runs along the edge of the tank. This is where the valve would be located, eighteen inches on its leg. (The witness produced a diagram, which was examined by counsel and the court.)

Q. Please use this paper to refresh your recollection, but testify as to your own knowledge.

A. Yes, sir. This hanger point, as we should call it, is the point where the pipe changed direction and was anchored by hangers to the hull at that point. There were two other hangers in the straight run that went along the hull, but they would have acted as a guide to allow the pipe to twist on it. This would have given a torsional effect on the pipe. Assuming now that it would take a deflection of three-quarters of an inch, this stress would have reached 7,380 pounds per square inch.

Q. Was this in the 4-inch section of piping?
A. This was the 3-inch discharge.

Q. Did you perform any other calculations?
A. I did not perform any other calculations on the trim and drain system, but I did on the distilling plant.

Q. Just what were the maximum stress levels that you found?
A. The maximum stress level I found in the distilling system was 1,508 pounds per square inch.

Q. This is assuming the same deflection of the tank top?
A. This is assuming the same deflection of the tank top, yes, sir.

Q. Did you make any other calculations?
A. No, sir, I did not.

EXAMINATION BY THE COURT

Questions by a court member, RADM Daspit:

Q. About what date did you make these calculations?
A. I started these calculations one week ago today. That would have been the 21st of April.

Questions by a court member, CAPT Osborn:

Q. Are these calculations applied to deflection of the distiller?
A. The deflection of the distiller plant was three-quarters of an inch. This is not the total deflection of the tank top. There is a rubber mount there which acts as a shock absorber. This took up some of the motion of the tank top.

Q. What if you assumed infinite rigidity of these things?
A. If we assumed infinite rigidity, this would increase these values in direct proportion to whatever our total deflection of the distilling unit ended up as being.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness indicated that his testimony was unclassified.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court adjourned at 1805 hours, 29 April 1963, to meet at 0830, 30 April 1963.

FIFTEENTH DAY

Portsmouth Naval Shipyard
Portsmouth, New Hampshire
Tuesday, 30 April 1963

The court met with open doors at 0830.

All persons connected with the court who were present when the court adjourned were again present in court, with the exception of (b) (6), who was relieved by (b) (6) as reporter. RADM Palmer, LCDR Hecker and his counsel waived their right to be present. Counsel for RADM Palmer was present.

Donald H. Kern, Captain, U. S. Navy, was recalled as a witness for the court, was reminded that the oath he had previously taken was still binding, and was examined as follows:

COUNSEL FOR THE COURT: Captain Kern, this is an open session of the court. For that reason classified information may not be divulged. You will, therefore, not volunteer any classified information. If the answer to any question put to you by the court, a member of the court, or counsel would, in your judgment, require the inclusion of classified matter in your reply to make it complete, you will not make reply but will so indicate. Do you understand that?

WITNESS: I understand.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. This court has evidence that the reserve feed-water tank of THRESHER was overpressurized during a test conducted on it during the post shakedown availability period. Are you familiar with the precise details of that casualty and the associated piping systems which could have been affected by it?
A. I am.

Q. At your direction, have certain studies been conducted in an effort to determine whether or not any deleterious effect to the associated sea water systems could have been suffered as a result of the overpressurization of the tank?
A. Yes.

Q. Would you describe the studies which have been conducted and the results thereof?
A. At the request of the court, I directed Mare Island Naval Shipyard to make certain pipe stress analyses to determine the stress levels that could be generated in the salt water piping systems that might have been disturbed by the lifting of the tank top due to overpressurization of the reserve feed tank during THRESHER's PSA. For purposes of making this analysis, Mare Island was furnished certain information: first, applicable reference plans; and, then, actual measured tank top deflections; and the information on the fail tank weld and structures; and these last two items were provided based on direct information from THRESHER data. Mare Island has completed the studies and reported the results to me by telephone on the 29th of April. The study was conducted using an IBM 705 computer, making use of computer programs already available to the shipyard for pipe stress analysis work. Mare Island first confirmed the deflection pattern of the top of the tank by structural stress analysis. Mare Island then determined the pipe stresses that would be

generated by movement of the tank top and the resultant movement of attached distilling plant piping and drain system piping. For the purposes of establishing the maximum pipe stress levels that would exist based on this tank top movement, they used the most severe boundary conditions that they thought practical; and, that is, the maximum possible dynamic deformation of the tank top was used. For fixity of ends of pipe, 100% fixity was assumed. And a conservative flexibility allowance for the various flexible connections was assumed. Using these severe boundary conditions, the maximum stresses, as determined by the computer analysis, that could result were found to be, first, in the section to the drain pump, which is copper nickel pipe with welded joints, a maximum stress of 19,000 psi would have been generated. In the discharge from the drain pump, which is copper nickel pipe with sil-brazed joints, a maximum stress of 11,400 psi would have been generated. In the feed system inlet piping from the distilling plant, which is copper nickel pipe with silver-brazed joints, a maximum stress of 2,800 psi would have been generated; and, in the feed system overboard piping from the distilling plant, which is copper nickel pipe with sil-brazed joints, a maximum stress of 3,900 psi would have been generated. These stresses that were computed for the displaced piping can be compared to the known physical properties of copper nickel material from which the pipe was constructed; and for purposes of this comparison, the allowable working stress for copper nickel is 11,000 psi. The stress at which copper nickel material will yield is 31,000 psi. The nominal stress at which the material will ultimately fail is from between 50,000 to 58,000 psi. In comparing the maximum stress levels generated in the tank and the capabilities of the copper nickel to carry this stress, it was determined that none of the vital salt water piping involved in the reserve fleet tank overpressurization would have yielded, nor would have permanently deformed, and that properly assembled pipe fittings would not have been disturbed by the tank top casualty.

Q. Based upon your naval and engineering background and experience, and taking into account the conservative nature of the assumptions made by the Mare Island Shipyard personnel performing this computation, do you concur in the results of that study?

A. Yes, I do.

EXAMINATION BY THE COURT

Questions by a member, CAPT Hushing:

Q. Were there any other studies made of this particular casualty by other shipyards or the Bureau of Ships?

A. Yes. Portsmouth Naval Shipyard conducted their own independent analysis of the stress levels in the piping based on their knowledge of the tank top deflections.

Q. Do you know the general conclusions of that study?

A. Yes, I am aware of the results of this study; and their study essentially confirms the studies of Mare Island, as reported, that I have in turn reported here to this court this morning.

Q. Do I understand, then, that both studies indicate little or no potential damage to piping systems from this particular casualty?

A. That's correct.

Questions by a member, CAPT Osborn:

Q. I want to emphasize one thing. Both of these studies were conducted after the loss of the THRESHER; is that correct?

A. Yes.

Questions by the president, VADM Austin:

Q. Captain Kern, what accounts for these low stresses despite the fairly sizable deformation of the top of that tank?

A. The factors, I think, that contribute significantly to the low stresses include the fact that this piping had sound isolation connections in it. The pipe hangers were of a sound isolation variety that permitted the pipe to flex. The piping itself, being of a copper nickel material, which has a low modulous elasticity, is in itself a fairly flexible element in the piping system and it is fairly thin-walled; so all of those factors, I believe, contributed to the finding of very low stress levels with this deformation that was found in the tank top.

Q. Then the court understands that a careful study of the independent analyses made by both Portsmouth and Mare Island leave no doubt in your mind as to whether or not any of the salt water piping attached to or running across the top of this tank top that was deformed could have exceeded the stresses at which they would have failed?

A. Based on the studies that have been conducted, I see no possibility that even the yield stress limits of this material were exceeded as a result of this casualty to the tank top.

Q. The yield stress, I believe, was 31,000?

A. 31,000, yes, sir. The maximum stress encountered was 19,000.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly warned concerning his testimony and resumed his seat as an adviser to the counsel for the court.

At this point in the proceedings the president announced that the court would sit with closed doors. All witnesses not otherwise connected with the inquiry withdrew from the courtroom.

No witnesses not otherwise connected with the inquiry were present.

Leon H. Valley, was recalled as a witness for the court, was reminded that the oath he had previously taken was still binding, and was examined as follows:

COUNSEL FOR THE COURT: This, again, is a closed session of the court, Mr. Valley, and classified information may be divulged. At the end of your testimony I will ask you to assign what classification you would give to your testimony. I understand you have notes with you from which you hope to refresh your recollection

WITNESS: Yes, I do have.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Just to refresh our recollection, would you briefly state again your present position at the Shipyard?

A. I am Structural Group Planning Supervisor. The shops involved are 11, 26, 17 and 23.

Q. What are those, please?

A. Shipfitters, Welders, Blacksmiths and Sheet Metal.

Q. And until the last three weeks of the post shakedown availability period, you were the hull superintendent for THRESHER, were you not?

A. Yes, sir.

Q. Can you describe, in general, all the penetrations made in THRESHER's hull that would have affected her watertight integrity? By that, I mean to include penetrations for access and those incident to work accomplished on THRESHER.

A. Yes, sir, I can.

Q. Proceed.

A. It would be easier for me to stand. Do you object to this?

Q. Please do. Make it the way best suited to you.

A. If it would please the court, I have a marked-up blueprint of the areas on the pressure hull that indicate the openings, penetrations, et cetera. Would you care to have this posted so I may illustrate?

PRESIDENT: I think it might facilitate matters if you do put it on the back board there.

Q. When you describe this, would you mention the frames and locations so the record will be clear?

A. I will attempt to do this essentially from the forward body of the ship to the after body of the ship, and include not only penetrations to the pressure hull, but also to the primary structure which was involved.

Q. Would you first identify the print for the record?

A. Print number is Portsmouth #1003381 Alteration M. The first openings in the vessel were in the Sonar sphere, BQS-6 hydrophones. There were 1245 of them removed and replaced. The second openings in the ship, moving aft, are in the forward elliptical head and identified approximately in this area. They were authorized by DM and were five and three-quarters in diameter.

Q. What area do you refer to as "this area"?

A. The forward elliptical head at approximately that point 14 feet two inches above the base line.

Q. And that point is at what frame?

A. That point is actually at Frame 10 minus a few inches. The two holes here were used for high-pressure electrical fittings concerned with BQG-2 PUFFS from arrays No. 1 and No. 2, which were in this forward body of the vessel. The next penetration, moving sequentially aft, was a David Taylor Model Basin instrumentation fitting at the top of the hull about thirteen inches from the

center line of the ship port, Frames 11 and 12. This was also a high-pressure electrical fitting. The opening in the hull was of approximately five and three-quarter inch diameter. Moving back to the forward trim tank bulkhead, Frame 14, there were two openings, one on the port side and one on the starboard side, for purposes of welders' ventilation, grit-blasting and painting. These were replaced and welded, MT'd and X-rayed. The next opening aft was between Frames 22 and 23. We removed an air insert from the hull and put a new closure plate in that opening. The opening was approximately ten inches in diameter. Moving again now to Frames 37 and 38, we removed the old garbage disposal unit and installed an entire new assembly.

Q. May we assume in your presentation of this evidence that all penetrations were magnetic particle inspected and X-rayed unless you note otherwise?

A. Yes, sir. I was going to make a general comment on that at the end. The actual opening in the shell was forty-four inches long and about seventy-two inches wide, running vertically with the shell. This had a twenty by twenty-six inch approximate opening cut within the limits of the sea chest itself, exposing the external surfaces of the sea chest to sea pressure. Within this area of the garbage disposal unit construction itself there were five openings. There was a four and a half inch diameter stuffing box insert which was sixty and a half inches aft of Frame 37. There was a hole in the top at twenty-six inches aft of Frame 37 which was three and three-quarter inches in diameter, and this was also a stuffing box insert. There was a hole at nine foot, nine and five-eights above the base line at Frame 38: this was a stuffing box for the cover operating gear; this was four and a half inches in diameter. There was a hole eighty-eight inches aft of Frame 37 for trim and drain; this was two and five-eights of an inch in diameter. There was a hole fourteen feet one and one half inches from center line of the ship at Frame 38, two inches in diameter; and this was also for trim and drain. This area was X-rayed and magnetic particle inspected. Moving again aft to Frames 45 and 46, we removed a pressure hull insert with a cylinder attached, referred to as No. 2 PUFFS, to identify it as old No. 2 PUFFS. We recut the opening from forty-four inch diameter to a forty-four inch opening, radius ends and four foot ten inches athwartships. This area was patched, the frames were repaired with inserts; there are applicable DM's and authorizations for this. At a later date within that same patch we installed a floating wire antenna cylinder which required a five and a half inch diameter opening in the hull. This was welded and MT'd. This, again, is identified as being between Frames 45 and 46 and approximately twenty-two inches off the center line of the ship, seven inches forward of Frame 46. In this area of the hull we installed a depth detector sea chest. This is identified as a pressure hull type insert structure. This was welded and X-rayed and MT'd. In the tank top of the auxiliary tanks No. 1 and No. 2 there were two access openings cut for personnel access and ventilation for doing the fatigue stiffening jobs. These were located between Frames 46 and 47 about six or seven foot out from the center line of the ship. They were approximately twenty inches square with radius corners. The material removed was replaced and welded, MT'd and X-rayed. At Frames 51 and 52 in the bottom of the normal fuel oil tank we cut a nineteen inch diameter hole at approximately the bottom vertical center line, equally spaced between basic structure. The purpose of this hole was for welders access and ventilation, et cetera, for doing the fatigue stiffening job in that tank. At Frames b(3) 10 USC there was an opening cut in the reactor compartment tunnel through the pressure hull, thirty-six by thirty-six inches, radius corners. It affected one pressure hull frame, I believe, which was Frame b(3). This required welding the patch back in and two butts on the frameweb and face plate. Moving aft to Frames 63 and 64, we cut two five and a half inch, five and three-quarter inch openings and installed again two pressure hull electrical fittings that were used for PUFFS arrays No. 3 and No. 4 located

in the area of main ballast tanks 4A and 4B. These were also welded and MT'd. Moving aft to Frames 65 and 66, we took the insert that was removed from this area, identified as Frame 22 and 23, and installed it on the starboard side of the hull at that point, welded it, MT'd it and X-rayed it. At the time this job was going on the shipfitter inadvertently layed this hole out on the wrong side, it was partially burned; they had to cut it the remainder of the way and patch the hull on the opposite side of the ship, so there is a patch existing in that area as indicated here on the opposite side of the ship. This was also MT'd and X-rayed. Proceeding aft again now to Frames 66 to 67, we removed a pressure hull insert with a cylinder attached, identified as old PUFFS No. 3, patched the frames on the pressure hull in this area, approximately a thirty-six inch diameter patch. Moving again aft to Frames 80 and 81, we cut a hole in the top of the hull for personnel and machinery shipping, twenty-one inches wide and approximately sixty--excuse me, twenty-one inches long and approximately sixty inches wide across the top of the hull, at the vertical center line. This affected no pressure hull structural framing and was welded back in and MT'd and X-rayed. Moving to Frames b(3) 10 USC we cut a machinery equipment shipping patch in the condensate bay in the engine room on the starboard side. This was thirty-six by thirty-six inches square with radius corners and affected one frame, Frame b(3) which required welding of the patch back in and two frame butts. This was also X-rayed and MT'd. Proceeding aft again to Frames 94 to 97, we cut an opening in the pressure hull for machinery and equipment shipping aft in the engine room, about forty-four inches long and five foot ten inches wide.

Q. When you say "long" and "wide" --
A. I am talking longitude.

Q. "Long" means longitude?
A. Right. And "wide" means athwart, sir.

Q. Would you restate the one in the upper forward end of the engine room?
A. Yes, sir, this was twenty-one inches running longitudinally, if this would be clearer, and sixty inches running athwart, sir. Again, the one in the engine room at Frames No. 94 to 97 was forty-two inches long and was located fore and aft of Frames 95 and 96; it was approximately five foot ten inches wide athwartships, and affected Frames 95 and 96. There was a butt on each one of those frames, port and starboard. Moving back to the after trim tank, we cut a sixteen inch diameter access opening in the trim tank top on the starboard side about six foot outboard of centerline to star. This again was for personnel access and ventilation and was MT'd, blasting, preparation for MT and for painting. This was reinstalled, the original material welded, MT'd, X-rayed, et cetera. Moving aft to the after elliptical head at about Frame 106, there were two openings cut into the hull for PUFFS electrical penetrations; they were about five and three-quarter inch diameter holes. The fittings were installed, welded and MT'd. This is, as I remember it, the total number of hull penetrations and/or affected areas we had on the THRESHER.

Q. Will you state for the record what your abbreviation "MT" was intended to mean?
A. This is magnetic particle inspected.

Q. Can you describe in general the work done during THRESHER's post shakedown availability on stiffening and general strengthening of her pressure hull?
A. Yes, sir.

Q. Both shock stiffening and fatigue stiffening?

A. Yes, sir. The fatigue stiffening job involved flat plate stiffening in the forward trim tank between Frames 11 and 14, and outboard to the tank top boundary, port and starboard. I have these plans available in my box here. If anyone would like to look at the fatigue stiffening jobs or any of the others, I do have these available here for reference. We had one fatigue stiffener in the torpedo impulse tank, located around Frames 33 to 35. This was on the flat tank top and was of "T" - bar construction. We also had one flat plate stiffener which was indicated as fatigue stiffening in the inboard bulkhead, or inboard face of the garbage disposal unit; this ran horizontal and was about equally spaced between the bottom and the top of the tank. This was also "T"-bar construction. WRT tanks Nos. 1 and 2, in this area, we performed fatigue stiffening on the tank top and the inboard bulkheads, all flat plate area structure. Auxiliaries No. 1 and No. 2, fatigue stiffening was accomplished in these areas as per plans and specifications. Normal fuel oil No. 2, we also performed a fatigue stiffening job in that area. b(1) tank, we also performed a fatigue stiffening job in that area. On the b(1) tank. I would like to go back one step. We did remove three sections of tank top plating in the b(1) tank top and replaced them, and replaced two tank top fittings that penetrated the pressure hull structure, or the primary hull structure. Proceeding aft again to the after trim tank, we performed a fatigue stiffening job in that tank as per plan and authorization. All of these tanks were MT'd, magnetic particle inspected.

Q. Some of the pressure hull cuts which you have described have considerable girth. What action was taken to insure proper circularity of the pressure hull structure following completion of all work on the patch?

A. The structural shop Shipfitters took a circularity on all pressure hull patches with the exception of No. 3, which they were not able to do because of the proximity of the keel; and those are a matter of record.

Q. Can you relate in greater detail the work done on the garbage ejector installation?

A. Yes. The original or initial garbage disposal unit was cut out of the hull, there's an outline here of the original insert on this plan. We requested assistance from Design to increase the opening of this area so that we could take the garbage disposal unit out with the cylinder as a total assembly because of a Bureau requirement for magnetic particle inspection before we sent it to the junkyard at Henderson's Point for disposal; and this was done. We cut the hull to a forty-four inch longitudinal dimension by approximately six foot athwartships so that we could remove this. The entire new sea chest assembly required the replacement of the frames, which were of three inch HY-80 material, and included in the frames were the sides or fore and aft bulkheads of the garbage disposal unit sea chest. These were installed and welded and X-rayed where applicable. Plan holes were drilled and insert stuffing boxes, et cetera, were installed. All the mechanisms were bolted into place. When the job was complete and sold, magnetic particle inspected satisfactory, we put a twenty pound air test -- we put a blank over this opening here and put a twenty pound air test on the entire sea chest.

Q. Would you describe in some detail the removal of the original PUFFS hydrophone system and the installation of the new system?

A. Yes, sir. Old No. 1 PUFFS hydrophone was located at the extreme end of the bow structure at approximately Frame 1. I believe. This was on a truss foundation and was not a significant structure. That was removed. PUFFS No. 2 was located at Frames 45. 46. As I described in patching the hull, this was removed from the vessel and the area repaired and returned to its original structure. PUFFS No. 3 was removed from this area, the bottom of the AMS space, auxiliary machinery room. between Frames 66 and 67. This comprised a pressure hull insert with a cylinder projecting inside and outside the boat. This was removed and all affected areas repaired. PUFFS No. 4 was located in the No. 7 main ballast at, I would guess, Frame 108. 109. This was removed and the structure replaced back to what it had been originally. This, again, was an insert with a cylinder attached.

Q. There was a Bureau of Ships requirement that all HY-80 welds be given a seven day soak period and then inspected by magnetic particle testing to determine if any weld cracking might have occurred during the soak period. Was this requirement met in all instances in regard to the work which you have described?

