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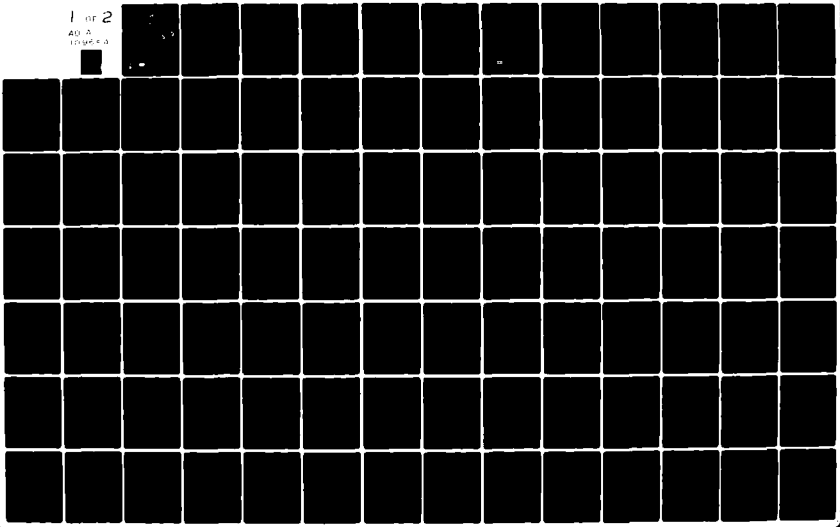

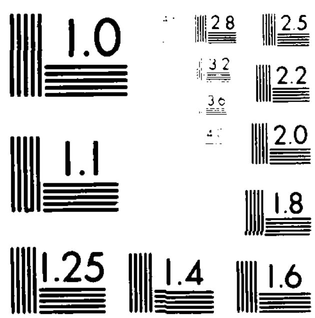

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SHIP OVERHAUL EFFECTIVENESS

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

CASREPs, DDG-2 Class, FF-1052 Class, INSURV, PEB, ship maintenance, ship material condition, ship modernization, ship overhaul/repair, SSN-637 Class, statistical modeling, 3-M system, UNITREP

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Effectiveness of naval shipyard overhauls is examined by relating the amount of repair and alteration work done in overhaul to ship material condition during the full period after overhaul. The relationships are determined statistically through a model which also includes the effects of other influences on material condition, particularly personnel and operating tempo. The study focuses primarily on repair work. It considers overhauls from FY 72 through FY 78, and for each of the FF-1052, DDG-2, and SSN-637 classes separately.

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20. In addition to examining the relationships between overhaul work and postoverhaul material condition at the whole ship level, the study also examined these relationships for a number of ship systems. These systems are representative of the hull, mechanical and electrical systems generally.

Material condition is measured by indicators from a number of sources. These sources include CASREPs, 3-M maintenance reports, UNITREP status, PEB examinations, and INSURV inspections. Limited use is also made of ship engineering logs. The single measure most emphasized is CASREP maintenance downtime.

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1. The Ship Overhaul Effectiveness Study attempted to answer whether a ship's material condition following an overhaul is influenced by the amount of repair and modernization accomplished. For the period FY72 to FY78 three ship classes (FF-1052, DDG-2, SSN-637) were examined both at the whole ship level and for selected ship systems. The statistical model used in the study included the effects of several other factors such as personnel, operating tempo, ship age, overhaul yard, and fleet assignment -- all of which were thought to also influence the material condition. The primary thrust of the analysis was centered on relating overhaul repair mandays to the various material condition indicators available.

2. The analysis showed that increased repair mandays did result in improved material condition indicators for the whole ship. The results were not as conclusive at the ship system level. Any additional conclusions or extrapolation of the findings are tenuous because of the lack of consistent, strong statistical correlation.

3. The study notes that the limitations of existing data bases and the complex interrelationships among the many variables involved cause resource-to-readiness analysis to be difficult.

4. Enclosure (1) is forwarded.

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CNS 1157 / June 1981

SHIP OVERHAUL EFFECTIVENESS

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EXECUTIVE SUMMARY

Overhauls of naval ships are of inherent interest to the Navy. Their purpose is to accomplish modernization, and to restore ships to a higher level of material and equipment condition through repairs not easily accomplished outside a shipyard. The present report studies the effectiveness of overhauls in restoring material condition, for marginal changes in overhaul work, and quantifies the effectiveness in terms of available material condition indicators.

The study is limited to a consideration of FF-1052, DDG-2 and SSN-637 class ships. Overhauls done in naval shipyards (and private shipyards for SSNs) during the period FY 72 to FY 78 are studied. The effectiveness of these overhauls is assessed by examining ship material condition during the period following a specific overhaul and prior to the subsequent overhaul.

Measuring material condition is difficult; in the end, it depends on indicators of material condition coming from various Navy inspections and reporting systems. The paucity of direct and accurate data on material condition was a major limitation in the study. It has precluded precise estimation of relationships and tradeoffs.

In this study, indicators of material condition are developed from Casualty Reports (CASREPs), 3-M system reports of intermediate and ships force corrective maintenance work, Propulsion Examining Board (PEB) inspections, Board of Inspection and Survey (INSURV) examinations, and UNITREP readiness status reports. In addition, a limited though significant measure has been developed based on equipment out of commission entries listed in official ships' engineering smooth logs. Of the measures developed, those based on CASREPs are taken as most reliable and insightful.

The effect of more or less overhaul work on later material condition is studied for a number of ship systems as well as at the whole ship level. The systems are: hull structure; main propulsion and its subsystems propulsion shafting, main steam piping, feed and condensate, propulsion boilers, and combustion air; electrical and its subsystem power generators; sonar; interior communications; climate control; refrigeration; distilling plant; compressed air; and steering. The analysis for each of these systems and for the whole ship is approached in the same way, so that comparison among the systems can be made.

The analysis is based on a statistical model which relates overhaul repair and alteration work, measured in mandays, to each of the indicators of material condition, in turn. Because material condition is affected by more than just overhaul work, the model has been constructed to capture the effects of other factors as

well. The effect of personnel has been included through variables counting the number of personnel in paygrades E5 through E9, and the average length of Navy service in paygrades E4 through E9. The effect of operating tempo has been included using information on steaming hours underway and hours cold iron. Preoverhaul condition is measured using CASREP maintenance downtime, and is included in the model. As well, ship age, ship fleet, and overhauling shipyard are included in the model. The focus in the model remains on overhaul repair mandays.

