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Technical Report No. 6

SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL:

IMPLICATIONS FOR

CERTAIN OPERATIONAL AND ADMINISTRATIVE PROBLEMS.

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PREFACE

This report is one of a series based on shipboard observation of electronics personnel aboard ships of the destroyer class. The titles of these reports are given here along with a brief indication of the content of each. Security restrictions do not permit the general circulation of all of these reports but the accompanying list will help the reader place the present report in context.

1. Shipboard Observation of Electronics Personnel:
A Description of the Research.

A general presentation of the problem, its background, and the observational techniques which were employed.

2. Shipboard Observation of Electronics Personnel:
Detailed Description of Observational Techniques.

A report for the professional worker who desires precise detail regarding the forms and instructions used and the decisions underlying their selection. The summarized data are provided in a classified supplement.

3. Shipboard Observation of Electronics Personnel:
Implications for the Training of Electronics Personnel.

Various problems of training are formulated and related to the observational data. (RESTRICTED)

4. Shipboard Observation of Electronics Personnel:
Shipboard Activities of Electronics Technicians.

Detailed accounts of the activities of electronics technicians are presented. Topics such as the materials, duties, problems, and future plans of the technicians are discussed. (RESTRICTED)

5. Shipboard Observation of Electronics Personnel:
Brief Descriptions of Related Electronics Jobs.

The jobs of the Sonarman, Radarman, and Radioman are briefly described. The areas of overlap between these jobs and the job of the ET are discussed. (RESTRICTED)

6. Shipboard Observation of Electronics Personnel:
Implications for Certain Operational and Administrative Problems.

Problems of Shipboard administration, policy, and the operational requirements of the electronics situation are related to the observational data. (RESTRICTED)

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7. Shipboard Observation of Electronics Personnel:
General Conclusions and Recommendations for Further Research.

The objectives of the research are reexamined and general conclusions are drawn. Promising research hypotheses and methods are presented. (RESTRICTED)

ACKNOWLEDGMENTS

The research reported in this series reflects the contribution of a large number of persons within the Military Establishment. Grateful appreciation for this assistance is extended to the Cruiser Destroyer Force, Pacific; the Training Command, Pacific, and the Underway Training Element of that command; the Training Division and the Research Division, Bureau of Naval Personnel; the Personnel and Training Branch of the Psychological Services Division of the Office of Naval Research; and the Electronics Coordinator's Section of the Office of the Chief of Naval Operations.

ABSTRACT

This report is one of a series based upon descriptions of electronics maintenance as observed on twenty ships of the destroyer class within the Pacific Fleet. The descriptions themselves were objective in nature and they attempted to produce an accurate non-evaluative "picture" of the current electronics situation. The present report presents those elements of the situation which are relevant to problems of shipboard organization and matters of higher policy. The organization of various electronics technician's groups is described along with the effects of the various forms of organization. The electronics material officer's relation to the maintenance situation is discussed. Effects of certain shipboard administrative arrangements are described in the section concerned with the role of the bridge in the electronics situation. Formal and informal methods for relaying requests for repair are described, and the effects of each type are discussed. The feasibility of combining certain of the electronics ratings is considered, and some material problems affecting maintenance are pointed out.

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SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL:
IMPLICATIONS FOR CERTAIN OPERATIONAL AND ADMINISTRATIVE PROBLEMS.

I. INTRODUCTION

This report is the sixth of a series of reports which are based upon data collected aboard ships of the destroyer class within the Pacific fleet. These data were collected by members of the research group who traveled about in teams of two and spent approximately four days on each of the ships that they visited. These men were interested exclusively in obtaining complete, detailed, and unbiased descriptions of the personnel aspects of the electronics maintenance programs aboard these ships. Although no specific effort was made to seek answers for a set of formalized questions or hypotheses, the methods used were expected to yield information which could be directed toward a number of problem areas in the general maintenance picture.

When observations had been concluded on twenty ships and the data were analyzed, those features of the descriptions which seemed pertinent to particular areas of interest were organized into technical reports.¹ The present report is an attempt to relate the descriptive data to Naval personnel policies.

II. ADMINISTRATIVE CONTROL OF ET TEAM.

At the time these observations were made, the administrative control of the electronics technicians was being shifted from the engineering

¹ See Preface, page 1

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department to the operations department. Most of the officers and enlisted men who were involved revealed a general approval of this shift. The chief engineers, who had been responsible for the ET team previous to the change, reported that they had been unable to assume more than a "paper" responsibility for the electronics technicians or to exercise any direct supervision of this group. In most instances, the engineering officers indicated that they had relied heavily upon the electronics material officer and members of the operations department concerning such matters as ET liberty. In addition, the chief engineers indicated that the lack of availability of ETs for general engineering duties was a source of some friction among the enlisted members of the engineering department.

The overall reaction of the chief engineers to the presence of the electronics technicians within that department was that someone had to sign papers for the ETs, and as long as this type of administrative control did not become too burdensome, the arrangement was satisfactory. Most of these officers felt that there was a closer bond between the operators of electronic equipment and electronics maintenance personnel than there was between the electronics maintenance group and other members of the engineering department.

The opinions of the CIC officers, the operations officers, and the electronics material officers were almost unanimous that the shift of the ETs from the engineering department to the operations department had been accomplished in practice prior to the official transfer. This group of officers

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generally favored the change because it gave them more direct control² over the ETs. These same officers stated that electronics technicians frequently worked for long, continuous periods of time, forfeiting their liberty, in order to have the electronic equipment in proper operating condition. The new administrative arrangement would permit the operations officer to compensate these ETs for their lost liberty by approving liberty at a more opportune time.

The observers generally report that the nature of the electronics technicians' duties was such that these men were relatively independent of strong departmental ties. The electronics technicians did not ordinarily work on a strict watch arrangement and on most ships the rated men were not required to stand deck watches at sea. A number of comments were received from both ETs and officers that the electronics technician group could function more effectively if they were given an independent, extra-departmental status. Whether this is justifiable is impossible to conclude from the data obtained.

2

Apparently there had been occasions where electronics technicians had sought and received liberty from the engineering department although some piece of electronics gear was out of order and the operations officer wanted the ETs to stay aboard and continue working on the equipment after normal duty hours. With the ETs in the operations department, this type of situation would automatically be eliminated.

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III. THE ET TEAM

A major portion of the actual maintenance of electronic equipment aboard destroyers is handled by the electronics technicians. To a large extent, the success with which the maintenance program is carried out depends upon the effectiveness of these men. Because of the key position of this group in the maintenance picture, this section of the report is devoted to an analysis of the internal organization of the electronics technician gang.

One might legitimately expect, on an a priori basis, several different forms of organization of a small group of specialists who operate somewhat autonomously within the framework of the total ship's organization. One possible organization would be that all of the technicians would have a coordinate status and would do very similar jobs. The group would be composed of a small pool of men with more or less homogeneous activities and duties. It would be quite difficult for an outside observer to determine which of the men were rated and which were not rated. One would not expect a member of this group to stand out as a "lead."

A second form of organization that the ET gang might take would be essentially similar to the one just mentioned. In this instance, however, one member of the gang would definitely stand out as a leading petty officer who supervised and controlled the activities of the other members.

A third possible form of organization would find the group divided into rated and non-rated men, while a fourth form would find three discriminable types of electronics technicians - a leading petty officer, other petty officers, and seamen.

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The ultimate in organizational heterogeneity is represented by the case in which the job as done by each of the various rates is different from that of the men in each of the other rates. The military rating structure and the differential qualifications for advancement in rating suggest this possibility. However, the observers found that either the second or fourth type of internal organization mentioned above was closer to the actual situation found aboard the destroyers visited. Generally speaking, the job as done by the men of a given rate (e.g., 2nd class ET) varied so much from ship to ship that the within rate differences were more striking than the differences between the various rates.

THE LEAD ET

Some of the regularly assigned ET leading petty officers were not on board at the time that the ships were visited and their places were being filled temporarily by another member of the group. There were also instances in which the lead ET had been assigned to the ship so recently he had not assumed the full responsibilities of his job. Setting these "doubtful" lead ETs aside, a comprehensive examination of the data was made to determine the extent to which the jobs of the eleven remaining³ lead ETs differed from the jobs of the other ETs in general. Table 1 is made up of those activities which were engaged in by at least 3 of the 11 regularly assigned lead ETs but which were not engaged in by as many as half of the remaining members of the ET sample.

³ This group of "real" leads consisted of 3 chiefs, 3 ET/1, 2 ET/2, and 3 ET/3.

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Table 1

Electronics Maintenance Activities Characteristic of Lead ETs and
Not Characteristic of Other ETs
(Card Sort)

Adjust number of pulses of range mark multivibrator.
Adjust pulse frequency.
Adjust range mark gating multivibrator.
Calibrate radar range marks according to a given known range.
Correct instruction books when field changes are made.

Determine receiver sensitivity.
Instruct ETs in maintenance fine points.
Instruct personnel in safety precautions.
Instruct radar operators in maintenance.
Measure oscillator output.

Measure output frequency of radio transmitter.
Mechanically adjust scope focus coil.
Replace broken interlocks.
Replace helipot assembly.
Replace variable capacitors.

Submit field change report card.
Supervise corrective maintenance activities.
Synchronize PPI sweeps in corrective maintenance.
Take inventory of ordinary hand tools.