A. No, sir. No, there were waivers requested and waivers granted.

Q. Can you itemize the waivers for us?

A. I am not able to, no. I can remember some waivers but I am not prepared to itemize each specific waiver, no, sir.

Q. What were the reasons for the waivers, as you recall?

A. Generally, scheduling. The fact that we had a particular area that we wanted to complete, we wanted to get it painted and closed up so other work could follow. We made our request waivers through the appropriate people and if it was granted we accepted it, and if it was not granted, and in cases it was not, we proceeded on the seven day wait period. General waiting was, as I remember, approximately four or five days in lieu of the seven.

Q. Before the ship sailed were these finally picked up?

A. No, sir. To my knowledge they were not picked up or changed, no.

Q. What percentage of the work done do you think was covered by waiver?

A. I wouldn't say it was a tenth of one percent.

Q. Can you testify to the best of your knowledge that all the structural work which you have described to us was performed in a satisfactory way?

A. Yes, sir.

Q. So as not to affect the seaworthiness of the ship?

A. Yes, sir.

Q. Is it a fact that your feeling was such that you volunteered to go on her final sea trials?

A. Yes, sir, I did. I volunteered to go on every THRESHER sea trial since she was built. I was the builder on the THRESHER.

EXAMINATION BY THE COURT

Question by a member, CAPT Nash:

Q. Where it was necessary to make hull penetrations, who decided whether or not such penetration would be made?
A. It was either authorized by Design Memo, DLI's or Plans and a JO from P&E.

Question by counsel for the court:

Q. What is a DLI, and would you please state what P&E means for the record?
A. This is the Planning Department, or Planning and Estimating Division. A "JO" is a Job Order; and "DM" is a Design Memo; and a "DLI" is a Design Liaison Instruction.

Questions by a member, CAPT Nash:

Q. Do I understand then that the directive to make the penetration initiated either with the Design Division or Planning and Estimating?
A. Yes, sir, with the exception of -- I cannot find the record that authorized the two holes from Planning and Estimating in Bulkhead 14 and the Forward Trim Tank. With the exception of that one area, there were authorization documents, yes, sir.

Q. Was there any formal authorization for that?
A. I believe so, but I can't produce it.

Questions by a member, CAPT Hushing:

Q. Mr. Valley, you stated your opinion that all inspections and tests were completed after the work was done on hull penetrations and on hull alterations. Can you tell me who in the Shipyard, or what group of persons, has actually examined each record of hull surveillance and tests and inspections?
A. Can I tell you specifically?

Q. Or a group of people; which group did it?
A. Well, 303-B; structural group inspectors in 303. The actual people, I believe I could name several of them. There was Mr. Plummer, a supervisor; a Mr. Dubie, the hull inspector.

Q. Has that group, to your knowledge, reviewed the records for completeness?
A. They have informed me that they have, yes, sir.

Q. Have they reported any areas in which records are not available?
A. Yes, they have. They have reported -- this is another thing I have on here -- they inadvertently drilled a pilot hole in this engine room patch and a week ago they informed me they had no MT record of that X-rayed pilot hole repair on that patch.

Q. Is that the only discrepancy that you know of?
A. This is the only one I was informed of, yes, sir.

Q. What size hole was that?
A. This was approximately an eighth of an inch and was repaired consistent with Shipyard plans.

Q. Now, regarding the records which do exist, do any of those records show defects beyond the allowable standard?
A. To my knowledge, no, sir.

Q. So that there are no waivers as to standards, to the best of your knowledge?
A. To the best of my knowledge, no, sir.

Questions by a member, CAPT Osborn:

Q. Mr. Valley, I'm interested with respect to inadvertently cutting into one side of the hull. What action was taken in that case?
A. There was a Damage and Waste Document filed by the Master Shipfitter. The man and his leadingman were called on the carpet and were reprimanded. The Damage and Waste Document is a matter of record and I have it in this room.

Q. With respect to being called on the carpet and reprimanded, what does this represent?
A. I was not responsible for this; I cannot describe it.

Q. What would that represent with respect to discipline -- was this a slapping of the man's hand or was something a little bit more attached to it?
A. I couldn't tell you, sir; I had nothing to do with it and I wasn't concerned primarily with the discipline.

Questions by the president, VADM Austin:

Q. Mr. Valley, with respect to the waivers on BUSHIPS requirements for seven day soaking of welds before giving them their required tests for magnetic particles, I believe you said that these waivers constituted one-tenth of one percent of the welds made?
A. I would say that would be maximum. This is difficult for me to analyze in a minute. The total was 100% of the welds that were MT'd on that ship for this job. I would say it was probably even less than one-tenth of one percent.

Q. And yet I got the impression from your reply to the question if you could identify the waivers, that these waivers were very numerous?
A. They were not. They were not numerous in relationship to the number of areas that had to be repaired and still pass on a seven day waiting period.

Q. At what level is a waiver granted in this shipyard?
A. Well, I have a record here, a copy of a record that shows that one area was granted on a Bureau level.

Q. What is the lowest level at which a waiver is considered valid?
A. It's somewhere within the Welding Engineer's Office.

Q. Welding Engineer's Office?
A. Yes, sir. I have no authority to grant or to authorize waivers.

Q. I noted in your cataloging of the openings in the pressure hull a number of openings of not insignificant size which were made for ventilation or access?
A. Yes, sir.

Q. Has a practice grown of making openings in these hulls to the point that it is done without serious design consideration of the effect on the hull of such a penetration?
A. I would say no, sir; these were all authorized by Design and I am sure they were given serious consideration by Design.

Unclassified

Q. At what level in the Design Division are these Design Memos, Design Liaison Instructions and Job Orders authorized which permit the making of openings in the pressure hull?

A. Well, I can answer for the structural design memos. At the level of Mr. Watts and Mr. Dunham, Assistant Chief Design Engineer for Construction.

Q. What was the other gentleman's name?

A. Mr. Watts.

Q. You have cited one unauthorized opening which was made in the hull. I believe you said it was only a one-eighths of an inch hole?

A. This was the initial opening, yes, sir. It was drilled out consistent with the standard patching plan for this type of error in the pressure hull. I was informed by Mr. Bogrett of Shop 11, the Quarterman, that he discussed this with Mr. Watts of the Design Division and he received this instruction as to how to repair it and concurred in repairing it. This was also X-rayed and proven free of defects and the X-rays are a matter of record.

Q. If one hole were inadvertently put in the pressure hull, what assurance do we have that other unauthorized holes were not put in the hull and not discovered and properly corrected?

A. We tested every compartment, every void, every space, every tank on the ship, sir. This is the assurance that you have.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly warned concerning his testimony and withdrew from the courtroom.

The court closed at 0922 hours, 30 April 1963.

Unclassified

The court opened at 0935 hours, 30 April 1963.

All persons connected with the court who were present when the court closed were again present with the exception of (b) (6) who was relieved by (b) (6) as reporter.

The court then recessed at 0936 hours, Tuesday, 30 April 1963.

The court opened at 0957 hours, Tuesday, 30 April 1963.

All persons connected with the court who were present when the court recessed were again present. No persons not otherwise connected with the inquiry were present.

Harley B. Remick, a civilian, was recalled as a witness for the court, and was reminded that his previous oath was still binding. He was also made aware that since the court was meeting in closed session, classified information could be divulged and at the conclusion of his testimony he would be requested to assign the highest classification to his testimony that he considered applicable.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. Remick, will you again, for ease of reference, tell us the nature of your duties at the Shipyard?
A. I am the head of the propulsion service piping section in the Design Division.

Q. Will you describe to the court the changes made in the check valves installation and piping in the constant vent system of THRESHER during her post shakedown availability?
A. As I mentioned the other day, we have this continuous vent system which ventilates all of the heat exchanger water boxes in the auxiliary sea water system. This goes to a single header and to a single overboard discharge opening in the hull.

Q. Do you have a blueprint that would help to exemplify your testimony?
A. Yes, I have.

(A blueprint was then attached to the board)

WITNESS: This is actually a diagram of the auxiliary salt water system on which we have shown the continuous vent lines. This is drawing Number 1862582. The continuous vent system is set up such that we can always have a working vent of the system so that the ship's force personnel do not have to concern themselves with insuring that the water boxes on any given heat exchanger are completely full of water. This vent system is set up, as I mentioned, such that in those instances where you can't vent the system through some higher point on the system itself, you lead them all into a header which goes through a single overboard discharge connection. In this ship it was in the engine room.

PRESIDENT: Is that header for the entire length of the ship?

WITNESS: No, sir. In this particular case this header only takes in the engine room.

Unclassified

PRESIDENT: I see.

WITNESS: I think the other day I gave the impression it took in the machinery space also. This is not true. The machinery space heat exchangers are vented to the auxiliary sea water system at a high point which is the overboard discharge line. It was considered in talks between the Design Division personnel and ship's force personnel that it would facilitate isolation of the system should anything go wrong, either in the actual supply and discharge to the heat exchangers, or if a continuous vent pipe should rupture it would facilitate isolation if we had check valves installed to protect these pipes. This is the basis for putting these check valves in. This particular installation - overall installation - was worked out with the ship's force personnel and the Design Division personnel before the ship left previously, and we got the design work completed before the ship came back this time, and this is what we put in. For instance, we have Motor Generator air coolers--it was considered that in this particular case they would be working in pairs. Here's b(3) 10 USC DC and b(3) 10 USC AC Motor Generator air coolers. There continuous vents are led up and connected in together and one line is led from them into a common line which ultimately goes into the overboard line. Just before this line hooks into any other line, we put a check valve, so that if that line should rupture, or any other line that was associated with these components should rupture, you could isolate this particular portion without concerning yourself with the fact that water could come back through the continuous vent system and out through the piping associated with those components. As I mentioned, we did the same thing with these b(3) motor generator air coolers. Our reactor fresh water coolers each had a line--these are return bend U-2 coolers so they only had one water box vent which we took a line from here and brought it over. We also had a line coming from the b(3) 10 USC 1 reactor fresh water cooler, and before those two tied together we put a check valve in each. We brought them down--this in actuality on the ship is approximately 15 feet of pipe, so we deemed it wise to put another check valve here to protect this pipe from the rest of the system. This concept was followed throughout the system. Again, this system was vented to the overboard of the system. This portion of the system in the engine room, all of the vents--well, from the air ejector condenser, for instance, we brought the vents up from the water boxes on each end and through a check valve here, just before lines were led in from--in this case--the SSTG air cooler, and any other components, before the connection to any other one, we put a check valve in. Thence through each and every component we had either a separate line with a separate check valve from each end, or, depending on the situation aboard ship, the space and piping arrangement situation, we either had this type of an installation where we would come up with both, with one check valve, or each end of the heat exchanger with its separate check valve; but ultimately, they all led into a single header which went through a hydraulically-controlled isolation valve to the overboard, which was a common overboard for the auxiliary sea water, main sea water, and air conditioning sea water. These check valves, in order to insure that the system would function properly, the check valves were specially designed so that they were spring-loaded to stay open and should you get a rupture upstream of them or in back of them from the rest of the system, a five pounds per-square-inch differential pressure would close them, keep them closed. These are not a swing check valve. They are actually a spring-loaded check valve with a seat and disk, similar to a blow valve, a tapered disk. I think I could point out each installation, but every heat exchanger and the pumps themselves all were provided with these check valves and any common line--for instance this was a header coming up from the after end of the ship. It's a fairly long header and in it we put a check valve to protect the headers also.

Unclassified

PRESIDENT: What size line is that particular one?

WITNESS: This particular line is a half-inch, sir. This line here was an inch and a quarter.

Q. Is it true, that on one of the first dives of THRESHER, there was a failure in the continuous vent system?
A. Yes.

Q. Can you locate that failure on the plan for us?
A. It was on the Number 2 hydraulic oil cooler and we have a connection coming off from each water box with an isolation valve in each connection. This connection was then led up through a common line to another shutoff valve to the common header. The rupture in this case was between these shutoff valves and the common header.

Q. What was the proximate cause of that failure--was the wrong material used?
A. As I recall it was a piece of CRES piping.

Q. What size line was that?
A. That's a half-inch line.

Q. What changes were made as a result of that casualty?
A. The changes that were made were study and subsequent design work to put the check valves in.

Q. Can you tell us of any new valves that may have been installed in the auxiliary machinery space?
A. In the continuous vent system?

Q. No, in the ASW system.
A. There were none during the PSA--there were none in the PSA.

EXAMINATION BY THE COURT

Questions by a court member, RADM Daspit:

Q. What is the necessity for this system? It would appear that all of these pieces of equipment could be vented by hand. Do they frequently get air bubbles in them?
A. The continuous vent system was put in originally because of the fact that ships, prior to this one, had had constant trouble with air in their systems. There is a study now for nuclear submarines, which are capable of staying submerged longer, to do away with this system, but at the time of the diesel-powered submarines they had to surface often enough and got air into their systems, apparently from blowing their tanks. That was one of the first considerations in the design, the consideration of putting in a constant vent system.

Q. Do you know whether as a result of this failure of the half-inch pipe on THRESHER, it was recommended by forces afloat that this system be eliminated?
A. I don't know whether it was recommended as a result of this failure. I know that there are studies that forces afloat have--I don't really know whether they have recommended them, but they have been very deeply involved in them--studies to do away with this system, yes.

Q. Are the sizes of the constant vent flow lines based upon the probability of getting air in a particular piece of equipment or on what are they based?

A. The sizing of the constant vent lines is based on, primarily, a heightening of experience of what was the minimum size that would work properly. Actually, how much air one might get into one of these water boxes per unit time, can be difficult to calculate.

COUNSEL: The witness has a diagram of the auxiliary sea water system.

Questions by a court member, Captain Hushing:

Q. What is the approximate distance above the keel line, of the intake for the ASW system? -- Is it one foot, two feet or three feet?

A. The ASW system. - b(3) 10 USC intakes, - the b(3) 10 USC 130 are very close to the keel. I would say that they wouldn't be more than--well, they wouldn't be more than b(3) 10 USC above the keel. The b(3) 10 in the engine room, I wouldn't say were more than b(3) 10 USC above the keel.

Q. Would this then place these intakes about b(3) 10 US below the water line of the ship under normal surface operation?

A. A maximum, yes.

Q. Has there been any evidence that surface operation would. with rolling, pitching and a reasonable amount of speed, have introduced air binding into any of the heat exchangers which are serviced by the continuous vent system?

A. Not in the heat exchangers themselves. We did have a report that they were having difficulties with the b(3) 10 US pumps in the machinery space becoming airbound. and we did redesign the lines from the pumps to the overboard header for that reason.

Q. Did you say b(3) 1 pumps?

A. Yes.

Q. In the engine room?

A. No, in the machinery space.

Q. And where did the air come from that bound them--from the water outside?

A. Yes.

Q. Entrained air then from ship's motion, perhaps?

A. It was either entrained air from ship's motion or air that came out through the ballast tanks from blowing them to surface the ship.

Q. Do you know which it was?

A. No, sir, I don't.

Q. Did you, on trials, conduct main ballast tank blow to determine the air binding characteristics of this ship?

A. No, I did not.

Q. You did not or you don't know?

A. No, I didn't.

Q. Do you know whether such tests were conducted?

A. No, I don't.

Questions by a court member, Captain Osborn:

Q. Do you think emphasis on isolation in this particular system and the instructions to the crew thereof, would have any effect on their casualty procedures in case they got a major casualty of flooding with respect to total isolation, partial isolation or no isolation?

PRESIDENT: Do you understand the question?

WITNESS: I am not too sure. I can't remember the first part of it.

(The reporter then read the last question to the witness)

WITNESS: Only in that it would eliminate the necessity of concerning themselves as to whether or not it were a casualty to a continuous vent line as the first of some other line in the system.

Q. Let's go back on this before. As the system was originally designed, you had no choice but to completely isolate the system because it was cross-connected to the constant vent system. is this correct?
A. Cross-connected?

Q. Yes.
A. The ASW system was cross-connected?

Q. Yes.
A. Well, the constant vent system comes off from the ASW system.

Q. But with no check valves involved, both loops have to be connected through the constant vent system?
A. That is correct.

PRESIDENT: Through any heat exchanger for example.
A. Through the constant vent systems, yes.

Q. Therefore, when the system was initially designed, you had no isolation feature?
A. Yes, we had the isolation valves in the continuous vent system, manually operated. They were not check valves.

Q. Well, the point I was trying to get in my mind was, a crew as they originally went to sea with this ship, had no choice with respect to isolation but to completely isolate the system. When the new constant vent system was installed, there was a possibility of isolating the system b(3) 10 USC 130
From your discussions with them, do you think their initial reaction would be to completely isolate the system and then cut the system in one at a time, or to try to isolate the system individually?
A. To completely isolate or to try to find the leak?

Q. Completely isolate from a safety point of view?
A. Well, I think that they would--I think it would depend on the circumstances again. I think that they would strive not to have to completely shut down that system.

Q. This is the exact point I am trying to make. Do you, as a designer, and the operators you speak of, say that the last thing they would do is to completely isolate the system or would that be the first thing they would do? -- And I want you to base this on your discussions and your thoughts with respect to the discussions of the system itself.

A. I think that they would strive to isolate that portion of the system where the leak was, or rupture.

Q. I didn't get the answer.
A. I think they would strive first of all to isolate that portion of the system where the difficulty was.

Q. You have been to sea on THRESHER when she had a salt water leak?
A. No, I have not.

Q. Is it your opinion that a salt water leak is an easy thing to find at deep submergence?
A. No, it is not my opinion.

Q. In retrospect, how would you operate this system?
A. I think that once again I have to say I think it would depend upon the circumstances, of how deep the ship was and what the mode of operation was. I feel that I would strive to isolate the portion of the system where the difficulty was.

Q. Do you think that you would get the answer to the questions any faster than the questions I am asking you right now--would you secure the system?
A. Well, once again, if the ship were down there at full submergence and it was operating at full power, they probably would have to do it if it was in that situation.

Q. Now, just one more question. If you were to completely secure that system, is there something sacrilegious in your thoughts or something - do you think you are going to blow up the ship if you did secure it?
A. No.

Q. What is the harm in shutting; why do you resist shutting?
A. The only reason that I resist shutting is that you have--you are servicing, for instance an SSTG lube oil cooler which, if that lube oil is allowed to get too warm, you are apt to damage, very apt to have damage to your bearings, or the same on your main propulsion turbines.

Q. This is true. Is this a fast thing or a slow thing?
A. I would say it could be very rapid. I do know that if you try to run a high speed turbine without any oil, it is a matter of b(3) 10 US before you can wipe a bearing b(3) 10 USC 130

Q. I agree with you with respect to this. With respect to lube oil temperature, is it something that skyrockets very fast?
A. We take b(3) 10 US out of--on the main turbine--out of b(3) gallons a minute. We cool the oil from b(3) 10 USC 130 I would say it would skyrocket rather rapidly.

Questions by the court president:

Q. Mr. Remick, continuing on this rise in temperature of the lubrication oil on your main turbine bearings, what temperature would that oil have to reach before these bearings were jeopardized?
A. Well, your oil starts to break down around at--well, your additives would start to come out of the oil at b(3) 10 USC 130 The oil would start to break down at some b(3) 10 USC 130

Q. The rate of rise in temperature would be somewhat faster between b(3) 10 USC 130 b(3) 10 USC 13 than it would between say b(3) 10 USC 130 would it not?
A. I would say it would, yes.

Unclassified

Q. It therefore would not be a matter of instantaneous failure of turbine bearings?

A. No.

Q. And even in the event that you had wiping of turbine bearings, would not the turbines continue to operate so that the ship would have power for awhile in an emergency?

A. The turbine bearings, if they are wiped, they are very apt to seize. I wouldn't consider - I don't really know what you mean by "awhile", Admiral, but I wouldn't consider they would be able to operate.

Unclassified

Q. Well we are considering a situation in extremis, where the ship is going to sink or survive depending upon whether or not it can maintain power to that shaft for a few minutes. Now, you are a knowledgeable person in the design and operation of the salt water system on these ships, and you have answered questions which indicate that you have been under the impression that it would be the last thing you would want to do, would be to shut down that salt water system is that correct?

A. Yes, sir.

Q. In other words, even in extremis, you would be loath to isolate that system by closing the valves to sea?

A. Admiral, I don't really feel that I can come out and make one across-the-board statement for any situation that the ship might be in. I do know that my concept when we were designing the system--

Q. I am giving you a specific situation, Mr. Remick. I am not asking you to address yourself to any permutations, combinations or situations. I am asking you to address yourself to one very specific situation: THRESHER at test depth, or within short range of it. A leak occurs somewhere in the ASW: water spraying about a compartment--we'll say the engine room. Would you be inclined to hesitate about isolating the entire ASW system or would you, in other words, prefer to try to find the source of that leak and isolate it without shutting down the ASW system?