The analysis confirms previous, independent estimates of systematic increases in overhaul repair mandays during the period covered, for the FF-1052 and DDG-2 classes. It is noted, however, that the SSN-637 class has exhibited no discernible growth along these lines.

The principal finding in the analysis is that material condition was improved as a result of more repair mandays, within the range of mandays expended in the overhauls studied. This is consistently exhibited for the various indicators examined. While this improvement held for all three ship classes, however, it differed in degree among the ship classes.

This finding at the whole ship level is supported by the analysis of the systems. Among the main propulsion systems particularly, increased repair work was associated with better material condition. This result also persisted among the auxiliary systems, with a small number of exceptions which the Navy may want to look in to.

The primary policy implication resulting from the analysis is that a decrease in repair mandays below current levels can be expected to lead to a degradation in material condition. The implication that further increases in repair work will further improve material condition probably holds, but is not established, because current levels of overhaul work are already at the highest levels considered in the study.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

CHAPTER I

INTRODUCTION

Ship overhauls constitute a considerable portion -- roughly 4 percent to 5 percent -- of the annual Navy budget. The effectiveness of overhauls in restoring ship operating condition is therefore an important concern for the Navy. An analysis of this effectiveness has implications for budget preparation, overhaul planning and overhaul management. Moreover, it bears on general Congressional interest in the relationship between resources and fleet readiness. This study provides a quantitative analysis of overhaul effectiveness.

The study specifically considers naval shipyard overhauls, during the period 1972 to 1978, for FF-1052, DDG-2 and SSN-637 class ships. Each of these classes is addressed separately, though some comparison between them is made.

The study concentrates primarily on ships as a whole, but also considers a number of ship systems. These systems are primarily engineering systems, falling within the main propulsion, electrical or auxiliary areas. Analysis at the whole ship level is particularly important for budgetary use. For other purposes, there should be interest in the insights and comparisons coming from the system level analysis.

The focus in the study is on overhaul work and the effects of changing levels of it on material condition. However, material condition is a complicated interaction of many factors. Whether applied at the system or whole ship level, the model in the study postulates material condition to be a linear function of overhaul work, ship's personnel, operating tempo and such other factors as ship age. It is necessary to include as many of these other factors as possible in order to elicit the actual effect of overhaul work.

Measuring material condition is a significant difficulty in the study. No direct measurement has been possible. Rather, we rely on indicators of material condition coming from various sources. These include reporting systems, such as CASREP, UNITREP and 3-M, and inspection results, such as INSURV and PEB. They also include a limited use of ship engineering logs for the FF-1052 class; such use is uncommon in this kind of work.

There has been considerable analysis in recent years of overhauls generally. Most of this seems to have centered on analyzing and documenting the increases, or growth, in overhaul work. One effort, the Maintenance System Development Program (references 1, 2, and 3), has focused on the DDG-2 class and achieved considerable insight along these lines.

This analysis found that overhaul mandays increased at a compound annual rate of about 17% during the period 1963-1978 (see reference 2). Moreover, it concluded that this increase in mandays is attributable in large part to the addition of new work, including some movement of overhaul work from the organizational level to the depot level, and to the attempts at meeting generally higher standards. The analysis further concluded that ship age is a far less significant factor in explaining overhaul work growth. The equipment areas of this work growth, along with their annual growth rate and share of the overall cost, were also explored in this analysis.

A supporting effort (reference 5), which also concentrated on the DDG-2 class, has compared the period 1970 to 1974 with the period 1975 to 1979. It further documents the growth in overhaul work, and generally confirms the previous analysis.

In a related vein, there has been work analyzing the effect of timing in preoverhaul planning on the increases during the overhaul itself of overhaul work (see reference 6). Unlike the previously mentioned analyses, this work includes cruisers, destroyers and frigates generally, but only addresses ships at the whole ship level; it does not consider systems or equipments.

This work is important to the Navy; yet it leaves another important perspective untouched. This other perspective has to do with the relative effectiveness of more or less work in overhaul. If, as suggested earlier, new work done in overhaul as well as a higher grade or extent of repair work done, largely explain the increases in overhaul mandays, there then remains the question of whether this additional work leads to significantly better ship equipment condition. In other words, there is still the question of whether more overhaul work is of benefit to the Navy or not. The present study starts from just this perspective.

Only limited work along those lines has previously been done. One study (reference 4) purported to assess the effectiveness of overhauls. This assessment was in terms of the change in material condition from before to after overhaul. It did not look at the extent of the overhaul, that is, the mandays expended, nor relate the relative extent to relative postoverhaul material condition.

This study considered the material condition of ships from 18 months before to 18 months after overhaul. It studied selected systems and equipments, as well as ships as wholes. For insight into material condition, it relied primarily on maintenance data from the Maintenance and Material Management (3-M) system, and on CASREP data.

The general conclusion of this study was that a definite beneficial effect accrued from overhauls. That is, it concluded that ships were in better material condition after overhaul than before. A minor though significant finding was that, due to a number of factors, the indicators of material condition and particularly CASREPs in the first few months after overhaul were liable to be misleading.

A more recent though quite limited work (reference 3) provides statistics on some ten indicators of material availability or condition. These are given for successive postoverhaul periods, for a number of DDG-2 class ships and only at the whole ship level. No firm conclusions are given. However, it is provocative that in all cases, overhaul mandays increased while in general, indicators of ship condition or availability declined.

The Ship Overhaul Effectiveness Study attempts a deeper and more penetrating analysis of the relationship between overhaul mandays and postoverhaul material condition. It is therefore a step toward filling an important void in the broad study of overhauls generally.

As it happens, the amount of repair work has varied over the period covered in the present study, even among ships in the same class and undergoing overhauls in the same year. Figure 1 portrays this variation by showing the overhaul repair mandays, for each overhaul included in the study, as a function of the fiscal year in which the overhaul began. It is clear from this figure that in any one year, the amount of repair work for FFs was less than for DDGs, which in turn was less, usually much less, than for SSNs. It is also clear that refueling overhauls for SSNs typically involve more repair mandays than regular overhauls.