There is no need to emphasize the fact that the lead ET petty officers⁴ engaged in numerous activities in addition to those listed. The items in the table, however, are those which clearly differentiate the lead ETs from the rest of the electronics technicians. Those items which are related to the instruction and supervision of personnel conform to the customary notion of the

⁴ For a complete list of activities engaged in by both leads and non-leads see Data Supplement, Report 2 of this series. For comparisons of activities of certain combinations of rates, see Report 4 of this series.

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activities of the lead ET. Other items, such as "adjust pulse frequency" are more difficult to rationalize as activities which characterize the leading petty officers. These other items may appear simply because the need for these activities occurs infrequently and the lead ETs have had more opportunity to perform them. Or, the lead ETs may reserve for themselves those repair activities which are of such a nature that an inexperienced man would have difficulty performing them.

Tables 2, 3, and 4 summarize an additional attempt to differentiate the lead ETs from the non-leads. The criterion used in the development of Table 1 (i.e., 8 of the 11 regularly assigned lead ETs reported these items but less than half of the remaining members of the ET sample reported them) was also employed in the construction of these tables.

Table 2

Responsibilities for Various Materials Characteristic of Lead
ETs but Not Characteristic of Other ETs.
(Job Questionnaire Item-2)

Checking the correctness of trouble report forms. Filing and checking the correctness of equipment operation records. Supervision and training in the use of test equipment. Maintaining a full allowance of equipment instruction books. Inserting published changes in maintenance bulletins. Ordering, inventorying, and maintaining a full allowance of tools.

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Table 3

Electronics Records Characteristically Kept by Lead ETs and Not
Characteristically Kept by Other ETs.
(Job Questionnaire Item - 26)

Resistance test records. Alteration records. Custody records. Equipment installation records. Daily equipment check lists. Weekly equipment check lists.

Table 4

Electronics Test Equipment Characteristically Used by Lead ETs
but Not Characteristically Used by Other ETs.
(Job Questionnaire Item - 28)

Radar test set. Resistance bridge. Microammeter. Wave meter.

Again it is found that the customary responsibilities of a leading petty officer such as "supervision and training in the use of test equipment" are listed in Table 2. There are also more items which are difficult to explain, except by the previous conjectures that they are less apt to occur in the non-leads experience or they are too complex for the non-lead and are reserved for the lead ET. None of the items in any of the tables was reported exclusively by the lead ETs, however.

Attempts to differentiate the jobs of the individual rates within the ET rating were handicapped by the small number of men in the higher rates and by

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the great disparity between the number of men in each of the rates. Although an analysis of this type is not possible on the basis of the present sample, inspection of the data suggests that there is little indication of rigid rate stratification particularly among the lower rates (2nd, 3rd class and seaman ETs).

Strong petty officer leadership may be a key issue in successful electronics maintenance in the fleet. Regular members of the group as well as the new ET aboard ship look to the lead ET for direction. The lead ET is expected to delegate responsibility, set a good example, and keep the younger men in line. He uses the technical knowledge he has gained through experience for a dual purpose, working and teaching. He is expected to perform corrective maintenance activities as well as train other members of the gang on a continuing basis in order to increase their effectiveness as members of the ET team. In addition, the leading petty officers' supervisory duties extend beyond the technical aspect of maintenance into administrative control of the members of his crew. He acts as a liason between the electronics technicians and other members of the ship's crew. He is fundamentally responsible for maintaining a team of electronics technicians who are highly motivated and who take pride in their work and their ship.

On certain ships the leading petty officer seldom made definite work assignments and the ETs were more or less always on call. As a result, the activities of the members of these ET gangs were determined almost entirely by men outside of the gang. In these cases, from an organizational standpoint, the lead ET was more of a spokesman for, rather than a director of, the group, and he was more likely to relay

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instructions than to initiate them.

While there are a number of ways in which the ET gang can be organized and in which the lead ET may exercise his leadership, it is not possible to determine from the present descriptive data which of the ways is "best." However, it appeared to the observers that on those ships where the lead ET assumed active direction of the ET gang, team work and effectiveness in maintenance were better than those cases where the lead assumed a status coordinate with other members of the group.

On most of the ships visited the job of lead ET was traditionally delegated to the highest rated man with the most seniority.⁵ Under normal circumstances, that is, assuming that each ship possessed high rated petty officers, this type of delegation would result in experienced men being appointed to the job of lead ET. This does not always prove to be the case, however. Many of the ships visited had no ETs of a rate higher than 3rd class, and as a result the important job of lead ET was assigned by necessity to men of relatively little experience, both in maintenance and supervision. Table 5 gives the rates of the lead ET petty officers on the ships visited. The table presents both "true" lead ETs (as characterized before) and acting lead ETs in separate columns.

⁵ On one ship, however, a chief was bypassed in favor of a 1st class ET due to an asserted "short-timer's" attitude on the part of the chief.

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Table 5

Leading ET Petty Officers' Rates

Rate of Lead ET	Number of "True" leads	Number of "Acting" leads	Total leads
Chief	4	3	7
First class	4	1	5
Second class	2	0	2
Third class	3	3	6
Total	13	7	20

It is apparent from the table that almost as many ships had third class lead ETs as had chief lead ETs. In light of the fact that the job of the lead ET is one of prime importance in a successful maintenance team operation, this information indicates a need for a method of ensuring that each destroyer-type ship has at least one chief or first class ET who is fully qualified to handle the job of leading petty officer. The higher rated men are more experienced and consequently have more to offer the rest of the ETs, especially in the important functions of instructing personnel, and in setting-up and carrying out an effective maintenance program. To further illustrate this fact, it was found that the leading petty officers of the rates of 1st and chief had an average of eight years service time in the Navy, whereas, the lead petty officers of the rates of 2nd and 3rd class had an average of only two and one-half years' service in the Navy.

V. THE ELECTRONICS MATERIAL OFFICER

The relationship of the electronics material officer to the ET gang, as well as to all other officers and enlisted men aboard ship, is another

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key to an effective electronics maintenance program. Electronics material officers were reported by the observers to range from those who had no experience or training in electronics, had little to do with ETs, and were never seen to contact ETs during the observational trip, to the other extreme at which the EMOs were constantly on top of the ETs, participating in all types of maintenance activity, and actually working inside of the gear. Neither of these extremes appeared to produce a balanced, well-integrated electronics maintenance team.

It appeared, rather, that the most effective EMO was the man who delegated the responsibility for the actual maintenance of the electronic equipment to the lead ET and other members of the ET gang while retaining the responsibility for administrative supervision. In this regard, the ETs and officers aboard each ship were polled to determine the part they thought the electronics material officer should play in maintenance operations. Table 6 gives the results of this poll.

It is evident from the table that the officers and ETs were overwhelmingly in favor of the electronics material officer confining his maintenance activities to supervision. Also, from comments made by ETs, it was felt that this supervision should be tempered so that the officers do not continually lean over the technician giving advice and asking questions.

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Table 6

Opinions as to the Part the Electronics Material Officer Should
Play in Tuning and Maintenance Operations Expressed in Terms of
the Percentage of a Respondent Group
Favoring an Activity.

(General Questionnaire - Item 8)

Respondent Groups		% Favoring the EMO Handle Equip.	% Favoring the EMO Supervise But Not Handle Equip.	% Giving No Response
N	Designation			
71	ET	3	94	3
12	EMO off.	8	84	8
15	CIC off.	0	87	13
14	ASW off.	0	79	21
13	Comm. off.	15	85	0
13	Oper. off.	0	100	0
18	Gun. off.	0	83	17
12	Eng. off.	0	92	8
11	Exec. off.	9	91	0

One complaint that was received from the ETs concerned the fact that sometimes the electronics material officer had only a limited knowledge of, and consequently, no interest in electronics. One EMO reported this to be the case with himself. In order to evaluate the extent to which this was true in the sample of EMOs observed, the following biographical information is presented.

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The sample contained thirteen electronics material officers from whom were obtained a number of facts concerning their backgrounds. By obtaining median values for these men, it is possible to give a picture of the typical EMO. It was found that the typical electronics material officer was a LT/JG, was 27 years of age, had served 48 months in the Navy, had held his present rank 14 months, had been on his present ship 8 months, and was as likely to be USNR as USN. He had held the job title of EMO for 11 months and had completed 16 years of civilian schooling. Eight EMOs majored in some kind of engineering in college, one majored in business administration, one in physics, and one had no major. Of those who majored in engineering, four were electrical engineers, two were electronics engineers, one was a civil engineer, and one was a mechanical engineer. Three of the officers had not been to any form of electronics school in the Navy and seven had not held civilian jobs which would apply to their electronics jobs in any way.

The question which is most important to the present section is whether or not the EMOs in the fleet have a background which would qualify them for the job. Inspection of the records of the EMOs reveals that only two EMOs had no qualifications (in terms of training, experience, or hobbies) which would enable them to perform the job of electronics material officer with assurance. Both had college majors which applied in no way to electronics, had held jobs in civilian life which were far removed from electronics, and had had no Navy electronics training of any kind. The other officers had either majored in electronics in college, worked in electronics in civilian life, completed an electronics course for officers in the Navy, or (in the case of several officers) had done all three.

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Biographical information was not available from seven EMOs.

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From this it can be concluded that, on the whole, the job of electronics material officer is being filled by qualified men. When this was not the case, the lack of qualification worked a hardship on both the officers and the men involved since a certain amount of comprehension and knowledge of electronics terminology, at least, is necessary in order to wisely and fairly supervise the ETs in their maintenance activities. Lack of this knowledge appears to engender a lack of interest on the part of the officers and a consequent lack of respect of ETs for their supervisor.