A. Admiral, I really am not trying to be difficult. If this ship, for instance, were heading down to test depth at a fairly rapid speed and all of a sudden she got water spraying in, I would not want to shut that sea water system down. I think that it--I would expect that the ship's force would want to try to use her main propulsion plant and change the direction of the ship and try to get it heading up, and if they shut that auxiliary sea water system down, they are endangering their turbines.

CAPTAIN OSBORN: Mr. Remick, this is exactly the point I have been asking you. This is the subject of every question I have asked you--how you thought about that and how did the people that talked to you think.

PRESIDENT: I think he has answered it now.

WITNESS: I am sorry, I just couldn't get it.

Q. Now, Mr. Remick, from the blueprint, it is obvious that the length, the total length of this continuous vent system is not inconsequential.

A. That is correct.

Q. It is pretty long; it is pretty involved; it goes into many compartments. What is your rough estimate of the relationship between the length of the continuous vent system and the length of the ASW system without the continuous vent system? Do you understand my question?

A. I think I do. I think what you're saying is that all of the piping that comprises this system, whether it be interconnected or not, as adverse to all of the piping in the auxiliary sea water system itself.

Q. Yes.

A. I would say that the continuous vent system is roughly one-fifth the size of the auxiliary sea water system in linear feet.

Q. Now when you say the auxiliary sea water system, did you include the length of the continuous vent system in that?

A. No, sir.

Q. In other words, it is one-fifth of the auxiliary sea water system proper?
A. One-fifth of the size of the actual system itself, yes, sir.

CROSS-EXAMINATION

Questions by counsel for RADM Palmer, party:

Q. Mr. Remick, turning your attention to the time that THRESHER did have a casualty in the constant vent system on the initial sea trials, can you help us as to whether THRESHER did completely isolate the constant vent system immediately?
A. I don't know for sure.

Q. Now, wouldn't manual venting accomplish the same thing as this automatic constant vent system?
A. In my experience, if they wanted their ship's force personnel to man the system often enough, yes.

Q. Is it correct to say that the purpose behind it was to relieve ship's force of the responsibility for manual venting?
A. Yes.

Q. Were attempts made by the Portsmouth Naval Shipyard after THRESHER's initial deep dive, to simplify and reduce the extent of the constant vent system?
A. Yes, we were directed to make a rather intensive study.

Q. And what action was taken as a result of that?
A. It was determined that the installation of the check valves was required.

Q. Who determined that?
A. I'd say the final decision was the assistant design superintendent.

Q. Did the Bureau of Ships direct elimination of part of the system?
A. I don't recall that.

RE-EXAMINATION BY THE COURT

Questions by a court member, Captain Osborn:

Q. Are you familiar with the incident involving the SKIPJACK and her initial blowing of the main ballast tank and binding of her b(3) 10 USC and binding of her b(3) 10 USC 130 ?
A. I have heard about it yes.

Q. Well was this pointed out as part of the reasons for looking into the design of the constant vent system in the first place for THRESHER?
A. No.

Q. Do you think, to some extent, that the constant vent system itself is primarily one that is associated with surface operation, in surfacing procedures?
A. I would say it is, yes.

Q. Don't you think this is a rather minor element of design with respect to a nuclear submarine?
A. A minor element of design?

Q. Yes, considering the fact that you always intend to be submerged when you're actually operating the ship.
A. This is the questionable element. I say this in view of the fact that ships--I can't quote exactly which ones just offhand--but ships have been directed to run tests and they have made reports that would indicate that they should not eliminate continuous vents from their heat exchangers.

At this point, counsel for the court offered in evidence the blueprint from which the witness had testified. There being no objection by the court, nor counsel for the party, RADM Palmer, the blueprint was accepted in evidence and marked as Exhibit 102.

Questions by court president:

Q. I thought you said it was at the request of the crew that these check valves were installed in the continuous vent line?
A. I said we worked it out with ship's force--this continuous venting system.

Q. You worked it out with them but they did not initiate the request?
A. (No reply by witness)

Q. Who, then, if you know, suggested the check valves?
A. To the best of my memory, this came to me as a -- well, a common request, if you will. Our assistant design superintendent and the ship's engineering officer approached me, called me up, and exactly which one I don't know, but I do know that our assistant design superintendent had been trying to develop something along these lines for sometime, and the ship's force personnel indicated that they would like to facilitate isolation of the system.

Q. Well, perhaps I misunderstood you but I did get the connection between the ship's force and the difficulty of isolating the system when you were talking about the installation of these check valves. Is it then correct to say that it was the difficulty of isolating the system, any part of the system, which was the cause for the design change which resulted in the installation of these check valves in the continuous vent system?
A. Yes.

Questions by a court member, RADM Daspit:

(b) (6) was relieved by (b) (6) as reporter at this point.

Q. Mr. Remick, do you know whether this alteration has already been picked up on the two ships on the West Coast, the PERMIT or PLUNGER, and whether they have had any operating experience with this new system?
A. To my knowledge, there is no other ship in the class that has it.

CROSS EXAMINATION

Questions by counsel for RADM Palmer:

Q. Mr. Remick, do you recall a BUSHIPS message change order to reduce the extent of the custom vent system after their casualty on their initial deep dive?
A. I don't recall it now.

Neither the counsel for the court, the court, nor counsel for RADM Palmer wished to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness classified his testimony as confidential.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

Cornelius J. Collins, a former witness was recalled as a witness for the court, was informed that his previous oath was still binding, and examined as follows:

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. Collins, this is a closed session of the court and you may disclose classified information. At the conclusion of your testimony I shall ask you what classification you would put on your testimony as a whole. Will you, for convenience of reference in the record, state your full name and your job here at this Shipyard?
A. Cornelius J. Collins, Quarterman Pipefitter.

Q. You are attached to Shop 56; is that correct, the piping shop?
A. Yes.

Q. Were you Project Quarterman for Project THRESHER until 15 March?
A. Yes.

Q. Thereafter were you the night Quarterman?
A. Yes.

Q. As Project Quarterman, did you have supervisory responsibility for all piping work on THRESHER, except for her nuclear power piping?
A. Yes, sir.

Unclassified

Q. Do you have a diagram to show all the piping work that was done in her during her post shakedown availability period?
A. On the salt water and the air I do have a diagram.

Q. Would you produce the salt water piping diagram?
A. Well, there are various ones.

Q. I'll take the jobs in succession. With regards to the check valve. in the constant vent piping, can you discuss the installation of them and show us your diagram?
A. (The witness placed a diagram on the board. The members of the court went to the board to view the diagram).

Q. Would you identify the print number for the record, please?
A. 1862582. These check valves are all installed. They are marked in yellow throughout (the witness demonstrated with a pointer). There are thirty-three of them, all told, and they work installed with a DM originally. Tests were made on them afterwards. As I say, there were thirty-three in all, I believe the largest was an inch and a quarter.

Q. With reference to this work, can you tell us, if you know, about any check valves which were installed backwards?
A. Yes, sir. After hearing about those I asked the Leadingman what happened, because we did have a complaint from the crew. He went down and investigated and there was, I believe, five of six valves installed. which was done with the cognizance of the crew, so they could run their reactor fresh water coolant. This would isolate it from the constant vent. I'm sure there were three or four that were being worked on at the time, and they were just in the line for lining up purposes, to facilitate things.

Q. Do you know if they were installed accidentally?
A. None whatsoever. At the finish, none. During the process of installing, you have to use them to line up the lines calibration.

Q. They were installed then as fitups?
A. That's right.

Q. And to cut off the reactor coolant?
A. Yes, in one of the KVA sets.

Q. What is a KVA set?
A. It's a motor generator that we use alongside the dock; it's for electrical power.

COUNSEL FOR THE COURT: I have no further questions with regard to this chart of the salt water piping.

EXAMINATION BY THE COURT

Questions by RADM Daspit:

Q. Did I understand you to say that five were actually installed backwards and had to be reversed?
A. Had to be reversed in the finals. These were installed in the reactor fresh water coolant. They would be right in this area here (the witness pointed

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to a section of the diagram), so they could run this coolant on the ASW while we were working on the main vent header.

Q. But they were not installed just for fitting up purposes? They were installed so that the ship could run salt water through them to run machinery?
A. Yes, sir.

Q. What action did you take in connection with the man who installed them backwards?
A. None whatsoever; they were at the request of the crew.

Q. Oh, the crew actually requested that they be installed backwards, so they could isolate a part of the ship?
A. That's right, sir. That was so they could run the auxiliary without going back into the constant mainheader, which we were working on.

Questions by a member, CAPT Hushing:

Q. You stated that you install certain check valves backwards for the convenience of the crew in running equipment; is this true?
A. That is true.

Q. When you install these check valves backwards, in accordance with plan, do you tag them or mark them in any way to indicate that they were installed backwards?
A. I don't believe they were at the time. We didn't know of them being in backwards.

Q. Were any plans marked or any indications, other than the man's memory that these valves were in backwards?
A. Not that I know of.

Q. So it was a retention in the minds of the mechanics under supervisors that these valves were in backwards, plus the crew who also knew?
A. That's right.

Q. Now turning to the use of these check valves as make-up blocks, or spools. When you used these valves for this purpose, not paying attention to which way they were installed, did you mark them in any way as being make-up spools?
A. No, I didn't, because there's no gaskets put in them when they are used as make-ups, so they would have to come down anyway.

Q. Is there any outward indication that they are in backwards?
A. Well, there is a flow arrow on the check valve itself, which, when we finish -- as I say, the final installation of check valves. these flow arrows were put in such a position as they could be seen.

Q. But with no tags on them, a crew member or other persons passing through the compartment, looking at the system, would feel that they were installed backwards?
A. Yes, sir, they would.

Q. Relative again to the use of these fittings as spools, or distance pieces, were there any plans marked up at any time to indicate where this had been done?
A. No, this was done on a continuing basis.

Q. So then this again was within the memory of the mechanic and probably his supervisor?
A. It definitely would be, but as I say, we would have to check them on the final installation, when he installed the "O" rings.

Q. However, during the process, there was no documentation?
A. No.

Q. But at the end there is a necessity for them to be finally checked out, and it was at this point that you expected to discover which, if any, were not properly installed?
A. Yes, sir.

Questions by a member, RADM Daspit:

Q. As I understand, these valves were put in as a spacer in order to fit up the pipes?
A. Yes, sir.

Q. Was the valve left in place while the pipe was actually being brazed or were the valves removed as soon as the pipe was fitted up?
A. Yes, I would say, yes, it would definitely have to be.

Questions by a member, CAPT Osborn:

Q. When you have to test the b(3) 10 USC 1 independent from the b(3) 10 USC 130 as your test indicates you did, you have to put check valves in backwards to accomplish this test.
A. No, sir. You check from b(3) 10 USC to the check valves from the b(3) 10 USC 130 which will close under pressure.

Questions by a member, CAPT Hushing:

Q. Did you install any check valves backwards deliberately other than the five you have discussed?
A. No.

Questions by the President:

Q. Was there not one check valve which was put in backwards because of a design mistake?
A. Not to my knowledge, no, sir.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Turning now to a new field of discussion; will you describe the work done on the replacement in all salt water systems, including the auxiliary sea water system, of the flexible hoses and couplings?
A. Well, the flex hoses in the salt water system, the only ones which were changed would be those through the venting system. This would consist of constant vents. I don't believe they would show on here (indicating the diagram). As I said before, these motor generator sets were flex hoses; that's all I know of.

Q. Can you tell us whether the installation of these hoses was thoroughly inspected?
A. Yes, sir, in this area.

Q. And what tests were performed on the hoses?
A. Well, when they are assembled in the shop they are tested to twice their working pressure, and on the boat they receive once and a half their working pressure.

Q. Do you have available for this court, records of the tests on the hoses and records of the inspections that were made?
A. I have the records of the tests, and the inspections, Code 303 would have. I haven't got those tests here. It is quite bulky, but it can be made available.

Q. Now were the inspections of the installation of the flex hoses signed off by ship's company?
A. Well, they were on this end of it, but we haven't been able to obtain the copy, and it was just at the end that the ship's company signed off on it. It was for our benefit that we did this.

Q. They signed off for the inspection aft but not forward?
A. We didn't get around to getting them to sign that off.

Q. But was the work all completed and the inspection all completed?
A. Yes, sir.

Q. What inspection are you talking about?
A. Flex hoses.

Q. On the inspection of the flex hoses aft, which were signed off by the ship's company, do you have the date when it was first signed off?
A. Well, it was not too long before they went to sea. I did not obtain this; Mr. West got this from Chief Wise on the boat.

COUNSEL FOR THE COURT: Counsel has no further questions on the installation of the flexible hoses and couplings.

RE-EXAMINATION BY THE COURT

Questions by CAPT Hushing:

Q. Mr. Collins, did you have reports of improper installations on board the ship of flexible hoses?
A. They were somewhat twisted, etc., which we went along and lined up. Most of our trouble in flex hoses is lining up and seeing they are in the right form; they're not allowed to drag or bend. Most of this was hanging. They were put in and then the hangers were applied afterwards.

Q. How about twisting of the hose during installation; did you receive any complaints about this?
A. Yes, at times. They could be put in twisted, but these would be only ones with a union type joint on the end of it.

Q. What did you do when you received those reports?
A. We went down and had them inspected again by 303 and then worked on them until they were satisfied.

Q. How about the mechanics who were installing these hoses? Were the same people involved with twisting hoses?
A. I believe in the end we had one of our mechanics, one of our better mechanics, go down to satisfy 303.

Q. Did the other mechanics then not do a satisfactory job?
A. I wouldn't say so, no, sir. It's a matter of opinion. Their opinion and ours as to what they consider satisfactory or unsatisfactory.

Q. Is there a process instruction that they are supposed to follow?
A. Yes. You look at the hose, some will say it's twisted too much; someone else will say not enough to bother.

Q. Do you have specifications which show how much twist is allowed?
A. Yes, sir.

Q. Can you measure the specification to the hose?
A. Yes, sir.

Q. Well then, is it a matter of opinion or is it a matter of comparison?
A. It's a matter which way they are reading it. I can't explain myself, I don't believe. It's mostly done -- we don't measure it. If it doesn't look right to then we install it right.

Q. Who makes the decision as to whether it is installed right?
A. Code 303.

Q. Before Code 303 is called to inspect, does your mechanic, or your supervisor determine that the hose is properly installed?
A. Yes, they are supposed to.

Q. And then he presents them to Code 303 just those which he thinks are properly installed?
A. Yes.

Q. Nevertheless, after such determination, 303 requires some hoses to be replaced?
A. Yes.

Q. What did you do, as the management representative, to try to straighten out this situation?
A. Well, we have talked to the men who install the hoses, tell them to be more careful. I'm not trying to belittle anything, but at times this hose will be the boat in a position where men going up or down a ladder might grab hold of it, or another man will step on this thing and bend it down, and when you're building a boat, things like that do happen.

Q. When 303 rejected a hose installation which you presented, was the item corrected then and there, with no deficiency report, or was a deficiency report made out on each rejection 303 made of your work?
A. I don't believe there was any deficiency reports put in on any of them; they were done with the inspectors there.

Unclassified

Q. So the inspectors, then, watched the reinstallation, or the correction of the installation?
A. I couldn't say in all cases.

Q. But in most cases?
A. That's right.

Mr. President, I would like to propose that the court witness the installation of this type of hose in the ship, along with the instructions for it, in order that we might fully understand the testimony.

COUNSEL FOR THE COURT: We can arrange that.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Then in a new area; can you discuss the removal and reinstallation of the auxiliary sea water pumps from the aspect of piping?
A. Well, in all cases, of course, these are flanges, these are portable. We broke them loose and the pumps were removed. In the instance of b(3) 10 US pumps, the new foundations for the new mounts, the pipe did not align up again with the pump, and we changed, as it shows in this area here (indicating a point on the chart) where we have changed and remade pipe. In most cases it was checked on -- these were mechanical joints --

Q. What did the auxiliary pump work include in the way of piping work?
A. Well, our instructions are to remove interferences.

Q. Was there work required as a result of replacement of auxiliary sea water pump motors?
A. Only in what I have just mentioned.

Q. Foundation changes?
A. That's right; there was only one instance where piping had to be remade. In other instances the old pipe went back in.

Q. Was pipe work necessitated as a result of the work on the pump shaft?
A. None that I know of.

Q. What mechanical seal work was required?
A. On the pumps?

Q. Yes.
A. That isn't my job to say; that's Shop 38.

Q. Will you explain the piping work that resulted from work on the condensate pumps?
A. That is on a different diagram; that is not salt water; that is on steam.

Questions by a member, CAPT Nash:

Q. I would like to be sure that I understand what was done to insure that you did in fact have a proper piping setup when you installed the pump?
A. This was inspected by Code 303 after the final fitup.

Unclassified

Q. Do I understand you to say that it was necessary to replace the piping?
A. In one instance, it was. I believe it was on b(3) 10 pump; this was right in this area here (pointing to an area on the chart) the pipe did not line up with the pump due to the new type mounts.

Q. You did replace them?
A. Yes, there was only one fitting involved.

Questions by a member, CAPT Osborn:

Q. This involves seven joints, does it not?
A. Yes, mechanical.

Questions by a member, CAPT Hushing:

Q. I have a general series of questions I would like to ask you. How do you, or your Leadingmen, check the material which the mechanics are working with when they are installing a new piece of pipe or joint?
A. Well, this material has been etched in the ship, and has been identified by acid tests.

Q. Have you ever checked the job order and material sheets against the material actually being installed by the mechanics?
A. Yes, sir.

Q. How do your do that; has he those papers in his pocket?
A. Yes, sir.

Q. In every case?
A. In every case he should have.

Q. Could we go down to the new construction ways now and find pipefitters making installations of this kind with the process papers and job orders and material identification within their hands, or within their pockets?
A. Yes, sir, I believe you could.

Q. Do you do this as a regular operation?
A. Yes, routine. We don't check every one; we spot check them.

Q. You do spot check them?
A. Yes.

Q. Your Leadingmen spot check them?
A. Yes.

Q. Have they found any instances in the last three months where improper materials have been in the process of being installed in the ship?
A. None whatsoever.

Q. Have you queried your Leadingmen in this?
A. Yes, sir.

Q. Have any of them reported any incorrect materials being installed in ships?
A. No, sir.

Q. Has any of the mechanics reported they had been given the wrong material to install?
A. None.

Q. Do I understand, then, that from your experience in the material identification control program, it has worked perfectly for the last three months?
A. Yes, sir.

Q. For the past four months.
A. Yes, sir.

Q. For the entire period of the PSA of THRESHER?
A. Yes, sir.

Q. So that from your checks you feel that there is no chance of any incorrect material having been installed in THRESHER during this post shakedown availability?
A. I would say absolutely none.

Questions by a member, CAPT Osborn:

Q. Mr. Collins, you are perhaps more familiar with the ship's crew on this particular ship than anyone we know around here; how did they operate this system, cross-connected or not cross-connected?
A. I wouldn't know their operations. It has been run -- I would say as they are running these reactor coolants and so forth, b(3) 10 USC 130 either b(3) 10 USC 130 would be in commission at all times, and then they would have to cross connect.

Q. Is it the general opinion, your opinion, that anything that has to do with the reactor plant, particularly a salt water system, that an engineer of a nuclear submarine would go critical without it being completely checked?
A. I don't believe so.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Describe now the piping work involved as a result of work done on the condensate pumps?
A. I don't have the diagram here, but this was a complete new installation in the condensate bay.

Q. Could you very briefly describe the work done?
A. Yes. These were b(3) 10 new pumps; I believe they were something to do with the phases; I'm not acquainted with this. It was a new piping job in the condensate bay and the condensate system.

Q. Can you describe the work done in the air conditioning salt water piping, and touch on the installation of the Hamel Dahl regulating valve?
A. Yes, sir. This Hamel Dahl valve is all welded piping. (the witness placed another diagram on the board). This is diagram 1862711-M. This Hamel Dahl valve was installed right in this area here (indicating a spot on the diagram), and these joints -- there were quite a few of them, are all welded joints, absolutely no brazing was on the Hamel Dahl installation. These were all welded joints that had been X-rayed.

Q. Identify the location.
A. On the port side. 76 and 78. approximate location. Here there's quite a few joints. There are many joints in that area.

Q. Did this work include the installation of six unions to make the pumps portable?
A. No, sir, these are on the air conditioning plants in this line here; three on each side.

Q. Would you identify those for the record?
A. You see I've got them marked right here; Job Order 50225. when they were installed.

Q. How much piping was installed in that?
A. Very little piping. All there was was the cutting of the pipe, fitting the union --

Q. The salt water piping in the air conditioning system was that all welded joints?
A. Not on the vent. They were sil-brazed. On the Hamel Dahl they were all welded.