Figure 1 also shows a distinct pattern of growth in repair mandays for FFs and DDGs. The rate of this growth appears to be roughly comparable for both ship types. Moreover, this pattern is fully consistent with the 17 percent annual rate of growth for DDGs mentioned earlier. In fact, our estimates of annual repair manday growth since the early 1970s are about 17 percent for the FF-1052 class and about 15 percent for the DDG-2 class. Since the DDG-2 class was commissioned in the early 1960s, and FF-1052 class in the late 1960s and early 1970s, it would appear that overall ship class age cannot solely explain an overhaul manday growth trend.

This growth trend is not apparent for SSNs. Rather, the apparent pattern is of a stable distribution in repair mandays over successive years. Our estimates of annual repair manday growth for the SSN-637 class, in fact, are less than 2 percent for regular overhauls and essentially 0 percent for refueling overhauls; in neither case is the estimate significantly different from zero in a statistical sense. It is clear, though, that there have been fewer regular overhauls and more refueling overhauls in recent years. As the SSN-637 class was commissioned in the late 1960s

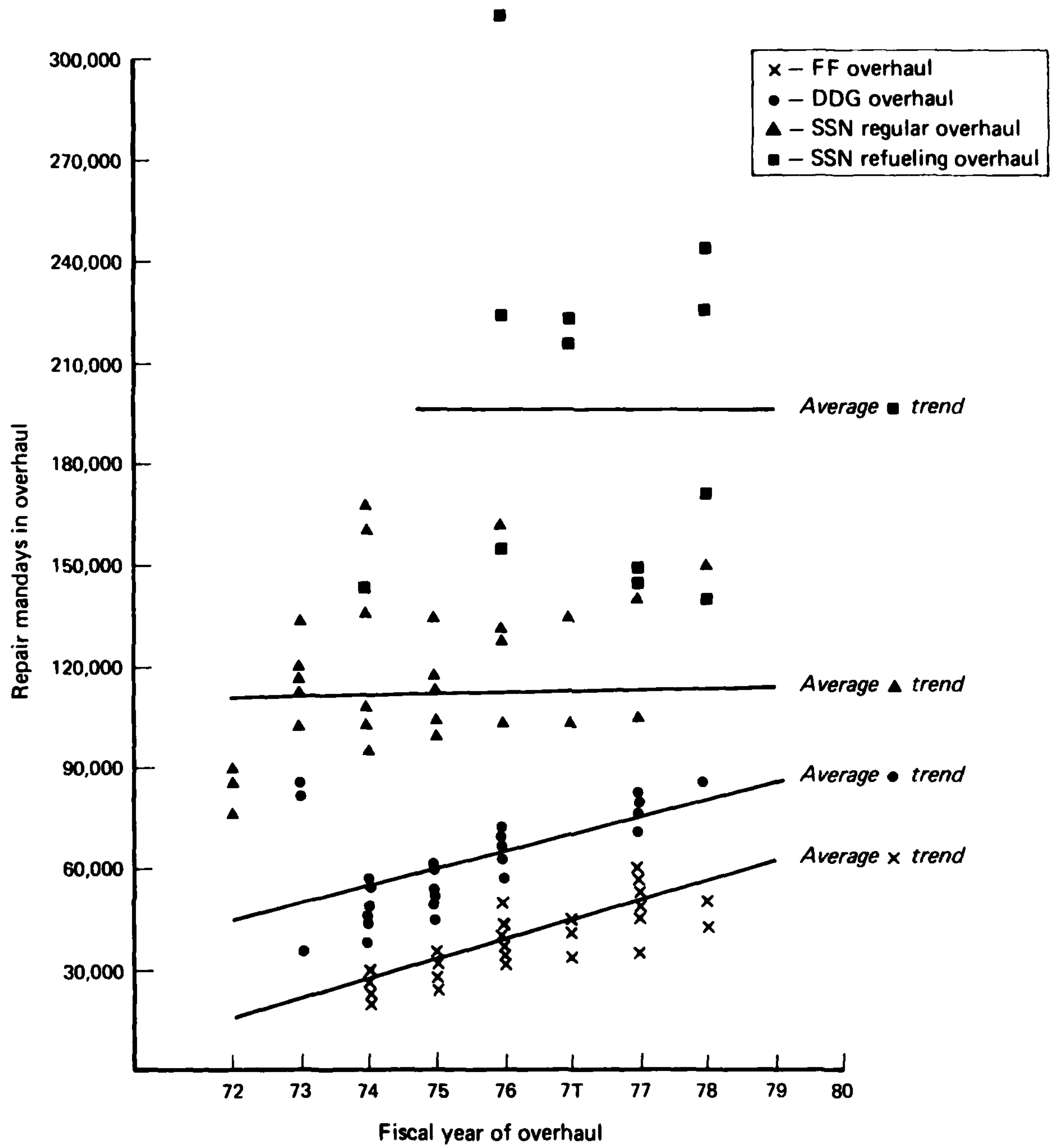

FIG. 1: FISCAL YEAR vs. REPAIR MANDAYS IN OVERHAUL

and early 1970s, this simply reflects the beginning of an alternating pattern in type of overhaul.

The variation in the amount of overhaul work which is shown in figure 1 is the starting point for this study. The purpose of the study is to examine the correspondence which different levels of overhaul work have had with ship material condition in the period following overhaul.

Chapter II begins by defining the scope of the study. It then describes the data in the study by defining and discussing each of the variables which are used.

Chapter III explains the statistical model designed to quantitatively estimate the relationships between overhaul work and material condition. This chapter also discusses the results of using the model, and forms the basic conclusions of the study based on these results.

Finally, chapter IV summarizes the results of the study, and frames them in terms of policy implications.

CHAPTER II

VARIABLES

The scope of the Ship Overhaul Effectiveness Study is in some ways quite broad, and in other ways necessarily limited. In order to isolate and account for the effect of greater or fewer overhaul mandays on later material condition, it is necessary to also account for the many other factors which affect this material condition. Included among these are material condition prior to overhaul, operating tempo, ship personnel levels, and overhauling shipyard. Inclusion of these and other factors broadens the study considerably.

