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INTRODUCTION

The 42nd Meeting of the Steering Task Group was called to order at 0900 hours by Rear Admiral Smith on 26 March 1964.

"As you know," said Admiral Smith, "I changed our normal program so that we can give total attention to the matter of logistics. We will not have the usual reports from the various committee chairmen. I think that the subject of logistic support points up the change both in the nature of the task now facing Special Projects and in the nature of our overall operation."

Dr. Whitmore took occasion to express the general congratulations of the Steering Task Group membership to Admiral Smith for eight years of dedication to Special Projects; Rear Admiral Galantin added his personal commendations as a preface to his opening remarks, and then briefly reviewed the missile flights occurring since the last Steering Task Group Meeting.

"An A3X was only partially successful in that it had a second stage nozzle failure," continued Admiral Galantin. "This firing completed the basic flight tests for A3X. There are six more to be shot from the USS OBSERVATION ISLAND (EAG-154) in the Pacific primarily for penetration aid development. It is interesting to note the last flight test in our basic developmental series was only partially successful. We are already assembling the first tactical missile at NWA and are committed to outload the first ship in September. So, there can be no letup in the intense scrutiny of the A3 on the six remaining shots and the various static tests.

INTRODUCTION

"There have been a total of five A2 DASO firings and all of those were successful. The A2 DASO boxscore stands at 85 percent flight success."

Admiral Galantin then reviewed the ship-building program slips and assured that maximum effort was being exerted to overcome them. He then cautioned against contractor representatives at shipyards demanding ship time or shipyard personnel that would be detrimental to the overall schedule. All contractor requirements should be coordinated with SUPSHIPS or FBM Project Officers.

"Personnel is still considered critical," continued Admiral Galantin, "but because of actions that have been taken, I am now confident that the program will not founder because of personnel problems. We will not be as well staffed with enlisted men in the 627-Class ships as I would like, but the problem is recognized and special action has been taken by BuPers, the Fleet, Type Commanders, and ourselves."

"On the B3, the request for proposal is scheduled to be completed by 1 July 1964. Things are proceeding as planned for this Program Definition Phase and a determination will be made whether in 1966 the program goes into Phase II, or actual development."

On completion of Admiral Galantin's remarks, Admiral Smith introduced Captain LaBarre to the Steering Task Group membership for the keynote discussion of the entire problem of logistic support.

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"This report," began Dr. Craven, "is based on the visit of the Committee to the Submarine Squadron at Holy Loch on 10, 11, and 12 March. The primary purpose of this visit was to gain an insight into the problems associated with spare parts, repair, and supply at the business end of the pipeline.

"The report I am going to present is divided into three parts: first, a description of operations at the tender site--marred only occasionally by recommendations; second, an analysis of the communication and inventory problems of supply and logistics--with an attempt to identify a few of what we think are generic problems that might explain a lot of the symptoms that we see; and, finally, some specific reviews and recommendations concerning men, money and materials.

"The operations at Holy Loch are a remarkable demonstration of the Navy's ability to maintain a posture of wartime strength and readiness with a minimum of impact on the peacetime society which it protects. And I think this is one of the fundamental aspects of deterrence. The gentle unhurried Scottish countryside maintains the 'noiseless tenor of its way' even to the banks of the Clyde and the landings through which POLARIS support is almost completely channeled. For example, at the town of Ardnadam, the most intense activity that we could discover was the construction, by hand tool of a vintage not known in the United States, of the America Cup yacht, the KURREWA. The towns that surrounded this, Dunoon and Gourock, were very quietly awaiting the start of the tourist season.

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"We have all seen many pictures of the bow of the tender, presenting a somewhat uncluttered scene. Figure SA-1 is a rear view of the tender and gives a better idea of the operations that actually take place. It shows one of the usual three or four submarines alongside, a Navy Yard Barge (YFNB), and the floating drydock. I think it is important to notice the large number of small craft that are moving around in this operation. This is not just a tender and a submarine; it is a complete complex. With the exception of some direct ship-to-ship transfer, these vehicles handle all the men and the material and the support that go into the operations conducted entirely in the stream. I might point out an unusual aspect of this picture: This was the one day in 365 when the Clyde is smooth!-- because there is a long fetch from the Clyde from which winds come down and make it generally a very choppy operation.

"Once every nine days a submarine arrives from patrol and another departs. The incoming submarine will, upon arrival, immediately submit approximately 1000 requisitions which will have been prepared by the ship's storekeeper under the supervision of the Supply Officer. The Supply Officer on the 598- and 608-Class ships will be a junior line officer who has additional duties either as Communicator or Assistant Navigator. He may or he may not have had some supply training through visits to PMO; but whether or not he has had this training, he is very aware of its value and is thankful he had it or wishes he did have it. While none of the 616-Class is now served by the tender at Holy Loch, when they come there will be strong pressure to qualify some of their officers in supply, which is offset by a strong pressure to have the officers share in as many workloads as they can. Either way, the officer will have a heavy work load, as also will the two enlisted storekeepers.

"In the early ships, there is a Storekeeper First Class and a Storekeeper Second Class. In later ships there will be a Storekeeper Second Class and Storekeeper Third Class -- or perhaps a Striker.

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The leading storekeeper plays a vital role in maintaining the coherence and completeness of the submarine inventory. Indeed, he is probably the chief man in maintaining strict discipline on the ship. In each of the engineering divisions there will be designated supply petty officers who will furnish the storekeeper information on parts which have been repaired and which will need to be replaced at the end of the patrol and who will assist in the breakout of spares from the spare parts lockers which are distributed throughout the submarines. But the storekeepers themselves, if they run the operation with a good discipline, will not permit anyone else to breakout spares: they, themselves, will breakout the spares on a 24-hour basis. Many of the spares are 'conveniently' located in living spaces and behind bunks so that it is frequently necessary to wake a man from his sleep to procure the necessary spare part.

"The requisition and inventory control process aboard ship is purely manual although Electronic Accounting Machine Cards will be prepared for use aboard the tender. The search for spare parts, when there is ambiguity or uncertainty about the item or acceptable alternatives, is aided by various technical publications, including a massive well-thumbed catalog called the FOCSL. The ship documents will also include a COSAL, an optimum COSAL, or -- in some phase of completion -- an Anniversary COSAL. Not infrequently, and this is an important point, the patrol responsibilities of supply will include an updating task, like converting from a RIAL to a COSAL or updating a COSAL in the form of an Anniversary COSAL. Although these are all supposed to be one-time operations, and such one-time operations will probably be in the picture for some time and are a symptom of what we think is a generic problem, they are not simple operations. One patrol involved the manual comparison and audit of some 8000 inventory cards. It was almost a fulltime job for a substantial portion of the patrol just to carry through the audit change of these 8000 cards and to visually check each one of them.

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"The office space for the supply tasks on the 598- and 608-Class is a small cubicle which barely contains space for the inventory documents, a typewriter, and one man. All of the ships feel the need for additional space. Under these space restrictions, with the present manual system of operation and its concomitant need for a rigid spare parts discipline, a storekeeper with extensive service experience in complex logistics operation is required to prevent a steady and progressive deterioration of the shipboard inventory and location system. We were pleased that every storekeeper we talked to was a man of this capability. We would anticipate this as being a personnel problem of importance in the future because this experience is actively required.