VI. THE ROLE OF THE BRIDGE IN THE ELECTRONICS SET-UP

The bridge (the Captain down through the department and division officers) has a principal role in determining the efficiency and adequacy of the electronics maintenance program aboard ship. Several of the more important factors relating to the role of the bridge in electronics maintenance are discussed in this section.

Coordination Between Departments.

Maximal coordination between the sub-groups of any organization is necessary for the most efficient functioning of any single sub-group. The information collected from the various ships yields several somewhat conflicting viewpoints concerning the degree to which the coordination achieved on the ships affects the electronics maintenance program. The ETs and various officers aboard ship were asked to rank five factors which contributed to excessive shutdown time of electronics equipment.

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Table 7 gives the results of this ranking.

Table 7

Opinions as to the Most Frequent Contributor to Excessive Shutdown Time of Electronic Gear Expressed in Terms of the Median of the Ranks Assigned By the Members of a Respondent Group*

(General Questionnaire - Item 29)

Respondent Group		Median Rank Assigned to:				
		Insufficient Preventive Maintenance	Spare Parts Difficulties	Poor Coordination Between Ship's Dept.	Inexperienced Personnel	Carelessness of Personnel
N	Desig.					
69	ET	2.8	2.3	4.0	2.7	3.2
12	EMO	1.5	4.0	3.5	2.2	3.5
13	CIC	1.9	2.6	4.8	2.6	3.9
9	ASW	1.7	3.0	4.8	2.2	3.2
12	COMI	2.2	3.5	4.2	1.8	3.5
7	OPER	1.75 (8)**	1.5 (8)**	4.4	2.3	4.6
10	GUN	1.2	3.8	4.7	2.3	2.5
11	ENG	1.2	4.2	4.2	3.0	2.8
10	EXEC	1.9	2.0	4.8	2.8	4.0

* Most frequent contributor was ranked 1; least frequent was ranked 6.

** N as indicated in parentheses.

It can be seen that poor coordination between departments was in almost every case ranked as the least important contributor to excessive shutdown time.

In interviews with both electronic material officers and CIC officers aboard the various ships, questions were asked concerning the relationship between these two officers, whose jobs overlap somewhat where the electronics equipment is concerned. The majority of both groups of officers indicated that there was little or no conflict between the two or between their men. Tables 8 and 9 give the abstracted answers of the EMOs and the CIC officers, respectively.

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Table 8

Abstracted Answers to Interview Question Asked of EMOs Concerning the
Relationship Between the EMO and the CIC Officer*

N = 9**

Relationship	Freq.
No conflict.	5
Electronics should be in operations department.	2
Small conflict as to who should do cleaning for inspection.	1
Small conflict in attempting to fix responsibility on each other when gear fails.	1
CIC officer personally hard to get along with.	1
CIC officer demands ETs time on trivial matters that his own men should be able to take care of.	1
CIC officer fails to work through proper channels.	1

*

In terms of frequency of response.

**

For this item, there may be more than one answer for each respondent.
Therefore, the N of the responses will not equal the N of the respondents.

Table 9

Abstracted Answers to Interview Question Asked of CIC Officers as to
the Relationship Between the CIC Officer and the EMO*

N = 9

Relationship	Freq.
No conflict.	7
Slight friction in coordinating time and effort. Otherwise no conflict.	1
EMO wants ETs to do preventive maintenance. CIC officer wants RDBs to do preventive maintenance.	1

*

In terms of frequency of response.

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Most of the comments in the two tables relating to friction between the two officers involve the proper division of responsibility between the ETs and the RDs.

On the other hand, many comments were obtained from interviews with the EMOs and the ETs which gave explicit mention of an existing lack of coordination between departments. The following comments are illustrative.

ET/2:

"I think division organization is a big handicap to the ETs doing their job. There is no set policy on how a job should be done. They should set and maintain a schedule of what has to be done and they should see that the ETs know what equipment is out and what has to be done. They don't do that here. The division officer should set up the schedule and see that it is carried out. If the lead ET tries to do it, it doesn't work out."

EMO:

"I remember the last administrative inspection we had, just after thirty-three days at sea. For administrative inspections everything has to be in tiptop shape, very clean. We had two days to do it. The radarmen, the radiomen, and the ETs all thought that everyone else was going to clean the gear up and when it came time for the inspection we were marked down for it. I had put the work out to the CIC officer or the leading radar man, and he said he was going to do it and he didn't. So I think the ETs were sort of waiting for him and he was sort of waiting for the ETs. It was a general all around mix-up."

ET/SN:

"There was water dripping down on the TBL and we couldn't work on it (the TBL) for three weeks. No one would fix the holes in the deck. The deck is supposed to be watertight and it would be pointless to try to get it (the gear) going if water was going to drip on it. We saw the shipfitters about it and they kept saying they were busy and finally ignored us. We finally left it to the radiomen to keep after the shipfitters."

Although a number of comments indicate a lack of interdepartmental coordination, the data does not show that this is an important problem in the general maintenance picture aboard ship. Such friction as was reported was in the one area of effective distribution of responsibility among the various

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ratings for the different levels of maintenance activities. This problem will be discussed more fully later in the report.

Proper Utilization of the ETs.

Many comments were heard by the observers concerning the fact that ETs were being improperly utilized aboard ship, that is, they were spending so much time doing non-electronic duties that they were wasting their extensive and expensive training. To determine the extent to which this was actually true, the enlisted personnel were questioned concerning the time they spent on non-electronic duties.

The ETs as a group reported that they spent about twelve per cent of their time aboard ship on non-electronic duties. Except for one ET who reported that he spent 95 per cent of his time on non-electronic duties, the range was from 54 per cent of the time to less than 8 per cent of the time.

Most of the ETs reported that they spent less than 8 per cent of their time at these activities, with 26 per cent of them reporting that they do not have any non-electronic duties. The most frequently reported non-electronic duties were general petty officer duties, gangway watches, and working parties. Eleven per cent of the ETs performed such activities as electrician watches, switchboard watches, and messenger duties, and they spent 20 per cent of their time at these activities. Four per cent of the ETs spent 31 per cent of their time on mess duty.

From the above information it would appear that, on the whole, ETs do not spend an inordinately large percentage of their time on non-

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electronic duties. In comparison with the other ratings, ETs spend 12 per cent of their duty time at non-electronic duties, SOs spend 25 per cent of their time, RDs spend 16 per cent of their time, RMs spend 12 per cent time, and FCs spend 13 per cent of their time at non-electronic duties. The ETs, therefore, spend less time at this activity than any other rating except RM.

On the other hand, a number of actual circumstances where ETs non-electronic duties interfered with performance of electronic duties are available. On one ship where there were three ETs aboard, one was assigned to compartment cleaning and stood an electrician watch and another stood an electrician watch 4 hours on and 8 hours off. This left almost all the maintenance in the hands of one man. On another ship, the electronics material officer reported "My ET complement was cut down because I had ETs standing gun watches overseas." On still another ship, two of the three ETs aboard were required to stand electricians watches of 4 hours on and 8 hours off. The third ET had been standing the same watches up until the time a fourth ET went on leave, and he was expected to return to them when the fourth ET came back from leave. Another ship had 3 ETs assigned to it, a chief and two strikers. Both strikers stood a duty watch of 4 hours on and 4 hours off. These strikers did almost no maintenance work, leaving the chief to take care of all the gear. An electronics officer (from a different ship than any of the above) pointed out the following situation:

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"I haven't had enough men to do the work because they have been short of men in the engine room and my ETs have been having to stand electricians watches and my lead ET is only a third. I have been trying to get the men off watches in the engine-room and gradually I'm succeeding, but it still means that all the repairs have to be made by the lead ET and whatever help he can find available."

Besides the difficulties arising from ETs being unable to work on the gear because of extra duties, another problem evolves from ETs working outside the realm of electronics maintenance. This concerns the practice of assigning ETs who have come aboard ship just after completing ET school to mess duty, compartment cleaning, etc. The effect of this policy can best be pointed out by reference to a quote from an ET seaman which is illustrative of the opinions of some of the other ETs, also:

"I'm an electrical engineer and I spent nine months in ET school, but since I've been aboard (about 8 months) the whole time I've been on mess duty or compartment cleaning. I've only worked on radar once in that time, and that was on my own. I've forgotten most of what I learned and I've lost interest in remembering it."

The point that these men seem to be making is that the assignment to non-electronic duties for a long period of time tends to remove the incentive for being a "good ET" which is instilled in the schools.

One possible solution to the above difficulties would seem to be that of giving special privileges to the ETs - that is, freeing them from all non-electronic duties. In this regard, many of the comments from ETs and officers indicate that they feel this would not be a good

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solution in that it would tend to create friction among the other men.

Considering the opinions obtained from the various officer groups as to the per cent of duty time that ETs should spend on non-electronic duties, these officers stated that the ETs should spend between 8 and 10 per cent of their time with these duties. This is somewhat less than the amount of duty time that ETs estimate they actually spend (12%). They feel that they should spend only 3 per cent of their duty time on non-electronic duties. In general both the ETs and officers indicate that ETs should spend a smaller percentage of their duty time on non-electronic duties than should the other electronic ratings.