The study addresses three classes of ships. These are the FF-1052 class, the DDG-2 class, and the SSN-637 class. Each of these is large and as nearly homogeneous as any in the Navy. Each class has a history of overhauls through the 1970s. Also, these classes offer a rich diversity. There are contrasts between the surface ships and submarines; notably, in overhaul expenditure, personnel levels, and material condition. Between the FFs and DDGs, there is similarity in operations, but there are important differences in both size and equipment complexity.

Only overhauls which were completed in the period FY 72 to FY 78 are included in the study. This criterion allows enough overhauls to be included to be able to get statistically reliable conclusions. At the same time, it leaves out overhauls which may not be current; that is, which may have been completed under different policies or different reporting systems. Finally, this criterion allows enough time after each overhaul for an assessment of post-overhaul material condition.

For the FF-1052 and DDG-2 classes, only naval shipyard overhauls are considered. This is an unavoidable limitation, because private shipyard overhauls for surface ships were done on a fixed price basis, so that overhaul manday information is not available. In fact, all DDG-2 class overhauls took place in naval shipyards anyway. For the SSN-637 class, private shipyard as well as naval shipyard overhauls are considered. This is possible, since private shipyard overhauls for submarines have historically been done on a cost plus basis, so that manday information can be reconstructed. Actually, very few SSN-637 class overhauls have been done in private shipyards. Over all three classes, data was available for 30 FF-1052 class overhauls, 27 DDG-2 class overhauls, and 40 SSN-637 class overhauls.

Finally, the scope of the study encompasses a variety of ship systems. That is, the relationship of overhaul mandays to postoverhaul material condition, which is the focus of the study, is sought at the system level as well as the whole ship level.

The systems considered are shown in table 1. This list is a representative selection, primarily from among the engineering systems. It is not a comprehensive selection of all ship systems.

TABLE 1

SHIP SYSTEMS EXAMINED

Whole Ship

Hull Structure

Main Propulsion
- Propulsion Shafting
- Main Steam Piping
- Feed and Condensate
- Propulsion Boilers
- Combustion Air

Electrical
- Power Generators

Sonar
Interior Communciations
Climate Control
Refrigeration
Distilling Plant
Compressed Air
Steering

Other than the ship as a whole, the major systems are hull structure, main propulsion, and electrical. There are a number of subsystems of main propulsion, and one subsystem of electrical. Propulsion boilers and combustion air do not apply to submarines. The remaining systems, other than sonar, are generally auxiliary systems within the engineering plant.

A number of factors led to the selection of these systems. First, the study was limited in the number of systems which could be included. Also, each system had to be specifically defined using each of two Navy classification schemes. The first is the ship work breakdown structure (SWBS), which, for submarines, has a modification, the ship system index (SSI). This scheme is used to document all overhaul work. The second scheme is the equipment identification code (EIC). It is used in all reporting within the CASREP and 3-M systems. System selection was greatly limited because The SWBS and EIC schemes do not closely overlap. The defining boundaries of the systems under these two schemes are shown in appendix A.

Another criterion in system selection was that the systems each tend to have more repair work than alteration work. This was consistent with the focus on repair work in overhauls, and tends to be satisfied more often among the engineering systems, as opposed to weapon systems, for example. Also, our interest was largely on systems which were at least similar in function across the ship classes. It was too much to require that the systems correspond exactly or that they have the same relative amount of repair work between classes. However, some comparability between classes was desirable. To the extent that this exists, insight into overhauls from across class comparisons may be possible.

Finally, it was desirable that among the systems together, there be some contrast in system function and reliability. So, for example, there are main propulsion, electrical, and auxiliary systems, as well as one weapon system, sonar. Moreover, refrigeration, for example, is a system with low failure and CASREP rates, while combustion air, including forced draft blowers, has considerably higher failure and CASREP rates.

Most of the systems selected do not meet all these criteria. They do meet most of the criteria, and these criteria did guide the selection.

The variables in this study fall naturally into two categories. One category consists of the material condition indicators. These variables are used to assess the equipment condition of ships in the period when they are not in overhaul. The other category consists of a wide variety of variables, each of which may influence the indicators of a ship's equipment condition. This chapter defines each variable in detail.

The actual data for these variables as used in this study is available from two sources. Reference 7 presents the data at the whole ship level in hard copy. Reference 8 describes the availability and format of the data on computer tape.

MATERIAL CONDITION INDICATORS

Table 2 summarizes the variables we use as indicators of ship material condition. In this section, each of these variables is discussed in detail. Appendix C contains a detailed graphical presentation of the trend each of these indicators has undergone over the period covered in this study.

TABLE 2

MATERIAL CONDITION INDICATORS

Variable	Source	Applicable systems
CASREP total downtime	CASREP reports	all
CASREP maintenance downtime	CASREP reports	all
CASREP occurrences	CASREP reports	all
C3-C4 total downtime	CASREP reports	all
C3-C4 maintenance downtime	CASREP reports	all
C3-C4 occurrences	CASREP reports	all
Out of commission days	Engineering smooth log	selected
IMA hours	3-M data	all
Ships force hours	3-M data	all
UNITREP C3-C4 overall status	UNITREP reports	whole ship
UNITREP C3-C4 equipment status	UNITREP reports	whole ship
INSURV inspection score	INSURV results	selected
PEB examination scores	PEB results	main propulsion

CASREP Variables

Casualty Reports (CASREPs) are filed when a material deficiency or failure degrades one of a ship's mission areas. A report must be filed if the deficiency requires outside assistance to correct or if it is expected to persist for 96 hours (or less, under certain conditions). The reports as finally submitted include, among other information, the beginning and ending times of the casualty, the amount of time in this interim waiting for needed parts, the cause of the casualty, and the equipment identification code (EIC) of the failed equipment. In addition, there is a word description of the equipment casualty and an assessment of the level of degradation, which is from a satisfactory condition level C1 to one of the increasingly degraded levels C2, C3, or C4.

From the records of a ship's CASREPs, we calculated several variables as indicators of material condition. One is the number of occurrences, i.e., the number of CASREPs filed. A second is the total sum of all CASREP equipment downtimes. A third is the sum of CASREP downtimes due to maintenance; that is, the total downtime less the amount of time awaiting parts supply.

