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Westinghouse Electric Corporation

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November 27, 1963

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Mr. R. W. Schroeder
Space Nuclear Propulsion Office
NASA Lewis Research Center
21000 Brookpark Road
Cleveland 35, Ohio

Subject: WANL-TME-573 - Addendum 1 - "Transcript of Questions and Answers During Contract Year 1963 Summary Meeting - October 22 - 23, 1963"

Dear Mr. Schroeder:

Transmitted herewith are twenty-three (23) copies of WANL-TME-573 - Addendum 1, "Transcript of Questions and Answers During Contract Year 1963 Summary Meeting, October 22 - 23, 1963".

Please distribute this report to the persons listed below:

E. Bosse*	L. Kulovitz	P. N. Ross
L. C. Corrington	J. Lombardo	R. W. Schroeder
J. Dutli	W. Mason	T. Squires
D. Fleishman	A. A. Medeiros	N. Thielke*
L. Gouldon	L. R. Nicholas	H. Tushar*
R. A. Hartfield	G. J. O'Brien*	R. Wilke*
A. S. Hintze	P. Ordin	E. Ziurys
L. Lovoff	D. Reilly	

* Received copy at WANL

SPECIAL REREVIEW FINAL DETERMINATION	Reviewer#	Class.	Date
	KAW	U	5-7-82
Class: <u>U</u>			

Respectfully,

H. F. Faught

H. F. Faught
Program Manager
NERVA Nuclear Subsystem

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TRANSCRIPT OF QUESTIONS AND ANSWERS DURING CONTRACT YEAR 1963
SUMMARY MEETING

October 22 - 23, 1963

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J. Kenney

a. Mr. Bosse - SNPO-C

"Q" - What is the status of the instrumentation release for NRX-A2 and A3?

Modified by Mr. Wilke - SNPO-C

"Q" - What is the status of the entire Block I drawings?

ANSWER: The NRX-A1 is completely released at this time. That is, 100% of the drawings and parts list are defined to reactor assembly and, except for day-to-day changes which occur as the direct result of assembly parts (that is incorrect fit-ups), there will be no changes in NRX-A1 from this point on, to my knowledge. NRX-A2, 3 and 4 are defined in various ways; for the moment, we have defined NRX-A2 and 3 as being the same instrumented reactor designs and all of the detailed parts have been released for NRX-A2 and 3. We have not necessarily completed all of the assembly drawings defining NRX-A2 and 3; they have been completed once, but we are, in fact, re-doing the drawings to take into account things that were learned during instrumenting NRX-A1. NRX-A4 is completely released as a set of detailed parts and a set of instrumentation has been defined for it; however, no design work has been done as far as incorporating instrumentation into NRX-A4 at this time. That is, we have not yet defined how NRX-A4 will be instrumented. We have just selected certain types of instrumentation and have released it for procurement, saying that it will take this type of instrumentation to instrument it. We have not decided where the placement of the instrumentation is.

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b. Mr. Wilke - SNPO-C

"Q" - Aside from instrumentation, are there differences in the drawings from NRX-A2, to A3, to A4?

ANSWER: The major difference between NRX-A1 and the 3 hot test reactors (A2, 3 and 4) is the fact that they are cold flow and hot test reactors, respectively, and that there is a difference in the fueled portion of the reactor, and in the poisoned control drum vs. natural boron controlled drums in NRX-A1. The instrumentation is different in NRX-A1 and the hot test reactors, but taking the hot test reactors as a block, and taking all of the structural members of the reactor, NRX-A1 through NRX-A4 are alike. In other words, the differences between the hot test reactors and the cold test reactors are principally the differences noted above associated with cold reactor and hot test reactors.

-----

c. Mr. Bosse - SNPO-C

"Q" - What is the date for completion of instrumentation and configuration definition on NRX-A2?

ANSWER: If you are asking in terms of assembly drawings, it will be some time mid-November; if you are asking in terms of the instrumentation definition, this has been defined for some time. Dick Thomas, Manager of Test Engineering, could define the documents that describe this.

-----

d. Mr. Wilke - SNPO-C

"Q" - How different is the NRX-A2 instrumentation now from the first one released early in the year?

ANSWER: The beryllium reflector is essentially unchanged, and the instrumentation in the core has been shifted around, based upon KIWI test data.

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2. F. Retallick

a. Mr. Bosse - SNPO-C

"Q" - Did Mr. Retallick's talk imply completion of the thermal fluid flow including transient analysis on NRX-A2 and A3?

ANSWER: The design report does include the analysis of what we consider to be the most severe start-up transient which the NRX should be capable of, which is 100°R exit gas temperature ramp, and also the similar shutdown profiles. Our feeling is that the analysis that we have done to date gives us the assurance to proceed to test. Our plans are to issue addenda to the design report for each reactor as we go along, in order to pick up those changes which occur from reactor to reactor; due to either hardware changes by variation requests or by purposeful design, and to up-date this depending on what the status of our capability for analyzing the situation is at the time. In addition, we will analyze the detailed run profiles for the reactors, which will be different than the design report case, which was chosen to be most severe.

-----

b. Mr. Bosse - SNPO-C

"Q" - Will there be any further analysis between now and the NRX-A2 run?

ANSWER: Yes, for instance; the core thermal capability depends very heavily on what is coming out of the fuel laboratory and it is going to be different, reactor to reactor, so that we will continue to analyze the reactors.

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c. Mr. Wilke - SNPO-C

"Q" - What is the status of NRX-A1 analysis?

ANSWER: The NRX-A1 reactor analyses which are done in the analysis reports for hot reactors are those which we say confirm the reactor design. The requirements for the NRX-A1 are to analyze the run profiles in detail, the tests which we are going to perform on gas, liquid and cold hydrogen. These are scheduled to be complete one month before test, which as I see it is about December 1.

-----
d. Mr. Ziurys - SNPO-C

"Q" - What is the difference between a preliminary test request and the final request?

ANSWER: I believe on NRX-A3, we have gotten one test request out. The difference between preliminary and final, I do not recognize. We basically put out one test request for each reactor, which goes to the Test Planning group, and we modify it by addenda as we see changes coming along.

-----
e. Mr. Bosse - SNPO-C

"Q" - What is the status of information on NRX-A3 which was required in Contract Year 1963?

ANSWER: The test requests, both nuclear and thermal, for the NRX-A3 were issued in September as required. The fuel loading for the NRX-A3, presently with no additional test data available to us, is going to be the same as NRX-A2. This has been specified.

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f. Mr. Wilke - SNPO-C

"Q" - What is the status of specific analytical work for NRX-A3 which might be different from NRX-A2?

ANSWER: The work in the design report is supposed to cover the block of reactors and would therefore be analytical work on the NRX-A3 to date. The additions we will expect are those which we again see due to design or run profile changes that may be put into NRX-A3, or variation requests which will be picked up in the addendum report for that reactor.

-----
g. Mr. Ziurys - SNPO-C

"Q" - What is the difference between the preliminary NRX-A3 thermal request and the final test request?

In view of the fact that A2 and A3 designs are similar, why was A3 chosen for a preliminary test request? Please note schedules and milestones of Project 1320. NOTE: This is a clarification of a question asked earlier on the same subject. See d above.

-----
h. Mr. Hintze - SNPO-C

"Q" - What is the status of the instrumentation requirements and the accuracy requirements as supplied by the analytical people?

ANSWER: The design accuracy requirements will be available in a report to be issued at the end of the month. The instrumentation requirements will be available in the test specification.

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3. E. A. De Zubay

a. Mr. Rice - AGC

"Q" - Are the same milestones delayed that were discussed in the
September 15 meeting?