Q. What was the maximum sizes of the pipe used on the Hamel Dahl and on the vent piping?
A. The Hamel Dahl was six inch and five inch, I believe, and the vent piping was quarter inch.

EXAMINATION BY THE COURT

Questions by a member, CAPT Osborn:

Q. Did I understand you, to make the salt water pumps portable, that is that you could remove it, and all the joints that you made on that, were quarter inch?
A. That's right.

Q. None of the big joints?
A. They were flanged.

Q. No changes in the big joints?
A. None.

Q. That's a six inch feed with a four inch distribution.
(no answer)

Q. On the operating of the valves. were all of the sea water valves taken out of the ship, both in the air conditioning and the ASW system with respect to re-coating?

Unclassified

A. Yes, all hull valves.

Q. How did they work after they were replaced?
A. As far as I know, very well.

Q. Do you have any measurements on torque on them at all?
A. That would be 38; that wouldn't be in my --

Q. You have no knowledge first-hand?
A. No trouble whatsoever.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Before we turn to the high pressure air system, can you discuss the silver brazed joints in the salt water system; the tests that were made, both hydrostatic and visual?
A. There weren't too many here involved. Any joint over two inch. they were both ultrasonically tested and pressure tested. Anything under was brazed with a card bearing mechanic; otherwise a qualified brazer, and we have records of all joints that were brazed, so any joint over two or three has a record, and all joints were pressure tested.

RE-EXAMINATION BY THE COURT

Questions by CAPT Osborn:

Q. When you say all joints, do you mean all joints that were installed, or all joints that work was accomplished during this post shakedown availability, or do you mean all joints in the ship?
A. It would include both. In the salt water system all joints were pressure tested.

Q. Pressure tested. I mean ultrasonic tested and pressure tested.
A. The old joints were done by 303, and all they did was joints that were accessible and where no lagging was to be removed, and that was what they were.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. What percentage of the joints under two inches in size were ultrasonically tested?
A. None that I know of. They do not have the equipment to ultrasonically test them in the Yard.

Q. What manner of inspection was accorded to the joints which were under two inches in size?
A. Well, these were inspected by the Leadingman before brazing and after brazing.

Q. How were they inspected?
A. Visual, and they were checked according to the specs. In other words, for roundness of pipe to check the clearances around the pipe and the fittings.

Unclassified

Q. Was this pre-braze inspection that you are talking about now?
A. It's pre-braze, yes, and it is visually checked out to us to see that it was --

Q. It is the inspection made after the brazing that we are trying to pinpoint. Can you tell us the exact nature of the inspection made on the joint after it is brazed?
A. Well, the only thing you do is go down and inspect the area between the fitting and the pipe, and you can see a silver solder ring. What we go by is to see that it is sufficiently brazed.

Q. What are the good features and the bad features that your men look for when they make this inspection?
A. There would be areas where you would not see silver soldering having been pulled by the heat up in the ring. The ring is halfway down in the fitting and it would be pulled up, and that, we consider, is sufficient, if it does not any areas where there is no ring.

Q. Are there any limitations or standards as to the amount of silver solder you have to see at the edge of a joint before you will judge the joint satisfactory?
A. All that is visible if the joint is done correctly is a thin line of silver solder, which would have to be seen all the way around in the case of a small joint.

Q. And if your man does not see it all the way around, what instruction did he have?
A. He would have to pull the fitting and renew the joint.

Q. Is that the only feature he looks for when he inspects after the silver braze job?
A. Yes, sir.

Q. Doesn't your man also check other features, for example, whether the joint is properly aligned?
A. Well, this is done before and after brazing.

Q. What other things does he look for after brazing to make sure that the work is done properly?
A. There is nothing else that I can think of offhand. We have an instruction, but I would have to check.

Q. They have an instruction but do they follow it?
A. Yes. 4410.7A, I believe, is the instruction.

Q. Can they tell, by the way, if a joint has been overheated?
A. Well, by looking at the fitting you can usually tell; discoloration of the fitting itself.

Q. But that is one of the things for the inspectors?
A. Yes.

Q. Then it isn't just a question, as you told before, of looking to see if there's silver visible all the way around?
A. Oh, no; I'm sorry if --

Unclassified

Q. You didn't mean to limit it to that, did you?
A. No, I said the main thing they look for is that.

Q. How many points in all do you suppose there are to look for after a silver braze job on a job to determine if the work is done properly?
A. Well, as I said, the silver solder ring would show, alignment, and check the fitting to see that it was not overheated. Anything else about it I can't say right now.

Q. You did mention the instruction number?
A. I couldn't say for sure; I think it 4410.

Q. Do they check for face feeding also?
A. Face feeding is not allowed.

Q. It is not allowed; then they do check for it?
A. Oh, yes; the only instance where face feeding is allowed is in a large joint that can be ultrasonically tested.

Q. On the smaller joints how do they determine if there has been face feeding?
A. You can tell by looking; there would be an extra solder around the outside.

RE-EXAMINATION BY THE COURT

Questions by a member RADM Daspit:

Q. In the case of a large joint that has been ultrasonically tested, who determines whether face feeding is permitted on that particular joint?
A. We make out what we call a routine report card and it is signed by the Ship Superintendent. He is usually the one who designates whether or not we shall do it.

Q. Is this done in every case?
A. Yes, sir.

Q. And this is a matter of record in connection with that particular joint?
A. Yes, sir.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Do you have with you the test results relating to the correction of the casualty to the Reserve Feed Tank?
A. Yes, these are on the other diagram. The test, as I say, was included in the entire ASW Tests. I have that on the other diagram.

Q. Will you produce the slip please, and read what it says on it?
(The witness removed a slip from the board and handed the slip to counsel who then handed it to the president).

RE-EXAMINATION BY THE COURT

Questions by the President:

Unclassified

Q. Mr. Collins, the court notes that there are inspection comments by someone, who said "Inspection of No. 3, PUFFS only, satisfactory".
A. That is because Code 303 was not on the job to buy salt water systems, but they were on the job to buy this installation.

Q. Who was on this job to buy the salt water system?
A. The crew.

Q. The crew was represented, I take it, by R. Podwell?
A. That is right; he has signed this.

Q. He has not signed anything that is indicative of a final inspection. He has signed a list of complaints about the system "O ring leaks; b(3) 10 ASW discharge, b(3) 10 ASW suction, b(3) 10 USC SSTG lube oil cooler valves, No. 2 hydro oil cooler drains, ETM IB fittings, b(3) 10 USC 130 TG lube co er, IB vent, b(3) 10 ITG lube oil cooler drain" signed R. Podwell. These are inspection comments. That is not an inspections acceptance. There are two places on this slip --
A. That is the way he signed it; he had noted these things; these were repaired and fixed. He would not sign this -- as a matter of fact Chief Arsenault is the one who went over it with Podwell, and he informed him to sign that off as being complete. These comments were things that they had found, and these were Apex valves and "O" rings which were replaced and renewed and retested.

Questions by a member CAPT Osborn:

Q. Where is the record of the retesting?
A. That is it; he did not sign that until he was completely satisfied.

Questions by the President:

Q. Well, this is an inspection comment, not a final acceptance.
A. Well, that is the way they signed them, sir. These were passed to us as final.

Q. There's no date for the final acceptance; there's no signature of final acceptance?
A. That is the way the crew signs them.

Q. Why didn't you ask them, or your people ask them to sign them correctly, so this court would have before it proper evidence?
A. Because we are not supposed to keep records. We keep these records for our benefit, and when they are completely satisfied then we are, too.

Q. Would there be any other office of the Yard that would have a final inspection on the auxiliary salt water system of the U.S.S. THRESHER before she went to sea and was lost?
A. No, sir, this was strictly crew who would have the records of it.

The inspection request testified to by the witness was offered in evidence as Exhibit 103, and there being no objection it was so received.

Counsel for a party, RADM Palmer, waived reading of the exhibit at this time.

Questions by a member, CAPT Osborn:

Q. It appears to me that when I was at your office sometime earlier in the investigation, I looked at a particular card from 303 and noted that a man named Newsome's signature was on a chit like this.
A. This is the same one; he looked at No. 3 PUFFS only.

PRESIDENT: His initials are on there for b(3) 10 Pump only. He said it was satisfactory.

Questions by CAPT Osborn continued:

Q. I am sure from my experience, Mr. Collins, that I wouldn't know that the initial "N" stood for a man named Newsome, but I know that. I'm sure that I've seen another card with respect to one of these things that had the name Newsome ont it. Can you produce it?
A. I have some on here; I don't know whether his name is on it, or not.

Q. And, I distinctly remember a name R. Podwell, and I asked who he was and I understand that he was a machinist's mate first class in the THRESHER crew.
A. That is right. In this area here I have none signed by Newsome. There may be others.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry that he thought should be a matter of record, therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

None whatsoever, except as I explained, in the case of this slip, they would not have signed them had they not been completely satisfied.

RE-EXAMINATION BY THE COURT

Questions by CAPT Osborn:

Q. Since this test was started on 3-7, what makes you so sure in your own mind that this test was completed after the reserve feed tank casualty?
A. Because we had to obtain these valves that were leaking. These were Apex valves which had to be replaced by Walworth, and we had to obtain the Walworth valves, which we had a hard time getting. Earlier in the overhaul we had a deficiency report put in, requesting that all these Apex valves changed to Walworth, and they were not obtainable at the time. These give us considerable trouble in our testing.

Q. What size valves were these?
A. About half inch, mostly.

Q. Do you think, in your own mind, that if you tested the ASW system properly, completely vented, that you could hold a b(3) 10 USC 130 test for an hour with a b(3) 10 USC 130 ?
A. Yes, sir, we did.

Q. What do you measure it with?
A. Gauges.

Q. What kind of gauge?
A. Spring gauge; that is the only thing required of us.

Q. What kind of a gauge?
A. A regular spring gauge.

Q. Is this any different from the instrumentation that we have in the ship with respect to the pressure?
A. It is the same.

Q. Do you think you can remotely read a fifteen pound increment on one of those gauges?
A. Well, yes.

Q. How wide is the needle in terms of pounds?
A. Well, it all depends. I mean on the gauge some are in ten pound increments, and the needle would not cover the distance between the two lines.

Q. Some of them. The one you used?
A. We used at this test -- we performed a b(3) 1(pound gauge, and I couldn't give you right now what the increments are on it.

Q. The point I am making, Mr. Collins, is that I don't think you have a gauge of that accuracy with respect to the ship's instrumentation. If you used one of those gauges it had to be a special gauge, rigged for the test.
A. Not in this instance; they do not require a special gauge. In some instances on drop tests, on air systems and oxygen they use what they call a Heise gauge, which can be very wrong.

Q. This is exactly what I wanted to know; did you use a Heise gauge?
A. Nor, sir, we are not required to.

REDIRECT EXAMINATION

Questions by the counsel:

Q. Can the test described by the question of the court member be demonstrated on TINOSA's ASW system?
A. I don't quite understand what you mean.

Q. We talked about a test that could be performed without a Heise gauge.
A. Yes, sir.

Q. Could that test be demonstrated in TINOSA on her ASW?
A. Yes, I believe it could.

Neither the counsel for the court, the court, nor the counsel for RADM Palmer wished to examine this witness further.

The witness classified his testimony as Confidential.

The witness was cautioned concerning his testimony and withdrew from the courtroom.

(b) (6) relieved (b) (6) as reporter at this point.

The court was cleared at 1145 hours, 30 April 1963.

The court was opened at 1230 hours, 30 April 1963, and the president announced that the court would recess at this point for lunch.

The court recessed at 1230 hours, 30 April 1963.

The court opened at 1335 hours, 30 April 1963, to sit behind closed doors.

All persons connected with the inquiry who were present when the court recessed were again present in court.

No witnesses not otherwise connected with the inquiry were present.

Frank W. Dunham, a civilian, Assistant Receipt Design Engineer for Naval Architecture, was recalled as a witness for the court, was reminded that his oath previously taken was still binding, and examined as follows:

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. Dunham, this court has heard testimony concerning various cuts, or openings, made in THRESHER's pressure hull for access, ventilation, and other purposes during her post shakedown availability period. Could you state the policy and the existing instructions of this Shipyard with respect to, first, controlling the number of cuts; second, authorizing the number of cuts; and third, detailing the exact manner in which the cuts were to be made?

A. The policy, first, on controlling the number of cuts: Our policy is that no cuts shall be made without the approval of the Structural Design Branch in the Design Division. We have an understanding with the Ship Superintendent that all requests for openings will be funneled through him, and we will honor only requests for openings that he had indicated he desires. This is a rather long question.

Q. I would be glad to come to the next point, if you desire.

A. Yes.

Q. The policy and instructions with regard to authorizing the cuts. Who authorizes the cuts, and under what circumstances and criteria?

A. The authorization for cutting openings are taken care of by either plans, which are taken care of by the Design Division, or by Design Memorandum, which is prepared by the Design Division. In each case the Structural Design Branch prepares this piece of paper, and they provide the necessary information for cutting the hole and the patching of the hole.

Q. That brings us to the last subdivision of the question, which related to the policy and instructions governing the detailing of the exact manner in which the cuts are to be made.

A. I can expand on that a little bit. Where we have regular closure plates in the large compartments that are put in there not just for the construction of the ship but are also put in there for necessary shipping of machinery, for later overhauls, and we put out a plan which we call a Closure Plate Plan. That gives very specific details exactly how to cut that plate, and how to reinstall it.

Q. Focusing now precisely on THRESHER during her post shakedown availability; what Shipyard department determined the number and extent of cuts to be made?

A. The actual cuts were all determined from Design Memoranda put out by the Structural Branch. The determination of the size opening required was usually arrived at by consultation with the Arrangements Section and the Structural Branch.

Q. Where in the organization is the lowest man who can say yes to a hole in the pressure hull?

A. The head of my Structural Branch, Code 252.

Q. What is his name?

A. Mr. Watts.

Q. Will you give us a brief description of his background and experience in this field?

A. Mr. Watts has been in the Design Division for over thirty years in the Portsmouth Naval Shipyard. He has been, over most of that period, intimately connected with the preparation of structural plans and has been the man to whom the Production Department directs their requests for assistance in the erection and construction of a ship. He has worked very closely with both Shop 11 and Shop 26 in providing them necessary design assistance for their work.

Q. What is the atmosphere with which a request for permission to cut a hole in the pressure hull is received; is it one of resistance or caution, or what?

A. Normally it is met with this type of attitude: We want to be shown that such a hole is necessary, where it is necessary; then we study the problem to locate the hole in such a place that it will cause the least interference with the arrangement of the ship inside and also with the structural arrangement of the hull itself. To expand on that a bit further, we always attempt to cut a hole so that it will not cut a frame. If it is required to cut a frame, we try and place the hole so that the butts adjacent to the frame can be easily reached for putting in the closing weld.

Q. From your own knowledge and recollection, can you relate an example where a cut in the engine room area was authorized that will demonstrate to the court the manner of authorization, the design details provided to the Production Department for making the cut, and finally patching up the opening in the hull?

A. I believe I can, sir. I have a Design Memo numbered 252A-136-62 dated, I believe that's 7-18-62, entitled, "Temporary Personnel Access." This Design Memo is an instruction to P. & E. to put out the necessary Job Order to cut an access in the high pressure hull as shown on Sheet 2 of this D.M., and Sheet 2 details the size of the opening and the exact location of the opening. In addition to that, on the first sheet, we note, "For method of replacing hull plate, see Drawing 1863566." An additional note on this memo says, "These temporary accesses were requested by Ship Superintendent." Now, going back to the plan that we referred to for replacing the hull plate, this is a plan entitled, "Closure Plate, Engine Room," and it gives very extensive notes on the plan describing the procedure to be followed for initial and subsequent removal of the closure plates in the engine room and the procedures to be followed for this temporary access opening that we requested to be invoked by this plan.

Q. This account has given us the procedure from the time of authorization to the design details of cutting the hole and repairing it later.
A. Yes, sir.

Q. Could you amplify a little bit what investigation procedures are followed before authorizing it?
A. On this particular one, we don't initiate the investigation because, normally, the requests for openings like this are generated by the Ship Superintendent or Ship's Force. On this particular occasion the Ship Superintendent indicated that he needed some additional openings in the engine room for personnel access. He personally visited the Arrangements Section in the Design Branch and discussed with them the best location for such an access opening. After his consultation with them, then he visited our Structural Branch and asked us to provide the opening.

Q. Does the Design Division specify the nondestructive tests to be made during in-process work on a patch and final inspection of the patch?
A. I will refer to this plan 1863566, under welding notes, Note E, entitled "Inspection." It says, "Total length of welded joints. Butts and seams in welded butt joints in the standing flange, except in the way of frame webs, shall be completely checked radiographically in accordance with BUSHIPS x-ray standards for production and repair welds, NAVSHIPS 250-692-2."

Q. A Bureau of Ships Instruction requires a seven-day soak period prior to making final nondestructive tests on HY-80 welds, is that correct?
A. Yes, sir.

Q. Are you aware of any waiver granted within the Shipyard or by anyone else which eliminated or foreshortened that required soak period during THRESHER's post shakedown availability?
A. On THRESHER I cannot recall an instance like that, sir.

Q. Can you tell us what procedures exist if such a waiver were requested for laying the request before the appropriate authority?
A. The procedure to be followed, I believe, is for the inspection people to put in a request for such a waiver. This request would be directed to the Welding Engineer. He, in turn, would take the necessary steps to get the waiver approved.

EXAMINATION BY THE COURT

Questions by a court member, CAPT Nash:

Q. Mr. Dunham, is there any difference in the philosophy of a decision to authorize hull penetrations in the DOGFISH as contrasted to a similar decision regarding TINOSA?
A. I wouldn't say so, no, sir.

Q. I am thinking, of course, of the difference in the hull. Do you consider that we should be more careful of hull penetrations in THRESHER class submarines than we have been on other submarines in the past?
A. No, sir. I see no difference.

Questions by a court member, CAPT Osborn:

Q. You keep talking about the responsibility of the Design Division and Structural Division. Who individually are you talking about?

A. Mr. Watts, the head of my Structural Branch. He is the one who actually issues the pieces of paper that authorize the cutting of any opening in the pressure hull.

Q. When you are talking about Mr. Dunham, how do you refer to him?
A. I am--I guess you would call me the general overseer. I do not get into the details of developing the size of these openings and where they should be cut, but when the D.M. is finally issued, I will sign them and give them a general review to make sure that the policy has been followed.

Q. There's no cut made on the ship, Mr. Dunham, that you don't approve of in either a direct or indirect way by your signature?
A. This is correct.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness indicated that his testimony was unclassified.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

Joseph R. Smith, a civilian, was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: Mr. Smith, this is a closed session of the court, and classified information can be divulged here.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Will you state your name, address, and present occupation, please?
A. My name is Joseph R. Smith. My address is Kittery Point, Maine. At this present time I am Acting Chief Quarterman.

Q. In the Pipe Shop, Shop 56?
A. In the Pipe Shop, Shop 56, that's correct.

Q. And you are employed by the Portsmouth Naval Shipyard?
A. Yes, sir.

Q. Tell us your background and experience in your present trade, Mr. Smith.
A. I came to work here July 2d, 1935, as an Apprentice Pipefitter. I served my time as an apprentice, and worked as a mechanic for a few years, and I was made a Leadingman on February 2d, 1942. The only broken service I had was voluntary induction in the military for a short period of time in 1945. I went in the Navy, and came back to the Shipyard and have been employed here since. At one time I made quarterman rate. This was in the vicinity of 1951.

In 1952 I was a Chief Quarterman for approximately a little less than a year, I believe. I went back to Quarterman, as it was told to me, due to the cutback in personnel in the shop. I've been Quarterman since. This is the first time I've acted in Chief Quarterman's capacity since that time, and that's due to the sickness of the Chief Quarterman.

Q. Prior to the 25th of March of this year, were you Quarterman on the afternoon shift for Shop 56?

A. Yes, sir. I had been for approximately a period of three years--definitely through the whole period of THRESHER. I would say approximately three years.

Q. Did you have supervisory responsibility for pipe work in THRESHER, along with other piping work in the Yard, insofar as the afternoon shift was concerned?

A. Yes, sir, I did. We had approximately 200 pipefitters and helpers and pipe coverers on the ship at times, and one to three quartermen, and in the neighborhood of 15 to 20 leadingmen. I was assigned the responsibility for all employees on the afternoon shift and the work that was done.

Q. I would like to talk specifically about THRESHER during her post shakedown availability. Will you describe your responsibilities as quarterman for the afternoon shift with respect to pipe work accomplished in THRESHER?