"Upon arrival, the ship's thousand requisitions will be screened by the tender staff and the electronic accounting machines within 24 hours. Obvious discrepancies in Federal Stock Number and verbal parts description will be returned to the ship for reconciliation. Now, this is an important item because there have been numerous cases where the Stock Number would provide a part which bore no relationship to the verbal description.

"Requisitions which the tender cannot fill will be transmitted to PMO and SPCC by direct communication. Progress in location and shipment of these parts from CONUS can and has been reported by a system called 'NAVSTRIP'. An important point here is that the communication by NAVSTRIP is so good, and will get better, that the tender is flooded with information about the progress of spare parts requisitions. Particular attention is therefore paid to a so-called 'hot list'. This is a list of items deemed necessary for the success of the next submarine patrol. These items get a Priority 1 category for air shipment and, if available at Charleston, should arrive by air in approximately five days. Other items will receive a Priority 4 designation and, if available, should arrive in 15 days. I have heard several figures about these deliveries, and apparently 70 to 80 percent of the Priority 4 items arrive later than 15 days--other figures suggest that the percentage may be only 60.

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"Each month the missile resupply ship arrives at the tender bringing about 1000 tons of cargo and supplies. She can carry much more, but the present average holds at around this tonnage.

"It is obvious that few submarines will benefit by ship transit for spare parts requirements generated during the refit period because of the one-month cycling on the ship as compared with the briefer cycle at the tender. The ship will be in phase for only a limited number of submarines during this brief period. This is important as it relates to the need for and the importance of air transport as a continuous and necessary part of the refit procedure.

"During the refit period, the submarine is a center of continuous activity. Soon after arrival there is a change of crew. This change has one salutary effect: It ensures the equivalent of an administrative inspection with each officer and petty officer certifying the condition of the equipment, spaces and records for which he is responsible. I think this is an important part of the discipline.

"The new crew, will quickly check that the ship is in a maximum availability condition because of the need to leave on patrol whenever possible. Spare parts and general stores material will be unloaded as rapidly as possible. Missile transfers are also accomplished at an early period and sometimes a dry-docking will be required. In the last seven days of the upkeep the submarine will put to sea for navigation grooming, torpedo firing and sabot launch. After return, provisions will be topped off and efforts accelerated to resolve 'hot list' items. At this point, that submarine becomes the 'hot boat' and a 'hot boat' concept is employed which means that when parts are not available on the 'hot list', and will clearly not become available, action will be taken to obtain them from the spare parts--or cannibalization if necessary--of other submarines on hand but not on the 'hot list'. Indeed, there has been a temptation to consider the submarines alongside the tender as a spare parts tender.

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"When the submarine finally deploys, there will be from 150 to 300 requisitions still outstanding. The 'hot list' will be almost completely or completely resolved, or resolved to the satisfaction of the Skipper.

"Figure SA-2 is a summary of some of the activities handled by the AS-31 during a one-year period, and these include:

- 480 Missile Lifts
- 787 Guidance System Lifts
- 864 Re-entry Body Lifts
- 650 Navigation SPALT's processed
- 661 Torpedo Lifts

I believe this can give you some idea of the high level of activity going on, especially when you recall that they are playing a continual game of musical submarines during this process.

"The efficiency and dispatch with which this complex sea operation is carried out-- and it is done extremely well-- is such that one could easily overlook the heavy demands on time and talent which are required and the innovations which might be introduced to ease the load. For example, the Committee believes that an analysis of the tender site in terms of intership logistics would suggest the introduction of many items of handling gear not now employed. The Committee noted in its prior visit to the USS HUNLEY that overhead railways or other means for lateral movement of material were inadequate. This has proven to be the case, and we re-recommend that studies be made to ensure that this deficiency has indeed been corrected in subsequent tenders or that corrections be introduced during subsequent tender overhauls. The use of conveyor belts, cableways and/or mobile lifts, both for tender and dockside use, does not seem to have been exploited. It is noted that a special cargo conveyor has been supplied for the

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USS PROTEUS and the USS HOLLAND at the as-yet-experimental Mediterranean moor at Rota. I understand that there is some difficulty with this Mediterranean moor, again because Rota is not a calm harbor.

"The continuous movement of ships and submarines alongside the tender suggests that thought be given to measures for improving 'alongside' maneuvering. Fortunately, the submarines are already aided in this regard by the steerable outboard motor. An additional outboard motor, attachable on arrival in port, would provide variation in moment as well as thrust for an operation of this kind. This is an obvious requirement for the ability to have low speed, and control of the submarine as it maneuvers alongside. The installation of commercially available bow thrusters on the supply ships would similarly improve their efficiency in this 'game of musical ships.'

"Small craft also play a significant role in the tender site logistics. Over a hundred men -- military and UK civilians -- are involved in the operation, exclusive of maintenance, of the motor pool. Since operation of these craft is almost continuous and since, as I pointed out, all of the supplies and men that do not come over by the supply ship but by the airfield instead are channeled through this activity, we feel that a study of these crafts, their landing characteristics, and so forth, is certainly worthwhile. Thus, higher speed craft -- even hydrofoil craft -- should prove cost effective, and improved loading facilities ashore should improve the efficiency and effectiveness of this operation.

"Finally, local communication facilities between tender, dry dock, submarines, small boats and shore landings need to be desired. Improvements in this regard are not only within the state of the art but are directly available as equipment and are readily measurable in manpower utilization of equipment.

"And before I continue this report I want to point out that manpower utilization is the key element in the success of the tender

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operation and that the Committee is seriously concerned over the fact that manpower is being strained to the limit in many areas of the tender operation. As we project this forward for 20 years, we realize that this is a strain--treating man as a spare part--that we will have a very difficult time coping with.

"The second phase of my report concerns the relationship between inventory control on the submarine, inventory control on the tender, and at the CONUS supply facilities. Three levels of capability in inventory control and analysis are clearly evident. At PMO Charleston, spare parts and supply inventory will be accomplished with the aid of a 1410 IBM digital computer. SPCC will soon greatly increase its computer capacity. The processing of COSAL's, requisitions, the location of alternate stock numbers and locations, the assessment of effects on cost and military essentiality of particular inventories can be easily accomplished with these machines. The tender, on the other hand, has electrical accounting machines which perform sorting, collating, receipt and issue posting, requirements determination, requisition preparation, financial accounting and inventory reporting.

"The location and identification of spare parts in the inventory or other classification tasks can be easily accomplished but are often limited by the card-sorting time of the machine. More sophisticated operations which are easy for PMO computers can require many time-consuming card sorts on the tender electronic accounting machine. And so the first point is that it is very easy for the shore-based system to place information demands on the tender, which quickly overtax its capacity, or to flood the system with non-absorbable information.