ANSWER: Yes, the same ones are.

-----

b. Mr. Tushar - SNPO-C

"Q" - Was the requested holdup really due to SNPO on the A-10 test?

ANSWER: It shifted our effort to looking into the insulator problems considerably more and as a result, we took the effort off of the procurement of the furnace and heat exchanger designs. On the basis of the questions that had been raised about who was the initiating party for the delay of A-10, we can summarize this by saying that it was by mutual consent that this program was delayed.

-----

c. Mr. Thielke - SNPO-C

"Q" - To what extent do the Quality Control people plan on reviewing the Quality Control tests on fuel elements?

ANSWER: The present arrangement is that one observer from Quality Control will be at the station when we run Quality Control type tests.

-----

d. Mr. Bosse - SNPO-C

"Q" - How many tests will be required to qualify NRX-A2 elements?

ANSWER: A minimum of 50 -- roughly 3% of the 1600 elements going into the reactor.

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- e. "Q" - Do you also plan on running additional tests in addition to the 50 minimum required?

ANSWER: Not specifically as Quality Control elements, but we will be running additional tests for heat transfer behavior, and behavior under off-design conditions.

- f. "Q" - Isn't it 2 out of every batch rather than 1 out of every batch?

ANSWER: At the start, it is more than 1 out of every batch.

- g. Mr. Helms - SNPO-C

"Q" - How many of the initial 100 tests do we consider gave valid results towards the A2 objectives?

ANSWER: Tests 50 through 100 were conducted with fueled elements and were applicable towards NRX-A2 fuel process development. Reference: TME-502, page 14-15.

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4. D. Wiebe

- a. Mr. Bosse - SNPO-C

"Q" - Were all milestones completed?

ANSWER: No, they were not.

- b. "Q" - What is the status of milestones on the B-2 test?

ANSWER: Yes, the milestones on the B-2 pyrotil lateral support assembly test.

I believe that material or the specimen procurement milestones were not met, and neither was the initial test complete. These were 2 milestones that apply. The B-4 graphite barrel test I believe had the same milestones; the material procurement was not complete as of the end of the year.

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c. "Q" - What is the status of your reports on fuel element tests?

ANSWER: The reports on the preliminary tests have been completed for NRX-A1 and A2 elements.

-----
d. Mr. Tushar - SNPO-C

"Q" - What is the status of the elevated temperature test under A-5?

ANSWER: The rate procurement is now in process for the higher temperature test. I don't know the exact schedule at this point. This was not considered a part of the '63 work program.

-----
e. Mr. Tushar - SNPO-C

"Q" - Requested that we elaborate on the status of the reports.

ANSWER: I have a list of reports here, Hank, which will be in the hand out, will this suffice? They are already written.

-----
f. Mr. Scheib - SNPO-C

"Q" - What is the status of Phase II G-1 vibration tests?

ANSWER: The Phase II portion has been modified. No, they do not apply as they were indicated in the original work statement. The milestones now include a first series of tests with the inner reflector and core assembly to be completed some time in the first part of November. Then there is a series of the complete reactor, including outer reflector followed by a shock series. Then there will follow the environmental series which was originally considered the Phase II portion. Remember, Phase II originally included a destruct test, which we no longer include in the program.

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g. Mr. Scheib - SNPO-C

"Q" - Was this a customer generated modification?

ANSWER: I believe there was general concurrence here, Mr. Scheib. You will recall when our TME-378 was issued and published, and I believe at that time this more or less consolidated our thinking as to what the test program was going to be, and it deleted Phase II or modified it.

-----
h. Mr. Bosse - SNPO-C

"Q" - Did we comment on the shield tests?

ANSWER: The shield tests were deleted in the program redirection. There were some shield tests performed in the early part of the contract year. I can run through those if you like, however, these were then deleted in the program redirection.

-----
i. Mr. Helms - SNPO-C

"Q" - What is the present status of the core support structural test?

ANSWER: This test is now practically underway. Those of you who will tour the laboratory will see everything in place, and the test should be proceeding very shortly.

-----
5. F. Spurrier

a. Mr. Tushar - SNPO-C

"Q" - What is the percentage completion on the plate?

ANSWER: On the full size plate, manufacturing is 10% complete.

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b. Mr. Ziurys - SNPO-C

"Q" - When do we expect delivery of the forged plate?

ANSWER: That at the moment depends on when the contract for manufacturer is let. The purchase order is presently at SNPO-C waiting for approval.

-----
c. Mr. Wilke - SNPO-C

"Q" - What is the status of the tangential lateral support system, and when will test data be available?

ANSWER: All of the P.O.'s on this design are out for manufacture at the moment, and I think that they represent a 3 month delay on most of these items. Most of them went out September for delivery of the hardware.

-----
d. Mr. Lombardo - SNPO-C

"Q" - What form of documentation is considered to constitute completion of a milestone?

ANSWER: (W. H. Arnold) This can be discussed tomorrow afternoon.

-----
e. Mr. Ziurys - SNPO-C

"Q" - How long will it take to obtain forged support plate after approval of procurement by SNPO-C?

ANSWER: Estimated procurement time is 5 months from the time the contract is let.

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f. Mr. Helms - SNPO-C

"Q" - What unique and worthwhile contribution does WANL consider they have made in the NRX-B program to date?

ANSWER: Superior reactor structural concepts have been identified which have substantially greater reliability than the NRX-A or the earlier KIWI reactor concepts. The cooled support plate and the core cage concepts are certainly unique and worthwhile contributions in this respect. The technology of cooled support plates has been developed in considerable detail and the results support the above conclusion. An incidental result of the NRX-B program developing from an analysis of the poison wire requirements resulted in a substantial revision in the requirements for the NRX-B reactor.

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6. F. R. Lorenz

a. Mr. Lombardo - SNPO-C

"Q" - What percentage of effort was shifted from pure development work to vendor follow as forced by the redirected schedule?

ANSWER: The first answer that I can give is that there wasn't very much change in that. Throughout the year, I think our effort has been very much as outlined in TME-426.

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b. Mr. Lombardo - SNPO-C

"Q" - Have we published a document which determines the operational limits of non-fuel materials?

ANSWER: No, we have not published such a document. We do have a compilation which lists all the components and the anticipated environment of the exposure for those materials in the various components, but we have not

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issued the document that you're referring to. We have not contemplated a formal document with everything in one package at the present moment. We have issued individual documents on certain critical applications.

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c. Mr. Thielke - SNPO-C

"Q" - To what extent are the data available from graphite vendors or other government services utilized in our development program?

ANSWER: Up until a few months ago, it was essentially the only source of information. We had no capabilities until the last 4 or 5 months of developing any of our data.

-----

d. Mr. Helms - SNPO-W

"Q" - What is the status of the milestones?

ANSWER: The milestones as listed in the Work Program WP(J) 017 are all completed.

-----

e. Mr. Scheib - SNPO-W

"Q" - What is the status of NRX-B Materials Review Milestones?

ANSWER: It wasn't dropped, but was concluded in our review meetings a few weeks ago. They had been completed as far as the conceptual designs would permit. Many specifications which would be used in that application would be exactly the same as we are using. Others would be special ones, but these can only be determined after the design is firmer.

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f. Mr. Thielke - SNPO-C

"Q" - What is the number of data sheets on graphite properties that have been incorporated in your documents?

ANSWER: Question Back - Do you mean the NERVA Materials Data Handbook?
(yes)

I can't give you an answer to that, but I would say that there are probably 30 or 40. The data sheets which we talking about are internal Westinghouse data sheets. We are selecting certain ones of these for transmittal to AGC. In fact, we have just finished doing this quite recently. Our problem now is that we have to re-do these in the format of the NERVA handbook. Our format is not exactly the same so AGC is going to send us blank forms which we can draft ourselves then transmit to AGC for reproduction there.