A. On the THRESHER I handled that, yes. I would contact the quarterman when key dates were involved. I would check with the leadingmen on the afternoon shift at random. One of the key dates was undocking. I was to give more time to the boat on undocking periods. Near the completion, I would spend more time with the boat. I would contact my leadingmen on the THRESHER, never less than one time a night, and that would be in person. I would make routine trips down on the THRESHER and at times when they requested me to review something specific. I can't remember going down there on anything specific, though. I would check with the day quarterman, and I would call in the quartermen in other areas on the day shift upon coming into work. My first assignment would be to report to the Chief Quarterman to see if there was anything that needed immediate attention, and the next thing I would call the quartermen about other things, but the THRESHER got preference. At one time there was the 606; another time it would be the SKIPJACK; and another time it was the launching of the 606.

Q. How is the work turned over from the day shift to the afternoon shift?

A. The leadingman of the P.M. shift contacts the leadingman of the day shift, and it would be a man-to-man turn-over on the ship. In my case it sometimes made it necessary for me to telephone. If the Chief Quarterman deemed it necessary, I would go down and talk to the quarterman at various stages of the overhaul. As I say, I think the best way to term that is on key dates, such as getting near completion. I would go down and contact Mr. Collins and write out anything pertinent, and I would check with my leadingmen at various times.

Q. Were there any turn-over logs kept at the quarterman level?

A. No, they were not kept. No, sir.

Q. Is there a rough turn-over log maintained by the leadingmen between shifts?

A. Yes, sir, there is, and I might add that it is rougher than we wish it was at this time. We do have it available.

Q. Are test slips maintained on tests completed?
A. They are maintained. I would hesitate to say 100 per cent, though.

Q. Are they signed by the mechanic who conducts the test?
A. No, sir.

Q. Are they dated?
A. I don't believe so. I don't know.

Q. Where would those test slips be maintained in the Yard?
A. They would be maintained during the overhaul of the boat--the Project Quarterman takes care of those in his desk. I might add a little to that. On the P.M. shift, if we required any test slips, we would put them in the Leadingman's Log Book, and the day shift would keep them.

Q. Speaking from memory, then, can you testify to the work done in THRESHER on THRESHER's piping during the afternoon shift during her post shakedown availability with regard to the check valves in the constant vent piping system?
A. It would be vague what I can remember. I refreshed my memory some with my leadingman on that shift, Mr. (b) (6) . We did some of the piping in the constant vent and check valves that we installed in this overhaul. This was brought to my attention, that the check valves were turned opposite from what they normally would be in operation so the crew could have the ASW system and we could continue picking up templates, and so forth.

Q. Do you have any personal knowledge of that, or is that what you have heard?
A. This is what I've heard.

Q. Do you have any personel knowledge which you can relate concerning the flexible hoses in the system?
A. The personal knowledge I have on the flexible hoses was near the completion of the overhaul, when the hoses had to be passed, okayed, by the shop and by Code 303. We did quite a considerable amount of work during the month of March, and we had the Leadingman Mechanic working along with the inspector to check these things, and after installation was when I got personally involved with it. In some cases they might get kicked a little bit, or they just weren't lined up perfect, and we had a mechanic and an inspector work along together on the flexible hoses. I can't identify which systems they were on. They were general throughout the ship.

Q. Does a man require any special training in order to be able to install flexible hoses in the piping systems?
A. Yes, sir. If I can start right at the beginning, we have people who we send to the Aeroquip factory, the people in the shop who assemble them as prescribed on the boat. And these people are qualified and factory trained. After the hoses are available, they are installed on the boat by the ship's crew. And they do have different laterals, and they should not be misconstrued. They should be kept on the same level.

Q. Do you know whether the men who assemble the hoses are required to carry a card signifying that they are qualified to do so?
A. In the shop?

Q. Yes.
A. I believe they are.

Q. Do you know whether they are or not?
A. I will say yes, I do.

Q. In the flexible hose installation work done in THRESHER, were deficiencies in the work found and recorded?

A. I feel that Code 303-- Well, a lot of deficiencies of weeps that came to my attention were of a weep nature on the flex hoses. We went through the ship, and Code 303 inspected them, and I feel that Code 303 kept the records.

Q. What would be the nature of a weep with respect to the installation of flexible hoses?

A. Not properly supported was the most common.

Q. How did you determine, as a management man, when a man's work had been consistently poor in this respect?

A. I did not determine that. What I knew about deficiencies in the hoses, I thought might have been due to people kicking or possibly stepping on them and springing them out. But that's a matter of thought.

Q. What protective devices were provided for the flexible hoses so that they wouldn't be stepped on and kicked about while work was in progress?

A. The only thing that comes to my mind, I think, was the idea to install them in the latter part of the overhaul.

Q. Were workmen cautioned about the sensitivity of such hoses in order to prevent this sort of thing?

A. Not to my knowledge

Q. Was the ship's crew alive to this question, if you know?

A. I don't know.

Q. Early in your testimony you remarked about the fragmentary nature of record keeping during turn-over from the day shift to the evening shift.

A. Yes, sir.

Q Have you been thinking of any possible ways in which turn-over procedures could be improved with regard to this work?

A. I've been thinking about it. I would like to make this statement: Our log keeping was very rough. I do not feel that it impaired the building or the overhaul of THRESHER. I don't want to give that impression. I do feel that at a time of crisis like this, we would be much better prepared to give information, which we all need.

Q. How would you improve it, Mr. Smith?

A. More detail. Other people, no doubt, will examine the books. I think it should be self-explanatory. Possibly the mechanic's name should be in the heading of the job. I think that way, you can trace back on who did the work or who did the checking and you would know exactly what was done. I feel truthfully, though, as I said, that this didn't impair the overhaul of the ship, and I don't think that we are required to keep this log. But I do think it would be beneficial to checking back on the jobs in many ways, and at a time like this, it would have been a help in clarifying what was done.

Q. On major tests, such as a test of the auxiliary salt water system, were you, as a quarterman, required to witness the test set-up?

A. No, sir. The test set-up on the THRESHER, such as the auxiliary salt water system, was spelled out by valve line-up on the Job Order. I think, by good luck, the mechanic who sold the final test on the auxiliary salt water system had this well spelled out on the Job Order. I have this piece of paper

in my pocket here, and I have been instructed to give it to the gentlemen who handled this when he is called to testify. I would sooner he testified about this, because it is only hearsay on my part. I was requested by the Legal Officer to give this paper to him.

Q. What is the name of that man?
A. That's Mr. DiPietrantonio. It's a very hard name to pronounce.

Q. May I see the piece of paper, please?
A. Yes.

(The witness produced a Job Order for the testing of the Auxiliary Salt Water System on U.S.S. THRESHER)

The said Job Order was submitted to the court and to counsel for RADM Palmer, a party, and was offered in evidence by counsel for the court.

There being no objection, it was so received and marked Exhibit 104. Counsel for the party waived the reading of Exhibit 104.

Q. (By counsel for the court) Mr. Smith, with respect to sil-braze joints, do you have any brazers assigned to the night shift working on the auxiliary salt water system, high pressure air, and hydraulic pipe joints?
A. In instances I feel that need, sir.

Q. Have you been trained in sil-braze technique; that is, the technique for proper fit-up, in-process requirements, and final inspection requirements?
A. I have not been actually trained in class. I have read the instructions. I think I know what the requirements are.

Q. You do know what the requirements are and what they were during THRESHER's post shakedown availability?
A. Yes, sir.

Q. Will you please tell the court what the requirements are, first in the area of proper fit-up alignment?
A. Yes, sir. It was developed in some of our trouble areas and some of the faults we had with brazing three or four years ago, when they found that sloppiness was due to brazing failures. So it was required that we train our people under a special instructor on brazing, and that they would have to carry a brazing card. They would be subject also to a refresher course periodically. That, I believe, is six months, but I wouldn't state that as a fact. A man was required to take an eight-thousandths gauge feeler, and if that could be inserted between the fitting and the pipe, it was considered in excess, and the pipe would be expanded to make it less than eight thousandths tolerance. The line-up was done visually to make sure there was no cocked pipe in the fittings. The leadingmen were instructed to review the braze joints visually. I feel that they did inspect all braze joints. Anything over two inches-- I have to go on my memory on this. I think it was toward the end of the availability that THRESHER required, if it was in a critical system such as the salt water system, it required a very strict test.

Q. What was the requirement with respect to the bottoming of the pipe in the joint?
A. There's a very small tolerance there. I think it was one-eighth of an inch in excess.

Q. Was there a requirement for work in process that a second brazer be standing by and observing the work?
A. Yes, sir.

Q. How did you check to make sure that this requirement was fully carried out in each case?
A. The leadingmen were down on the job the biggest part of the time, and they were observers. The brazers, I feel, would not braze at that time without a brazer. This was cut down on smaller size later on, I believe. This was done away with. But this was quite recent.

Q. Was that the only requirement which you have mentioned to us so far which was finally relaxed?
A. That's the only one I know of.

Q. What are the final inspection requirements?
A. The final inspection requirements were-- well, visually to see that the pipe was not out of line, that you could see where your solder had drawn up from the ring inside the insertion - a sil-brazed ring. The color - to check for discoloration, and if it was black and it appeared to be burned, it could raise a question. We had an assist from Code 303 on that. They checked at random a lot of times, and they would also inspect all new work - sort of a double check. They could condemn fittings also.

Q. How did you check visually for percentage of bond?
A. There was no way I know of for checking bond - not visual.

Q. Did you personally check the sil-braze joints made in THRESHER during her post shakedown availability period?
A. I have at random, just casually, sir, as I walked through the ship, but not on a special detail.

Q. Do you have any misgivings in your own mind as to the quality of work performed by your men in THRESHER in this respect?
A. No, sir, I have no reason to.

Q. Were there any men working for you on sil-braze joints who were sent back to be retrained because the quality of their work was not up to snuff?
A. I don't remember any, sir.

Q. What supervisors were assigned the specific responsibility for inspection of sil-braze joints in THRESHER?
A. On my shift Mr. (b) (6) and Mr. (b) (6)

Q. Do they keep records of those inspections?
A. Yes, sir. We have brazing cards.

EXAMINATION BY THE COURT

Questions by a court member, CAPT Nash:

Q. Mr. Smith, early in your testimony you discussed the weeps in connection with flexible hoses. One of them was a flexible hose which was improperly supported. Please explain that.
A. I did make that as a general statement, sir. I believe, that, if my memory serves me, that seems to be one of the general-- I feel back along the line that they did have to rehang some.

Q. Would you be a little more specific? I don't understand what you mean by "improperly supported?"

A. Well, in some larger size hoses, they would take a sag, and they should not take a sag. They should be hung properly.

Questions by a court member, CAPT Hushing:

Q. Mr. Smith, you mentioned that you had approximately 200 men on the afternoon shift, I believe; is that right?

A. Yes, sir.

Q. What kind of people did you have assigned to the THRESHER, your best people, your worst people, or an average group?

A. I thought we had a good average, and in some cases we had some very good people assigned to the THRESHER.

Q. Did you make an effort to assign specially qualified people or did you leave it up to the leadingman to assign these men?

A. I handled that in this way: I checked with the leadingman, and if they have any qualms about needing a particular mechanic that may be specialized in certain things, I would attempt to get the man for him. The leadingmen usually handle this, and if they don't care for a man's ability, they usually say so, and he may be put on a lesser job. But I can't remember that happening here.

Q. Specifically, did any leadingman send back any mechanics?

A. Not to my knowledge, no, sir.

Q. Did you assign any rejects from other ships to THRESHER?

A. No, sir.

Q. How about the work effort of these people in terms of time on the job; did you have any complaints from your leadingmen relative to slacking off, not doing a fair day's work?

A. No, sir. They would have had complaints from me from my observation if there were any.

Q. Did you personally observe them?

A. I personally observed them at various times in the evening. They would have a coffee break, and that was one of my jobs, to keep discipline in the gang, to see that they didn't come off the boat and hang around the coffee machines and throughout the Yard. If there was anything like that happened, it would be my job to speak to the leadingman. It would be his job to see that they weren't doing that.

Q. Did you find it necessary to discipline any men of your gang during the period of the PSA of THRESHER for work reasons?

A. Not that was assigned to the THRESHER. I think I had two disciplinary actions in the Yard, but not on the THRESHER.

Q. Did any of your leadingmen have to discipline any of their men for work reasons?

A. Yes. I'm sorry. My memory did fail me. On that tank failure. We wrote a letter of admonishment on them.

Q. Are you talking about the No. 2 reserve feed water tank, which occurred early in March?
A. Which occurred on the 8th of March, yes, sir.

Q. There were letters of admonition written in that case?
A. Yes, sir.

Q. Do you know how many?
A. On my shift I wrote one to the leadingman and the mechanic involved.

Q. But those were the only cases of discipline that you remember?
A. Yes, sir.

(b) (6) relieved (b) (6) as reporter at this point.

Q. Would it be fair to say then that you were satisfied with the caliber of the work force on THRESHER?
A. Yes, I was.

Q. You were satisfied with their work effort?
A. Yes, sir.

Q. Were you satisfied with the product?
A. Yes, sir. You mean the complete job, with the boat done?

Q. Did you, in your inspections, see any indications of unsatisfactory work, such as twisted flexible hose?
A. I did not. I had a report from this Mr. Lamb and inspectors that some of them they did have the line up and they said that they carried on the job, they thought, quite well.

Q. Did the ship's force complain to you about any unsatisfactory work?
A. Not to me directly, no, sir; nor indirectly, no.

Q. Did they ever complain to you about valves being installed backwards?
A. They did not to me, no, sir.

Q. Did you ever hear any talk about valves being installed backwards?
A. Not until this tragedy occurred. But I did hear some talk, I think, about the hydraulic system. It was corrected. I understand, in my mind, I think it was something on the hydraulics to the mast and I think it was a design mistake.

Q. I believe you mentioned that you did not maintain a detailed log for turnover from the day shift to the evening shift?
A. On the Quarterman level, no, sir.

Q. Did the men on the evening shift receive copies of the specific job instructions for the work they were doing?
A. I don't feel that they did. If it was so, it was very much in the minority. But they were available at the desk in the field office and the leadingmen would see that they had their instructions. I don't feel that they carried the JO's on the PM shift. Our work was of a nature, too, of a pick up, and a good deal of it was man to man turnover.

Q. You mean mechanical man to man turnover?
A. Yes, sir, we did in many cases, yes, sir, on the ship, with the leadingman following right behind checking as soon as he could to see if there were any questions.

Q. Did you check mechanics on the night shift to see that they had proper job instructions?
A. I did not myself, no, sir.

Q. Did you require that of your leadingmen?
A. Yes, sir, I would assume they would have done it. I believe their training would lead them to. I did not follow through.

Q. You did not check them to make sure this was being done?
A. On the JO's, you're speaking of?

Q. Yes.
A. No, sir.

Q. Did any of your leadingmen report to you that their mechanics did not have satisfactory job instructions?
A. No, sir.

Q. Do you think that this is a good system, to depend on word of mouth?
A. Well, it wasn't entirely. You spoke of JO's. We had the log and the leadingmen had contact -- my PM leadingmen had contact with the day leadingmen. The men were instructed by their leadingmen what to do, and they were overseen by the leadingman that they were doing that on the job by observation.

Q. Well, were the job instructions available to mechanics in any spot near the ship?
A. Yes, sir, they were. There was a field office right handy to the gangway.

Q. Right next to the gangway?
A. Yes, sir, right close to it, sir.

Q. Were the men required to read the job instructions?
A. They would usually be instructed by their leadingman after he had read them.

Q. After he had read the job instructions?
A. Yes.

Q. Did the day shift and the night shift divide up the work in any way such that the day shift worked on one group of jobs and the night shift worked on another?
A. Not so much on this THRESHER overhaul. You might on new construction but on an overhaul I would say no. We had in the neighborhood of twelve to fifteen men at work, I would say as an average, on the PM shift, and we would pick up jobs that the day shift felt essential to keep moving, possibly continuing their checking or installing valves or hanging systems or, such as I have mentioned, the constant vents, we carried on on that.

Q. If check valves had been installed backwards on the day shift on purpose, do you think that this would have been transmitted to the night shift?
A. I believe that some of them were done on the night shift. I believe it would, yes, sir. I definitely do.

Q. Well, why do you believe it would have been transferred?
A. I believe it would have.

Q. Why do you believe it?
A. Eventually when the system was operated to the satisfaction of the crew, it couldn't have missed anyhow; and if that system -- well, I just feel that they did.

Q. You think that the mechanics were close enough to each other that they transmitted this word by word of mouth?
A. And the leadingman.

Q. And the leadingman?
A. Yes, sir.

Q. So that there was never any question in your workmen's collective minds as to what the status of the system might be?

A. I don't think in the final analysis, near the end, there might have been. At the beginning I feel that it might not have been necessary to have had two shifts in this particular instance; but as a job progresses and time may become an element, and when it's passed over, I think it's checked thoroughly.

Q. Was there any tag out system in use to indicate peculiarities in the system, such as missing items or items that should not be operated?

A. I don't think so, sir.

Q. Is there normally a tag out system in use in the Shipyard under these circumstances?

A. Well, a check is put in backwards, it is not too common; I would say no, there is not.

Q. How about the situation where the internals of a valve are not actually in the valve body; is there a tag out of any kind put on the valve itself to so indicate?

A. I can't think of any. That deal would be entered in the log book.

Q. It would be entered in the log book, but a person looking at the valve wouldn't be able to tell whether the valve was operative or not?

A. That could be true.

Q. Let me turn to a situation where a system has been completed, inspected, tested, and turned over to the ship's force. It then becomes necessary or desirable for the Shipyard to take out a component in that system. There is Shipyard work to be done and a re-test to be performed. Can you describe to me the kind of rip-out precedure or re-test procedure that would be used?

A. If it was a mechanical joint -- when I say mechanical joint, couplings or unions, with the agreement of the ship's crew there could be an operational test. If it involved brazing or cutting, or cutting the pipe, or such, or brazing, it would require either the soak period, which would be twelve hours, or a flush, and a re-test, the same as if it were new work.

Q. Would any formal piece of paper move from the Yard to the ship or from the ship to the Yard indicating responsibility for that portion of the system?

A. I feel in most cases that we would have had a test slip, re-test, re-do it, in most cases have a re-test that I know of, and a re-test check for new work.

Q. Is there a rip-out log maintained anywhere in the vicinity of the ship for this purpose?

A. Not that I know of, sir.

Questions by a member, CAPT Osborn:

Q. When you came in the courtroom this afternoon, I noticed you greeted the former Commanding Officer of the SWORDFISH, which was built in this yard. Did you know Commander Harvey?

A. No, sir, I did not know him.

Q. Are you in the habit of knowing most of the skippers of the ships pretty well?

A. The last boat I was involved in was the NAUTILUS overhaul. I was on the day shift and would be what you probably would call the Project Quarterman -- at

that time it was not phrased as such; and I felt that I had a very good relationship with Commander Zech.

Q. You didn't have any intimate contacts with Commander Harvey?
A. No, sir. I did not, sir.

Q. How long do you think it would take to put a test on a complete ASW system?
A. If it was all ready, sir --

Q. All ready to go. I say, "Test this system."?
A. It can vary an awful lot, sir. I hesitate to commit myself.

Q. Everything just went perfect.
A. Everything went perfect. I would say it would run from two days to four or five, lining up, and so forth, in eight hour shifts a day.

Q. You mean to tell me it would take fifteen shifts to put a test on an ASW system?
A. Two to four days would be eight hour days -- that's the way I explained it, sir, yes.

PRESIDENT: He's talking a single shift per day.

WITNESS: The system would have to be filled, you'd have to get your test equipment, start right from scratch. You'd have to vent out your system all possible, pump it up, try to work the air out as well as possible. I would say two to four or five days.

Q. Who would conduct the tests?
A. The leadingman and mechanic.

Q. Are you usually there when one of these tests is going on?
A. At times, yes, sir' not all the time; most of the time.

Q. But this is usually a function of transfer from leadingman to leadingman, isn't it?
A. Yes, sir.

Q. You seem to be pretty familiar about the ASW system. When was the test completed?
A. I do not know, sir.

Q. Do you know whether it was completed or not?
A. I feel that it was, on reviewing the slips, talking to the mechanic, talking to the Project Quarterman who was on the day shift. We have a slip that makes me feel it was completed.

Q. You're familiar with the test foreman that was giving it. Do you think
b(3) 10 USC 130 is a reasonable drop on that system?
A. Some systems, it seems, never be able to stop dropping and others do; I can't say any concrete statement on that. You take a large system like that, it is possible to have a drop and almost never find it due to a valve leaking by and it's pretty hard to discover.