"Now, they can 'talk' to each other in that there is a card-to-tape converter aboard ship and you can put the tape results on the air, but they really cannot 'talk' to each other as computers in the sense that one is a sorting and collating machine and the other is an electronic accounting machine. It operates by card sorts essentially; and the

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others are going to be, to some extent, random access computers. So it is extremely easy for information to come in that will flood the receiving capacity of the electronic accounting machine, and it is relatively easy for some demands to be made which are essentially trivial demands insofar as the shore-based system is concerned. I cannot predict what the demands are going to be in the future. I can only show that there have been some in the past which completely overlooked the tender capability, and this is why I say it is a generic problem that is involved.

"It is therefore easy for the shore-based system to place information demands on the tender which quickly overtax its capacity. We heard Mr. Kitchen make a statement about an additional set of items that the submarine is going to fill out on the cards; and I have noticed over the past two days how often problems are to be resolved by having the fellow on the submarine add one more line or one more item to the simple card that he now fills out for the inventory management and control procedure.

"For example, there has been recently introduced on the submarine a system for handling preventive maintenance repairs; it is the type of system that uses check-off cards. While it is a good system, it requires that the man handle one more set of forms in addition to the failure reports, inventory documents, and the others. In this sense, it is just one more manual task in the business of record-keeping aboard the submarine. I will return again to this point of the over-loading of hand-work for the submarine personnel.

"Mr. Kitchen mentioned seven data processing tapes being used at LMSC and particularly that these tapes already contained information well beyond any capability of absorbing it. In this sense, we have data beyond our abilities for data management. Thus, I suggest that we look at this problem with consideration of the fact that the bulk of our inventory is on the submarines, and that for ten submarines we have an inventory management group of only 20 storekeepers and

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10 part-time supply officers. Further, this small group functions without too much help from automatic data equipment. The tasks they do are important and should be done; modern technology gives us the means for them to do these tasks well -- there are even computers on the ships now that could be used.

"The ultimate solution is an appropriately matched computer capability on submarine and tender; not necessarily the same capacity and size, but an appropriately matched capacity. A dilemma is posed between the need for a study to determine the best computer requirements and the passage of time during which no capability exists. As noted in our last report, the PCO of the USS SIMON LAKE has made a study which indicates that immediate gains would accrue by acquisition of a computer of the same make but smaller capacity than that which would be employed at Charleston. The Committee recommends this acquisition as a pilot operation in exploiting tender computer utility. The Committee recommends against installation, at this time, of a computer aboard tenders now actively engaged in submarine support.

"The margin of reserve manpower on these ships is now so small that the disruptive effect of innovation could not be tolerated despite future gains. Such installation should be made during overhaul and after study. Similarly, the Committee reiterates its belief that the computer capability already existing on the submarine could, after study, be effectively employed in the inventory process. There are, of course, many other tasks which a shipborne computer could perform: The scheduling of tender workload, accounting and payroll, personnel schedules and determination from a suitable military essentiality cost model of the changes in tender load."

"We also have the 1004 on the AS-19 and AS-32 now," said Captain LaBarre. "It is certainly a step above the EAM, but not at all comparable to the 1410 being mentioned for the AS-33. It is working well and its continued use is recommended."

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"We can proceed along two lines here," Dr. Craven replied. "First we should equip the USS SIMON LAKE with whatever gear its Captain would like to have aboard. Second, we should conduct a very thorough study of what ought to be aboard the other tenders, including the USS PROTEUS. This study should be directed at establishing an overall system, and thus it must include a careful look at what PMO Charleston has and what SPCC has in the way of equipment, together with the kind of things they now generate and the things they can generate and may generate in the future. One of the requirements for the tender system is going to be the ability to meet the requirements laid on it from PMO and SPCC.

"Then we must go one step further and look at the submarine, because the submarine is the place where everything begins. Even if the tender is well coordinated with PMO and SPCC, the tender personnel will be forced to do a vast amount of pencil-and-paper work unless the submarine can function compatibly with the tender system."

"Is ours a problem of translation of new information into machine-useful form?" asked Admiral Smith. "A major part of the submarine's work in this area has to do with new information, whether it is in spares, supplies, or in preventive maintenance."

"That is correct," replied Dr. Craven, "and we must find an automatic way of processing this new information on the submarine into a form that can be accepted by the computers on the tender and in the shore bases. The submarine is focal in originating new information -- in a sense this is what they do much of -- about changes in its inventory, its spare parts, its usage data, its failures, and so on."

"Will you give us an idea of how this can be done?" asked Admiral Smith.

"There are equipments in use now which handle production information and can read into the machine whether or not a job has been

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completed," said Mr. Eyestone. "The job goes through a plant with a planning ticket with it. The ticket is so set up that when placed in a read-in box it indicates completion and at what time. This may not be exactly what you want, but it might be adapted to these needs."

"We must determine how we want to 'talk' between machines -- cards, tapes, or wires," said Dr. Frank.

"An 'automated chit' system is now used in many department stores," said Dr. Craven. "A card or chit is fed into a computer and there is no manual processing. These cards are created by the manufacturer or supplier and are packaged in with the shipment."

"Are you talking about imposing this requirement in some way nationally, on all of DSA's stock for instance?" said Admiral Smith.

"I think it is important to note that these problems belong to the Department of Defense and not just us," replied Dr. Craven.

"I think you could go to COSAL and select parts," suggested Captain Sims, "which is what he is working against anyway."

"We can provide any number of aids as part of the COSAL for purposes of access to the computer," added Captain LaBarre.

"Let us forget that for the moment," said Dr. Craven, "because Admiral Smith's questions had to do with the generation of new information as it automatically occurs in relation to the receipt or use of a spare part, and this has nothing to do with the COSAL. This information is generated when the storekeeper unlocks a locker and breaks out a spare part. As soon as that part is distributed, the storekeeper has to complete some manual operations. He must subtract that part from his list of spares. He must indicate when he needs to reorder it when he can, and such similar functions. In connection with, we would like a simple system for the man to get this information into machine record form."

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"It is to this end, in fact, the 'automated edit' system in that he is dealing with pieces of punched cards which identify the piece he just broke or issued. The card should be in the package just opened, and these extra cards represent a list of items issued."

"Do we impose this system on the entire DOD?" asked Admiral Smith. "About half the items we are concerned with here come under the Defense Supply Agency of DOD."

Dr. Frank observed that the major problem here is the mass of information on the submarine which is now handled by some manual method, and that it seemed highly likely that some computer on board could be adapted to meet the problem. Admiral Smith disagreed, noting that the problem was converting the information into some computer-useful form; the computer did not have to be located on the submarine at all.

Dr. Craven summarized briefly: It would be desirable to have some form of machine system on the submarine to assist the personnel in keeping the mass of information they have about stores and spares in stock. If such a system were developed, it would be necessary that it, as a system, communicate directly with the data system on the tender; that, in advance of this, a job analysis should be done on the work of the submarine storekeepers according to the parts issued, SPALT's accomplished and similar tasks. In particular, it might be well to note those incidents when a spare is not available under its own listing, that the storekeepers thumb through their data books for another part which might serve as well, do locate this other part and use it, as this can occur even when a man might be an unimportant spare and the second might be quite important. In short, we can learn the total load on the storekeepers.

Captain Sims relates that the "computer" which might come from Dr. Craven's suggestions would be for use on the entire DOD in that

the attempts to systematize at the ship level will eventually degrade the data somewhere in the overall system. Dr. Kirchner observed that a study of the overall functions on the tender should tackle the problems there rather than trying to solve things from a global standpoint.