One other point concerning non-electronic duties may be mentioned. The ETs and officers were asked to rank six activities in terms of which would be best for the ETs to do when all of the gear is working. Engaging in non-electronics duties was ranked lower than doing preventive maintenance, working on maintenance records, participating in organized electronics training, and studying electronic publications. The respondents preferred that the ETs perform non-electronic duties rather than the sixth choice which was "taking it easy but remaining on call." It might be added, however, that the ETs were an exception to the latter rating. They preferred taking it easy but remaining on call to the performance of non-electronic duties.

In summing up this discussion most ETs do not spend a large amount of time on non-electronic duties, although they spend more time on non-electronic activities than the officers feel that they should. Nonetheless, in some cases, the ETs indicated that they spent so much time in this manner that the gear could not be properly maintained, and some ETs fresh from ET school

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were divorced from the electronics program for as long as nine months.

Regular Inspection of Gear and Preventive Maintenance.

During the time the observers were aboard ship, they witnessed no regular formal inspections being made on the electronic gear. It was noted, though, that the electronics material officers observed the gear, and, upon occasion, called an ET's attention to something that needed to be done. One electronics material officer was observed to make up a work list for the ETs on things that were needed on the equipment. It is quite probable that this regular association with the equipment sufficed to keep the EMO informed, to his satisfaction, of the status of the gear. For this reason, the EMOs may have felt formal inspections were unnecessary.

In an item on a questionnaire, the ETs and various officer groups were asked if the electronics material officer made regular electronic equipment inspections. Fourteen of the 71 ETs stated that inspections were made weekly, 9 said inspections were made every two weeks, 3 said monthly, and 3 said quarterly or less frequently. Forty ETs said that regular inspections were not made. Six of the 12 responding EMOs said that regular weekly inspections were made, while the other six said that regular inspections were not made. The executive officer and the department and division officers showed a tendency toward not knowing whether the EMO made regular inspections or not.

Some ETs felt that formal scheduled inspections were desirable, if based upon a true desire to arrive at an accurate picture of the status

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of the electronic gear for the purposes of determining what could be done to improve the maintenance program. This, they felt would provide an incentive to the men to perform their assigned task. They added, however, that the value of this would be lost if the inspections appeared to involve punishment for incompleting or incorrect work, since this leads to attempts to cover up and attempts to fool the officers. This is done in several ways, for example, recording proper preventive maintenance readings without actually making a check - sometimes done all at once for a whole month.

ET Training and Selection in Relation to the Ship's Administration.

The ship's administration has the task of evaluating the qualifications of ETs for advanced training in electronics and recommending them to these advanced schools. They also choose men from the ship's personnel to become strikers for a rate as an electronics technician and under proper circumstances send them to class A school. Several items from the data are pertinent to this situation.

In a questionnaire item, the ETs and officers were asked to choose from among eight possible prerequisites for advanced training those that they felt were the most important and least important determinants for class B electronics training. Their responses are presented in Table 10. (See page 25)

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Table 10

Opinions Concerning Prerequisites for Class B Electronics Training Expressed in Terms of the Percentage of a Respondent Group Selecting a Given Response

(General Questionnaire - Item 20)

Respondent Groups	Prerequisites for Class B Electronics Training																			
	Regular Navy		Lengthy Sea Duty		Lengthy Combat Experience		Strong Interest in Electronics		High School Grades		Good Electronics Perform.		Good Petty Officer Qualities		High GCT Score		% Giving No Response		% Giving No Response	
H	Desig.	if*	L*	M	L	M	L	M	L	M	L	M	L	M	L	M	L	M	L	Both
71	ET	4	20	1	20	0	24	42	0	0	11	37	0	1	4	1	6	14	15	0
12	EMO	8	8	0	42	0	33	33	0	0	8	50	0	0	0	0	0	0	0	9
15	CIC	7	33	0	27	0	13	39	0	7	0	27	0	0	7	0	0	0	0	20
14	ASW	0	21	0	29	0	29	29	0	0	0	50	0	0	0	0	0	0	0	21
13	COMM.	8	8	0	15	0	54	23	0	8	0	23	0	8	8	15	0	0	0	15
13	OPER.	0	0	0	23	0	31	31	0	0	8	31	0	0	8	8	0	8	8	22
18	GUN.	0	6	0	28	0	38	22	0	11	0	33	0	0	0	6	0	0	0	28
12	ENG.	0	33	0	25	0	8	42	0	0	17	50	0	0	0	0	0	0	9	8
11	EXEC.	0	36	0	9	0	27	9	0	0	0	64	0	0	9	27	9	0	10	0

* H represents the percentage of a respondent group designating the prerequisite as most important, and L represents the percentage designating the prerequisite as least important.

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In general, they chose "Strong Interest in Electronics" and "Good Electronics Performance Record" as the most important, and "Lengthy Combat Experience," "Lengthy Sea Duty," and "Regular Navy" as the least important prerequisites. The executive officers, who have a major hand in choosing men to be sent to school, showed a difference from the other groups, in that they did not consider "Strong Interest in Electronics" to be as important as "High GCT score."

Some comments were received relevant to the use of "Good Electronics Performance Record" as a criterion for choosing men for advanced training. Some of the ETs asserted that they felt it to be difficult for officers to judge "good performance," due to the fact that most often this judgment was made on the basis of the speed with which a repair was accomplished. The ETs feel so many variables enter into determining the speed with which a repair may be affected that an unfair judgment may easily be made.

Another source of information available from the data are comments from the ETs concerning the difficulties encountered in seeking advanced training. Many of them expressed a desire for further training, but they stated that they were unable to obtain appointment to advanced schools - especially class B school. Analysis of the data shows that only 3 out of 79 ETs reported attending schools of more than 15 weeks duration after class A school. These men were all 1st class ETs. However, 30% of the men reported attending schools of less than 15 weeks duration.

⁷
These included 2 ET/Cs, 3 ET/1s, 4 ET/2s, 8 ET/3s, and 7 ET/SNs.

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Figure 1 presents a frequency distribution of time spent in Naval electronics schools. It can be seen that the majority of men cluster around the period of 30-49 weeks as would be expected since most class A schools have durations which lie within this range.

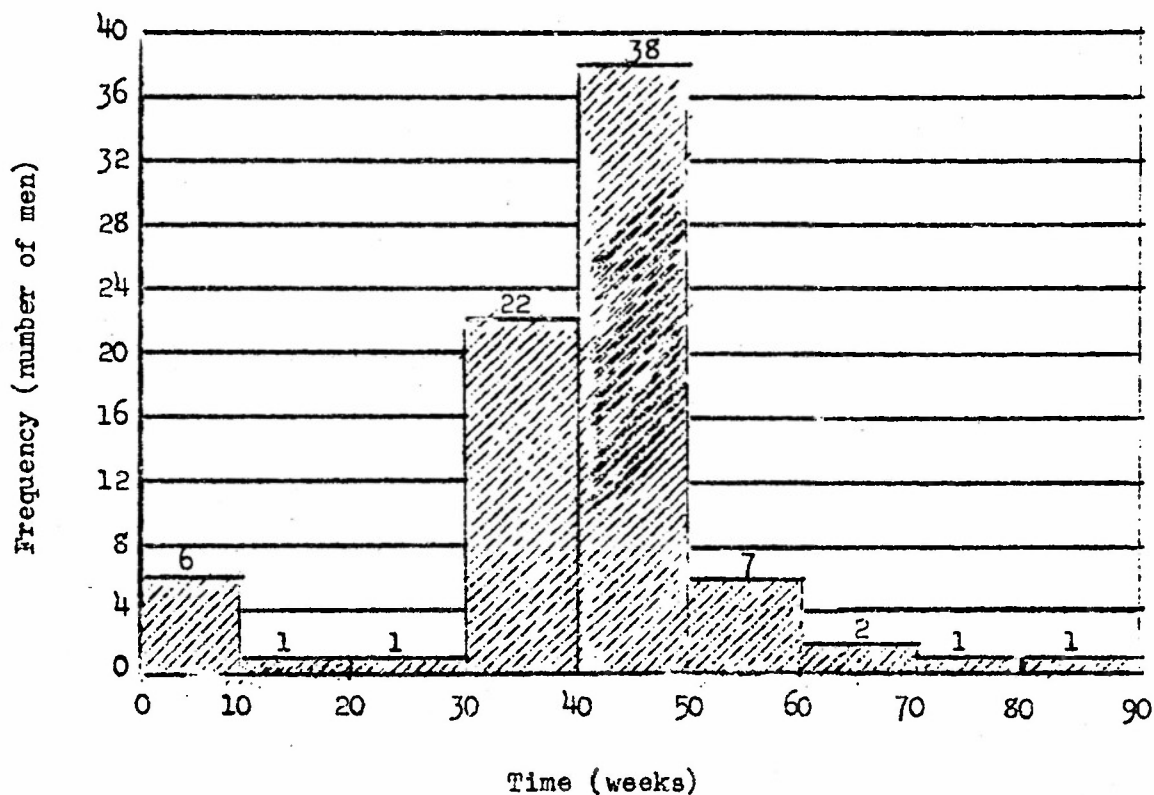


Fig. 1. Time Spent in Naval Electronics Schools.

A distribution of time ETs have spent in Naval electronics schools.