Q. Do you usually test this system b(3) 10 USC 130 or the complete system at the same time?

A. Well, sometimes it's done in sections, on new work, and usually a final complete test.

Q. How is the final complete test done?

A. On this ship here it was done according to the JO. The boundaries were given; they hooked in -- I don't know where, a convenient place, possibly a drain but I'm not sure of that, sir.

Q. Are you familiar with whether it was a loop test or a complete test?

A. On the final, I believe it was a complete test. This is hearsay from talking with Collins and DiPietrantonio.

Q. You haven't checked the detailed Test Memorandum over with respect to valve line up?

A. Not with plan and line up, no, sir.

Q. Certainly the ASW system as a whole was one of your major jobs during this PSA for the pipefitters. Do you think that the fact that the job was completed or sold would have come to your attention?

A. I think it was, and I think it was sold, sir.

Q. When?

A. I do not have the date.

Q. Where would you have gotten the information, from whom?

A. I would have had no reason to get the information on the date. If I had the Test Slip -- and in my status on this boat I would not have been reviewing the Test Slip if it was not sold on my shift.

Q. It's a peculiar thing. I'm trying to determine, Mr. Smith, something you were relatively insignificantly interested in -- or not interested in in this particular case -- yet you have a particularly good idea that it was sold. I want to know where you got this information on the THRESHER.

A. We reviewed -- Mr. Collins -- we had been reviewing the diagrams pertinent to this hearing and we came up with a slip that it was sold by a member of the crew. I presented a JO, and according to the mechanic on the job, it was a valve line up according to this JO, and it was circled as a closed valve, and the slip was supposedly passed to me by the Project Quartermaster on days, or at least we discussed it, was the receipt of the sale. And that was discussed also in Captain Heronemus' office; you were present, sir. And the slip was, I believe, presented. It was not in its entirety clear. After that we sent for this DiPietrantonio. He presented the JO. And it is testimony from him that says it was sold complete and signed by the crew.

Q. Now I want to clear up one other thing, Mr. Smith. Was most of the discussion of this particular job with respect to whether the job was signed off or not discussed prior to the THRESHER going to sea or after the THRESHER went to sea?

A. It was after the THRESHER went to sea when I got into the conversation.

Questions by a member, RADM Daspit:

Q. Mr. Smith, some of the surviving members of the crew expressed concern about the twists in the flexible hoses. Is there a definite instruction as to how much twist is allowed when installing these hoses?
A. As I interpret the instruction, there should be no twists, sir.

Q. None at all?
A. None at all, sir. That is the way I interpret the instruction.

Q. In many of the instances it appeared that the workmen did install the hoses with twists and it was not until the ship got the inspecting people to come around and look at the hose that the correction was made. Were the workmen carefully instructed that no twist at all should be allowed in the hose?
A. I do not remember being involved in that job until we were practically going through the ship with Code 303 inspectors, this man Lamb, and all we had to do in correcting any of those conditions

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. During THRESHER's post shakedown availability, what time did the day shift work day end?
A. At 12:30, sir. Day shift? I'm sorry --

Q. Day shift.
A. Ten minutes past four.

Q. Ten minutes past four. What time did the afternoon shift start to work?
A. They were instructed to be on the job at four o'clock.

Q. So there was an overlap during which a turnover could start to be accomplished between the leadingmen?
A. Yes, sir. I might point out that in many instances Mr. West, who was a very active leadingman on the day shift, stayed over and made sure that instructions were understood down on the boat, as well as going over the log -- go over any questions, any pertinent things. I used to ask Mr. Collins if there was anything pertinent that I could watch for, and usually he was quite satisfied.

Q. Now you told us that on your shift in THRESHER you had occasion to write an admonition to a leadingman and a mechanic involved?
A. Yes, sir.

Q. Do you have any difficulty in taking disciplinary action against the people who work for you?
A. Is that a general statement?

Q. A general statement -- in your work in the Shipyard?
A. Not if it's clearcut and understood. I think in the last six months I have been instrumental in having one man removed, and I think there was another man that was suspended for ten days due to disciplinary action that I forced.

Q. When you say "removed", is that the same as fired?
A. Yes, sir.

Q. Do you feel you have enough authority to make the people who work for you do the job right the first time?

A. Yes, sir, I do.

Q. Would you like to have more authority than you've got already?
A. No, I think it's ample, sir.

REEXAMINATION BY THE COURT

Questions by a member, CAPT Osborn:

Q. Have you experienced any difficulty in remote operating valves with respect to the ASW system valve isolations in your piping systems?
A. I was not involved in that, no, sir. I was not involved in that; it was not brought to my attention.

Q. On the occasion of your test, when you got ready to conduct your test, did you have a problem with these valves operating?
A. I can recall none, but I feel that there could have been and not been brought to my attention. Very seldom is a test put on there isn't a leak in the bonnet or somewhere along the line. The leadingman would handle that directly with the leadingman of 38.

Q. I was just interested in it from your own first-hand information with respect to your people conducting tests on piping systems, whether, if they started to operate a valve, they had trouble operating it, or somebody on the ship had trouble operating it?
A. Not to my knowledge, Captain.

Questions by the president, VADM Austin:

Q. Mr. Smith, you seem to be convinced that there was a proper final check made on the ASW system of the THRESHER?
A. Yes, sir, I do, sir.

Q. But the records which have been available to this court have left some doubt as to when and by whom these tests were completed to our satisfaction. Do you feel that the keeping of these records is up to the standard that it should be?
A. I feel that it was up to any standard we had ever been required to meet, and I feel that it did not in any way affect the complete overhaul. In the position we're in today, it certainly does not seem to be as adequate as it could be; and I still feel that as a result of this we will keep better records. I know so.

Q. In other words, at your own level, with your own authority, you can insure better records for that part of the work that comes under your supervision?
A. I certainly feel that I can.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Following the casualty to BARBEL, was there any change in the pipe shop test record keeping procedures?
A. I can't think of any, no, sir. Code 303 was always relied upon by us, I think, maybe possibly more than they should have been; but I won't say that.

But I think we relied on Code 303 when they were involved.

Q. Did you think that there was any record keeping that was necessary at that time?
A. I think records are necessary at all times.

Q. I was referring to improvement in record keeping?
A. You're referring to like the log, turn-over, tests?

Q. Records of tests particularly?
A. Well, I think at that time we did keep all the test slips. That's all that we did have and all we were concerned about. We'd keep them till the completion of the boat at least. I feel that we did this in a pretty fairly good manner.

Q. There's a higher standard of record keeping in the construction of a boat than there is in its overhaul; is that what you're saying?
A. No, I'm saying that it's a little different on the construction of a boat. Everything gets a double check from Code 303, they keep records; and on this boat, on new work, Code 303 was involved, but on old work the crew were involved.

REEXAMINATION BY THE COURT

Questions by a member, RADM Daspit:

Q. Mr. Smith, is it possible that in the log that was turned over from leadingman to leadingman there may be a record that this test was completed; has this been checked?
A. It is possible. But we're checking through so many records I hesitate to say for sure that the log book -- but the log book will be available. And I'm not uncertain in my own mind that Mr. Collins or Mr. West do not have the date. Mr. West wrote the test slip on this ASW, as I remember, and as I say, I think it could be pretty closely pinpointed, sir. I do not have the date available.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The president of the court informed the witness that he was privileged to make any further statement covering anything relating to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness made the following statement:

WITNESS: I would like to bring out the notes that I took of April the 5th. They are what we call a 593 Conference -- at one o'clock. How I happened to have this note, I was at a meeting in the field office with Mr. Biederman, who was the Ship Superintendent, a quarterman, I had a leadingman there who was Mr. West. There was a representative from the ship, an officer. All pertinent matter to going to sea was discussed at this meeting, I felt. I was looking through the desk, naturally, when we came through this for anything I might get ahold of, and I got this out. And I think it gives a fairly good feeling, truthful, not just an estimate, but possibly in words what we felt was left to do on that ship the fifth of April. I think it's a fairly good piece of evidence. I showed it to Captain Heronemus and he thought it was; and I think he had a quick copy; I know Mr. Poor does. It shows just about everything that the ship had the chance to voice their

dissatisfaction or pleasure with any work. We were charged with any WEEP's. This is mostly the WEEP list, which we do work on prior to going to sea. And those that were done were corrected with a large "C" by me at the meeting, and I reported this back to the foreman. And I think it might be of interest. I hope it is.

Question by counsel for the court:

Q. Is that your own handwriting?
A. That is my own handwriting, yes, sir, for the foreman's report.

Questions by the president, VADM Austin:

Q. I take it, Mr. Smith, that the absence from this list of a test on the auxiliary salt water line is, in part, what you are relying upon when you say that in your own mind you are convinced that had been checked off?
A. Not from that list, sir. I wasn't referring necessarily to the ASW system. On the ASW system, after talking with the mechanic, I believe his testimony was forthright and forward that he concluded the complete test on that slip, as I remember it; and I took it up to Captain Heronemus and that's about the last time I saw it. There was some one or two WEEP's that at the time left a little doubt in my mind, whether they were WEEP's to be done or completed. On asking directly, without any grooming, I, frankly and honestly, the mechanic came forth very quickly and said that those WEEP's had been accomplished; that this particular man that I cannot name, from the crew, signed that off as being complete. And that is what I base my judgment on that the -- or at least my feeling -- that the system had been so tested.

Q. Do you have anything further, Mr. Smith?
A. No, sir, I do not.

Notes taken by the witness at a 593 Conference on 5 April were submitted to the party and to the court, and were offered in evidence by counsel for the court. There being no objection, they were received in evidence as Exhibit 105. The reading of the exhibit was waived by the court.

Q. Is there anything particular you want to explain on this?
A. No. That shows remaining work. There was an officer from the crew, the Ship's Superintendent, Mr. Biederman. I could very quickly get the name of that officer, too; it slipped my mind. I feel that were there more work or anything doubtful in the mind of the ship's representative at that meeting, it would have been thrashed out with Mr. Biederman.

Questions by a member, CAPT Osborn:

Q. Do you think it quite likely, Mr. Smith, that you would be conducting an ASW hydrostat test at that time, whether you had conducted it or not?
A. Was I thinking of that?

Q. Well, would you think it quite likely that you would be conducting a hydrostatic test at that late date if you hadn't conducted it at that time?
A. Oh, I definitely feel that that was all done then. It would have been brought up at that time had it not been done. But that is not why I presented that, sir.

Neither the counsel for the court, the court, nor the party desired to examine this witness further.

The witness was asked if he had anything further to state and replied in the negative.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court recessed at 1504 hours, 30 April 1963.

The court opened at 1515 hours, 30 April 1963.

All persons connected with the court who were present when the court recessed were again present in court.

No witnesses not otherwise connected with the inquiry were present.

Rinaldo DiPietrantonio, (b) (6) was called as a witness for the court, was informed of the subject matter of the inquiry, was advised of his rights against self-incrimination, was duly sworn, and examined as follows:

COUNSEL FOR THE COURT: This is a closed session of the court and you can divulge classified information.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Would you state your name, address, and present occupation?
A. Name is Rinaldo DiPietrantonio, and I live at (b) (6)

Q. Where are you employed?
A. I'm employed at Portsmouth Naval Shipyard. My badge number is (b) (6)

Q. Are you a limited pipefitter?
A. I am a limited pipefitter.

Q. Were you so employed during the post shakedown availability period of THRESHER?
A. I was.

Q. What were your duties in connection with THRESHER's post shakedown availability.
A. My duties was tester, mostly the auxiliary salt water.

Q. Testing the auxiliary salt water piping system?
A. Yes.

Q. What is your background and experience in your present line of work?
A. Well, most of the time, for instance, I worked in other boat yards, boat machine shops, and I worked for the Sewer Department, always on water testing systems.

Q. How long have you been at the Portsmouth Naval Shipyard?
A. At the present time I've been here about thirty-eight months.

Q. How much of that time has been spent on conducting tests of water systems?
A. Mostly, well about two years.

Q. Are you familiar with the salt water piping tests in the auxiliary salt water system of THRESHER?
A. Pretty good at it.

Q. Would you describe the way the tests were performed -- first, the preparatory testing of the system?
A. Well, you want to know it from the beginning?

Q. Yes.
A. Well, before we start testing we get a slip from the leadingman. That slip is like a work slip. We go the Ship's Sup in the field office. He signs it. Then we go over and record it in a book for one of the men that works in 04. I take that same slip and go over to the ship and get one of the duty officers of the day to sign it. He gives me the O.K. to go ahead on the system that I want to test. Then we go by this Test Memo they give us, the job order. This job order -- before we touch a valve each valve is turned on by the crew, whoever is assisting me. I don't touch no valves. They help me made the line up.

Q. Now going back to the testing of the ASW system in THRESHER. At first were small portions of the system tested as they were completed?
A. That's right.

Q. When did you start that way?
A. Well, the exact dates I don't know.

Q. What month?
A. Well, we started around January. Between January and February we started testing most of the systems that were completed.

Q. We are trying to find out whether a final test of the entire system was completed, and if it was we want to learn details of it?
A. It was.

Q. Can you state of your own knowledge that such a test was completed?
A. Yes, I made that test.

Q. You made that test yourself?
A. The final test.

Q. Now about what day was that, do you remember?
A. I don't remember the day; it was sometime in March.

Q. Was it in the beginning of March?
A. No, around towards the middle I'd say.

Q. Towards the middle?
A. Yes.

Q. Do you remember what day of the week it was?

A. No. See, we get these slips and we turn them over right after we see them we turn these slips right over to the leadingman and then we start.

Q. Do you remember who the leadingman was on the day you stopped?
A. The day I stopped I was working for West and Ray Plourde.

Q. West and who?
A. Ray Plourde.

Q. P-L-U-E-T -- oh, Poor?
A. No, Plourde, Ray Plourde.

Q. I show you this paper on which we've written Exhibit 104 at the bottom. Do you recognize this piece of paper?
A. Yes, I had that paper several times.

Q. Would you tell us what it is and how you are able to recognize it?
A. This slip was given to me by the leadingman. It's the line-up of each test we make of ASW, trimming range, both on here.

Q. Which leadingman gave it to you?
A. Mr. Dame.

Q. Mr. Burleigh Dame?
A. Dame.

Q. Burleigh Dame?
A. Right.

Q. Is that piece of paper, in your mind, associated with the final test of the ASW system in THRESHER?
A. This piece of paper was given to me for the line up of the test. After I got the line-up I returned it to the leadingman.

Q. To Mr. Burleigh Dame?
A. Well, the last guy that was on the desk. Burleigh Dame had it.

Q. All right, who was the leadingman at the time you put it back on the desk?
A. Well, that's what I mean. The last I had it was Mr. Dame had it in his hands and he put it in the drawer, and I went in the drawer several times and took it afterwards.

Q. Tell us about that final test. How you conducted it, who was present, and who accepted it?
A. Well, on the final test we started that day the test, I put it up three or four times. We had, let's see, there was Bain, a seaman --

Q. A seaman from THRESHER?
A. Yes.

Q. Please identify the people for us?
A. There was Mr. Bain, there was Mr. Kieserkier, and McCord --

Q. Where were they from?
A. All in the crew. There were three or four that assisted me in this test. Bain mostly, because he helped me most of the line-up. Well, we begin the test at our last pressure; each time we isolated one unit at a time. We kept going, like SSTG's, I kept going testing just the SSTG's that held b(3) 10 We kept going. He opened up another system. And he opened one of the coolers. Until we find out where the leak was. I found four leaks on this test.

Q. Where were the leaks?
A. One was on the SSTG's.

Q. Where on the SSTG's?
A. Right on the header, cooler.

Q. Was it a joint, a silver-brazed joint, or a welded joint --
A. It was a valve.

Q. A valve?
A. An Apex valve.

Q. What happened about that?
A. The machinist lapped that valve and corrected that one on the outboard side.

Q. He lapped it while it was in place?
A. While it was in place.

Q. Where was the next leak from?
A. The next leak was on the main hydraulics cooler, the forward one. We renewed that valve.

Q. Was that also an Apex valve?
A. That was also an Apex valve. And there was another one on the main head cooler; and that was an Apex valve. We replaced that.

Q. Where was the fourth one?
A. The fourth one was where my test gear was.

Q. Where was that?
A. On the inboard of the SSTG's. I had my test gear; that's where I tested from. That was lapped in.

Q. Was that on the b(3) 10 SSTG?
A. b(3) 10 USC 13

Q. Air cooler drain?
A. b(3) 10 USC 1 SSTG on the air cooler drain: that's right on the head.

Q. And that was left in place?
A. That was left also in place.

Q. Now will you tell us what the test pressure was, what the type gauge was that was used?

A. I was using the b(3) 10 pound gauge, and my pressure gear was b(3) 1 I had a little over b(3) 10 USC 130

Q. How long did you hold that pressure.
A. I held that pressure for b(3) 10 USC 130

Q. What was the leakage experienced during the test?
A. Well, I had about b(3) 10 She went in between about b(3) 10 USC 130 She dropped and she stayed about right there.

Q. About a five pound drop?
A. Well, she was about four, four and a half pounds.

Questions by a member, CAPT Osborn:

Q. What kind of a gauge were you reading this on?
A. This was one of those regular test gauges that we draw out of the shop?

Q. What's the diameter of that gauge?
A. I don't know, sir.

Q. About what diameter?
A. Well, I don't know what the diameter of the gauge is. We draw them out of the shop and we tell them we want a b(3) 10 USC pound gauge.

Q. Is it about the size of your hand?
A. It's a round gauge, that's right; it goes right on the test gear.

Questions by counsel for the court:

Q. What visual inspection of the whole system is made while the test pressure was being held?
A. Well, the crew went over the system with me before they bought the system. There was Bain and McCord, I'm pretty sure, at the time.

Q. What were you looking for?
A. Well, we checked everything out. We always checked everything out on the test to make sure that we didn't miss nothing.

Q. What is it that you check out?
A. Well, we checked out the leaks that we had mostly, on those drains, to see if they were dripping; and they were all right.

Q. What about the joints in the system?
A. The joints was made before the test.

Q. Well, did you check out the joints?
A. We checked all the joints that we made. The brazing leaks was checked out before the crew even bought the test.

Q. In addition to the joints which you made, did you check the other joints as well?
A. All those that was visible we checked; most of them was covered with asbestos.

Unclassified

Q. How much of the system is covered?
A. Well, I'd say a good seventy percent.

Q. Well, with reference to the other thirty percent then, did you go over every inch of them?
A. Well, I wouldn't say every inch of it; I couldn't state that. I could say I went over most of it.

Q. And who went over the rest of it?
A. The crew really went over it all.

Q. How many people in all were working on this test, on the final test, which was held for a period of about two hours?
A. There was Bain, me and McCord.

Q. The three of you?
A. Yes.

Q. Who bought the test for the ship?
A. I don't know which it was, Wise or Arsenault.

Q. What was his rate?
A. They were chiefs, both chiefs.

Q. What makes you feel that it was one of those two?
A. Because they was the two that were in the engine room at the time I was making the test, and McCord was telling them the test was pretty good, it was holding good, and he says, "It's up to you fellows." So I took the Test Memos, went up and got the test slip --

Q. Where did you get the test slip?
A. The leadingman makes it out, Mr. West.

Q. Mr. West made it out?
A. He makes it out, and then you go back and give it to the crew after the two hours.

Q. Well, you went up and got the Test Memo from Mr. West, and then what did you do?
A. Brought it down to the crew and they signed it off.

Q. Well, you must have brought it to someone in the crew?
A. Yeah, in the engine room. Arsenault was there, and Wise; I don't remember which one signed it; and they bought the test. They said they were well satisfied.

Q. Did you see him sign his name to it?
A. Yes, sir. No, I didn't see him. Wait a minute, I take that back. I didn't see him sign the slip. McCord handed it to me.

Q. I see. And it was signed when you got it?
A. Yes, sir.

Unclassified

Q. Was it dated?
A. Yes, there was a date on the slip.

Q. The date of the signature or some other date?
A. No, the date that they marked on the slip. Mr. West puts the date on it. The leadingman gives you the Test Memo and they put the date on it.

Q. Did you report to anyone that that test was completed.
A. Yes, I gave the slip to the quarterman.

Q. Who was that?
A. Mr. Collins.

Q. Mr. Collins?
A. I laid it on his desk, said, "It's all done."

Unclassified

(b) (6) relieved (b) (6) as reporter at this point.

Q. Did you receive any special instructions or training here at the Shipyard in the conduct of such tests?
A. No, never.

Q. What instructions were you working under on the day that you have described to us?
A. On the date of this test?

Q. Yes.
A. We went by this test memo. We went by this system here, each valve is marked. You see as we checked along--we have circles on some of this.