"We feel that we have identified some major bottlenecks," resumed Dr. Craven. "One has to do with the small boat, one with intership logistics, and one with the so-called 'hot list' items. The boat problem may be more of a problem at Holy Loch than at Rota, but we have not yet enough experience to tell.

"Concerning the 'hot list' we have found a small degree of commonality in terms of repeating items, and some anomalies like tritium paper, which is an AEC item that is never in stock. For the most part, the 'hot list' is short without too many repeaters on it.

"Yesterday, Captain Moore spoke of determining the tender load in terms of military essentiality: this relates directly to what we said earlier about using the computer to make changes in the tender load from a study of suitable military essentiality. Figure SA-3 shows by hull number the various requisitions processed by the USS HUNLEY; earlier I mentioned that when the ship first came in, a thousand requisitions would be processed and then an additional 400 to 500 items would show up in requisitions during the refit. Of the total, about 900 or a 1000 can be filled from the USS HUNLEY, and the others must be transmitted to PMO Charleston. Of those sent to PMO, possibly a third will be items that showed up late in the refit and are placed on the 'hot list' because of the time pressure.

"There are some items that cannot be carried on the tender; in fact, we must simply accept the fact that there will always be items that will not be in stock on the tender. We will continue to make improvements in the tender loading, but we will never be able to answer every need.

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"On the figure, NC means items not carried in the tender load, while NIS refers to items carried but not in stock at the moment. The NC items are those items for which replacement cannot be anticipated such as when someone breaks a glass door. Again, we must anticipate some demand for such things, but it will not be enough to justify carrying them on the tender. Other items, like SPALT kits, are not carried on the tender as a matter of policy. There are several categories -- about six or seven small groups -- that are not carried as a matter of policy."

Captain Pugh observed that some of the Not Carried items might not actually be repair parts or spare parts, and Captain Cooley added that any items carrying Federal Stock Numbers should be in the system; in one sense Dr. Craven is discussing how we are stocked with FSN items.

"Figure SA-4," continued Dr. Craven, "indicates the types of action occurring at the tender. The first line suggests items that the ship changed its mind about, or items asked for but not on hand that may not have been essential or important, so the requisition was withdrawn. The NSI items on the figure are Not Stocked -- we used NC for this on earlier figures -- items that are not in the stock system, and do not have Federal Stock Numbers. These must be ordered by part number or manufacturer's number."

Captain LaBarre cited as an example contractor furnished material that was selected, bought and installed by the contractor in the hull, mechanical, and electrical area; items here are not carried as listed spares, are not part of any allowance document, and may number as high as 3000 or 4000 and include all manner of consumables and non-consumables.

"Getting on to requisitioned material," resumed Dr. Craven, "on the SSBQ#600, PMOLANT received requisitions as follows:

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system or not; they can be needed spares or they can be missing items but in each case the particular CO does not feel he can go to sea without them.

"It is obvious to the Committee," continued Dr. Craven, "that the tender, of itself, will never be able to maintain complete supply and support effectiveness. It is also obvious that the time schedule of the submarines requires airlift capability to the tender site. Thus, we recommend that we establish a regular airlift capability which would go from Charleston through Holy Loch and through Rota and back again.

"While the Committee did not recommend this next item and while we did not talk about it, it seems possible that we might be able to save time in returning spare parts by air, particularly for those that are in the pipeline an inordinately long time.

"This takes us to the question of the doctrine for the tender and possibility of replacing this air capability with a more frequent ship capability. The Committee feels that these plans relate to the survivability of the system; they relate to treating the system as a survivable element. In other words, we treat the submarine as a load list on a military essentiality criteria not only for its patrol effectiveness but its survivability. We must presume in a post-strike situation that there may not be a tender, and that the submarine should have the kind of on-board spares supply list that would keep it effective as long as possible.

"On the next level, we can consider the tender and the submarines together in a system and presume that in a post-strike situation not only would there be no airfields available but there probably would not be ships available; thus we ought to look at tenders versus submarines as a total survivable system without any support. Accordingly, a

portion of the tender stock should be continuously maintained at what we might call a 'warehouse operation' wherein supplies should be stored on the basis of military essentiality criteria. We are presuming that the tender and the submarine are being considered as a total unit."

Admiral Smith wondered how Dr. Craven could reconcile this thought with his earlier expressed need for regular air transit.

"The basic point is that military essentiality could determine the load for the tender," replied Dr. Craven. "Earlier we heard that all items should be cleared off the tender if they have not moved in two years. In the light of our ultimate mission, I think that essentiality is a far better criterion. I think that we can look at the tender and see that we have, might have, stocked the tender heavily with desirable but not essential items, possibly to relieve the need for airlifting them. Now when the tender is stocked heavily with such items, then this means that space is being used that might be set aside for militarily essential items, and accordingly will detract from the survivability of the submarine/tender system. I am suggesting that the tender keep a full stock of militarily essential items at all times and that the airlift be used to supply the desirable but not essential items, even when they are high-usage items.

"We have spent a great deal of time and money in developing the tenders. One of the major reasons is the long transit time for the submarine in going to and from CONUS, which would mean a good many more submarines would be needed to maintain the deterrent posture. In that sense, the tender saves a great deal of money and represents a peace-time convenience. But only up to the point of going to war.

"In predicting wartime conditions, we must have considered the survivability factor for the tenders -- we must have one planned to

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operate at Charleston, plus the three overseas sites. The tenders are intended to get out to sea rapidly if a wartime situation develops because we do not intend to lose tenders unless it cannot be helped. Eventually the tenders must take to some harbor and be ready to service the submarines. One of the major reasons for POLARIS is its survivable role; we must also presume that the tenders have a good chance of surviving. If they do survive, then their facilities must be able to guarantee the submarines as long an operational life as is possible. At that time, the need for militarily essential items will be overriding and the tender must be able to respond to it.

"Now at present, in determining essentiality, the primary consideration will certainly be whether the lack of this item would cause an abort of the mission. After that, we would have to search for a balance in support that would carry the largest number of submarines for the longest period of time. Thus, I think the first question to be answered is: Can we define a military essentiality criterion that relates to the military essentiality of the tender?"

Admiral Smith observed that the tender would most likely be filled with emergency rations and people under such a plan. Mr. Stevenson felt that there could be another application where the aircraft might not be available but AK's and similar support ships could still be used.

"This is an optional way of looking at the problem," replied Dr. Craven. "More frequent ship travel -- if the crossing time can be held down -- would possibly best work if a ship left Charleston so that its arrival at Holy Loch would correspond to the arrival of a submarine. However, this would cut off support in all those items where the need turns up during the last fifteen days of the refit period. I grant that we are using a rather large ship for a relatively small cargo, but should we be deprived of air transport for any reason, we would have to fall back on the use of ships. We can also presume that ships

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are a great deal more survivable than will be airfields near Holy Loch, for example.

"Here again, we must face the need to determine the tender loading so that it can best be self-sufficient in supporting the submarines during any war situation. The items essential for the submarine mission should be on the tender at that time rather than on a transiting ship. To accomplish this, we must accept the capacity of the tender and then plan how we may best use it in terms of supporting the SSB(N)'s during war.