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VII. KNOWLEDGE OF ETS JOB

One of the most frequent complaints of ETs is related to other individuals' lack of understanding of the ETs' job. A number of incidents and comments were received in which difficulties were encountered by the ETs in performing their jobs and which had as a basis misunderstanding or lack of knowledge on the part of individuals outside the ET group. One of the areas of controversy is that of the problems involved in trouble shooting as far as speed is concerned. Frequently, it was reported, the officers demand time estimates for making a repair of the gear before the ET has had a chance to locate the trouble. Also, officers many times set time limits for the completion of a repair, which are not based on an estimate of the complexity of the repair but rather on the urgency of need for the equipment. It is not unusual for a seemingly simple repair job to turn into a long range repair due to the complex interactions of electronic circuits which can give rise to damage to several parts when one part breaks down. Restrictions imposed on the ETs in such cases (the ETs feel) cause undue pressures which hinder logical analysis of, and systematic search for, the trouble.

Another problem with a similar basis relates to officers making unrealistic demands of the ETs because of unfamiliarity with the limitations of the equipment. One example involved requiring the ET to trouble-shoot radio equipment because it isn't reaching another ship, when in actuality the equipment is not designed to reach that far. Similarly, they sometimes fail to take into account the fact that weather conditions hamper reception and transmission.

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A different type of behavior stemming from a lack of understanding of the equipment involves frequent calls for the ET when some minor adjustment on the equipment needs to be made. Many incidents were related by the ETs in which operators of electronic equipment called an ET to repair the equipment when the trouble was merely a switch or control knob which had been turned off and which the operator had failed to check. Many of these incidents were merely carelessness on the part of the operator. Others were due to lack of knowledge of the working of the equipment. Certain incidents were related in which officers did not know how to turn up the volume or did not understand how to switch to the proper sending or receiving equipment. Such unnecessary calls tend to disrupt the ETs in their more important duties, cause them to lose sleep, and are deleterious to their morale.

VII. RELAYING INFORMATION.

It was noted by the observers, and mentioned a number of times by the officers, that the method of relaying information concerning breakdowns or malfunctions of the electronic equipment can create problems in trouble shooting. For example, a captain of one of the ships felt that the major problem which he had to face as far as electronics was concerned was the system by which orders for trouble shooting were passed on. He told of a recent trouble in which a repeater on the bridge wasn't working when they needed it for navigating and the quartermaster who noticed it called a friend of his who was an ET and told him that the repeater wasn't working. The ET decided that since it was his

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friend who told him, it wouldn't matter if he took his time getting there to fix it. The Captain felt that the proper thing was for the quartermaster to report to the OD on the bridge that the repeater was out and thence the order should have been passed to the ET, thereby insuring that the work would be done immediately.

It was found, however, from the interviews with the electronics material officers, that they were fairly evenly divided as to whether it is more desirable to have a strict chain of command in informing the ET that some work needs to be done on equipment or whether it is best that such situations be handled on a more informal basis. In favor of this latter method of passing the word, an officer made the following comment:

"If you are operating and something goes wrong, why to go through the chain of command on a small ship is ridiculous. We don't have any surplus equipment like you could get on a large ship which could be set up and then a request turned in for repair of the other. Things have to be fixed, whether it's day or night and it would be a little ridiculous to call the electronics officer first."

Although the immediate effectiveness of the situation may be increased by permitting a man to go directly to an ET, there can be several rather serious disadvantages to such an arrangement. One such disadvantage has already been pointed out in the incident related by the ship's captain. Another drawback in bypassing the chain of command in this type of situation (as was pointed out by several officers) is that it gives rise to a tendency to bypass the chain of command in other situations. Some concrete examples were given of an engineering officer who frequently bypassed the electronics

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material officer to give orders to the ETs thereby making the EMO's job difficult. Also, on another ship the electronics material officer reported that frequently the ETs receive conflicting orders from three different sources (the engineering officer, the executive officer, and the operations officer).

Several incidents related by ETs centered about the problem of relaying information. Generally speaking, they involved a failure to notify the ET of malfunctioning equipment when casual methods of passing the word were relied upon. Although numerous equipment breakdowns are discovered by the ETs themselves in their routine checks of the equipment, erratic troubles or those troubles which occur in places where the ETs do not make frequent checks may go unnoticed. In any case, the information must reach the ET before he can effect a repair.

Those who favored some organized system for notification of equipment failure felt that for such a system to succeed it must be possible to fix the responsibility for reporting equipment failure. In this way, once a piece of information is started through the channels, the likelihood of its reaching the ETs is maximized.

IX. DELEGATION OF RESPONSIBILITIES TOWARD EQUIPMENT.

A key to efficient shipboard organization is the allocation of responsibilities in such a way that the necessary work is accomplished as quickly and effectively as possible, and friction producing factors such as misunderstanding and "buck-passing" are reduced to a minimum. Many instances were found in the data or reported by the observers

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where a lack of formal structuring of the duties and responsibilities for the different ratings resulted in reduced effectiveness in some part, or all, of the electronics system aboard ship. The following comment is illustrative:

"The main thing that stands in the way of ETs doing a better job is the conflict between the ET force and the operators. It doesn't seem to be clearly understood between the men what should be done by each one. This is mainly in terms of preventive maintenance."

It is evident, from the data collected, that there is no formal fleetwide policy to which all of the ships conform in the division of responsibilities among the ratings. Tables 11 and 12 show that there is a wide variability among the ships as to the amount of responsibility which the ETs assume toward the various types of gear, especially in terms of preventive maintenance activities.

It can be seen from the tables that corrective maintenance for radio and radar are the only activities which the ETs assume exclusively for themselves throughout the entire twenty ships. The division of responsibility for corrective maintenance on sonar and fire control radar is also somewhat standard (the ETs have the same responsibilities on about half the ships).

Not only are there differences in the amounts of maintenance performed by each of the ratings, but there are also a number of differences of opinions as to the amounts of time the various ratings should spend at this job.

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Table 11

The Number of Ships on Which ETs Have a Given Level of Responsibility for the Preventive Maintenance (P.M.) of Various Types of Electronics Equipment.

Level of Responsibility	Number of Ships			
	Search Radar	Sonar	Radio	Fire Control Radar
1. ETs do all P.M., operators do none	3	1	3	7
2. ETs do most P.M., operators help.	7	1	8	4
3. ETs do half P.M., operators do half.	5	1	6	2
4. ETs help with P.M., operators do most.	3	1	2	2
5. ETs do no P.M., operators do it all.	2	16	1	5
Total ships	20	20	20	20

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Table 12

The Number of Ships on Which ETs Have a Given Level of Responsibility for the Corrective Maintenance (C.M.) of Various Types of Electronics Equipment.

Level of Responsibility	Number of Ships			
	Search Radar	Sonar	Radio	Fire Control Radar
1. ETs do all C. M., operators do none.	20	4	20	11
2. ETs do most C.M., operators help.	0	2	0	4
3. ETs do half C.M., operators do half.	0	0	0	2
4. ETs help with C.M., operators do most.	0	4	0	2
5. ETs do no C.M., operators do it all.	0	10	0	1
Total Ships	20	20	20	20

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Table 13 shows the percentage of time that the ratings of ET, SO, and RD should spend on preventive maintenance.

Table 13

Opinions Concerning Per Cent Duty Time Various Electronic Ratings Should Spend on Preventive Maintenance Expressed in Terms of the Median of the Percentages Assigned By Each Respondent Group

(General Questionnaire - Item 14)

Respondent Group		Median % of Duty Time That Should Be Spent on Preventive Maintenance By:		
N	Desig.	ETs	SOs	Rds
69	ET	15 (70)*	23	22
12	EMO	22 (11)	20	19
12	CIC	22	26 (11)	21 (13)
11	ASW	21	12 (13)	11
9	COMM.	45 (10)	25	20
12	OPER.	22	26	24
7	GUN.	26	18	18
12	ENG.	49	27	24
10	EXEC.	50	20	20

* Numbers in brackets indicate where N differs from that given in the left-hand column of the table.

The opinions shown in the table above illustrate several interesting points. The ETs felt that they themselves should spend a smaller percentage of their time at preventive maintenance than either the RDs or the SOs. This is in conformance with the opinions expressed by ETs in interviews, in which they stated that they regard repairing of in-operative equipment as their primary duty and, therefore, they should not have to spend their time performing routine preventive maintenance tasks which the operators are capable of performing.

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The electronics material officers, the operations officers, and the CIC officers in general felt that the three ratings should spend equivalent amounts of time at preventive maintenance activities. All of the other officers expressed the opinion that the ETs should spend a much larger percentage of time at these activities than either of the other ratings. This apparently indicates that ETs should take a position of leadership regarding preventive maintenance.

The ETs estimate that they actually spend 23 per cent of their duty time on preventive maintenance, the SOs estimate that they spend 9 per cent, and the RDs estimate that they spend 5 per cent. From this it can be seen that the ETs spend much more of their duty time at present on preventive maintenance than do either the RDs or SOs. The opinions of the communications, gunnery, engineering, ASW, and executive officers, as to what the relationship should be, conforms somewhat to the relationship as it is now. The opinions of the EMOs, operations officers, and CIC officers are very different from the existing situation, and the ETs' estimates of what should be the case is just the reverse of the actual situation.

Also of interest are the estimates given by the officers and ETs as to the percentage of preventive maintenance activities which should be divided between the ETs and the operators of particular types of gear. Table 14 gives the percentages for the ETs and operators for each of four types of gear. It can be seen that in every case the officers and ETs are agreed that the largest share of preventive maintenance should fall to the operators.