Each of these variables was computed by system and by month. Moreover, each was computed by considering only C3 and C4 CASREPs together, and by considering all C2, C3 and C4 CASREPs. This is important, because different ship types exhibit very different patterns of CASREPs. For example, a DDG, which has four boilers, may not be as seriously degraded by one boiler failure, and may only file a C2 CASREP. An FF, by contrast, has only two boilers, and a boiler failure may result in a C3 or even a C4 CASREP.

Over the period examined in this study, there has been a general decline in all these CASREP variables for all three ship classes. The decline in CASREP total downtime was on the order of six percent per year for the FF-1052 and DDG-2 classes, and about three percent per year for the SSN-637 class. The decline in the number of CASREPs reported was also about six percent for the FF-1052 class, but was close to zero for both of the other classes.

In general, the number and duration of C3-C4 CASREPs may be more accurate in indicating important differences in ship material condition for FFs and DDGs. For SSNs, however, C3-C4 CASREPs account for an extremely small fraction of all CASREPs and tend to represent unusual circumstances. The number and duration of all C2, C3 and C4 CASREPs is likely to be a better indicator for SSNs.

CASREP data as an indication of material condition is apt to be more reliable than other sources for several reasons. CASREPs are official reports which receive a high level of attention. Consequently, great care is taken in filing them and they are likely to be more accurate. The reports do contain the detailed information mentioned before, and they apply to all essential equipments.

CASREP data, however, may be an inconsistent indicator of material condition. This is largely due to the inherent subjectivity in deciding on the level of degradation caused by an equipment failure. These decisions would also be affected by the changing policies between type commanders and over years regarding emphasis on CASREP reporting. Also, a reluctance to attribute a casualty to personnel error may result in improper reporting of the cause of a CASREP, and CASREPs can be biased by their relationship with the supply system and by at sea periods.

Prior to our use of the CASREP data, effort was expended in editing the reports. In particular, the match between EIC and equipment word description was carefully checked to get the CASREP in the proper system. This should have largely remedied potential reporting mistakes.

Engineering Log Variable

A ship's engineering smooth log is a record required to be maintained daily and to be retained for at least three years. Among the entries in the log each day is a midwatch entry stating the ship's location and activity, and the major equipments in the engineering system which are currently on line and those which are out of commission (OOC).

As an indicator of material condition, we have tallied from these logs the number of times specific equipments were listed as OOC. The tallies were made over three month periods and were organized by system within the engineering area. We interpret the number of entries in the OOC listing as the number of days of system downtime. This is the engineering log variable for an engineering system in a three month period, or quarter.

Engineering logs are apt to be reliable, as they are official, legal documents and as the entries are easy to make. Moreover, the logs, and therefore our variables, represent a nearly continuous record of equipment condition.

However, there is no entirely specific policy on what equipments must be logged. This leads to some inconsistency between ships and even between periods for the same ship. The listing of some smaller equipments may reflect the interest or specialty of the person filling in the log. Moreover, there is ordinarily no description of the scope or criticality in an OOC entry, so that it may not be possible to distinguish equipments down for preventative maintenance. This suggests that our variable may be an overestimate of problems in material condition.

Finally, the number of logs we were able to examine was quite limited. The variable is applicable in this report only to the FF-1052 class; the ships and months for which data was obtained to compute this variable are shown in table 3.

Because it is also applicable only to selected systems, it is not emphasized in this report. However, this variable is thought to be quite accurate and penetrating as a measure of material condition. For this reason, a separate analysis (reference 9) was undertaken to compare this variable with those based on CASREP data.

The main conclusions of that analysis were twofold: first, there is a high degree of correlation between engineering log downtime and either CASREP C2-C3-C4 total downtime or CASREP C3-C4 total downtime; and second, even in the presence of this strong correlation, there is always a greater amount of engineering log downtime recorded in terms of actual magnitude. An additional conclusion was that the correlation was greater and more reliable for those systems which experienced greater amounts of equipment downtime generally.

The import of these conclusions for this report is that CASREP downtime at the whole ship level stands to be a reasonably dependable, relative measure of material condition.

TABLE 3

SHIP MONTHS FOR THE ENGINEERING LOG VARIABLE

Hull number	Ship	Number of months
FF 1054	USS Gray	12
FF 1055	USS Hepburn	15
FF 1058	USS Meyerkord	31
FF 1059	USS W.S. Sims	12
FF 1060	USS Lang	15
FF 1061	USS Patterson	12
FF 1062	USS Whipple	14
FF 1063	USS Reasoner	33
FF 1066	USS Marvin Shields	24
FF 1068	USS Vreeland	14
FF 1070	USS Downes	24
FF 1072	USS Blakely	34
FF 1075	USS Trippe	12
FF 1076	USS Fanning	17
FF 1077	USS Ouellet	11
FF 1079	USS Bowen	16
FF 1080	USS Paul	12
FF 1084	USS McCandless	15
FF 1088	USS Barbey	15
FF 1092	USS Thomas S. Hart	14
FF 1095	USS Truett	12
FF 1096	USS Valdez	12
DDG 13	USS Hoel	29
		405

SF and IMA Variables

The Navy Maintenance and Material Management (3-M) system is the means for documenting maintenance work, whether done on the organizational level by a ship's force (SF) or on the intermediate level by an intermediate maintenance activity (IMA). With rare exceptions, the documentation pertains just to corrective maintenance.

We assume in general that more SF and IMA corrective work on a ship's system is an indication of worse material condition; we note, however, that good SF maintenance may improve ship condition going into overhaul. (Moreover, more SF and IMA preventative maintenance work would certainly not indicate worse material condition, and even more corrective work may include some fixing of small problems which prevents greater amounts of corrective work later.) Under this assumption, we compute from 3-M data two variables as material condition indicators. One is the number of SF manhours expended on a system in a month. The other is the number of IMA manhours expended on a system in a month. A third possibility would be simply the number of maintenance actions by the SF or IMA. This, however, was felt to be less penetrating as an indicator of material condition problems.