Q. I refer you to page three of Exhibit 104.
A. Uh huh.

Q. I notice a list of numbers.
A. That's right.

Q. Preceded by the letters "ASW".
A. These are all there.

Q. Each one of them represents a valve?
A. Yes.

Q. What does the circle represent around these?
A. Each one we come around to on the sale we checked it. We circled the ones with red, I remember distinctly; the ones we was in doubt to find them. Then we find them and I circled them.

Q. I notice that 154 has a line but is not circled. What does that indicate?
A. They was all tested and all in this lineup. We might have just skipped it.

Q. You said you might have skipped it. Do you mean you skipped the valve or simply skipped circling it?
A. No, I wasn't sure just where that valve would be but we did locate them all and circled them. Some we might have skipped; we might not have marked them.

Q. 279 doesn't have a red line and has no circle.
A. That is what I say, I probably skipped and didn't mark it.

Q. Again, you skipped marking it or skipped checking the valve?
A. No, I probably skipped marking it.

EXAMINATION BY THE COURT

Questions by a court member, Captain Nash:

Q. Were there any of the ship's officers involved in the tests?
A. The only time the ship's officers was involved in this test, sir, was when I had to go get permission to go ahead on it. I don't think there was any other time there was any officer. Mostly it is the crew and the chiefs.

Questions by a court member, Captain Osborn:

Q. Where do you hook in to conduct this test?
A. On one of the drains on the inboard side. We had a special fitting brazed on and hooked up to our test gauge.

Q. Does that test the complete system?
A. That will test the complete system.

Q. Do you have your check valve isolation valves in the system and your valves shut? Don't you have to test b(3) 10 USC 130 to check--test the complete system?
A. Not necessarily. If the cross-overs are open you are getting your whole system.

Q. You had the cross-connects open?
A. All open, sir. I made several tests on this now, sir. One test included just the b(3) 10 USC 13 That's before we sold this main test, and b(3) 10 USC 130 was very good and b(3) 10 USC 130 the cross-over wouldn't hold. They had to replace--I mean take out the valve, and whatever the machinist did to it, and put it back. They didn't take the whole valve out, just the bonnet. And then there was two that the crew worked on, that was forward of the cross-over valves, and they replaced them themselves. They just took out the bonnet.

Q. When you were conducting the test, you had the cross-connections open?
A. On the final test, both cross-connections were open. There were several tests on the ASW pumps because they were out and replaced.

Q. I understand the various tests you made on work as it was completed. I am more interested in a complete test and the exact dates involved.
A. The crew now--this is another thing--the crew when they worked with me, they relined everything open and said the whole system was on this test. So I started hydroing. That is all--I found drains that leaked and replaced them and brought the pressure up three or four times.

Q. Now, how did Podwell get into this whole picture.
A. Podwell?

Q. You have not mentioned him to date.
A. Well, on the final test Podwell wasn't in on it. Podwell was also working in the engine room. On several tests he was there. There was Bell and this other first class. I can't think of all the names.

Q. Are you positive that this test was conducted after the reserve feed water tank number 2 was ruptured?
A. That reserve feed water tank was mentioned to me once before. That didn't happen on my shift.

Q. After that accident happened?
A. Well, I couldn't say. I didn't remember it even happening. I didn't hear about it until about a week or two later.

Q. You mean you didn't even know there was a casualty in the feed water tank?

A. I didn't until a week or two later. They were kidding me, said I blew it up. Some of the boys used to kid me. I said, "What are you talking about?"

Q. When do you think it blew up?
A. I have no idea.

Q. When did the ship go critical?
A. I can't say the exact date.

Q. You are pretty vague on all the dates. Anything you remember about this period specifically?
A. Not dates.

Q. Is it ordinary procedure to put on the date and time that a test is completed?
A. I don't have any signing to do. The dates are on the slips and I don't pay much attention. I don't even sign my name to them when I sell the test. That's all they require is the ship sup's and the chief or whoever buys them.

Q. Certainly you don't just go down there and conduct a test by yourself. There are certainly other considerations there. Are all the other considerations put into this thing for insuring that the cognizant people know that you are ready to conduct the test?
A. Most of the crew knew.

Q. You do not have anything that you can remember specifically that would fix a date in the first 15 days of March?
A. No, I don't.

Q. When is Saint Patrick's day?
A. That is the 17th of March.

Q. Did you test that system before or after Saint Patrick's day?
A. Well, I must have tested before--it was before. I was on weeps for quite awhile and hangers right after the tests.

Q. Quite awhile?
A. On weeps--they put me on weeps. That's on hangers, repairing hangers right after I finished testing the auxiliary salt water.

Q. Did you have many weeps on hangers after the ship went critical?
A. I didn't stay until the ship went final. I was transferred a week before.

Q. You were transferred a week before the ship went critical?
A. No, I was transferred a week before the ship went out.

Q. How long were you on weeps before you left the ship?
A. Oh a good three or four days before I was transferred.

Q. A week?
A. No, not quite a week, three or four days, I'd say, and I was transferred off.

Examination by a court member, RADM Daspit:

Q. Do you remember what time of day it was that you completed the test and it was signed off?
A. No, I don't.

Q. You testified that you notified Mr. Collins by putting these memoranda-signed paper on his desk. Was he at his desk or did you leave it there?
A. When I got through, sir, I think he was out. I left it on his desk.

Questions by a court member, CAPT Hushing:

Q. When you were doing partial tests of the system, before the final test, did you have to put in any special stop valves or did you rearrange the check valves in any way?
A. I don't touch any valves when I am testing. We get a machinist to do it.

Q. Did you have to get the machinist to do anything to line up part of the system?
A. No, not lining up but the machinist fixed a few valves like a cross-over we found out was leaking.

Q. Did you reverse any check valves?
A. No, not that I know of, not a bit.

Q. None to the best of your knowledge?
A. That is right.

Q. During the line up or the test, did you find any valves which were installed backwards?
A. No.

Q. So that when it came time for you to do the tests, the machinist did not have to reorient any valves?
A. That is right.

Q. Including check valves?
A. That's right.

Questions by a court member, Captain Osborn:

Q. When did you say you were transferred from the ship?
A. Well, I don't know the exact dates but just a short while before they went out because I was asked if I wanted to go on sea trials and I said "yes."

Q. Well a short time before they went out? -- They went out the 9th of April; you are telling me you left the ship about the 15th of March?
A. No, it was a little after the 15th I left the ship. I was on weeps three or four days. I stayed and helped also to put on the shore steam. I helped with several little jobs there when he had nothing for me to do. I helped somebody with the shore steam.

Q. Was the last job, other than weeps, you were scheduled to finish, the ASW system?

A. No, that was way done when I went on weeps.

Q. You had several other jobs to complete before that?
A. They were all weeps. I had a drain, a funnel, to put in in the motor room--diesel room--another funnel I had to put in the MS, just weeps.

Q. What was the last testing job you did on the THRESHER?
A. That I don't remember; the last test I made on the THRESHER was the ASW. When she first come in, it was trim and drain.

Q. I am trying to get a time date with respect to when the test was completed?
A. That I cannot tell you, sir. I don't remember the exact dates.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. I show you a piece of paper which we have marked as Exhibit 103. Do you recognize it at all?
A. These are the two "O" rings.

Q. Two "O" rings. At the top it says the "entire ASW aft system on the above ship is ready for" and the space marked is "test".
A. That is right.

Q. The date is March 7, 1963?
A. Right.

Q. The signature of the key shop is T. R. West?
A. "West" right. That is the way I got my slips. I never looked at the dates.

Q. And down at the bottom is the signature of Ralph Podwell?
A. I called Podwell when I put the two "O" rings in there to check them. He was in the engine room available at the time.

Q. Then Podwell's signature on this slip indicates only that he signed for the "O" ring test?
A. That's right.

Q. And not for the test of the entire ASW system aft?
A. No, he didn't get the entire ASW system; he just signed for these "O" rings.

RE-EXAMINATION BY THE COURT

Questions by a court member, Captain Nash:

Q. You said that you assisted with the shore steam hookup?
A. Just hooking up the valve and the lineup through the boat.

Q. Do you remember whether that was before or after the test?
A. No, no, I don't. I only worked one or two days on it.

Questions by counsel for the court:

Q. Were you absent from work at any time the first two or three weeks of March?
A. That I couldn't say; I might have been.

Q. You don't remember?
A. I don't remember.

Q. Did you have any assistance from a qualified pipefitter mechanic who checked out the test line-up before completion of the test?
A. No.

Q. Do you feel that you needed any special training for inspecting and checking out the submarine auxiliary salt water system to insure you were doing it properly and finding all possible defects?
A. Well, I sure--I could say right now, I don't because the way they got this lined up is simple. The crew does the work. All I do is put the water and hydro in. They do the line-up.

Q. And who does the checking?
A. The crew.

Q. And did you check at all?
A. I went with the crew, assisted the crew.

Q. And you say that you put the finished receipted sold test slip on your supervisor's desk?
A. That's right.

Q. Did you ever thereater, after dropping off that slip, have any conversations with Mr. West?--Did he say "Pete, did you check out that ASW system?"
A. Not after the final test. I dropped that slip and I told him it was sold and that was the end of it and he assigned me to another job.

Q. Would he have assigned you to another job if the test wasn't finished?
A. I don't think he would have. He usually keeps me right on the job.

Q. Has it happened before that you went on a job until you performed the final test?
A. No, not completely. He took me off the trim and drain.

RE-EXAMINATION BY THE COURT

Questions by a court member, Captain Osborn:

Q. How many carbons--how many copies were there on this completed test?
A. There are four slips on the test slip. One is taken by the ship sup. Another is taken by the crew and one--there are four copies in the book. There is a pink one and green one; the green one we keep and the pink one, if not rejected we get it back. The other two--one is given to the ship and one is given to the crew to sign. He keeps one--whoever signs it.

Unclassified

Q. There should be two copies available?
A. That's right.

Questions by court president:

Q. Mr. DiPietrantonio, I believe you said you don't even sign your name to these?
A. No, I never sign any of these slips.

Q. Do you have a sense of responsibility with respect to these tests?
A. Yes, I feel I do. I feel every test I make I want it right, and want to make sure it is right.

Q. You do realize that tests are intended to insure the safe operation of the system?
A. That is right; I realize that, sir.

Q. Well, if you do appreciate the responsibility of making proper tests, it would seem that you would want to identify, by initialling the slip or something, that this was a test that you were involved in, and any other tests that didn't have your initials on it, you wouldn't be involved in.
A. I agree with you, sir. We are not noted to do it. Nobody ever done it testing. I hear we have to do it now in the Yard, initial them and put our badge number on it.

Q. I see. Do you happen to remember the name of the mechanic who lapped in the Apex Valve on b(3) 10 USC 13 SSTG cooler valve?
A. No, it was a machinist.

Q. Do you know him?
A. I know him if I see him, yes.

Q. But you don't happen to know his name?
A. No, but I could find out.

Q. Do you know the other machinist, if it were a different person, who lapped in the valve on b(3) 10 USC SSTG?
A. I don't know the name, sir.

Q. How many times have you performed tests, similar to the test on the ASW system of the THRESHER?
A. Well, I've tested on the 606, mostly ASW and trim and drain.

Q. So this is roughly the second submarine on which you have performed such tests?
A. That's right.

Q. Did any leadingman or quarterman come down to the boat and ask you anything about this test while you were testing?
A. The leadingman usually does. The leadingman goes through every once in awhile, not the quarterman.

Q. Did he in this case?
A. There were several times he asked me how things were going.

Unclassified

Unclassified

Q. During this test?
A. Yes.

Q. That was Mr. West?
A. Mr. West, and he calls me Tony.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. DiPietrantonio, here is the back sheet of Exhibit 104. Do you recognize that handwriting?
A. That looks like my writing.

Q. Does it refresh your recollection about anything? This says "ASW aft Chief Arsenault inspected entire system with Podwell and instructed Podwell to sign off test slip marked #10 for entire system." When was this written?
A. I don't remember.

Q. Well, did you write it after the THRESHER went to sea?
A. No, this here was written when we first lined up the system. Now, wait a minute--let's see if I can recall that. I don't recall that writing. I don't remember. It looks like my writing.

Q. You don't recall ever having written it?
A. I know I wrote it.

Q. Well, this--the line above it says "Crew opened & close by crew in presence of X56 test man (R. DiPietrantonio)"
A. This is not my writing up here.

Q. Someone else made that note, is that it?
A. Yes.

Q. What does this mean "Kieserkier--Gaynor and Hudson on line up"?
A. This is on trim and drain.

Q. Did you write it?
A. And Gaynor & Hudson on the line up.

Q. Did you write it?
A. No--yes, I made this line up. Yes I wrote that.

Q. Did you write that before or after you did the test?
A. I don't remember. I don't remember that at all.

Q. Have you done it recently?
A. No, I haven't seen this test memo until right after I got through with the ASW. I don't remember this at all.

Q. You don't remember this last bit at all?
A. No, nope.

Unclassified

Q. When was the last time you saw this piece of paper before coming in the courtroom?
A. The last time I saw this piece of paper, I laid it down; I think it was the same morning of the test, the final test.

Q. And the next time you saw it was when?
A. Today, right now.

Q. And if you wrote this, it would have had to be written at the time of the test--
A. That is right.

Q. --or before the test, or immediately after the test?
A. At the time of the test, this would have been written.

Q. Now let's see what it said again here. "Chief Arsenault inspected entire system."
A. That is right. I believe Chief Arsenault went around the whole system with me. I don't remember Podwell. I thought it was McCord. They were all there--McCord, Arsenault--as a matter of fact they all went over the system at one time or another.

Q. When you conducted the test on the 606, of the ASW system, did you write a note like that on the back?
A. No, I didn't make the final test. I worked on the test of the 606.

Q. Is it your habit when you finish a test to put a little diary notation on the back?
A. Not all the time, no.

Q. Do you carry a ballpoint pen with you?
A. Yes, I always do, a Navy pen. (holding up ballpoint pen)

Q. Is that the pen you used to write with on that?
A. No, I have had several pens since.

CAPT OSBORN: How about writing out the same thing again on another piece of paper?

WITNESS: Sure. (Witness writes with pen on pad of paper)

Q. Do you always carry a ballpoint pen?
A. Not always.

Q. When you don't carry a ballpoint pen, do you carry any other kind of pen?
A. The school pens--kids' pen--the school pens kids carry. I usually take one when I ain't got one and stick it in my pocket.

Q. Do you sometimes make an "A" like that? (indicating on Exhibit 104)
A. Sometimes I probably do, sir. I don't remember now. I wish I could. It looks like my writing though.

Q. It is your writing?
A. It looks like my writing.

Q. And had to be written at the time, is that it?
A. Yes.

Q. Because you haven't seen that paper since that day?
A. That's right.

PRESIDENT: What is test slip number 10? (looking at Exhibit 104)

COUNSEL: There is a "10" on this one, sir. (Hands Exhibit 103 to court.)

PRESIDENT: Is that his signature?

COUNSEL FOR THE COURT: He says that is not his signature, sir.

WITNESS: I am not sure. I don't know whether I signed that or not. I don't think I write that clearly.

PRESIDENT: You know your own signature when you see it, don't you?

WITNESS: That looks like my writing. I said it does look like my writing, but I don't remember writing it.

RE-EXAMINATION BY THE COURT

Questions by a court member, Captain Osborn:

Q. You use a capital "P" in your name, don't you.
A. Yes.

Q. That doesn't have a capital "P".
A. I know it.

Q. I don't think that would be your signature then.
A. That is right. I told him that it doesn't look like my writing of my name.

PRESIDENT: What is your badge number?

(b) (6)

WITNESS:

Q. Ordinarily, in a Shipyard, there is a letter from the ship designating certain people to sign off tests in certain systems. So you don't have the wrong person witness a test from a standpoint of a test itself. Were you familiar with what people were supposed to sign off on what system, particularly the ASW?
A. Nobody showed me no letter.

REDIRECT EXAMINATION

Questions by counsel for the court:

Q. Mr. DiPietrantonio, when is your wife's birthday?
A. March 17th--16th, sir. I am so nervous; I can't remember.

Unclassified

Q. Do you have any children.
A. Yes, three.

Q. Are they small?
A. One is 14, one is 12 and one is four.

Q. You don't have a baby sitter problem?
A. No.

Q. Did you go out for her birthday to celebrate?
A. No, stayed home.

Q. Stayed home--do you remember what you did?
A. Just sat around the house. I was broke.

Q. Did you bring her a present?
A. No, never brought my wife a present.

Q. Do you remember whether this test was before or after her birthday?
A. No, I don't remember. It was before--I know it was before.

Q. You can remember that?
A. Yes, I can remember it was before, but my wife's birthday we hardly ever go out.

Q. All right, thank you.
A. It sounds like a dull life but--

CROSS-EXAMINATION

Questions by counsel for RADM Palmer, party:

Q. In answer to a question by the court, you said that you did not know the name of the machinist who lapped in those two valves?
A. That's right.

Q. Do you know him by sight?
A. I believe I do.

Q. Have you seen him since the day of the hydro?
A. No.

Q. If the court asked you to try to identify him, do you think you could?
A. I am pretty sure I could, sir.

PRESIDENT: The court wishes to deliberate for a short period and we may wish to request Mr. DiPietrantonio afterwards. In the meantime, the court is closed.

The witness was warned not to discuss his testimony outside the courtroom.

The court then closed at 1603 hours, Tuesday, 30 April 1963.

The court opened at 1620 hours, Tuesday, 30 April 1963.

Unclassified

Unclassified

All persons connected with the inquiry when the court closed were again present.

No persons not otherwise connected with the inquiry were present.

Neither the counsel for the court, the court, nor counsel for RADM Palmer party, desired to further examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated he had nothing further to add.

The witness was duly warned concerning his testimony and withdrew from the courtroom.

Thomas R. West, a civilian, was recalled as a witness, was reminded that his previous oath was still binding, and testified as follows?

The witness was informed that since the court was meeting with closed doors, classified information could be divulged, and at the conclusion of his testimony he would be requested to assign the highest classification he thought applicable to his testimony.

DIRECT EXAMINATION

Questions by counsel for the court:

Q. Now you are the leadingman pipefitter in Shop 56?
A. That is correct, sir.

Q. And on the first part of the THRESHER's post shakedown availability you were the hydraulic coordinator?
A. That is right.

Q. You held that job until January the 19th, 1963.
A. Yes, sir.

Q. From that date until April, you were the leadingman in charge of the pipe work on auxiliary salt water piping aft during the day shift, is that correct?
A. Right.

Q. And also leadingman on the condenstate piping work for the day shift?
A. That is right.

Q. Can you describe the procedure for turnover of work at the leadingman level between the day and the afternoon shift?
A. The procedure of turning over work between the day shift and the afternoon shift, we always wrote notes in the day book and in the turn-over book, and I always stayed over every night at least one hour, sometimes two, to make sure that all jobs were going along satisfactorily.

Unclassified

Q. Did you keep a book called a leadingman's log of work?
A. We called it a shift book.

Q. A shift book?
A. That is right. This was not in full detail. This was to give a brief description of the job that the afternoon or midnight supervisor would be taking over.

Q. Did you log any tests in a book like that, which had been completed?
A. Not if it was completed on the day shift; it would not show in our book. This was a record for the day people so that they could tell how far a job had progressed.

Q. Can you describe for us the procedures regarding tests and test slips? -- For example, tests conducted on the piping system?
A. I was requested to pick up a copy of these inspection requests which come out in four copies. (Hands book to counsel) This is when we request an inspection.

Q. We are familiar with that.
A. You are familiar with it.

Q. We are familiar with the form but would like you to tell us about the procedure.
A. When a system is ready to be tested, inspected, this form is filled out by the supervisor containing the job order and test memo number, if one pertains to this; the ship which the test is to be performed on by name and number; the system to be tested, if it is in its entirety or partial--whether it is an inspection test, complete partial or a repeat. If more than one shop is involved, the key shop has to get the signature of other shops involved, to certify that they are in order for this test. If 303 is involved--your inspection group--quality assurance. Then this slip is presented to them. If it is presented to them, they automatically put on a file number. On this normally your diagram plan is written on, and if it is a partial, your boundaries will be on. Actually, they should be on if you are taking an entire system--shop comments, sir.

Q. Well, supposing Code 303 of the Shipyard is not involved and the test you're performing is at the request of the ship's company and one which you are going to sell to the ship, how much information does it have on it?
A. If there is an entire test, you may have the entire system on this. If this is satisfactory with the ship, they will sign it.