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Table 14

Opinions as to the Percentage of Preventive Maintenance ETs Should Do
on Different Types of Equipment Expressed in Terms of Mean of the
Percentages Assigned by Each Respondent Group

(General Questionnaire - Item 1)

Respondent Groups		% of Preventive Maintenance to be Done on:							
		Radar by		Sonar by		Radio by		Firecontrol by	
N	Desig.	ETs	RDs	ETs	SOs	ETs	RLs	ETs	FCs
71	ET	33	67	14	86	34	66	24	76
12	EMO	29	71	12*	88*	32	68	26*	74*
14	ENG.	44	56	38	62	41	59	25	75
12	EXEC.	46	54	33	67	36	64	19	81
13	OPER.	32	68	19	81	30	70	--	--
13	CIC	32	68	--	--	--	--	--	--
17	ASW	--	--	14	86	--	--	--	--
11	COMM.	--	--	--	--	37	64	--	--
10	GUN.	--	--	--	--	--	--	22	78

*

Mean percentage calculated from N-1 cases.

Another question which is relevant to the problem of division of responsibilities is whether the ETs or the radiomen should be responsible for calibrating and maintaining radio frequencies. The officers and ETs were questioned concerning this problem and the consensus seems to favor making the radiomen responsible for calibrating and maintaining non-crystal controlled radio -- although the ETs are not as much in favor of it as the officers most closely related to the problem (EMO, Comm. O, and Oper. O.). The complete percentage breakdown of these responses is shown in Table 15.

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Table 15

Opinions as to Whether ETs or RMs Should Be Responsible for Calibrating
and Maintaining Non-crystal Controlled (BFO) Radio Frequencies
Expressed in Terms of the Percentage of Each Respondent Group
Expressing a Given Response

(General Questionnaire - Item 6)

Respondent Groups		% Favoring ETs	% Favoring RMs	% Giving No Response
N	Designation			
71	ET	42	58	0
12	EMO	25	75	0
15	CIC	20	60	20
14	ASW	29	42	29
13	COMM.	23	69	8
13	OPER.	8	92	0
18	GUN.	5	28	67
12	ENG.	33	50	17
11	EXEC.	9	73	18

The opinions relating to which of the two ratings should perform these activities for crystal controlled radio frequencies do not as clearly favor one rating over the other. The percentages are shown in Table 16. The ETs rather definitely favor giving the ETs this responsibility and the communications officers also slightly favor the ETs. However, the operations officers rather definitely favor the RMs and the EMOs show a slight preference for the RMs.

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Table 16

Opinions as to Whether ETs or RMs Should be Responsible for Calibrating
and Maintaining Crystal Controlled Radio Frequencies Expressed in
Terms of the Percentage of Each Respondent Group Selecting a
Given Response

(General Questionnaire - Item 5)

Respondent Groups		% Favoring ETs	% Favoring RMs	% Giving No Response
N	Designation			
71	ET	66	34	0
12	EMO	42	50	8
15	CIC	33	47	20
14	ASW	42	29	29
13	COMi.	54	38	8
13	OPER.	38	62	0
18	GUN.	28	17	55
12	ENG.	42	50	8
11	EXEC.	46	36	18

Very much a part of all the discussions regarding the distribution of maintenance responsibilities is a consideration of just how far the operators should be allowed or expected to go in their maintenance activities. Table 17 shows the limits to which men of the various electronic ratings are allowed to proceed when working with the equipment.

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Table 17

Percentages of Indicated Groups Checking Various Equipment Maintenance Activities as Being Required, Forbidden, or Neither Required, Nor Forbidden by Their Supervisors

	Per Cent of Those Responding				
	Dust Exterior	Dust Interior	Replace Fuses	Replace Received Type Tubes	Replace Soldered Components
ET					
Required	35	52	85	87	89
Forbidden	0	0	0	0	0
Neither	65	48	15	13	11
Sonarmen					
Required	88	79	58	51	58
Forbidden	1	3	10	11	19
Neither	11	18	32	38	33
Radarmen					
Required	90	80	27	7	1
Forbidden	0	2	23	50	58
Neither	10	18	50	43	41
Radiomen					
Required	95	81	14	16	3
Forbidden	0	7	21	32	46
Neither	5	12	65	52	51
FC (T)					
Required	93	88	100	88	93
Forbidden	0	0	0	0	0
Neither	7	12	0	12	7

The activities presented in the table may be thought of as points along a continuum progressing toward more and more complex activities in preventive and corrective maintenance. Only ETs, SOs, and FCs are required to replace soldered components (the most complex activity listed).

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On the other hand, radarmen and radiomen are not required to do this, but are not (in the case of about half of each group) expressly forbidden to do it. Most ETs feel strongly that RDs and RMs should not be allowed to perform maintenance activities inside of electronic equipment. It may be important to notice that the electronics material officers, CIC officers, and the communications officers do not agree with the ETs with regard to this matter. This disagreement is of particular interest because these officers are most closely related to the problem of operation maintenance. From comments by the ETs, it is probable that their opposition is due to their opinion that neither the RDs nor the RMs are adequately trained to work within the gear, and that when they do, frequent troubles occur. Table 18 presents the percentages for all of the operator ratings as given by all of the officer groups.

In terms of corrective maintenance the ETs and officers were unanimous in agreeing that ETs should do most of the work on radio and radar gear. On sonar gear, where the operators are trained for maintenance, the ETs, ASW officers, and the electronic material officers felt that the ETs should do about 40 per cent of the corrective maintenance. The operations officers, engineering officers and executive officers were in opposition, feeling that the ETs should do much more of the sonar corrective maintenance than the SOs. For the fire control gear, all of the ETs and officers felt that both the ETs and fire controlmen should do about half of the corrective maintenance.

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Table 18

The Percentage of Individuals in Each of Various Respondent Groups
Who Favor Allowing Operators to Do Maintenance on the Inside of
Electronic Equipment

(General Questionnaire - Item 2)

Respondent Groups		RD			RM			SC			FC		
		% Yes	% No	% Nr	% Yes	% No	% Nr	% Yes	% No	% Nr	% Yes	% No	% Nr
N	Design.												
71	ET	23	77	0	32	68	0	89	11	0	87	13	0
12	EMO	67	33	0	67	33	0	100	0	0	83	17	0
15	CIC	67	33	0	67	13	20	80	0	20	73	0	27
14	ASW	54	29	7	71	14	15	78	14	8	86	7	7
13	COMI.	54	23	0	85	15	0	77	0	23	69	0	31
13	OPER.	77	23	0	92	8	0	100	0	0	84	8	8
18	GUN.	17	28	55	22	22	56	33	17	50	83	11	6
12	ENG.	42	58	0	50	50	0	75	25	0	92	8	0
11	EXEC.	45	45	10	54	36	10	45	45	10	73	18	9

The preceding information serves to emphasize several points with regard to the division of maintenance responsibilities among the various ratings. First, it is apparent that the range of operators' maintenance responsibilities among the ships is large. Second, the opinions of the officers and ETs aboard these ships vary a great deal as to the apportionment of maintenance. Some feel that all of the preventive maintenance should be done by the operators and that the ETs should do exclusively corrective maintenance. Others feel that the operators should only operate and that all maintenance should be done by the ETs. The majority feel that the operators should do the bulk of the preventive maintenance on their own equipments, and that the major radio and radar repairs should be handled by the ETs. Corrective

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maintenance of sonar gear and fire control radar should be more or less equally shared between the operators and ETs. Third, the data collected does not provide conclusive, or even substantial, evidence as to what is the "best" division of these responsibilities -- if there is a "best" division.

It appears likely that there may not be a best division at the fleet policy level. The key may lie in a broad policy which permits each ship to determine the optimum division of responsibilities, according to the experience and training of the available personnel. The essential features of this setup is the need to ensure that there is a specific and well defined allocation of duties aboard a given ship -- and that the policy is understood by everyone concerned.

One reason to doubt the efficacy of a detailed fleet-wide policy is that wide differences exist in the training and experience of the men in the different electronic ratings. Table 19 shows the distribution of the time spent in Navy training schools by each of four electronics ratings (SO, RD, RM, FC).

Some additional figures may be pointed out in relation to the training of these men. In the case of 188 radarmen reporting on their training 45 per cent had less than 16 weeks of training, 31 per cent had less than 10 weeks training, and 25 per cent had less than 5 weeks training. Of the sonarmen (116 men), 16 per cent had less than 20 weeks training, and 9 per cent had less than 5 weeks training.

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Table 19

Distribution of Time Spent In Navy Training Schools
(ET, SO, RD, RM, FC)

Weeks Schooling	Number of Men				
	ET	SO	RD	RM	FC
0 - 4	6	11	47	19	3
5 - 9	0	0	11	2	0
10 - 14	1	5	23	4	1
15 - 19	0	3	51	61	1
20 - 24	0	49	28	10	2
25 - 29	1	30	15	2	0
30 - 34	0	11	8	1	0
35 - 39	22	2	3	3	0
40 - 44	24	4	2	2	2
45 - 49	14	1	0	0	1
50 - 54	6	0	0	1	1
55 - 59	1	0	0	0	1
60 - 64	1	0	0	0	2
65 - 69	1	0	0	0	1
70 - 74	1*	0	0	0	1*
Total N -	79	116	188	105	17

* In addition, one FC/C spent a total of 104 weeks and one ET/C spent a total of 80 weeks in Navy training schools.

In the case of the fire controlmen, the derivation of percentages is of little value due to the fact that they were a select sample and were probably not representative of all fire controlmen, and the sample was so small (17 men) that any percentages would be meaningless.