During the period examined in this study, both SF and IMA corrective work declined by about 30 percent for the SSN-637 class, but increased by about 12 percent for SF and 30 percent for IMA for the DDG-2 class. For the FF-1052 class, there was an increase of about 6 percent in IMA and a decline of roughly 20 percent for SF.

Like CASREP reporting, 3-M reporting uses a standard and specific format. Also, it provides detailed information including the dates, EIC, and expended manhours, all of which we use.

As a data source, however, the 3-M system is likely to be less reliable than the CASREP system. 3-M reporting is a greater administrative burden and receives less attention, so that there may be less accuracy and completeness. For example, incorrect reporting of EIC can be expected more frequently.

A more serious reservation involves the reporting requirements. For surface ships, not all corrective maintenance need be reported. Although there are some specific guidelines, there is inconsistency in SF reporting. Consequently, we do not rely on the SF variable for surface ships. For submarines, however, all corrective maintenance actions are required to be reported. Therefore, the data should be very complete, and accordingly, we place more confidence on these variables for submarines.

Finally, there is some weakness in the IMA variable due to policy variation in the work undertaken between years and IMA facilities.

UNITREP Variables

Each ship's readiness condition, given as C1, C2, C3 or C4 exactly as with CASREPs, is continually reported through the Unit Reporting (UNITREP) system. This system was formerly the Force Status (FORSTAT) reporting system. It reports the ship condition in each primary mission area, for each of the categories of personnel, equipment, supply and training, as well as for the ship overall. The variables we use from this system are the percentage of time in which equipment and the ship overall are degraded to a C3-C4 condition. Over the period covered in this study, the average overall status improved by about 5 percent for the FF-1052 and DDG-2 classes, but became worse by about 15 percent per year for the SSN-637 class.

Like the CASREP system, the UNITREP system follows a standard policy and filing format, receives a high level of attention, but is ultimately subjective in assessing readiness condition. Our use of the variables from this system is considerably limited by two considerations. The reporting system, and therefore the variable, addresses only the whole ship and not specific systems. Also, the data is not available prior to 1975.

PEB Variable

The Propulsion Examining Board (PEB) conducts periodic propulsion plant inspections for all conventionally powered ships. A light off examination (LOE) is given shortly before a ship completes overhaul. An operational propulsion plant examination (OPPE) takes place several months following an overhaul and at roughly one year intervals thereafter.

Each exam results in extensive comments. In addition, a ship receives a pass or fail score in the areas of material, knowledge, and administration during an LOE, and in these as well as the areas of casualty control and boiler flexibility during an OPPE.

We use as one indicator of propulsion plant material condition a score of 1 or 0 depending on whether a ship did or did not pass, on the material portion, both its LOE and postoverhaul OPPE. We use as another indicator a score of 2, 1 or 0 depending on whether a ship passed, on the material portion, both, one or neither of the LOE and postoverhaul OPPE. We do not include later OPPEs because they are not uniformly scheduled throughout different ships' postoverhaul cycles, and because we wish to minimize any effect of a ship's operations and crew on the propulsion plant material condition. Similarly, other exam areas are not used because they are all a direct function of crew performance, and not as closely related to equipment condition.

These exams tend to be consistent and objective, and therefore provide a good basis for our indicator variable. However, the pass-fail scoring gives us only a crude distinction between ships and greatly limits our assessment of material condition. Moreover, the exams, and hence our variables, address only the main propulsion system generally. We get no insight into other systems and subsystems. Finally, our variable does not give us material condition information over an entire postoverhaul period.

The Nuclear Propulsion Examining Board (NPEB) conducts a postoverhaul reactor safeguard examination (PORSE) and an operational reactor safeguard examination (ORSE) for submarines and other nuclear powered ships. These are similar to the LOE and OPPE. However, results of these exams were not available to us.

INSURV Variables

A direct and thorough examination of material condition is made on each ship by the Board of Inspection and Survey (INSURV Board). Generally, one exam is given during each postoverhaul period. Extensive comments are made, and for surface ships 25 factors within ten functions or areas of a ship are rated 0, 1, or 2, with a 0 as best. The sum of these represents a ship index.

Only four of the factors match up with a ship system. They are: sustained power with our main propulsion, electrical power with our electrical system, environment control with our climate control, and maneuver with our steering. We use the factor scores as variables for these four systems. We also use the overall ship index as a variable for the whole ship.

As with the PEB exams, these inspections are largely objective and consistent. They vary considerably in the time during the postoverhaul period at which they occur, though. Since material condition is apt to vary significantly in the postoverhaul period, this may greatly influence the scores.

Other difficulties with this source are that not all our systems are covered, and those which are are only measured crudely by the score of 0, 1 or 2. Finally, these variables are not available for submarines; although submarines have INSURV inspections, they are not given scores.

Other Material Condition Variables

Some insight into a ship's material condition comes from a consideration of the work done on it in restricted availabilities, selected restricted availabilities, and technical availabilities. Repair work in these availabilities affects subsequent material condition. However, more repair work in restricted and technical availabilities also indicates greater material condition problems. From this viewpoint, such repair work is a depot level counterpart to SF and IMA corrective maintenance work at the organizational and intermediate levels, respectively.

It has not been possible to develop an indicator of material condition based on these availabilities. This is because no consistent and detailed documentation of them is available for the period covered in this study. Records of these availabilities have not been uniformly maintained on file, and in any case, a breakdown of the work by repair mandays is often not made for work done in private and foreign shipyards. Therefore, this variable could not be included in the study.

Several other potential sources for material condition insight were considered and rejected. Among these, Ship Qualification

Trials were felt to be inappropriate as they deal only with weapons, which are not among our systems. Operational Readiness Inspections were not used since in addition to being subjective and dependent on individual squadron commanders, they are intended to measure primarily crew training.

Among the indicators which have been described, those from CASREPs are expected to be most complete and descriptive. The other variables are nevertheless important in contributing to the description, and in providing indications of consistency.

EXPLANATORY VARIABLES

The explanatory variables are listed in table 4. The more complicated of these are the ones dealing with overhaul work expense and ship crew characteristics. They are treated in considerable detail. The remaining variables are then treated through brief discussions.