"We are not thinking along these lines now. If we need greater capacity at Holy Loch, we add some barges. When we think about improving efficiency, we suggest offloading all parts that have not moved in two years. If we can be assured permanent peace, this is a reasonable suggestion; whenever a slow-moving item is needed, it can be airlifted or ship-carried to the tender. If we introduce an emergency basis to this system, immediately there is a problem of assured delivery.

"We have never done a thorough study of why we have a tender and why we have the kind of tenders that we do. For example, present tenders have an 18-knot capability; this was done at the insistence of the Ships Characteristic Board and the only reason that I can assign to this is the increased survivability gained by the 18 knots. Similarly, we plan to keep a tender at Charleston; again survivability seems to be the best explanation. The higher speed has added a high premium to the cost of the tenders, and the expenditure can only be justified in greater survivability; in all other senses, we could live as well with a 5-knot or 8-knot ship."

Dr. Kirchner observed that one could take a better look at what ought to be done on the tender if he ignored the essentiality criteria, and added that he would recommend the elimination of all items that had not moved in two years. Dr. Craighan disagreed.

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"Next, I would like to read the final sentence in this paragraph to sum up the conclusion to which the majority of the Committee agree: It is therefore important, from the standpoint of survivability, that the tender load be based on a criteria of military essentiality and from the standpoint of cold war operations, that the airlift capability be improved to provide a continuous and, if necessary, private airlift channel linking Charleston, Holy Loch, and Rota. The Committee so recommends.

"The final phase of this report is a series of recommendations concerning men, materials and money. The Committee notes that many of these recommendations are in the process of implementation and will be implemented in the near future. Indeed, the frustrating problem of operations today is the unavailability of recommendations to be implemented tomorrow. The Committee therefore recommends with respect to men:

- (a) That line officers designated as supply officers be given off-patrol training in supply and spare parts management and that off-patrol seminars for the exchange of ideas and problems be encouraged.
- (b) That efforts be made to maintain the high experience level of storekeepers -- that submarine duty not be a prerequisite for this duty if an experienced man can otherwise be obtained.
- (c) That the desirability of having supply officers on the 598- and 608-Class submarines be re-examined.
- (d) That recognition be given to the heavy work overload, particularly in the Navigation Department, of the tender by a concerted effort to reduce the number of routinely required navigation grooming tasks, to reduce the numbers of tender-implemented

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SPALT's, and to increase the return of parts rather than repairing parts aboard the tender.

The Committee recommends that with respect to material:

Recognition be made of the fact that at the present time all spare parts are unwrapped aboard the tender and rewrapped to the lowest component level for submarine storage. This tedious and non-quality controlled operation should be eliminated by component level packaging by the vendor. It is understood that this is being implemented for parts peculiar to POLARIS-FBM. It should be implemented for the total ship system. Seals are broken--humidity seals, and things of this kind--and then the parts are rewrapped and resealed in poor quality-control environments by a long and tedious operation."

Asked about the packaging problem, Dr. Craven explained that the original packages from the manufacturer have the shock protection and insulation deemed necessary, which means that the package is somewhat oversize in terms of the contained material; the tenders break them open and place the parts in plastic bags for delivery to the submarine. Admiral Smith observed that the level of protection needed on the submarine was less than the level needed during transit and handling. Dr. Craven agreed, but felt that better packaging right from the start might help this problem by eliminating the need to break open packages on the tender; he noted that some success had been realized already in this area but only in dealing with a small percentage of the total items, and that the desired plan would allow the tender to transfer items without breaking any humidity seals, dust covers and similar protections.

"We have found," resumed Dr. Craven, "several problems that have become evident to the tender personnel. They do not easily recognize that these problems are generic with the equipment that we have. They should be called to our attention as problems that

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the tenders are aware of. For example: The atmospheric control equipment trouble and failure record is sufficiently higher than other systems to be clearly evident to them. This suggests an early implementation and acceleration of advanced research and design of items like the gas chromatograph, electro-dialysis oxygen generator, and CO₂ scrubber. These things that are now in the difficult development stage should be accelerated and would probably be cost-effective in terms of reducing the amount of work that the tender now engages in; this has meant a very heavy workload for the tender and is a continuing cause of concern.

"The tender is, of course, plagued by the problem of non-standard valves and pumps in each submarine. Here is a case where the demand record is not very high but the non-standardness of these items from submarine to submarine is a cause of a great deal of work. The tender has found that alternate valves and pumps can sometimes be used, though they are not so designated as a result of a Federal Stock Catalog or whatever change is installed on such items in order to get the equipment moving. This suggests a more detailed look at interchangeability and at the use and design of adapters to ease the tender inventory and supply problem with respect to these items that are really non-standard. When we recognize that we have a parallel ship construction operation in four yards and that each yard has the option of using its own purchased parts and that there is a class change each time, we can realize why we get a ship-peculiar problem with respect to some of these parts.

"Finally, it should be reiterated that material handling is a major part of effective material use. There is complete agreement on the need for crane facilities of modest lift ability which can reach the outboard submarine when two are moored alongside; that is one example of the importance of improving the material movement problem at the tender.

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"Finally, with respect to money, the Committee notes that for some time the squadron has been operating in an anomalous situation in which a budget is established for each refit and full price for each replacement item is charged regardless of the fact that only a small portion of the rejected and returned item may require repair. This is indeed an anomalous accounting procedure.

"The real problem that occurs here-- and it is both interesting and relevant-- concerns the items that account for its stewardship, the small items that go for ship management and control. The other part of these items are the items which go with its equipment. Here we attempt to encourage the policy of sending back major components rather than digging into the equipment and making changes.

"This can be clarified by figure SA-5, where we can see that for the SSB(N)600, where one percent of the total requisitions cost \$160,000 and represented 38 percent of the total refit cost, and further down the column where 21 percent of the total requisitions accounted for 95 percent of the total refit cost.

"These figures and percentages impose a very natural desire on the submarine commander to attempt to cut down on these costs and leads him to try more and more on-board repairs, and to break things down to the lowest component level before sending them in for repairs. This situation will change when we move from the NSA accounting system to the APA accounting for then, parts will become free for the ship, and this fact alone can introduce problems. For the present, I think the artificial budgeting figures do impose real constraints upon the tender and the submarine, and that we should attempt to release them from this responsibility as soon as possible.

"The second aspect of money is true cost. It is difficult and possibly misleading and even presumptuous to make observations on absolute cost, viewed solely from the user's viewpoint without any association

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with the design, the quality-control-position aspects, and so forth. Nevertheless, the user on the tender has an opportunity to observe item cost over a wide spectrum of industrial supply. Having that opportunity, the tender people regard the real cost of navigation spares as being higher than any others in the total system. While the Committee is generally cautious about recommending changes as a result of this kind of a feeling, and with some caution about value-engineering, we suggest that a cost review of navigation spares might yield profit even in the face of requalification of each value-engineered part. The tender felt sufficiently strong about this to take us down and show us a number of items which they had selected from their inventory with their cost. It would be less than honest for the Committee to say that from its own value standpoint, it did not agree that the pieces shown them were high-priced. These parts seemed to be higher in cost than we would not have expected based upon our own limited experience in the hardware field."