X. COMBINING RATINGS.

It was suggested by several sources that combining various ratings within the electronics group might lead to a more efficient utilization of man-

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power and eliminate much overlap in duties among the various ratings. The officers and ETs aboard the ships visited were asked to consider various possible combinations and to register their approval or disapproval of each combination. The results show that only two combinations were favored to any great extent. The combination of the ratings of FT and FC was favored by 59 per cent of the respondents and the combination of the ratings of ET and FT was favored by 44 per cent of the respondents. Table 20 gives the complete figures on these responses.

Table 20

Frequency With Which Various Respondent Groups Say That Certain Electronics Ratings Should Be Combined*

(General Questionnaire - Item 16)

Respondent Groups		Listed Combinations of Ratings					Combination of Ratings Added by the Respondents					Freq. of No Resp.	
		ET-FT	ET-RD	FT-FC	RD-FC	RM-ET	ET-YN	RD-SO	RM-TI	SO-ET	SO-FT		None
N	Desig.												
71	ET	34	2	40	2	4	0	0	0	2	0	4	10
12	ENO	6	0	4	1	0	1	0	0	0	0	1	2
15	CIC	5	0	6	1	1	0	0	0	0	0	3	4
14	ASW	1	1	3	0	1	0	1	0	1	0	2	7
13	COMI.	3	2	4	2	3	0	0	1	1	0	1	4
13	OPER.	2	1	4	1	2	0	0	0	0	1	4	2
18	GUN.	5	0	11	0	1	0	0	0	0	0	1	1
12	ENG.	4	1	4	0	0	0	0	0	0	0	0	7
11	EXEC.	0	2	5	0	0	0	1	0	0	0	0	5

* Respondents not limited to one selection.

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One method for evaluating the feasibility of combining jobs is to determine the extent to which the abilities required for one job are also required for another. In this connection, officers were asked to indicate the relative importance of nineteen abilities for the jobs of the men they supervise. Examination of their responses reveals that the abilities needed for the job of ET are similar to those needed for the job of FT. Also, the abilities needed for the job of radarman are rated to be similar to those needed for the job of sonarman. (It may be noted that the latter combination was not included in the questionnaire given to the officers and ETs but two officers added this to their questionnaires as shown in Table 19.)

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From data obtained from the Job Questionnaire, it was found that the jobs of ET and FC did indeed seem very similar in terms of activities performed, materials used, tools used, responsibilities, etc. However, the jobs of sonarman and radarman, whose ability requirements were pointed out as being similar (according to the officers and ETs who rated them), did not have a great deal in common. In fact, the job of the sonarman seemed to have much more in common with the ET and FC ratings.

In summary, with the exception of the ET-FT and the FC-FT rating combinations, there is little support for any modification of the rating structure which would call for the merging of electronics ratings. The

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For a complete discussion of the analysis of the Job Questionnaire, see Report 5, this series.

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fact that the FT rating is involved in both of the above combinations suggests that it probably should not exist as an independent rating. This finding appears to substantiate the Navy's decision to absorb the FT rating into the FC rating.

XI. MATERIEL PROBLEMS AFFECTING MAINTENANCE.

Among the problems rated as most important by the electronics technicians and electronics material officers was that of the shortage of tools and test equipment aboard their ships. Twenty-eight per cent of the ETs rated this as the most important problem they faced and only 3 per cent rated it as least important. Table 21 gives the percentages for all of the officers and ETs who responded to this question.

To further illustrate the reported shortages in tools and test equipment, Table 22 gives the judgments of the officers and ETs as to whether tools are adequate in quantity and in quality. Table 23 gives the judgments of these individuals for test equipment.

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Table 21

(pillions Concerning the Most and Least Serious Problems Facing an Electronics Technician Expressed in Terms of the Percentage of a Respondent Group Selecting a Given Response

(General Questionnaire - Item 9)

Respondent Groups	Problems														
	Inadequate Electronics Training		Too Few ETS Per Ship		Operators Fouling the Gear		No Elect. Repair Shop		Inadequate Tools & Equipment		Lack of Spare Parts		MR	NR	NR
	IR*	L*	IR	L	IR	L	IR	L	IR	L	IR	L	IR	L	Both
Desig.															
71 ET	24	10	4	25	11	21	7	11	28	3	14	21	12	8	0
112 ENO	50	8	8	17	8	17	0	17	25	0	0	42	9	0	0
115 CIC	13	27	46	0	7	0	0	0	7	33	7	13	0	7	20
114 ASW	21	21	29	0	0	36	0	0	14	7	14	14	0	0	22
113 COMI.	31	0	31	8	0	23	0	8	8	8	8	31	0	0	22
113 OPER.	8	8	45	0	0	38	0	8	8	15	8	8	8	0	23
118 GUN.	28	6	28	6	0	17	0	6	0	6	6	21	0	0	38
112 ENG.	17	17	25	8	25	0	8	24	0	17	0	17	8	0	17
111 EXEC.	54	0	27	18	0	9	0	27	9	18	0	18	0	0	10

II represents the percentage of a respondent group designating the problem as the most serious, and I represents the percentage designating the problem as the least serious.

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Table 22

Opinions Concerning the Adequacy of Tools Available to ETs Expressed in Terms of the Percentage of a Respondent Group Selecting Each Alternative

(General Questionnaire - Item 12)

Respondent Groups		Quantity Adequate			Quality Adequate			%NR Both Items
N	Designation	Yes	No	NR	Yes	No	NR	
71	ET	41	59	0	84	13	3	0
12	EMO	25	75	0	83	17	0	0
15	CIC	53	14	0	53	7	7	33
14	ASW	57	14	0	50	7	14	29
13	COMI.	61	8	0	69	0	0	31
13	OPER.	46	38	8	69	15	8	8
18	GUN.	28	17	0	39	6	0	55
12	ENG.	83	8	0	83	8	0	9
11	EXEC.	45	37	0	64	18	0	18

Table 23

Opinions Concerning the Adequacy of Test Equipment Available to ETs Expressed in Terms of the Percentage of a Respondent Group Selecting Each Alternative

(General Questionnaire - Item 13)

Respondent Groups		Quantity Adequate			Quality Adequate			%NR Both Items
N	Designation	Yes	No	NR	Yes	No	NR	
71	ET	49	51	0	79	20	1	0
12	EMO	25	75	0	67	33	0	0
15	CIC	53	7	0	53	7	0	40
14	ASW	28	43	0	36	28	7	29
13	COMI.	46	23	0	54	15	0	31
13	OPER.	38	46	0	69	15	0	16
18	GUN.	22	22	0	22	17	5	56
12	ENG.	75	17	0	67	17	8	8
11	EXEC.	27	45	9	54	18	9	19

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It can be seen from the above tables that about half of the ETs and the electronics material officers (who are in a position to be aware of these factors) felt that there is a shortage of both tools and test equipment. However, both groups felt that the quality of the tools and test equipment was adequate. In general, the other officers who responded felt that test equipment was not sufficient, but, contrary to the ETs and EMOs, many of them felt that the available tools were adequate.

In interviews, the ETs and EMOs were asked to name the factors which stood in the way of their doing a better job. The responses most frequently given by the ETs were "lack of proper tools" and "inadequate test equipment". The EMOs named lack of proper test equipment more frequently than any other except "short-timers" attitude. Only one officer named lack of tools as being a factor.
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Also of some concern, in terms of shortages of materials, is the spare parts situation. In expressing their opinions as to the most frequent contributor to excessive shutdown time of electronic gear, ETs rated spare parts difficulties higher than any of the other choices (see Table 7). However, the EMOs rated it lower than any of the other choices.

"Spare parts difficulties" is a rather general category and should be examined in terms of more specific aspects of the problem. One of these is

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For complete lists of ETs' and EMOs' responses, see Tables 110 and 115 in Data Supplement to Report 2 of this series.

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the problem of shortages of spare parts aboard ship. In this regard, although "lack of spare parts" was not rated as the most serious problem by as many ETs as was "inadequate tools and test equipment" (Table 21), 14 per cent of the ETs felt that it was the most important problem facing them. However, none of the electronics material officers rated it as most important, and half of them rated it as least important. Also, it was found that roughly 20 per cent of the incidents related by ETs concerning times when electronic equipment was shut down longer than necessary had as a basic factor a lack of spare parts.¹⁰ In general, it may be said that while a lack of spare parts is not one of the most important problems facing ETs, it occurs frequently enough to bear more than passing mention.

Another aspect of the general category of spare parts difficulties relates to the problem of defective spare parts. Comments and incidents were received from the ETs concerning the fact that on a number of occasions replacements taken directly from the spare parts proved to be defective. This was especially true on ships that were re-commissioned with the same stock of spare parts left when the ship was de-commissioned. Apparently the parts deteriorated during the period when the ship was in "mothballs".

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See Critical Incidents, Report 2 of this series.

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A third aspect, and probably the most important of the spare parts difficulties, was the problem of obtaining spare parts replacements. This is related to the problem encountered by the ships in obtaining tools and test equipment. There were reports of having spare parts and test equipment on order for periods up to three years without receiving the needed material, and, in some cases, without receiving an indication when the order could be expected to be filled. It was felt by both the electronics material officers and the ETs that some means should be found by which the ships could purchase urgently needed articles directly from the manufacturers or from outside vendors so as to by-pass the delays encountered in the normal Navy supply system. To illustrate this, it was pointed out by electronics material officers that it creates quite a morale problem for a gang of ETs to have to accomplish their repair work without a needed piece of test equipment which they were told would not be available to them for a year or more, and then to walk into town and see the same piece of test equipment displayed for sale to civilians in a radio supply store.