-----
g. Mr. Schroeder - SNPO-C

"Q" - To what extent does the slippage in reactor schedules drag along some materials effort in following VR's and questions from the shop floor which are service functions in general to go along with the assembly?

ANSWER: I think the answer to that one should be discussed tomorrow afternoon in discussions of administrative and fiscal aspects.

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7. C. Meuche

a. Mr. Thielke - SNPO-C

"Q" - While the coating process was under development, how was the technical staff employed to maintain productivity?

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ANSWER: The technical staff in terms of technicians were employed doing the same things that they would be doing had they been manufacturing production elements. It is the same staff of people with the same equipment; when the equipment isn't being used for production, it is being used for development.

-----

b. Mr. Rice - AGC

"Q" - How many acceptable elements did we have as of the 30th of September?

ANSWER: I can only answer that indirectly. I think there were some 2884 elements shown that had been extruded; 1522 were through graphitization.

"Q" - What are the losses?

ANSWER: Now indirectly, I can answer this; that our non-destruct testing which occurs after machining at this point indicates through losses of all the process through this point will be around 7%; less than 10%. So the majority of losses we anticipate will be in the coating stage then.

"Q" - Of the 160 there were indicated to be through coating as of the 30th of September, how many were acceptable?

ANSWER: None of these can be classified as acceptable because none of these have cleared the paper channels through to Large. If you want a figure of approximately how many would be acceptable, I would say of that batch about 30% of them.

"Q" - How many in addition to the 160 have gone all the way through the process including coating?

ANSWER: Roughly around 400.

"Q" - What is the anticipated percentage of acceptable elements in the 400 estimated?

ANSWER: We are estimating a yield of approximately 80% out of coating; 80% of the elements in will be acceptable.

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c. Mr. Bosse - SNPO-C

"Q" - How could we have completed the NRX-A3 process spec?

ANSWER: The decision was made that the elements for A3 would be the same as the elements for A2 and the process would therefore be identical. It is the most current version of the A2 process spec.

-----
d. Mr. Helms - SNPO-W

"Q" - The elements shown as having been completed through extrusion, were these before the batch change or the die change?

ANSWER: In both cases, they were subsequent to the changes described here. Yes, they are presumably all useful.

-----
e. Mr. Rice - AGC

"Q" - What is the current rate of satisfactory elements through coating?

ANSWER: I can give you a rate in terms of the number of runs that we're about to produce at this time. We're running right now, about 6 runs per week. We hope to bring this up to about 8 runs per week. We can only make an estimate that 90% of the runs will be acceptable.

CLARIFICATION: We can only make an estimate that the 90% of the runs will be acceptable per se; in addition, we will have a mortality rate out of each good run just due to handling. This mortality rate is high at the present time; this should diminish.

-----
f. Mr. Rice - AGC

"Q" - What is basis of the 2-1/2 month carry-over for completion of NRX-A fuel production:

ANSWER: This was based on 80% of over-all yield through coating. This includes bad batches and total bad runs, as well as mortality rate in handling.

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g. Mr. Rice - AGC

"Q" - What has experience been on the first 4 weeks of the 2-1/2 months?

ANSWER: I can't give you an answer because things have not gone through a final inspection; this is really the critical point right now.

-----
h. Mr. Beveridge - AGC

"Q" - Originally the acceptance test based on corrosion had been based on gas temperature outlet. This has been changed to a surface temperature measurement. Do we contemplate going back to gas temperature?

ANSWER: I'll defer that as not in my labor grade, so to speak. Dr. Boltax or Dr. De Zubay are better qualified to answer that.

-----
8. A. Boltax

a. Mr. Scheib - SNPO-W

"Q" - Questions the status of the Quality Control procedures to be used for NRX-A2 fuel elements.

ANSWER: I believe the document you are talking about is a revision to an original document. Reactor Analysis and groups in the laboratory in cooperation with the Materials Department, created a document approximately 9 months to a year ago, which defined the Quality Control test based on Los Alamos experience and the needs of the hot test schedule. What we're doing now is writing a realistic document based on experience in testing these elements, and this is the document that I think you are referring to.

Mr. Scheib questions Mr. O'Brien whether this is indeed the correct status.

Answer was "yes".

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b. Mr. Thielke - SNPO-C

"Q" - What is the participation of the Quality Control Department in the writing of this document?

ANSWER: They will have editorial privileges. The document is prepared by the Materials Department and edited for comments by Quality Control.

"Q" - Is there a Quality Control acceptance test, and whose judgment is it that decides whether an element is accepted or rejected?

ANSWER: The preparation of the document is being carried out by the Materials Department and they are exercising judgment in writing of that document. This will be reviewed by Quality Control, Reactor Analysis and so on, and in their review will reflect their judgment. If there is some disagreement, then it will come out at that particular time. The actual acceptance or rejection of fuel elements will be Quality Control responsibility.

-----

c. Mr. Scheib - SNPO-W

"Q" - Is this Quality Control manual which is 15% complete actually needed to get fuel elements through the process?

ANSWER: I really am not familiar with that particular document. Is there someone here that could answer questions about that document?

ANSWER: Mr. O'Brien (SNPO) - It is not needed.

-----

d. Mr. Bosse - SNPO-C

"Q" - What document presently exists, and is now being used as a basis for acceptance or revision of fuel elements?

ANSWER: The earlier draft of the above document.

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9. F. Montgomery

a. Mr. Bosse - SNPO-C

"Q" - Why are the fabrication cycles for such critical components as the beryllium reflector and the graphite barrel longer than originally estimated and, secondly, were the lead times here originally underestimated; thirdly, what are we doing to overcome these problems, and last, do we expect these lead time requirements to persist?

ANSWER: On the beryllium reflector, the trouble had been with the deep hole drilling; the rest of the machining is not too tough. The deep hole drilling is a problem and is still under development. The graphite barrel -- the amount of work that had to be done into this, that the deep hole drilling included in that and all of the milling of the butterfly openings took considerable more time than what was estimated. With both of these items considerably more tooling had to be procured in order to really come out with the close tolerances that were required. We do not believe they were originally underestimated, actually we lacked experience in the amount of deep hole drilling time that was going to be required. We are reviewing all these items and seeing what can be done about new methods and tooling that could overcome some of this. We hope to better these times.

-----
b. Mr. Rice - AGC

"Q" - To what extent does manufacturing services review the drawings, prior to its sign-off?

ANSWER: Manufacturing Engineering has people continually with design engineers and drafting trying to point out what we know about manufacturing methods and techniques; what can be done to manufacture the parts to the tolerances they want, and of course at the least possible cost.

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c. Mr. Rice - AGC

"Q" - In the face of this review, why have we had such a large volume of variation requests?

ANSWER: That is one thing we would like to know ourselves. It seems as though there are hundreds of vendors involved with the manufacture of our detailed parts and we have an NMDR action on say 90% of them. A bolt or anything like this, it seems as though Quality Control goes through the thing and they find some little thing wrong with it, and it has to go for MRB action. How you overcome some of these things is a problem; you can't live with every vendor, hold his hand, do everything he is getting paid for doing. It is a matter where we have to keep on in our job of trying to find vendors that can produce precision parts.

-----

d. Mr. Rice - AGC

"Q" - Do we have within Manufacturing Engineering specialists in such material as graphite and beryllium, in addition to people with experience in normal machining?