TABLE 4

EXPLANATORY VARIABLES

Variable	Source
Overhaul Repair Cost	Shipyard Departure Reports
Overhaul Alteration Cost	Shipyard Departure Reports
Personnel Levels	Enlisted Master Records Ship Manning Document
Hours Steaming Underway, Not Underway, Cold Iron	Steaming and Fuel Master Data File
Ship Age	Jane's Fighting Ships
Ship Fleet	Jane's Fighting Ships
Type of Overhaul	Shipyard Departure Reports
Overhaul Shipyard	Shipyard Departure Reports

Overhaul Expense Variables

Variables for the amount of work expended on a system during an overhaul represent a primary focus of the study. The thrust of the study is in the direction of understanding the effect of these variables on later equipment condition.

The most fundamental of these variables measure, in shipyard mandays, the amount of overhaul work actually expended on each system. This work is broken down into repair work and alteration work, depending on whether it was funded by the type commander or by NavSea. This means that some minor alterations (e.g., title D and title F alterations) were grouped with repair work. All the manday expenses come from the official shipyard departure report issued at the overhaul completion. As such, they represent the actual documented work expended.

The departure report work items were matched to our systems primarily on the basis of the system work list identification number (SWLIN) under the SWBS or SSI system. Each of the systems in the study is essentially identified by a list of such numbers; these are given in appendix A. In order to avoid, as far as possible, reporting discrepancies, the departure report work items were also examined on the basis of their brief word description and, when it appears, the equipment identification code (EIC). This allowed for the best possible cross-checking.

Departure report work is documented in shipyard mandays, so that mandays lead directly to a unit of measure for this study. Beyond this, mandays are desirable, as opposed to dollar cost, because they are a more fixed and consistent standard for use between different shipyards and years. Dollar costs were obtained for the total overhaul expense on a ship, but were not used because of these inconsistencies.

In addition to these figures on final, actual overhaul expense, considerable effort was also made to obtain information on preoverhaul authorizations; these could provide greater insight on estimates of necessary work. This effort met with only limited success. The data has generally not been retained. Available documentation of preoverhaul estimates and shipyard planning letters was too limited for use in this study.

Personnel Variables

A ship's crew has a considerable influence on the ship's equipment condition. This equipment cannot be divorced from the people who operate and maintain it. As a result, it is essential to include some account of crew capability in any relative assessment of equipment condition.

Our account of shipboard personnel is based on information obtained from the Navy enlisted master record (EMR) files. We were able to obtain for each ship and for various points in time, the number of crew members in each rating and paygrade, their length of Navy service, time onboard that ship, and number of Navy enlisted classifications (NECs) accumulated. From this information, we have computed a number of variables which quantify various aspects of the ship's crew.

Before describing these variables in detail, it may be useful to discuss the way these variables are matched to the systems in the study, and the way they are derived for each month. Matching them to a system is achieved by computing the variables only for those ratings which most directly and significantly deal with the system. Table 5 shows the correspondence between the ratings and the systems in the study. As a result of this matchup, each personnel variable will have different values for different systems. This reflects a potentially different crew capability for different systems of the same ship. While there is some question concerning our assignment of ETs and ETNs to some of the SSN systems, the impact either way is expected to be quite small here.

The problem of deriving the variables by month arises from the fact that the EMRs are only available periodically, usually every three or six months. For a month in which an EMR is available, the calculation is straightforward, and simply uses that month. For a month between the dates of two available EMRs, a linear interpolation is used on the variables from those months. In this way, a value for each variable and each month results.

Two personnel variables are used in this study. The first is the number of enlisted crew members in paygrades E5 and above divided by the ship manpower document (SMD) requirement for paygrades E5 and above. This variable is therefore a measure of crew manning and to some extent crew quality.

For the SSN-637 class, there is only one SMD for the entire class. For the FF-1052 and DDG-2 classes, however, there is a specific SMD for each ship established at each overhaul. The SMD requirements for specific NECs may vary considerably. However, the SMD requirement aggregated to the rating and paygrade level is quite consistent over a class, and we use simply the average requirement. This is of minor consequence since the SMD requirement is used only as a standard for comparison between classes.

The second variable is the average length of Navy service among crew members in paygrades E4 and above. This variable is therefore a further measure of crew quality.

Steaming Hour Variables

The steaming hour variables used in the study are quite straightforward in description and computation. As they are quite important in the study, however, they are discussed separately here. The variables themselves are measures for each ship in each month. They measure the number of hours in the month that a ship was

TABLE 5

SYSTEMS AND CORRESPONDING RATINGS*

Systems	FF, DDG Ratings	SSN Ratings
Whole ship	All ratings	All ratings
Hull structure	HT	--
Main propulsion	BT,MM	ET, ETN, MM
Propulsion shafting	MM	MM
Main steam piping	BT,MM	ET, ETN, MM
Feed and condensate	BT,MM	ET, ETN, MM
Propulsion boilers	BT,IC	--
Combustion air	BT	--
Electrical	MM,EM,EN,IC	MM, EM, IC
Power generators	MM,EM,EN	MM, EM
Sonar	ST,STG	ST, STS
Interior communications	IC	IC
Climate control	MM,EM,EN	MM, EM
Refrigeration	MM,EM,EN	MM, EM
Distilling	BT,MM,IC	ET,ETN,MM,IC
Compressed air	MM,EM	MM, EM
Steering	MM,EM	MM, EM

*The rating abbreviations are as follows:

HT Hull Maintenance Technician
BT Boiler Technican
MM Machinist's Mate
ET Electronics Technician
ETN Electronics Technician (Communications)
EM Electrician's Mate
EN Engineman
IC Interior Communications Electrician
ST Sonar Technician
STG Sonar Technician (Surface)
STS Sonar Technician (Submarine)

steaming and underway, steaming but not underway, and cold iron. A ship is always in one of these states. Therefore the sum of these variables should be the number of hours in the month.

These variables are used as a proxy for operating tempo. Steaming underway is generally taken to indicate a high tempo of operations, while cold iron is taken to indicate minimal tempo. As a proxy, this will naturally be more accurate for some systems than for others. For main propulsion, and its subsystems generally, steaming underway should be a good indicator of actual operating tempo. For auxiliary systems, it is much less clear. Probably for refrigeration and interior communications it will be quite poor, while for sonar and steering it may be far better. In any case, the steaming hours variables are our best available proxy for operating tempo.