In response to a question from Captain Chrisman, Dr. Craven explained that the missiles come to the tender as free items, with no price tag attached at all. "As a matter of fact," continued Dr. Craven, "the missile is hardly any problem at all for the personnel on the tender. There is very little work done on board and very few gripes and beefs from the working personnel. There is a workload concerned with the missile, but it is kept away from the tender. The tender's ability to work on missiles is man-limited."

Mr. Parran observed that there was a moral in that fact-- more wooden sub-systems. Mr. Peterson wondered if the Skippers of the tenders and submarines were judged in any way by the refit costs-- given some part of their rating because the crews are good or because they are no good and break a great many things. Dr. Craven observed that there might be a grading of the efficiency of the management of the ship inventory. Dr. Craven was also asked if there were any

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duplication of requisitions between the outgoing and the incoming submarine commanders when the crew change was made, and he replied in the negative.

"You have mentioned the navigation sub-system several times," said Commander Oesterich, "and I would like to hear your summary of what feelings your group took away from the tender regarding this equipment and the attitudes of the tender personnel about it."

"Summarizing this will not be easy," replied Dr. Craven, "because we know how difficult navigation is, the great number of parts associated with it, and the high precision required of it. It may well be that the nature of navigation requires a continuous grooming and a continuous load aboard the tender."

"If this is indeed the case, then we must take strong measures to increase the number of people in the navigation repair shop aboard the tender. In other words, we have to get many more highly qualified people. The way it is now, there are too few men -- only 25 to 30 men -- involved. These men are in short supply because they have had to be well trained and they are forced to work hard for long hours. They are deprived of liberty periods that other personnel have. They are not part of the submarine crew, and so they do not have three months ashore."

"It is going to be particularly difficult to retain these men in service for more than six years. Therefore, we have to look carefully to determine if this is indeed the case; and if it is, then we may have to take drastic measures in regard to tender personnel. This is the way I would summarize our feelings."

Dr. Barrow wished to make certain points regarding computers that would be in line with Dr. Craven's remarks in his talk, as follows:

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- a. The computer is probably the smallest part of any data processing center -- usually being two small consoles, surrounded by data processing equipment which get information into and out of the computer.
- b. Very rarely has the installation of a data processing center led to any reduction in work or in personnel. On the contrary, personnel are almost always increased because once this equipment is available, then there are a host of tasks that people would not even consider doing before they had the computer and data processing equipment. Suddenly all kinds of tasks pop up, and it is often quite difficult to keep the data system from becoming a monster.
- c. Invariably, people tend to grossly underestimate the amount of non-hardware effort that must go into an automatic data processing center.

"There is another point to consider," said Mr. Parran. "The submarine has inventory, maintenance, and operational functions, and so, for that matter, does the tender and the personnel on the beach. They share these operations. It seems that any system that might be able to answer the requirements on the submarine, should also be able to communicate with the systems that answer these requirements on the tender and on shore back in CONUS. In other words, these things must be approached on an overall system standpoint.

"As a second point, the escalation of the TFR's has convinced me that we need to do things that will simplify the transfer of TFR data to the punched card form; if we cannot do better with the TFR's, we may well bog down completely with this input information."

"My point is directed towards relieving the load on the man in the submarine," replied Dr. Craven. "We have been creating for the

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beach here some pretty elaborate systems in information processing, and yet all of it relates to what is happening on the submarine. All these systems must draw from the submarines the data for the system -- every time it represents a new demand upon the submarine for some form of information. I may have misused the word 'computer' in my remarks, but we certainly need some system on the submarine to get all of the information out of the submarine that all the land based systems of ours require in order to function. We have these big systems, but they all seem to be supported on the backs of one or two men in the submarine."

Dr. Barrow suggested that the information might be gotten out without any elaborate data processing center there -- the processing could be done elsewhere -- and he agreed that something better than the present system must be found.

"Whatever we use," responded Dr. Craven, "we place an even higher premium on the accuracy of such information. I might add that this kind of accuracy is hard to come by on the submarine -- it starts in training and must continue through a stringent day-by-day supply discipline on board the submarine; it means continual resistance to all chiefs and petty officers who might want a set of keys or who might happen to be nearer the supply bins. The ship's storekeeper will have to be a good accountant and a very strict disciplinarian about his assignment, because misinformation that would get into any system from the submarine, would not easily be controverted.

"This is an area of great importance -- an SSB(N) with two ineffective storekeepers might have to have the entire COSAL done over again on its return from one patrol."

At this time, Admiral Smith called the meeting into Executive Session for a discussion of a report of his own.

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It was stated that, "We have had changes in this SDC as we have gone from class to class and some of the information obtained in previous classes does not pertain. But the fact is that we have had changes, and we have had component failures on newer classes of SDC and this has been our prime example. We have certain items which have been turned in for repair which are not repaired. They are now taking a look at providing a COSAL for some of these items which have not failed in the past.

"However, by certain changes from the 598- to the 616-Class, appears that people thought we had adequate support and we apparently do not.

Admiral Smith observed, "One of the pitfalls we want to avoid, though, is to accomplish the same thing by cannibalizing from pieces of equipment that are in production. That is what you are trying to avoid here."

Mr. Conigliaro commented, "There is provision in the contract where Sperry can move very fast and get at least an initial buy on those critical parts plus, of course, we can expedite data on production of prime equipment. I feel even when we know this it takes a long time for us to get that part back into the system."

Admiral Smith added, "We have got to look at it in relation to the manufacturing time, too. Your problem may disappear by the time some of these things get manufactured."

Captain La Barre asked Commander Wilson, "If you give us a good list do you think that most of these problems will go away?"

Commander Wilson replied, "The additional layer on the navigation, this will help. but to go one step further I asked that consideration be given not to cancel the I&C spares concept throughout

the construction until we finish the 640-Class, or I think we are going to be in trouble. Complicating it further is the pipeline, when you have to get a replacement, we locally requisition a replacement from Charleston. If it is to come from Sperry, I believe Sperry sends the part to Charleston and it may be down there meeting other demands for the Fleet and we are unable to get it, and again I have statistics of real logistics to get replacement parts. It is tough, and I suggest maybe these could come directly from the vendor."

Admiral Smith asked, "Would you rather they not go to the deployed ships?"

Commander Wilson replied, "I am saying that is one reason. It may be it is sitting in Charleston, and we are being told by the repair parts program management plan reports that we are 100 percent outfitted, and we are not. Charleston must have used these parts submitted by the vendors for deployed ships, and we do not have them. Thus, for the ships outfitting, and for I&C spares and when there is no I&C, we have shortages.

"I really believe that we need I&C spares until the completion of the construction program in all systems, and suggest a study to shorten the pipeline."

At this point the meeting was recessed for the day.

"When yesterday's discussion ended," resumed Admiral Smith after calling the Friday morning session to order, "we were still discussing points introduced by Captain Moore in his talk."

Mr. Peterson noted that he had some question on the wisdom of adding a spare on the basis of one new requisition, as this seemed little better than requisitioning by guesswork.