XII. TURNOVER IN THE NAVY.

It is unnecessary to point out that a problem exists for the Navy in the rapid turnover of personnel. Numerous sources are available to point up this fact. Especially crucial to the electronics program and to the Navy in general is the large proportion of electronics technicians who leave the Navy at the end of their first enlistment period. This creates a loss, in terms

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of the time and effort spent in extensive training of these personnel, and the loss of a large amount of their effective labor power. After the end of a 36-week training period only about a year remains in a two-year enlistment. Table 24 shows the median percentages of time that ETs and other electronic ratings have spent in school out of their total time spent in the Navy.

Table 24

Median Percentages of Time Spent in Navy Schools Out of Total
Time Spent in the Navy

(Job Questionnaire Item No. 16)

Designation	Total		C		1		2		3		SN		No Resp.
	N	Medn%	n	Medn%	n	Medn%	n	Medn%	n	Medn%	n	Medn%	
ET	74	29	6	11	6	25	8	23	29	25	25	46	8
SO	109	21	3	6	8	9	23	16	32	23	43	37	7
RD	188	13	3	5	4	9	30	13	54	14	97	15	14
RN	107	13	2	6	4	7	10	9	24	11	67	18	5
FC	15	10	4	10	5	9	1	--	4	27	1	--	3

It is interesting to note that the ETs in this sample spent almost a third of their time in Navy schools.

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Of the remaining time, after schooling, that the men are in the Navy, some is lost (as far as effective work is concerned) while they become indoctrinated in the problems of actually repairing equipment in the fleet. One ET estimated that it took him six months of shipboard experience after completing Class A school before he was able to learn the ropes of shipboard maintenance.

No "solution" to the problem of excessive turnover was found. However, some of the information gained concerning the problem may be useful. This information centers around the opinions of the ETs as to why they wish to leave the Navy, and their suggestions as to what may be done to make ETs more likely to desire the Navy as a career.

In a sample of fifty-four ETs who were asked their future plans, 87 per cent definitely expressed their intentions of leaving the Navy at the expiration of their current enlistments. Only 7 per cent planned to remain in the Navy until their retirement.¹¹ The remaining 6 per cent were undecided. Even allowing for changes in the decisions of some of these men (which could go either way), these figures are disturbing, especially when it is considered that the sample contains men of all rates from seamen through chief petty officers.

It is interesting to note that of the men who definitely intend to leave, 49 per cent plan to obtain further schooling in electronics or

¹¹

All of these men were leading ET petty officers.

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electrical engineering and 23 per cent plan to go directly to work in electronics - in other words, presumably 72 per cent of them plan ultimately to work in electronics. This is undoubtedly highly correlated with the fact that one of the most frequently repeated reasons for ETs leaving the Navy is that since they can earn so much money in electronics work "on the outside," there is little reason for them to want to stay in the Navy at their present comparatively low salaries.

Besides the pay differential between the Navy and civilian occupations, another major reason for their desire to leave the Navy was that lengthy periods at sea made it an unsatisfactory way of life for anyone who has any interests in a family. Many of those who are married say that they see their families so seldom that it creates a real problem in adjustment for both themselves and their families. Those who are unmarried and desire to wed say that they cannot contemplate such a venture under the restrictions imposed by Navy life. The only solution that either group sees is to return to civilian life.

There are many less frequently expressed reasons for the men's desires to leave the Navy. Some of these were dissatisfaction with military discipline and regulations, dissatisfaction with their positions in the shipboard system as compared with their own opinions of their worth, dissatisfaction due to their inability to obtain more electronics schooling, and others.

The same ETs were asked what could be done to attract and hold capable ETs in the Navy. The responses were almost unanimous in agreeing

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that there is virtually nothing that can be done, and, in almost every case, the reason given was that it is just too much more attractive in civilian life compared with Navy life.

However, when pressed by the interviewer, 56 per cent of the men (55 respondents in the sample) were able to give some positive suggestions.¹² The other 44 per cent stated flatly that nothing could be done and could offer no positive suggestions. It is interesting to note also that in only a few cases where suggestions were made, did the men say that if their ideas were incorporated in Navy policy would they change their opinions and consider reenlisting. The majority said that their suggestions would in no way change their intention to get out although they thought that some ETs might be influenced by them. The most frequently expressed suggestion (26 per cent of those offering suggestions) referred in one way or another to the problem of rotating duty between shipboard and shore stations. Most of the suggestions referring to this problem stated specifically that some way should be found to guarantee the men that they would have to spend no more time on sea duty than they spend at a shore station. Some of them declared that this was promised to them but the promise was not kept. Those who were most insistent in this regard reported that they themselves or personal acquaintances of theirs had spent as much as four years aboard ship before being assigned to shore duty.

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A complete summary of these responses may be found in Table 111, in the classified Supplement to Report 2, of this series.

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Table 25 gives the median percentages of time that the different ratings reported spending at ¹³shore stations out of the total time they have been in the Navy. Table 26 shows the median percentages of time that the different ratings reported spending aboard ship out of total time in the Navy.

Table 25

Median Percentages of Time Spent at Shore Stations Out of
Total Navy Time

(Job Questionnaire Item No. 18)

Design- nation	Total		C		1		2		3		SN		No Resp.
	N	Mdn	n	Mdn	n	Mdn	n	Mdn	n	Mdn	n	Mdn	
ET	82	2	6	30	7	2	8	52	29	2	28	1	4
SO	116	1	3	15	8	26	22	1	27	1	47	1	9
RD	202	1	3	25	4	2	27	1	56	2	98	1	14
RH	112	2	3	45	4	42	10	2	25	1	68	1	2
FC	18	2	4	15	5	15	3	2	5	1	1	1	0

¹³

This refers to regular shore station assignments, and does not include time spent at Navy training schools.

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Table 26

Median Percentages of Time Spent Aboard Ship Out of Total Time
Spent in the Navy

(Job Questionnaire Item No. 17)

Designation	Total		C		1		2		3		SN		No Resp.
	N	Mdn%	n	Mdn%	n	Mdn%	n	Mdn%	n	Mdn%	n	Mdn%	
ET	81	45	6	60	7	66	8	8	31	50	29	35	1
SO	115	60	3	65	8	72	23	78	31	60	50	45	1
RD	119	70	3	65	4	81	30	77	57	71	105	59	3
RM	111	62	3	35	4	25	10	55	26	75	68	60	1
FC	18	62	4	52	5	70	3	75	5	60	1	--	--

From these tables it can be seen that the ETs report spending only 2 per cent of their total time at shore stations as against 45 per cent of their total time aboard ship. The figures are much the same for all of the ratings.

Not only do the men indicate that they do not wish to reenlist with the likelihood of facing another hitch at sea, but they also point out that there is no provision by which they can plan or look forward to shore duty at some known period in their enlistment. To summarize their opinions on this matter, they felt that they should spend the same amount of time ashore as they do at sea; that they should be able to make definite plans as to the periods which

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they will be either ashore or at sea; and that they should not be promised either of the above unless such promises can be kept.

In connection with the problem of rotation, it is interesting to note that some of the men felt that the reason they were not given more time at shore stations was due to the lack of an adequate number of available shore billets. This, they felt, is partially due to the recent influx of the WAVES into the shore billets, thereby denying the men the opportunity of being assigned a position ashore.

Another suggestion that was made by some of the men concerned the problem of obtaining further training in shore schools. It was felt that if the possibility of achieving advanced training in electronics were made more available to the men they would be more likely to reenlist. These suggestions were accompanied by comments on the fact that only the highest rated men were allowed to go to advanced schools, that only men with a large amount of obligated time were chosen, and that strikers were frequently denied basic electronics schooling because the ship's captain refused to deplete his complement for the period of time necessary - especially with the likelihood that the man would not be returned to the ship at the completion of his training due to the necessity of sending some of the men to school on nonreturnable quotas.

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A frequently voiced suggestion was that ETs should receive higher pay and quicker advancement in rate. They felt that the pay should be made equivalent to what the men would be worth in civilian industry. However, some of the men recognized that these solutions would not be practical since they would tend to engender friction between the ET rating and the other ratings who did not receive these benefits.

Other suggestions which the men felt would help to retain ETs in the Navy included such things as giving ETs a higher rate automatically if they ship over, providing enough tools and test equipment, making the enlistment period for ETs six years or more, or putting ETs in their own division.

To summarize this section, it was found that 87 per cent of the ETs interviewed plan to leave the Navy at the end of their present enlistment. A large proportion of these men plan to work in electronics after returning to civilian life, which confirms their major reasons for leaving the Navy, i.e., better pay and better living conditions in civilian life. Another of the most frequent reasons given for leaving the Navy was the large amount of time spent at sea as compared to the time at shore stations. It was found that ETs reported spending an average of 45 per cent of their total time in the Navy at sea and only 2 per cent of their time at shore stations. Despite the suggestions offered by the men concerning things which may be done to attract and hold ETs, no real solution was found for the problem of excessive turnover in the Navy.

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This report has sought to emphasize the importance of proper shipboard organization and policy to the maintenance of a satisfactory electronic readiness condition on ships of the destroyer class. Various facets of the situation have been discussed one at a time. As a final comment it may be well to point out that so many different men and groups of men are in a position to affect the electronic maintenance situation aboard ships that optimum electronic readiness can be attained only when all of those involved make a special effort to make some positive contribution to the situation. It appears unlikely that the desired readiness condition can ever be attained by the efforts of the electronics technicians alone.