ANSWER: We think we have a real good group of manufacturing engineers that are experts and, of course, they have learned considerable in dealing with these materials. Seventy-five percent of the people in the group are graduated apprentices, or tool machinists, or tool makers, and they really know the job and how to run one. They know what machines can do and what tools can do. I do not believe we had anyone who had a lot of experience in machining of graphite in the type and size and the tolerance that we have had here in this project, or beryllium; but we're learning.

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e. Mr. Scheib - SNPO-W

"Q" - Was it Manufacturing Services that set up the arrangements with Speer Carbon for manufacturing of filler strips?

ANSWER: Speer Carbon received their contract through Procurement.

Manufacturing Services did have people who helped in setting up the tooling and the processing. Gene Call, who is our manufacturing engineer, is a good man on tooling and helped set the whole thing up that way.

-----
f. Mr. Helms - SNPO-W

"Q" - Would you please outline the steps taken in qualifying and letting out reflector requirements for segment orders?

ANSWER: Prior to letting beryllium machining orders, a piece of beryllium in the form of control drum was procured, and three vendors were asked to do deep hole drilling on this part. The holes were 3/16" in diameter and 52" long. The vendors were asked to drill three holes each straight through from one end to the other and three holes from each end meeting in the center. From this experience, it was determined that the 3/16" diameter holes should be drilled from both ends. In the meantime, procurement had a total of fourteen vendors bid on the complete machining of sectors and control drums. Only three vendors replied. The Marquardt Corporation was the successful bidder due to price and delivery. A visit to the Marquardt Corporation, Ogden, Utah revealed they had necessary equipment to do the complete job with the exception of the deep hole drilling. This equipment they purchased for this particular job. A second source was set up which was the Pratt & Whitney Machine Company, Hartford, Connecticut. They had the necessary equipment to do the job.

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Two other companies contacted, the 20th Century Machine Company, Detroit, Michigan and Howard Dearborn Company, Cleveland, Ohio, but did not have facilities to do other than deep hole drilling. To date both Pratt & Whitney and the Marquardt Corporation have been fairly successful in deep hole drilling of the 3/16" diameter cooling holes. Neither one has had too much success in drilling 1/2" Shim Rod Holes because of the straightness requirement to accept the shim rods.

-----
g. Mr. Bosse - SNPO-C

"Q" - What procedures are you establishing to provide a list, if any, of qualified bidders. Are you establishing such a list?

ANSWER: Quality Control has established lists, as I have read off in the paper. There is something like 88 that had been approved, some were conditionally approved, 16 disapproved. This is kept up-to-date all the time.

-----
10. N. Pollack

a. Mr. Bosse - SNPO-C

"Q" - I would like for Nick to indicate the milestones he considers not completed.

ANSWER: The 2 milestones that were not completed during the contract year 1963, one was to complete, assemble and ship our NRX-A cold flow, and secondly to assemble for the PAX for NRX-A2.

Comment by Mr. Schroeder - SNPO-C

"Their TAD's show 2 milestones for each one of ours."

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b. Mr. Scheib - SNPO-W

"Q" - Do you plan to build another shipping container?

ANSWER: Yes, we do; the second shipping container is in the making. But I don't know what the delivery of it is.

-----
c. Mr. Bosse - SNPO-C

"Q" - Do you plan any further shipping demonstration other than by train?

ANSWER: Yes, we have recently discussed shipping the engineering mock-up both to WANEF Criticality Facility for handling by their fixturing, then also by truck to the MAD Building in Nevada. We have discussed this with the people here at Astronuclear.

-----
d. Mr. Bosse - SNPO-C

"Q" - Have you defined the vibration test that you will perform prior to shipment of NRX-A2?

ANSWER: (Dr. Esselman) This test is defined, but is not collected in a single document. It is a combination of component tests of A-9 and G-1. If those tests are completed on schedule they would provide this basis for the shipment.

-----
e. Mr. Helms - SNPO-W

"Q" - How do we record the use of and location of non-standard parts for future use in post-mortem analysis, and do we provide photo coverage for such non-standard parts?

ANSWER: We do Mr. Helms. This is a combined effort, but basically controlled and handled by Quality Control, and we have taken approximately 1000 stills for post-mortem evaluation prior to and during the assembly of the

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NRX-A1 reactor. In addition to that, we have taken several thousand feet of 16 mm colored film, so that it is all tabulated in one brochure and will be ready for post-mortem evaluation.

-----

f. Mr. Wilke - SNPO-C

"Q" - In light of the slipped schedule, how have you been using your manpower?

ANSWER: First, we used our people for training on the Engineering Mechanical mock-up. We have then diverted our efforts from the Mechanical mock-up to the instrumentation mock-up on ND-101, these being directly related to the efforts that we have expended on the actual cold flow reactor. In addition to that, there have been a few assembly technicians assigned to Quality Control.

-----

g. Mr. Scheib - SNPO-W

"Q" - On looking through the VR's, I note that some items have been marked for the cold flow only, such as graphite instead of pyro tubes, for instance. How do we keep these separated?

ANSWER: The difference between the pyro tubes and the graphite tubes is pretty evident. We receive all the material in the assembly area from Manufacturing Services and Stores. It is all released to us on a material release form that is signed off by both that organization and Quality Control as being an acceptable item for that particular component in that particular reactor. (Making reference to NRX-A1 or currently on the ND-207 reactor which we are currently orificing and will probably start clustering before the end of the week.)

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h. Mr. Helms - SNPO-W

"Q" What will be the disposition of our large number of undersized tie rods?

ANSWER: This disposition is made before a rise in the assembly. We never receive those.

(Dr. Esselman amplifies the reply) - I don't remember that particular action, Ira, but if the review board would decide that those tie rods could not be used, they would be immediately defective, red tagged, and it would never get into the reactor assembly area. If they were for example said to be used for ND-101 only they would be immediately separated, and would be released for ND-101. They have individual serial numbers, so if any that are released to assembly, they check the serial numbers against all outstanding V.R.'s and NMDR's to be sure there is no words in any of them which says for 101 only or for 102, so that there is a Quality Control check before they get into assembly. A recheck of these papers is then made to make certain that there is nothing for 101 that could get into 102.

-----
11. F. Henning

a. Mr. Dutli -- SNPO-C

"Q" Where do we stand on the apportionment of NRX-A1?

ANSWER: Way back, I believe these were worked out in C.Y. '62. These are the numbers we are still using, as we have gotten no goals for the engine.

-----
b. Mr. Wilke - SNPO-C

"Q" What is a apportionment?

ANSWER: This is a matter of taking the reliability goal for the whole engine and breaking it down to the various component.

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c. Mr. Dutli - SNPO-C

"Q" What was the manpower situation at the beginning and end of the contract year?

ANSWER: The first thing I can say is in both cases, it was below the limit; we had trouble hiring people. I don't recall the precise numbers at the beginning of the year, but at the present time we have 12 engineers and 8 technicians.

-----
12. Mr. Regenda for Mr. Anthony

a. Mr. Wilke - SNPO-C

"Q" Do we have any standards to compare numbers of parts checked, etc., against the missile industry to see where we stand?

ANSWER: May I ask what are you considering standards?

CLARIFICATION of question - - Experience

Many of our people have all been in the missile industry, but as far as standards go, I don't think that there is any set answer - due to the complexity of the item.

-----
b. Mr. Scheib - SNPO-W

"Q" Is the organization and method of operation of the group covered in the so far unapproved Quality Assurance plan?

ANSWER: (Mr. Henning) - Yes, it is in there.

-----
c. Mr. Scheib - SNPO-W

"Q" We are proceeding out on a limb with regard to government approval on your document.

ANSWER: (Mr. Henning) - It is in the document, but the document is not approved.