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"For my part," observed Admiral Smith, "I would like to know about the depth of spares that would result if we added a new line item to the system stock each time we received a requisition. You can say that there is a six month delay and that this delay would not be too important because there would be little demand for such items. This does not mean much because you decided that there will be no usage beforehand; however, if usage should occur, what about the six months delay?"

Dr. Frank remarked that cannibalization would be necessary merely to keep operating. Captain LaBarre clarified Admiral Smith's comment by explaining that it would apply to non-stock-numbered items such as items on the consumable ship construction list; these items are not necessarily repair parts as such, and we do not know very much about them except EB's work on what the tender needs to maintain a nuclear submarine.

"Commander Wilson spoke of this as a flat policy," continued Captain LaBarre, "and I believe this is the normal policy in this area. However, such repair part requisitions are given a second look, and it is not easy to predict the depth that will be bought from one demand. Again, these might be items with potential repetitive use which were overlooked the first time; similarly, this could cover items which had been considered and we were satisfied from the characteristics that they would never need to be replaced due to normal wear and tear and handling. Then the item is dropped or is smashed with a hammer and we need replacements. In cases like this, we would need to know the failure experience.

"Again, some of these items may be carried as consumable items and they are bought on a dollar-value order basis; purchases of this kind can be monitored on a monthly basis."

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Mr. Parran had certain points about repairable items: If someone wants a repairable item, what triggers the process? Is it a statement of needing the item or the actual fact of a failure? If one fails, it can be close to a catastrophe for the submarine; what triggers a buy or a consideration of a buy?

"Buys are triggered by a demand first," explained Captain Wheeler, "followed by contact with the SP people concerned. Then if the item is not under contract, we will have to replace it, in the case of a shelf item, or requisition one if it was, in fact, a usable item."

Commander Oesterich observed that earlier in the program there were many requests for items not covered by the allowance list, but that supply discipline, had improved with time. "Lack of funds may be one reason," continued the Commander, "because the Type Commander cannot tolerate requests for unlisted items. We could have the problem of submarines wanting to carry some spares which are not on the allowance list where there is no breakdown -- people who want to be on the safe side. If the part actually breaks down, then we must supply the replacement."

Captain LaBarre pointed out the most often the replacement is secured in these cases without putting the item on the allowance list. Captain Sadler mentioned from his own experience a bearing failure that had not been predicted or else had been overlooked on the allowance lists; once the failure occurred, the item was purchased in quantity and stocked.

At this moment, Admiral Smith introduced Captain Hammerstone for the presentation of the Launching Committee's logistics support efforts. Captain Hammerstone turned the meeting over to Mr. Herbert Cabral of Westinghouse at Sunnyvale, the Deputy Manager of the Westinghouse POLARIS project.

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"Admiral Galantin mentioned yesterday," began Admiral Smith, "the over-all look at the system that Secretary Nitze and Secretary McNamara took. This was generated largely by Secretary McNamara; all the words and figures of the presentation were closely monitored, reviewed, and ultimately approved by him.

"I do not know whether he had his tongue in his cheek a bit, but the way in which he presented this information to the Congress gives us a picture we have not had before of what he expects of us, what he understands the situation to be today, and what he expects of the system in the future. He placed many things we have talked about in perspective. When I say 'his tongue in his cheek' I mean he certainly did not know what it was going to cost. If we present him with a bill, we really do not know whether he will say 'Fine. That is what I expected.'

"We have on two figures a number summary of the data he presented to Congress. Figure 1 is a measure of the readiness of the over-all submarine while it is on patrol. Strictly speaking, it is the readiness of all the systems to start carrying out the functions that they were designed to carry out.

"In the logistics sense, a piece of equipment that is essential to firing that is not functioning for a portion of the patrol will be reflected in these figures. He is saying that he expects 98 per cent alert readiness reliability in the future.

"The 100 per cent launch reliability figure has to be interpreted. In the first place, this figure relates to a two-hour time period and shows the ability to get all the missiles off. All the figures on this and the next chart are rounded to the nearest whole numbers.

POLARIS WEAPON SYSTEM RELIABILITY FACTORS
SHIPS AT SEA - NO WARNING CONDITION

	FEB 25 1964	END FY 1965		END FY 1966		END FY 1967		END FY 1968		END FY 1969	
	A-1 A-2	A-1 A-2	A-3	A-1 A-2	A-3	A-1 A-2	A-3	A-1 A-2	A-3	A-1 A-2	A-3
<u>WEAPON SYSTEM RELIABILITY</u>											
<u>ALERT READINESS RELIABILITY</u>	100% 98%	100% 98%	—	100% 98%	—	98%	—	98%	—	98%	—
<u>LAUNCH RELIABILITY</u>	100% 100%	100% 100%	—	100% 100%	—	100%	—	100%	—	100%	—
<u>IN-FLIGHT RELIABILITY</u>	50% 79%	50% 79%	—	50% 79%	—	79%	—	79%	—	79%	—
<u>WARHEAD RELIABILITY</u>	99% 99%	99% 99%	—	99% 99%	—	99%	—	99%	—	99%	—
<u>TOTAL WEAPON SYSTEM RELIABILITY</u>	49% 76%	49% 76%	76%	49% 76%	76%	76%	76%	76%	76%	76%	76%
<u>SURVIVAL RATE</u>	100% 100%	100% 100%	100%	100% 100%	100%	100%	100%	100%	100%	100%	100%
<u>PENETRATION RATE</u>	100% 100%	100% 100%	100%	100% 100%	100%	100%	100%	100%	100%	100%	100%
<u>TOTAL RELIABILITY SHIPS AT SEA</u>	49% 76%	49% 76%	76%	49% 76%	76%	76%	76%	76%	76%	76%	76%

Figure 1

POLARIS WEAPON SYSTEM RELIABILITY FACTORS
NO WARNING CONDITION

	FEB 25, 1964		END FY 1965			END FY 1966			END FY 1967 TO END FY 1969		
	A-1	A-2 TOTAL	A-1	A-2	A-3 TOTAL	A-1	A-2	A-3 TOTAL	A-2	A-3 TOTAL	
A. TOTAL MISSILES IN FORCE	80	96	80	208	176	32	208	320	208	448	656
B. PERCENT AT SEA * & YEAR AVERAGE, EXCEPT FIRST COLUMN	80%	83%	59%	59%	59%	59%	59%	59%	59%	59%	59%
C. TOTAL RELIA- BILITY SHIPS AT SEA	49%	76%	49%	76%	76%	49%	76%	76%	76%	76%	76%
D. T.F.D. ** (B X C)	39%	63%	29%	45%	45%	29%	45%	45%	45%	45%	45%
E. TOTAL WEAPONS ON TARGET (A X D)	31	60	23	94	79	9	94	144	94	202	296
F. TOTAL FATALI- TIES	25 TO 35 MILLION ***								40 TO 60 MILLION ***		

• THE FIGURES FOR THE A-1 AND A-3 WILL VARY FROM THIS WHEN THE CONVERSION FROM A-1 TO A-3 IS TAKING PLACE.

•• TOTAL FORCE DEPENDABILITY.