Q. Where do they sign it?
A. They are very apt to sign up in "inspection comments." Occasionally, they will sign down in the bottom right hand corner where it says "Inspection test by" and "date". But normally they prefer to write their name up above to make sure there is nothing else added in. This is a characteristic and I don't know as I blame them. If they sign it, they sign it as acceptance. If they do not accept it why they will not sign it.

Q. Who presents the slip to a member of the ship's company for signature?
A. The mechanic which is on the test.

Q. How does he know which member of the ship's company to approach for signature?--Is there a list of designated ship's representatives?

A. On some ships there are. Most ships you contact your duty officer if there is not one posted. On this ship, normally, in the engine room area, they would normally contact the crew that is responsible for it.

Q. In the case of THRESHER, do you recall who was designated to sign for the tests performed on the auxiliary sea water system?

A. Chief Wise or Lieutenant Commander Lyman would send a man down, and to my knowledge, just about every one of the machinists must have been qualified, because at one time or another we had a majority of the first class and second class people as well as the chief, signing things.

Q. If you went over the inspection tests, then, in this form which you are describing to us for the THRESHER, you would be able to find us a lot of different signatures of different members of the crew in the engine room?

A. That is correct.

Q. Well then, if you can go over the forms and find that number of different signatures, it must be because you keep a file of the forms?

A. That's right.

(b) (6) was relieved by (b) (6) as reporter, at this point.

Q. What happens to the form after it has been signed at the request of your man?
A. The form then comes back into the office. We keep a record of the form. The ship always takes one copy of the test and if the inspection code is in there, normally the inspection code would take the first copy, which is the white copy.

Q. If the inspection code is not involved in the work, what happens to the white copy?
A. We keep the white copy.

Q. Your office; is that right?
A. That's right.

Q. What office is that?
A. The Shop Project team will retain a copy.

Q. Who is in charge of the Project Team's office in the case of the THRESHER's post shakedown availability?
A. Mr. Collins.

Q. Where does he maintain his files?
A. Presently the files are maintained in Building 174, unless he has left some of them here.

Q. What happens to the other colored copies of this Inspection Request?
A. On some of these Inspection Requests we maintain all except the one copy that the crew has.

Q. What colored copy is left with the crew?
A. The yellow, sir, I believe.

Q. Then in the case of work done for THRESHER, but not involving Code 303, or some other shop, the Project Team office should show three of these slips; is that right, one being retained on board the ship?
A. Not necessarily over two, sir. Not normally over two. I was hunting for a piece of paper which is around some place, telling us that we are not to keep a batch of records, but we have always maintained our inspection slips until such time as the ship has finally gone to sea, and whenever possible we end up with a slip signed off on an entire system, with a final acceptance this being the key slip to the entire system, rather than a batch of parcels.

Q. That is a key slip; is that why you keep adding duplicates?
A. Normally it is kept in two places.

Q. Where are the two places the slips would be kept in?
A. Sometimes the Leadingman who had the job will keep a copy in his desk, and the Quarterman will keep a copy in his desk.

Q. How do the slips, after they have been signed out, get into the hands of the Leadingman and Quarterman?
A. You mean when they come back? You are a little over me.

Q. I guess I am. I'm at the point where a ship signs off for a test. Now the paper is signed. How does it get from that point to its filing spots in two different places?

A. The mechanic gives the slip back to the Leadingman, the remaining copies to the Leadingman. The Leadingman, in turn, turns them over to the Quarterman, so therefore, he maintains a slip and the Quarterman has a slip.

Q. On an important job, like the testout of a whole system, that is a key job; is that right?

A. Yes, that's your final acceptance of a whole system.

Q. And the Leadingman would be apt to keep his copy where?

A. In his desk.

Q. And where would the Quarterman keep his?

A. In his desk where he keeps his files, or in his portfolio for the inspection test.

Q. And the fourth one would go to the--

A. The fourth one would go to the boat. One would be thrown away. The pink copy is normally known as the one that is basically used by the inspection code for rejection, not acceptance.

Q. Referring now to the final test of the ASW system in THRESHER during her post shakedown availability period. How many slips of this nature, how many copies of the Inspection Request, would be retained in file outside of that retained in ship?

A. On this I can't honestly answer. I would say probably two.

Q. You would say that based on --

A. Based on normal procedure.

Q. Because it was a key type of test?

A. It is a key type of test.

Q. Important enough to have two copies?

A. That's right. If I were to sell a copy complete I would have a copy, as well as the Quarterman having a copy. Then should somebody come up and say "What about this system" I might have lost the partial test, and speaking of one portion of the system, I've got a slip to prove that it didn't make any difference if I sold that or not, because if I couldn't find the slip I would have a final saying that the system was satisfactory.

Q. Did your people sell the final test on the ASW system of THRESHER?

A. That I couldn't honestly answer, whether it was my people or the afternoon shift.

Q. Well it was a key job, wasn't it?

A. That's right, sir.

Q. As a Leadingman, would you keep track of a key job?

A. Yes, I'd keep track of a key job; in fact I was probably the one who ended up with the slips on the system. This I can't recall, because I can't honestly tell you. There are times on this boat when Mr. Collins was out, and I was the senior supervisor, and sometimes I would be off at a conference and the slips would end up with me. If so, one of the other supervisors would have sold this; his people would have sold this.

Q. But you say that the slip probably did end up with you in this case?
A. It would have if Mr. Collins had been out anyway, because I would have the file copy. In this particular case I think I was the one who filled out the test slip.

Q. How did you keep track of key jobs under your supervision?
A. The completion of key jobs normally signed off and closed out by Job Order Three.

Q. No, not how they are normally closed out. How do you keep track of the fact that work is completed? Perhaps I can make it clearer. You have some responsibility for the work being done on the ASW system of THRESHER. When the work progresses to a point where partial tests are being conducted, and finally the key job is coming up, the final test of the ASW piping system, now that is of interest to you, is it not?
A. That is correct, sir.

Q. In the ordinary conduct of your business, that's a matter of importance, the sort of thing that you would carry in your mind?
A. That's right.

Q. Then how do you know when the test is completed?
A. When the test slip is returned and the system has been let down and restored to order.

Q. If the slip just isn't returned to you to be filed with the other key memos in your case, you would ask about it, would you not?
A. That is correct.

Q. Where is the signed off test slip for the final test of the ASW system in THRESHER, conducted during her post shakedown availability?
A. Where is it?

Q. Yes, where is it; your copy of it?
A. I don't have a copy of it, because all of the copies -- I was away, and when I was contacted by telephone I asked that all copies that were stored in the trailer which we were using for a field office, be brought into the office, and all the job orders and other papers pertaining to the THRESHER were taken out of the trailer we were using for a field office and taken to 174 to the conference room, sir.

PRESIDENT: By whom were these files of yours taken away from their normal place?

WITNESS: This I could not answer; I was not here.

Q. When was it done?
A. Well, I couldn't answer either, sir, I was not here.

Q. I'm sure you could tell whether it was done this week or not.
A. No, sir, this was done, I believe, either Wednesday or Thursday after the THRESHER went to sea.

Q. When did you find out about it; that your records had been taken from you?
A. When I came back a week ago, Monday, sir.

Q. Did you ask where they were?
A. I was told where they were.

Q. Did you ask by whose authority they were taken from you?
A. I requested it. I requested Mr. Scarponi. I had a telephone call from Mr. Scarponi, the shop foreman, and I requested that he pick up any papers that might apt to be pertinent and see that they were taken care of.

Q. Mr. Scarponi is a foreman at what shop?
A. Pipe Shop, Shop 56.

Q. Now if I were to ask you to produce the signed off test slip in the case of the final test of THRESHER's ASW system, you would then go to Mr. Scarponi and ask for it?
A. I would go to Mr. Collins and ask for it.

Q. I'm not referring to the copy of the slip that Mr. Collins would be likely to have filed, I'm referring to the copy of the slip that you would file in your desk.
A. All of these slips were in a common pool when I came back, and filed according to job orders, and diagrams were marked up from these slips.

Q. Have you asked for the final test slip of the ASW inspection of THRESHER?
A. No, sir, I have not; I've had no call to ask for it.

Q. I call for it now. Will you see whether you can get it for us the first thing in the morning and bring it in?
A. I will if I can, sir. This is something that I can't guarantee.

Q. Why can't you guarantee that a slip which you had that was picked up by Mr. Scarponi will be delivered to the court if it asks for it?
A. That's because I don't know whether it's still there, sir.

Q. What makes you think that a key piece of paper wouldn't be there?
A. I didn't say it wasn't there; I said I didn't know whether it was or not. I know that when they wrote these slips up, and they set these slips up by diagram, they put one copy of every slip with it, and they slipped the spares into an envelope. Now I don't know whether my spare is in the envelope or not.

Q. But we have two chances of finding it, don't we? There's the one that's in the envelope and the one on the diagram.
A. I understand you have the one on the diagram, sir.

PRESIDENT: Mr. West, how did you understand that the court had the one on the diagram?

WITNESS: Because I went to look at the diagram after lunch, and it wasn't there.

PRESIDENT: What made you think the court had it?

WITNESS: I asked.

PRESIDENT: Whom did you ask?

WITNESS: I asked Mr. Collins. He said "I haven't got that now," and if he hasn't got it, somebody has. He and I had no conversation other than that. There was a test slip and he said "I haven't got it."

Q. Was the test work on the ASW system of THRESHER done on a two-shift basis?
A. I would say that some of the testing was done on a three-shift basis.

Q. Then wouldn't it be noted in your log book if it was turned over each day to an oncoming shift?
A. Yes, it would.

Q. Would you refer to your Project Shift Book?
A. I don't know which one it would be in; I'll have to look.

Q. All right, we'll wait.

(The witness handed counsel a book) "Continued drop test on 2 and 4 banks continued tests on ASW and sold the crew."

Q. Can you give me any idea what date that was; 3-7-63?
A. It was the midnight shift to the day shift, the day shift to the afternoon shift.

Q. What does it say across the entry?
A. "Complete sold."

PRESIDENT: Is that date the 7th of March?

A. The entry is marked 3-7-63, sir.

PRESIDENT: And the notation is "Complete Sold"?

COUNSEL: Yes, sir, I'm going to question him about it.

Q. Mr. West, I have just gone through every page of this book, which starts on 3-3-63, according to the entry, and ends on 4-7-63, and I don't find another entry which says "Complete Sold". Does that surprise you?
A. No, sir.

Q. Have you any idea who wrote "Complete Sold" on there?
A. No, sir, I have not.

Q. Is it your writing?
A. No, sir.

Q. Do you recognize it?
A. No, sir, I don't. I was checking some of the other writing in the book and I don't associate it with Mr. (b) (6) writing, or Mr. (b) (6) ; I don't associate it with Mr. Moulton, of the midnight shift.

Q. Is it an unusual thing when you read through a book like this in the normal course of your day's work to find something written vertically, like that, up and down this sheet?
A. No. By looking at that I would say that the job was completed.

Q. Yes, yes, I draw the same conclusion from it. Is it unusual to find an entry like that in the book, scribbled across the test entry, saying "Complete Sold"?
A. Normally they would write it underneath, if it was sold, or carry it over to the notes for the next day as being sold.

Q. It is unusual, then?
A. Yes. Don't ask me why, because I can't answer.

Q. Would you have an entry like that in any of your other books?

(The witness showed counsel another book.)

Q. What is this book that you are showing me now?
A. Another shift book, starting 2-7.

Q. Starting in February; is that right?
A. Yes.

Q. I've thumbed through it and I don't see a single entry that says "Complete Sold." It runs from 2-7-63 to 3-2-63. Can you find one in an August and September book?
A. No, sir.

Q. Let's go into some of the other books.

The court closed at 1650 hours, 30 April 1963.

The court opened at 1705 hours, 30 April 1963.

All persons who were present when the court closed are now present. The witness resumed his seat.

The following documents were offered in evidence: "593 Shift Book" for the period from 3-3-63 to 4-7-63. "X56 Changeover Book" for the period from 2-7-63 to 3-2-63. "X56 SS-593 Project Shift Book" for the period from 7-18-62 to 9-25-62. "Shop 56 Change of Shift Record" for the period of 12-16-62 2-7-63. "Quarterman's Project Turnover Book" for the period 9-26-62 to 12-15-62. These books were offered in evidence for the purpose of excerpting pertinent entries therefrom for inclusion in the record. There being no objection they were received in evidence as Exhibits (106), (107), (108), (109) and (110).

Counsel for RADM Palmer waived his right to read these exhibits at this time.

Q. Mr. West, looking at the entry dated 3-7-63, and marked "Complete Sold," can you deduce from that entry when the system might have been completely sold?
A. What date, no, sir I can't. The only thing I can is -- it appears that it was sold on the shift following that. It would appear that it was sold on the afternoon shift, or the PM shift, reading that book.

Q. The PM shift of the 7th?
A. I would say that is the way it would appear just picking the book up.

Q. Is that in accord with your memory of about when the test was sold?
A. I thought it was sold after that, sir, but anyone picking that book up would say the same thing that I just said; there's no denying that; that's the way it appears right there.

Q. What is your recollection of when it was sold?
A. I recall that starting around the 7th we had some valves that we replaced because they were leaking on drains, and the ship wanted to operate a portion of the system, I don't remember whether it was the MG or whether they wanted some fresh cooling at that time, and we had to knock our pressure off so they could proceed with the work, which was pertinent to coming up to their fast cruise.

Q. What is your best recollection, then, of when the system was finally completely sold?
A. I would say it was around the week of the 11th or 12th, somewhere along towards Thursday or Friday of that week of the PSA, but it doesn't show in the Shift Book.

Q. Thursday or Friday would have been the 14th and 15th of March. Is that what you mean?
A. Somewhere in that area, yes, sir.

Q. That is your best memory of it?
A. I remember when I wrote the slips for the start but I can't answer when it was sold.

Q. You can't answer for sure, but is that your best estimate?
A. That is my best estimate; somewhere in the neighborhood of a week, because we had valves to change and lube oil coolers, the drains were leaking and we replaced these. We replaced a valve on No. 2 hydraulic oil cooler drain. All that was done before we went back to the test.

Q. Can you describe briefly the piping work done in the following areas of the auxiliary salt water systems of THRESHER during her post shakedown availability; first, the flexible hose work which was done?
A. The flexible hose work that was done -- P&E put out a job order which covered some of the air systems, not entirely. The condensate system, the hydraulic system, the ASW system, I would dare say they put out approximately 90% of the flex hoses aboard the ship to be changed. Those that were not to be changed were emergency breathing, your plumbing drains to your sanitary tanks. They originally issued a job order to change -- none of the metallic hoses were changed, and on the test memo they classified--your steam configurations were classified as a flexible hose, as flexible connections in your test memo. Those were not changed. Your ED type were not changed and your lithium bromide plant was not changed, due to the fact that it was not pumped down; this would be your lithium bromide solution from the air pumps to the machine itself.

Q. When were the steam operations conducted, do you recall?
A. No, sir, I can't recall that.

Q. Do you recall for how long the operations went on?

A. As I recall we were off the boat for approximately -- from the time it started until the time it finished, seventy-two hours, I would say.

Q. Now what piping work was done with regard to the auxiliary salt water pumps in THRESHER?

A. Your pump foundations were changed from a b(3) 10 USC 130 pump. This made the piping on b(3) 10 pump not line up. b(3) 10, on this I changed the piping, which was b(3) 10 USC 1 on your discharge, b(3) 10 USC 1 on your suction; this was the reason I had to go to that diagram plan to make checks to make sure that I was right and which size pipe was which. That's how I missed that test slip. The suction side, I had to make one cut and replace that. That was welded pipe. That was rolled in on elbows. On b(3) 10 pump we did as we call "snap aligner". We made a aligner of that one for finishing up alignment. I would dare say that it was almost 3/8 of an inch from fitting. On b(3) 10 US pumps there was no pipe we made. These pumps were tacked in place, holding their mounts, and in the time before the final flanges were made up to the pumps, Design came down and checked the alignment on these pumps, to their satisfaction, which would mean that there would be no pressure. The flange to the pump would fit flush, with perfect alignment fore and aft, and athwartship. All the bolts would slide in free before the final makeup was made and that there was no clearance between the pump and the piping. That was on all b(3) 10 pumps. The only piping that was changed was on b(3) 10 U The piping that was changed there was a flange, an elbow, and this was UT'd. The first UT was not satisfactory and we pulled that elbow off and put a new elbow on, and re-UT'd it, and flushed and tested the separate piece between two flanges, before it was reinstalled to make sure we wouldn't have trouble there.

Q. When you say UT, you mean ultrasonic?

A. Yes, sir, ultrasonic. On copper nickel pipe, which was made up between flanges, nipples and three elbows, two flanges and a nipple, we had to take that off the boat, take a wooden template, and set up a target in the shop, cut the flange and turn it, roll it into place, and that was welded, and was X-rayed. I thought it was tested, but I can't prove it; I have no test slip to prove that it was hydro'd.

Q. Was it reported to you as having been tested?

A. Yes, it was, I believe.

Q. Who reported it?

A. I was trying to think whether we were working two or three shifts at that time; I think it was three shifts. It was either the midnight shift or the other half of the afternoon shift. This I can't report; I think it would have been Mr. (b) (6) .

Q. Would you describe very briefly the work on the salt water piping in the air conditioning system?

A. When the ship came in, on your air conditioning and salt water, we had a Metrix valve and the reason for the removal of this to a Hamel Dahl valve I don't know. It was a work list item. On this we had to cut the six inch header from the pump. We had to cut back and your lithium bromide condensers, and Design gave us a DLI of repiping on this. It was flanges and tees and elbows off the condenser to the Hamel Dahl valve from forward to aft, to outward to inboard, there was a reducer, nipple, elbow and flange. All this pipe

was all X-rayed before it was put aboard the ship, and the joints that were welded on the ship were X-rayed. As I recall, they only had the slag repair, which only made one repair aboard ship and this was from your pump discharge, and this piping was tested with the air conditioning and salt water pump.

Q. Describe briefly the piping work and the installation of b(3) 1 new condensate pumps.

A. Everything in the condensate bay was stripped, pumps, foundations and piping. This was within the bay itself, within the condensate bay itself. This ran from Frame b(3) to I think it was Frame b(3) it might not be correct. piping from your hot well to your pump was replaced. Your pump discharges were replaced, which gave you your b(3) 1 inch, b(3) 10 USC 130 inch pipe replaced, b(3) 10 U inch. b(3) 10 USC 130 pipe, sampling lines, cooling lines, had to change the high and low leg or your variable legs, in the condenser itself. This is what gives you your high level and your low level indication. Chill water to this was changed. All the hoses were changed on this. The new poppets were put in the three-way valves. There were bosses put on the system for test purposes, and these plugs we never welded; these were to be welded after they took their instrumentation readings, or sound, or whatever it may have been. The only thing that I remember, two instances that I remember, all of this piping was to be flushed and tested by Code 303 and the crew. The Askania valve on the starboard side was piped according to plan, and this was not correct. They wrote up a Design memo changing the piping; the pipe on the left-hand and right-hand side were the same, and later on, during operating, they found that the high-low level alarms were alarming at all times. and they changed their location; they rotated -- I want to call it a pressure switch, but I don't think that's the proper term for it. This is your high and low level indication, b(3) 10 USC 130 We put new demineralizers in this system, b(3) 10 USC 130 . This was all flushed and tested. During their heat run the ship figured that they were getting proper flow through the mineralizers, and I was just trying to think of the Design man who was called down on the ship at the time; I don't recall who the engineer was, who was aboard at the time on this. I think your oxygen analyzing line on it had two elbows that were leading at the time. The ship had initiated a work list item and this was corrected.

Q. Is that your best recollection of the work performed?

A. Against the bulkhead we rotated two salinity cells, b(3) 10 USC 130 . because they were not readily accessible. This work was also flushed and tested. This was against the bulkhead. I know that pictures were taken of this condensate bay area, the pumps. Exactly how many shots were taken I don't know, but I know that the pictures were to be sent to COMSUBLANT.

Q. Was it your understanding that the auxiliary sea water system and the air conditioning system were cross-connected in the final test, the one big test to be performed on both of them?

A. That's correct, sir.

Neither the counsel for the court, the court, nor counsel for RADM Palmer, a party, desired further to examine this witness.

The president of the court informed the witness that he was privileged to make any further statement covering anything related to the subject matter of the inquiry that he thought should be a matter of record in connection therewith, which had not been fully brought out by the previous questioning.

The witness stated that he had nothing further to say.

The witness was duly cautioned concerning his testimony and withdrew from the courtroom.

The court adjourned at 1735 hours, 30 April 1963.