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d. Mr. Scheib - SNPO-W

"Q" What is the schedule for approval addressed to Mr. Schroeder?

ANSWER: (Mr. Dutli - SNPO-C) - There are about a half dozen problems. It might be a matter of semantics. There are memo's and meetings which have spelled out the conclusions that have not been finally printed, and put in the document, and the document has not received written formal approval. However, it is in fairly good shape.

-----
e. Mr. Helms - SNPO-W

"Q" Under vendor surveillance, whose responsibility is it to determine the adequacy of the facility and in particular, who was responsible for determining the adequacy of the heat treat facility on the aluminum barrel?

ANSWER: Actual facilities of any plant is the responsibility of our Manufacturing Engineering Group. Quality Control is basically responsible as the conditions to perform our particular function. Manufacturing Engineering which we have a complete group that evaluates the equipment.

-----
f. Mr. Bosse - SNPO-C

"Q" What is the status of procedures for Quality Control of fuel elements?

ANSWER: At the present, this is a function of the Astrofuel Facility. At present, overall procedures have not been approved, but some of them are. We are using drafts at the present time.

-----
g. Mr. Bosse - SNPO-C

"Q" What is our policy on source and receiving inspection. Do we have 100% receiving inspection?

ANSWER: When material is source inspected, we do not do a 100% receiving. In such a case, we do a spot check on receiving to do a verification.

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h. Mr. Dutli - SNPO-C

"Q" Approximately how many suppliers and vendors do we have and what percentage have been surveyed as to Quality Control adequacy?

ANSWER: In C.Y. '63, we had initial evaluation of 140 suppliers; 39 were conditionally approved, 15 were disapproved, and the balance were approved. In addition, we use many small job shops on which we can adequately perform inspection of the parts in house, as well as for commercial off the shelf items.

-----
i. Mr. Mason - SNPO-C

"Q" We have recommended a formal procedure and checklist for the review of procurement packages. What is the status of this?

ANSWER: There is a checklist in operation. There is a formal procedure in effect - refer to WANL-TNR-088.

-----
13. Dr. H. S. Kirschbaum

a. Mr. Hintze - SNPO-C

"Q" The contractual work specifies analyses of the nuclear sub-loop components of the engine control system.

ANSWER: These were not completed. I'd say about half of them were completed; this is a carry over item and has been identified as such in C.Y. '64.

-----
b. Mr. Dix - SNPO-W

"Q" In our malfunction analysis, have we looked at possibility of control drums binding in the full out portion during loss of coolant accident?

ANSWER: No.

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c. Mr. Medeiros - SNPO-C

"Q" Does the transient analysis show any different restraints from that shown by F. Retallick in Project 1320?

ANSWER: We have been staying within restraints as specified by F. Retallick for the reactor. Our control is based on keeping the tie rods cooled.

-----
d. Mr. Medeiros - SNPO-C

"Q" Whether the propellant feed system is a more severe restraint?

ANSWER: Our studies don't indicate this.

-----
e. Mr. Reilly - SNPO-C

"Q" Was our startup control analysis as indicated in the milestones completed?

ANSWER: This was completed for A-2 and A-1.

-----
f. Mr. Helms - SNPO-W

"Q" Does ACFI have from us all information needed for the test car design?

ANSWER: The man who could best answer that isn't here. As far as I know, yes.

-----
g. Mr. Medeiros - SNPO-C

"Q" In the instrument checkout at NRDS, can we check the polarity of instrumentation, particularly strain gauges?

ANSWER: Yes

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14. Mr. Gilmour

a. Mr. Hintze - SNPO-C

"Q" (1) Were the control sensor requirements supplied by the controls people"

(2) If so, were they used to determine the instrumentation program, and

(3) Were the objectives met?

ANSWER: (1) If you are referring to the nuclear instrumentation, yes, they were. These were established quite early in the program and have been followed throughout the year.

(2) Were these used in establishing or guiding the instrument development, yes, very definitely.

(3) Yes

-----
b. Mr. Scheib - SNPO-W

"Q" Have we specified the neutron detector for use in NRX-A2, and is it ready at the present time?

ANSWER: Yes, we are using the standard compensated ion channel. The detectors referred to in Task 1344 are aimed at engine requirements. The detectors being used at NRDS are like those presently used.

-----
c. Mr. Scheib - SNPO-W

"Q" Questions the working of the Milestone which says, "established developmental neutron detector for use in NRX-A power measurements"...

ANSWER: (Mr. McCreary) - This TAD is read "to establish the requirement".

Our answer is that we are using the existing detectors. The developmental detectors will be used and tested with the NRX-A system, but will not be used to control NRX-A.

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d. Mr. Ordin - SNPO-C

"Q" Approximately what percentage of our development work is in-house as compared to being done by outside vendors?

ANSWER: (Mr. McCreary) - This work is under the direction of the people here but much of the detailed design is done in vendor plants.

-----
e. Mr. Scheib - SNPO-W

"Q" Does that include nuclear detectors, or are they typically done in-house?

ANSWER: This is in-house. This is the Westinghouse Tube Division.

-----
f. Mr. Scheib - SNPO-W

"Q" Is that arrangement similar to that which we would use with other vendors?

ANSWER: This goes out on an IWR.

-----
g. Mr. Helms - SNPO-W

"Q" How many dollars are involved?

ANSWER: (Mr. McCreary) - I do not remember exactly, but is of the order of \$35,000.

-----
h. Mr. Helms - SNPO-W

"Q" What are the written qualification procedures for non-nuclear sensors?

ANSWER: In our design specifications we have the qualification tests spelled out for each transducer.

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- i. Mr. Scheib - SNPO-W
"Q" Who established these?

ANSWER: The instrumentation laboratory, in cooperation with the analysis people who specify the instrumentation.

- j. Mr. Helms - SNPO-W
"Q" Is this all instrumentation we are using, or are these selected instruments under development in Task 1347?

ANSWER: (Mr. McCreary) - I would say this is about 99% of our effort. Anything that doesn't show up here is relatively minor.

CLARIFICATION: Yes, all instrumentation for use in NRX-A are qualified through this series of tests.

- k. Mr. Helms - SNPO-W
"Q" In the use of piezo-electric accelerometers, is there in addition to radiation problems, a low temperature noise problem?

ANSWER: There is a possible low temperature noise problem. It is due to thermal shock conditions inherently due to low temperature itself. Thus by putting thermal lagging around these piezo electrics, the change in temperature can either be slowed down or delayed until after the test is over; and the information is obtained.

- 15. Dr. Arnold
  - a. Mr. Miller - AGC
"Q" What was that about the Aerojet-GE Contract (with regard to the milestone on NE-2731)?

ANSWER: There was a package we sent out in May; we can get you the

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the documentation. We had a request to you, I believe it was May 10th. This was a number of small samples to be irradiated, and then we were going to study the re-entry behavior of fuel samples, following irradiations. We first sent this out on May 10, and followed it with a letter on June 24, to find out where it was.

-----

b. Mr. Fleishman - SNPO-C

"Q" Have any studies been made with regard to optimization of the poison system?

ANSWER: The answer to that is "yes", we have done a number of studies; we have looked at arrangements of the poison wires non-uniform in the core. We have looked at various materials for the use for the poison wires for assembly. You'll notice in the talk, I specified B-10, whereas our shipping system uses B_4C . The reason is we can effect a reduction by about a factor in the use of poison wires, and this becomes very important in the force required in the pull system. We have also done trade-off studies on having fewer wires near the edge of the core because the wires at the edge of the core involve more force. This will be covered by a milestone for the month of November. We are to specify an arrangement of poison wires for the Flight System.