••• A CONSERVATIVELY LOW ESTIMATE OF FATALITIES TO SOVIETS ALONE.

Figure 2

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"He expects the warhead reliability, the survival rate, and the penetration rate to stay above 99.5 per cent throughout this period of time.

"The last line on figure 1 is a product of all above in the total.

"This takes care of performance expected on patrol, but the relation of supply effectiveness and equipment reliability affect these figures.

"Line A in figure 2 is a computation of the number of missiles against the plan. Line B is the percentage that is expected to be ready to stay at sea. This comes into the logistics effectiveness, as far as completing the refits within the scheduled period of time is concerned. We multiply this figure by the reliability figure from the first chart; the end product is the Total Force Dependability shown in Line D.

"In getting together some of the goals in supply, logistics, and tender effectiveness, we deduced that it was this sort of perfection that was expected. This is the first time we had really seen a statement or an acceptance on the part of Mr. McNamara that this is what he really proposed. Our deduction was made by translating these figures into dollars in terms of the investment cost of the total system -- particularly when we compared other investment costs, such as the magnitude of inventory of spare parts and things of this sort.

"The total, as Dr. Craven mentioned here meetings ago, is something like \$13 times 10⁹. One per cent change is worth quite a bit. Essentially, you would have to argue that, if you do not want to make the investment in that way, then to get the same results you would have to put it in additional force. We have to conclude that there is a relation between need and costs in buying the total force.

"At the same time, we have struggled for some time with the problem that Dr. Craven mentioned. That is, why we stock the tender in a particular

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way; this has been just as knotty a problem as it appeared to be when we started questioning Dr. Craven because there is an additional factor that does not come into this at all -- what is the value of that mobility of the tender? I have never been able to get this argued out any better than we did a little while ago.

"I would like also to comment about one further general problem in this area -- budgeting. It was noted several times that we can expect more and more pressure in various areas because of the cost of the inventory, the way we purchase, and generally, the justification of the budgeting.

"We here in SP have certainly felt this, and considerable efforts -- some of which you have seen the results of -- have been directed towards planning how much we should have to get as direct a comparison as possible. We want to do this in as logical and repeatable manner as we can, based on as much data and as little judgment as possible.

"Every time we have been able to relate the costs directly, as a budget justification, to the effectiveness or the reduction of effectiveness, no one has been willing to say that the system is not worth the 13 billion dollars that we paid for it, and we really do not want to pay to hold that effectiveness at the less than one per cent reduction.

"This has led to some of the problems that have been discussed today of predicting precisely two years in advance what the needs will be. I am quite sure that we are going to have to continue to call on you for more sophistication and planning more directly related to provable numbers than we have in the past. It is going to get worse, and in many ways the replenishment part of it is the worst.

"However, in the replenishment area, we are predicting the usage by putting together such a budget, predicting what the needs will be to hold this over-all performance up to that degree.

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"What will the needs be two years in advance? If we do not get the money to put in the budget, then all of this planning falls apart. We can do better and better jobs with what we have, but we still run up against that end point eventually.

"I think this covers the general points I wished to make before we start talking about what we can do concerning some of the items in the recommendations. I think the first one we should consider is, 'Can we get more complete usage data and, if we can, what steps should we take to obtain this information'."

Captain Sims observed that the general trend suggests that usage data are less accurate than demand data, and that the need for greater accuracy tends to force the use of the demand figures. Captain LaBarre suggested that the RADCOM project might yield more accurate usage data in the near future. RADCOM was explained as a system to extract usage and demand data at the tender level on information supplied by the submarine; the system also relates the part used or required to its component, equipment or item. These data are relayed to Mechanicsburg for processing and outputs to management. The important output is usage-by-component and this can become a useful warning signal when the output is given in 'exceptions' or items whose usage and demand extends well beyond the originally estimated rate. These outputs can be pulled according to contractor. Soon RADCOM will be able to give a three-year usage profile to show how the usage rate is changing drastically from the past. High-usage items are being identified and corrections are being made, either as SPALT's, as future production design changes, or both. As a result of these efforts, usage rates have dropped to zero in some examples.

Admiral Smith observed that there seemed to be two ways in which this situation can go, "one of them involving changes expected to reduce the usage, and these would be made on the basis of available input data;

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the other would entail the gradually improving basis for extrapolation of usage data that can eventually be gained by close examination of the nature of individual troubles and failures. In each case, we are still in the position of having to depend upon this data for some important decisions for the program."

Regarding installation and checkout, Mr. Peterson stated that there were far fewer problems when the I&C was maintained tightly within the SP-contractor loop, but that this technique was not necessarily the most expensive way of handling the I&C phase; Mr. Parran agreed that the best I&C cost-effectiveness seems to occur when control is tight, response time rapid, communication lines short, and responsibility firmly placed on the shoulders of the people who are furnishing the prime equipment.

"I wonder if there might not be some merit in having a parts pool for procurement," suggested Admiral Smith, "at each of the construction yards. This pool would be in the custody of the sub-system contractor who would function under a job-order contract to replace any materials withdrawn from the pool."

Captain LaBarre agreed that the pool might be the best solution possible at the present time. Admiral Smith added that the budgeting problems for installation and construction are far different than the budgeting problems for the rest of the procurement; he referred to the specific problem of the unexpectedly and unpredictably high costs of the navigation purchases.

Discussion then turned to the criticality and essentiality of parts and components. Admiral Smith suggested that essentiality is defined best by what happens to the equipment and to the mission if this piece of part is missing or fails to function. Mr. Stevenson observed that if you can provide an engineer with a failed-part situation under specific operating conditions, he can give a flat 'Yes-No' answer about the success of the missile; when the described conditions do not prevail or when the operating conditions are not known, he cannot give a flat answer and he may not be able to give any answer.

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"We certainly must be able to define parts and components in terms of their effect on mission success," stated Admiral Smith.

"By way of terminal remarks," said Admiral Galantin, "I suspect that one of our problems is to bridge the differences in function, and to bring together the sometimes-conflicting responsibilities of the men who are in technical control of a system and the men who are responsible for the more mundane functions of stocking, procuring, budgeting and the like. At times, these two factions do appear to be in conflict --- their differences can be almost diametrically opposed in matters involving the budget, for example. But from this discussion, I have hopes that we can draw the two elements closer together. Certainly I think that Captain Wheeler has a new awareness of the reasons for our intense scrutiny of technical detail and quality control, and for the reluctance of the technical groups to turn control over to the existing OSO system until they are completely assured about responsiveness. I think that the technical groups may have a keener appreciation of OSO's abilities as a result of this discussion, and that we may have better communication and understanding between these two groups as a result of this meeting."

"I might add," said Admiral Smith, "that Secretary McNamara's presentation to Congress has left us no room for any reduction of effectiveness in the POLARIS system. The figures he gave Congress are within one percent of the nominal, and until we hear otherwise, we must take this as a statement of what he expects of us."

Other discussion having ended, Admiral Smith assigned the 20th and 21st of May as the dates for the next STG meeting, breaking, at the request of many of the members, the long-standing Thursday-Friday meeting schedule. The meeting was then adjourned at 1818 hours on 27 March 1964.