-----

c. Mr. Hartfield - SNPO-C

"Q" Did Westinghouse do any safety review of NERVA designs with regard to the engine?

ANSWER: The answer is "no", except insofar as we participate in ROVER Flight Safety Panel deliberations, and providing an input to the RIFT Safety Review document.

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d. Mr. Hintze - SNPO-C

"Q" What forces are exerted by the poison wire system on the nozzle?

ANSWER: I guess we'll be exerting about 3,000 lb, or something like that. It seems to be what is required to pull this system out of the core. The conceptual design of this mechanism did have the puller in the nozzle held by leaf springs.

CLARIFICATION: (Dr. Esselman) - That assumes that the mechanism is mounted on the nozzle.

-----
e. Mr. Corrington - SNPO-C

"Q" What is the status of the report on this poison wire system?

ANSWER: We have issued a preliminary feasibility report in September as called for in the milestone. Our next milestone is to define the location and number of wires in November. That report is listed in the Bibliography which will be in the hand-out.

-----
f. Mr. Hintze - SNPO-C

"Q" Questions whether the 3,000 lbs required to pull out the poison wire system included the weight of the system or was just the pull force.

ANSWER: It is just the pull force. That is only a rough number.

-----
g. Mr. Corrington - SNPO-C

"Q" Has an analysis been made of the possibility to damage to the nozzle tubes by the requirement that the wires were conformed to the shape of the nozzle?

ANSWER: The answer is "no". We are only using a ring and a harness to mockup the nozzle. We haven't completed a study of damage to the nozzle yet. This would come in a later stage of the program. We have talked tentatively of a C.Y. '65 effort which would involve larger scale testing of this type of system.

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h. Mr. Tushar - SNPO-C

"Q" Are we taking advantage of LASL's experimental information in the fission product diffusion?

ANSWER: The answer is "yes". We visited them within the last 2 weeks on this and other subjects.

-----

i. Mr. Dix - SNPO-W

"Q" Have any of the controls people looked at the poison system for its compatability with startup?

ANSWER: The answer to that one, I believe is "yes". All we're talking about is a single signal coming from the engine programmer which would initiate the pull system. On only needs a trigger signal to start it, as its energy is self-contained. It has to be pulled out before startup.

-----

j. Mr. Lamonds - AGC

"Q" Have we an estimate of the amount of time required to extract these wires?

ANSWER: No, we have a requirement which is less than a minute, but I'm not sure what the number is.

-----

16. Mr. G. R. Thomas

a. Mr. Bosse - SNPO-C

"Q" What is the status of the milestones for Project 1380, in particular, Test Plans for A-1, A-2, and A-3?

ANSWER: The 3 milestones you are referring to are shown in there to be A-1, 2, and 3 actually was intended to be the block program summary. This would not have A-4 in it when originally developed; since A-4 was added to the block later and was therefore covered by the block program milestones that I indicated we had completed.

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b. Mr. Lamonds - AGC

"Q" Did we say the engine would have to operate at 25% power to prevent two phase flow from entering into the core?

ANSWER: You are talking about an engine startup in which case you take advantage of the stored heat capacity in the reflector on a transient startup. We're talking here about starting reactors up slowly in the NRX program and having several holds at steady state in which case you cannot take credit for the stored heat in the reflector. This is lost after the first few seconds of flow. In case you try to operate at low power steady state and cannot take advantage of stored heat, you must operate at a power level high enough to add enough heat to the coolant as it enters the reactors to prevent two phase flow from entering the core.

-----

c. Mr. Lamonds - AGC

"Q" Is there enough heat stored in the reflector to vaporize the liquid for a period of the order of 50 seconds?

ANSWER: The normal engine startups take advantage of the stored heat in the reflector for about the first 10 or 15 seconds. If you compared a cold flow startup with the same flow shape as in a power startup, you will find that the temperature at the core inlet drops in both cases but begins to go back after 15 seconds in the power case. It's that initial drop when you're taking advantage of stored heat; at this time the power level in the reactor is so low that it really doesn't matter whether there is power or not. So, no, I don't think you can take advantage of stored heat in the reflector for as long as 50 seconds.

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d. Mr. Helms - SNPO-W

"Q" Have we run eddy current probes for NRDS through coated blocks to check whether we could use it in the outer regions where it is hard to get around the shape of the nozzle?

ANSWER: It isn't planned to use the probe around corners so to speak while the reactor is on the test stand, but we intend to probe through the 8" throat on the nozzle in cases where we are interested in knowing whether or not there has been any damage in the center of the core. If there are indications during any of the probing that some damage has been done, we then would have a partial disassembly, as we call it, in which the nozzle would be removed and then the core would be probed near the core periphery. But there are no plans to probe the outer periphery of the core with the nozzle on.

-----
e. Mr. Helms - SNPO-W

"Q" What portion of the core can be probed through the core?

ANSWER: About 100 elements can be probed directly through the nozzle (about 1/16 of the core).

-----
f. Mr. Rice - AGC

"Q" In the event we decide that the maximum power reached on A-2 is less than 100%, do we still plan to keep the intervening steps of 22, 42%, etc.?

ANSWER: Not necessarily, I think this depends on when the final assessment is made. But certainly if there is time to make a change in plans and use more steps if we feel is desirable at that time, we would do so. I think, in general, the problem is not too severe because the profile drums which are used in the control will not be made up until the week before the test. There is then only the question of assurance and that the flow, power, and chamber temperature values have been properly synchronized during the run.

-----
g. Mr. Rice - AGC

"Q" To what extent do we expect to learn anything in these 10 or 15 second holds at the various power levels which will determine whether or not we go on up?

ANSWER: There are really 2 different kinds of holds; there are several 15 second holds, and there is a 15 minute hold. The only person who has the capability of making any kind of a decision in 15 seconds is the Chief Test Operator or the Chief Test Engineer. You can't have a committee meeting and decide anything during the 15 seconds. During the 15 minute hold we will have a group of competent people who can review the quick look data and make a decision.

-----
h. Mr. Helms - SNPO-W

"Q" What is the peak nozzle exit pressure expected in the A-1 profile?

ANSWER: The peak pressure of the nozzle at the inlet are about 600 psi, and at the exit about 100 psi.

-----
i. Mr. Helms - SNPO-W

"Q" What is the maximum inlet reflector pressure?

ANSWER: The maximum reflector inlet pressure occurs during the split flow test and is about 250 lbs below the inlet pressure which would make it about 350 psi.

-----
j. Dr. Trent - AGC

"Q" If we go to a 100% power on A-2 at power level, do we switch over to liquid?

ANSWER: The defining parameter generally is that the system pressure when you want to switch over must be above critical pressure. The values shown on the slide indicated a switch over of 42% power. It can be accomplished a little lower than that.

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17. Mr. W. B. Henderson

a. Mr. Lamonds - AGC

"Q" To what extent will our personnel be prepared to perform the post operational survey of the core on NRX A2?

CLARIFICATION: (Mr. Henderson) - Is this prior to A2, or in the present time?

ANSWER: At the present time, the necessary training to conduct the post operative examination of A2 is not complete. It had been started in the form of advanced training on a mockup and with the equipment we have; it will be completed prior to A2. We will interrupt it for the A1 test period in Nevada and reinstitute it again after A1.

-----
b. Mr. Lamonds - AGC

"Q" Will we have the capabilities at the site to conduct radiation and radiochemical analyses of fuel?

ANSWER: This is hard to answer - we have the capability within our grasp. Certain facilities, consultation, etc., are presently existing in the LASL system, namely Wing 9, J-11 Radiochemistry Facility, etc. These have been made available to us consistent with our needs and we are presently evaluating this program based on the information we have regarding the A2 test plan.

-----
c. Mr. Vreeland - AGC

"Q" Please clarify what post operative equipment we have inspected?

ANSWER: The major effort involved here is training with facility installed equipment such as head manipulators, the 2 side ball manipulators and the main bay, the boroscope, parascopes, etc., involved in the hot cell and upper bay remote work. As an example, a surplus gasoline engine from Mercury, is being

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disassembled and reassembled remotely. The intricacy of the parts is similar to the intricacy of what will be expected in the reactor. Basic training in the area of handling of the delicate parts is accomplished by using an erector set, in the hot cells for example.

-----
d. Mr. Vreeland - AGC

"Q" How about handling reactor fuel elements specifically?

ANSWER: We have not undertaken any additional training in that area. Some of the WANL funded technicians and the ACFI technicians who are presently in the MAD building do have experience in the handling of this material from the B4A and B1B.

-----
e. Mr. Vreeland - AGC

"Q" What is the status of the availability of a trunnion device to accept a post operative NRX?

ANSWER: It is at the site. That was the picture of it that I just showed. That was a NERVA fixture that had been received and put through receiving inspection and checkout at the site. It happens to be the most major and most complex one.

-----
f. Mr. Rice - AGC

"Q" To what extent are site people being used at WANL to work with assembly and become familiar with the A-1?

ANSWER: At the present time, we have continually one engineer. Not always the same one, depending on what operations are going on here. We have additional engineers who are back here as the operations and assembly required. We have from the MAD building 15 technicians right now, who are a combination of WANL and ACFI technicians who have been back here, some of them for as long as 2 1/2 months.

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18. Mr. Poindexter

a. Mr. Helms - SNPO-W

"Q" What is the disposition of the reactor after performance of the test, etc, in particular emphasis on A-1?

ANSWER: A-1 is somewhat of a special case, since it was a cold flow test. After the parts of the reactor are taken apart at NRDS and examined, they will be sent back to WANL and the ones suitable, will be re-used. The ones that are undamaged and satisfactory will be used in the reactor for the cold flow development test at LRP. They are shipped in containers individually in trays.

-----
b. Mr. Reilly - SNPO-C

"Q" We bought 128 pieces of receiving inspection equipment under NE-2300. Have procurement action been initiated since the September 30 date for the rest of these?

ANSWER: Procurement actions were initiated on all of them prior to the end of C.Y. 1963. Procurement had been completed on 25 of them.

-----
c. Mr. Reilly - SNPO-C

"Q" 12 items of cold disassembly equipment you didn't mention. What is the status of procurement of these?

ANSWER: Fabrication of these were substantially completed. A number of these has been delayed, and in fact, have not been delivered yet.

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d. Mr. Scheib - SNPO-W

"Q" Was it necessary to procure additional spent fuel shipping containers, or will we be able to use the LASL container?

ANSWER: We have obtained approval from LASL for use of spent fuel shipping containers that they have. (Referring to the so called fuel elements cask

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liners - each to hold 100 elements)
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e. Mr. Squires - SNPO-C

"Q" Why is the shield shipped separately?

ANSWER: The shipping container for the reactor and shield were designed by the Reactor Mechanical Design group. Really, you should get the answer from them. The shield is merely trapped between flanges of the pressure vessel rather than being attached to the reactor, so that it was better to ship them separately.

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f. Mr. Kulovitz - SNPO-C

"Q" What criteria do we have for distinguishing equipment that is funded from expense and that which is funded from capital?

ANSWER: (Dr. Arnold) - This question should be reserved for this afternoon.

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19. Dr. S. Stein

a. Mr. Lombardo - SNPO-C

"Q" Would you describe the additional radiation work that Westinghouse did at Plumbrook? Then in addition, what was called for in the TAD?

ANSWER: Mr. Lombardo, as you pointed out, the performance of the tests in the water cooled loop at Plumbrook was additional work. Similarly the establishment of the operating staff and the training of these operators was additional work.

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b. Mr. Lombardo - SNPO-C

"Q" Who is responsible for determining gamma heating rates on instrumentation?

ANSWER: This is something we worked out with the design engineers. Working

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with the design engineers of the components and with people from Reactor Analysis, an attempt was to indicate or determine the environment that each particular component would see. So actually, it's a joint effort, the Reactor Analysis people determine the radiation environment, the design engineers determine and select the components and we working along with them.

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c. Mr. Bosse - SNPO-C

"Q" What is available in the literature regarding irradiation effects on teflon?

ANSWER: There is quite a bit of information in the literature on teflon. The particular use of it as solid lubricant in this particular condition I don't think actually existed, but what we found was actually pretty much in accord with other experience.

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d. Mr. Wilke - SNPO-C

"Q" Are many of these tests that we are performing on instruments or components the first of their kind?

ANSWER: (Mr. McCreary) - The answer is "yes", but you would have to talk about specific instrumentation.

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e. Mr. Wilke - SNPO-C

"Q" What was the date of the shutdown of the WTR, and what was its power level?

ANSWER: (Mr. Johnson) - March 19 or 20, 1962. Authorized power level 60 MW.

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f. Mr. Thielke - SNPO-C

"Q" What was the date of useful or beneficial operation of Plumbrook?

ANSWER: We began to run some tests in either June or July 1963.

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g. Mr. Fleishman - SNPO-C

"Q" These components were not irradiated at the same spectrum to be expected in NERVA - What is the effect of this difference?

ANSWER: We hope to get some measure of the effect by running some of these at both the General Dynamics reactor and Plumbrook, where the environment is somewhat different. We might be able to determine what the effect of a situation which doesn't exactly simulate NERVA might have.

CLARIFICATION: Mr. McCreary - In many instances the instrumentation will never see the actual neutron and gamma spectrum which one sees in NERVA until one actually gets into NERVA; however, the irradiation program will serve to screen out the weaklings in this field and we can study total dose effects.

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h. Mr. Lovoff - SNPO-C

"Q" What is the status of test reports for each of these tests which have been completed?

ANSWER: They are still being prepared.

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i. Mr. Lovoff - SNPO-C

"Q" Is the milestone really met on a test completion unless the report is out?

ANSWER: On the milestones shown here, we didn't call for completion of a final report in this period.

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j. Mr. Lovoff - SNPO-C

"Q" Can we indicate what is lacking in order for WANL to complete their test reports?

ANSWER: In some cases, it's the final analysis of the data. In some cases, things were screened, and these results are available.

AMPLIFICATION: - Dr. Esselman - We should make everyone aware that we

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have actually put out a preliminary data report.

SUMMARY OF DISCUSSION: (Dr. Stein) - Basically, we are running irradiation tests at a particular facility - General Dynamics - Fort Worth. Their preliminary test report and a final so-called data report is put out by the facility. These are then preliminary test reports. A final test report is one which evaluates the components and its suitability for NERVA and is the functional responsibility of the design group.

STATEMENT BY (Mr. McCreary) - These reports were then put out after the design group have had a change to evaluate the data. The instrumentation is then recorded in the instrumentation data book.

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k. Mr. Scheib - SNPO-W

"Q" No matter what the procedure, there seems to be an intolerable time lag. For example, Test No. 4 was reported to be completed in April - it is now October, and the cycle has not been completed?

ANSWER: There were two published reports on Test No. 4.

CLARIFICATION: (Mr. Lombardo -SNPO-C) - G.D. issues a report and a copy is sent to Washington two weeks after the test has been run. The preliminary report is put in a document within 30 days after the test has been run, and this has been done consistently. The final report is within 45 days after the test. This is again put in a report which is identifiable and issued on a 6 month basis. Information however is transmitted to the design engineer as soon as the information is available. The final report accepting or rejecting a component (be it a pot or turbo pump), is the designers responsibility. It should not be inferred that the irradiation effects program makes the final decision.

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l. Mr. Scheib - SNPO-W

"Q" Are these unofficial numbers which are allowed to be used by engineers; are we lacking an official seal of approval?

ANSWER: I don't understand the question - It is the design engineer who determines the suitability of components, not ourselves.

STATEMENT BY: (Dr. Esselman) - This may clarify it, I hope a little bit. I would expect the following to happen on an instrument - we have many environmental tests, some cryogenic tests, other thermal shock, one of these is an irradiation test. The instrument people will determine that this type of instrument requires an irradiation experiment, and they will check the parts available and facilities that they have at their disposal. Under this project (1980) they will see that the piece is put in the capsule, put in the reactor, and the irradiation test is performed. The data from this is reported very promptly to the design group. The design group then takes this with all the other environmental data and decides whether or not this is a qualified instrument. I think the final thing is you have a qualified instrument which has input from irradiation tests, vibration tests, shock tests, and many other things so that there isn't a final data report that would necessarily come out for every irradiation test.

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m. Mr. Vreeland - AGC

"Q" Are we saying that an instrument is never certified as shock resistant or cryogenic resistant or irradiation resistant, but is just identified as being acceptable for the NERVA environment?

ANSWER: (Dr. Esselman) - When an instrument is said to be certified for use, a tabulation is put in the measurements requirement book which says what has been performed on it, that it has had a shock test, and has had a radiation test, and has had cryogenic test, etc.

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20. Mr. Koetting

a. Mr. Kowalsky - AGC

"Q" Do we furnish cost reports to AGC semi-monthly?

ANSWER: Yes.

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b. Mr. Kowalsky - AGC

"Q" Is the Accounting Department included in the 4.2 costs?

ANSWER: No, the Accounting Department costs are overhead costs.

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c. Mr. Kowalsky - AGC

"Q" What type of EDP equipment is used in costs of 4.2?

ANSWER: None, we charge for computer hours directly to the various projects.

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d. Mr. Kowalsky - AGC

"Q" Under what task is the equipment reported, and what criterion is used to define equipment costs?

ANSWER: Special test equipment, that which is funded in the AEC side, comes under Project 5000.

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e. Mr. Ross - SNPO-C

"Q" Have we compiled a log which delineates schedule problems which were run into NRX-A1 and A2 so that we learn from these experiences?

ANSWER: We have information available that is not in the form of a log per se; we don't have a book that could be looked at with all the information in one spot.

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f. Mr. Ross - SNPO-C

"Q" Do we have information which enables us to trace the history of these schedule delays?

ANSWER: By reviewing progress reports, the purchase order change notices, and so on, the formal documentary pieces; you can very easily follow or trace the delays.

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g. Mr. Hintze - SNPO-C

"Q" Did you say that computer costs are tied directly to the task?

ANSWER: In July of 1963, there was a large negative charge to the analysis task in the controls area.

(Dr. Arnold) - You are talking about the analog computer there.

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h. Mr. Lovoff - SNPO-C

"Q" In subtask 1360, milestone number 3, there is a question: Are acceptance tests activities of the procured items chargeable under this subtask?

ANSWER: Yes.

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i. Mr. Lovoff - SNPO-C

"Q" Are all of the NRX-A1 instrumentation on hand now acceptance tested?

ANSWER: I couldn't answer that one specifically as 100%. It is a high percentage. I think this question should be answered by an instrumentation man because the acceptance testing is monitored by those people.

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j. Mr. Lovoff - SNPO-C

"Q" Milestone No. 9 - can we indicate about what percentage of the NRX-A3 procurement has been completed or placed?

ANSWER: (Mr. Faught) - That will be discussed this afternoon.

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k. Mr. Thielke - SNPO-C

"Q" What is your current philosophy on spares in the procurement ordering and how does this differ from what it was at the beginning of the year?

ANSWER: The spares philosophy is a loaded question. We try to be consistent with the budget on initial releases; we budget for initial hardware plus an allowance for spares, and then we have been factoring in performance when we find our reject rate is higher, or so on. I couldn't give you an average number that would mean anything when you get into instrumentation; it goes high percentage wise. In some other areas it is zero.

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l. Mr. Scheib - SNPO-W

"Q"¹⁵ We set up an NRX-A1 task force when procurement items begin to get into difficulty to implement and to expedite procurement; is it our intent to do this for NRX-A2?

ANSWER: (Mr. R. W. Schroeder) - The name of the task force has been changed to embrace the whole NRX-A series. This is intended to monitor interfaces more than to do any in-plant monitoring that Westinghouse would do.

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m. Mr. Scheib - SNPO-W

"Q" Is this a step towards project type organization? Are we going to a reactor by reactor follow rather than a line type follow?

ANSWER: (Mr. Faught) - This task force was used internally to focus the attention on the specific assembly of the NRX-A1, which is very pertinent at the time the parts began to come in and through the last of the procurement and assembly. There is an aspect of planning before which would not certainly involve as large a task force as it does down where you are factoring parts through the vendor, the vendor assembly, shipping, or our receiving and then into the Reactor Assembly.

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n. Mr. Lovoff - SNPO-C

"Q" Have all NRX-A1 instrumentation been procured and acceptance tested?

ANSWER: Yes, all has been procured - All have been acceptance tested except six transducers which are spares and will be used as replacements for damaged transducers. These are expected to be acceptance tested by October 24, 1963.

o. Mr. Lovoff - SNPO-C

"Q" Has any NRX-A3 instrumentation been procured?

ANSWER: Without checking detailed orders, I believe none has been procured.

21. Mr. Greehan

a. Mr. Hintze - SNPO-C

"Q" Whom do we ask to get the engine control system reactor sub-loop put in the PERT network?

ANSWER: You have to work on me.

b. Mr. Ledbetter - AGC

"Q" In the next to the last slide, we indicated that if the test date which I believe is a major test date, or a reactor run slipped, or stretched out, that the computer then programmed in the change of all the event dates leading up to that. Does this indicate that all of our end dates are automatically slipped on the schedule?

ANSWER: The computer will affect the schedule line, but not the actual line. There was only one line shown on the slide, but there is a second line in the program. The computer only will affect the schedule as it exists and this then provides a basis for review. For example, on this particular test, because some other test prior to it has slipped, this would be the reasonable to re-

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schedule. Then at some point, in time, we may prove that we have additional time to procure hardware, additional time to write test specs, or test plans, etc. If we worked the two system together and determined that slip in the current test will affect a test down-stream, we will get a new date from the PERT quicker than any other method. We will put in a new test date in the bar chart and run back all the detail schedule on a bar chart foremat.

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c. Mr. Ledbetter - AGC

"Q" When do we have to start and finish work for each of the line items which were shown?

ANSWER: During the week shown on the schedule.

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d. Mr. Ledbetter - AGC

"Q" But, this is a prior test, not a subsequent test.

ANSWER: (Mr. Greehan) - I'm not sure I understand your question.

CLARIFICATION: (Mr. Ledbetter) - Maybe it was just a position on the chart, but it appeared that this test which you stated would slip, was one which followed this line of events. All the events on the top of the page appeared to be building up to the test and if this end test slips, then this does not automatically allow the preceding events to pull out also.

ANSWER: (Mr. Greehan) - That is right.

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e. Mr. Thielke - SNPO-W

"Q" Do you take a given reactor test schedule for example and determine its validity with respect to all the events that preceded historically?

ANSWER: We attempt to do this.

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