<u>Other Variables</u>

A number of other variables are included in the model. Each of these may have an effect either on material condition itself or on the indicators of material condition used in the study. By not including them, the true effect of overhaul mandays may be masked and misestimated. A short description of each of these variables is given in this section.

The age of the ship at the end of overhaul is included to account for possible material condition change, probably deterioration, due simply to getting older. This is measured in months from the commissioning date of the ship to the overhaul completion date.

Another variable distinguishes a ship by assigning a 0 or 1 according to whether it is assigned to CINCLANTFLT or CINCPACFLT. This distinction of a ship according to fleet should account for differences in maintenance policy, whether on the depot, intermediate or organizational level. It should also account for systematic reporting differences between coasts in the indicators of material condition. Finally, it should account for different modes of operation between the coasts which may affect material condition.

For the SSN-637 class, a variable is included to distinguish the two types of overhauls it may undergo. A 1 or 2 is assigned according to whether the overhaul was a regular or a refueling overhaul. In the refueling overhaul, the nuclear core is replaced. This makes an overhaul more extensive, as well as longer by about three or four months. This variable therefore controls for the extended (nonoperational) depot period.

Another factor which may influence later material condition, and which, moreover, may particularly affect the relationship of overhaul mandays to material condition, is the overhauling shipyard.

One variable for each shipyard is used to account for shipyard differences. It assigns a 1 or 0 according to whether the overhaul was done in that shipyard. This will account for general systematic differences resulting from having had overhauls in different shipyards.

CHAPTER III

ANALYSIS

MODEL

An analytic model is used in this study to quantitatively measure the effect on a ship's material condition due to the many factors which impact this condition. The model developed here investigates this effect for each of the three ship classes and many ship systems described in Chapter II.

The factor of primary interest is overhaul repair mandays. A number of other factors are also of interest, however, and so is the comparison of relative effects among all the factors together. Moreover, inclusion of all the factors is necessary in order to accurately bring out the effect of each factor individually.

The model used to bring out these effects starts with the premise that the material condition of a ship system in a month may be represented as a linear sum of the values of the relevant factors for that month. Though the precise relationships may actually not be linear, a linear model is nevertheless reasonable, for several reasons. First, each ship class is examined separately, and the ranges of the variables in a class are relatively small, so that a linear approximation can be quite accurate. Moreover, the fundamental goal of the analysis is to determine the effect, positive or negative, of more overhaul work on material condition; and the estimated effect from a linear model will have the same sign as the (nonconstant) effect from a curvilinear model (some testing of various other forms has confirmed this assertion). Finally, the data in this study is not considered precise enough to distinguish the subtle differences among nonlinear forms.

In detail, the model presumes that material condition (MC) in a month is given by a linear combination of the following factors: the repair cost or work in the most recent overhaul (RC); the alteration cost or work in this overhaul (AC); the level of manning of the ship's crew in that month (PP); the quality of the ship's crew in that month (PQ); the amount of steaming underway during the three months prior to that month (ST); the amount of time cold iron in the month just preceding that month (CI); the preoverhaul material condition for the most recent overhaul (PC); the age of the ship at the end of that overhaul (AGE); the fleet, LANT or PAC, to which the ship is assigned (FL); and the overhauling shipyard of the preceding overhaul (SY). For submarines, there is additionally a term for the type of overhaul (OH), whether regular or refueling. This relationship is summarized in the following equation:

$$MC = a_0 + a_1 RC + a_2 AC + a_3 PP + a_4 PQ + a_5 CI + a_6 ST + a_7 PC + a_8 AGE + a_9 FL + a_{10} SY$$

Months were chosen as being a reasonable period for observing material condition and other variables. An autocorrelation correction was made, since there is always some continuity in material condition from one month to the next. Each month following an overhaul was used as an observation period in the model, with the following exceptions. The first three months after overhaul were not used. These months include a shipyard warranty period on overhaul work, and indicators of material condition in this period are not reliable. Moreover, ships in this period are not yet at the point of performing their operational missions, so that material condition is not of the same significance. For SSNs, the months following a selected restricted availability were not used, since this additional depot level work could not be related to the preceding overhaul work. Finally, months beginning in 1980 and later were not included, since data in these months was not available.

Repair work and alteration work are given in mandays. The crew manning level refers to the number in paygrades E5 through E9. The crew quality uses the average length of service of the crew members. Preoverhaul material condition is measured by CASREP maintenance downtime in the nine months before overhaul. The other variables or factors are as discussed in Chapter II.

The coefficients a_0, a_1, a_2 ... are determined statistically using regression analysis and the equation above. The units of observation are ship-months for ships within a class; there were 817 such observations for the FF-1052 class, 856 for the DDG-2 class, and 946 for the SSN-637 class. Each coefficient gives the relationship of its variable or factor to material condition. These coefficients can be expected to differ between systems and ship classes. Consideration and comparison of them is the basis for the study conclusions.

The coefficient of primary interest in this study is that of repair cost (RC). The sign of this coefficient indicates the effect of more repair work on material condition. With respect to the CASREP variables, for example, a negative coefficient indicates that more repair mandays were associated with fewer CASREP problems, either in numbers or in downtime. This would, in fact, be the expected sign if repair work has its intended effect. The model described above accounts for the three major factors which impact material condition: overhaul work, crew personnel, and operating tempo. However, none of the variables used in this study to quantify material condition is, by itself, entirely satisfactory. Conceivably, they may each give different insights. Therefore, all the variables are used. That is, coefficients in the above equation are generated for each of the indicators of material condition. For each such indicator, the coefficients show the effects which the explanatory variables have had on that indicator.

The initial quantitative output from the model is a set of tables, one for each ship system and class. Each table lists the coefficients for all the variables, for each material condition indicator. For any variable, comparison of that variable's coefficients shows how consistent an effect it has had on the different indicators. These tables are shown in appendix B.

In these tables, each coefficient has listed with it its t-statistic. This is a statistical measure of the confidence with which the variable may be taken to have the relationship indicated by its coefficient. Also given in these tables is the R-squared and F-statistic for each equation. These measure the extent to which the equation explains its material condition indicator, and the confidence with which this explanation may be taken, respectively. As is common in this kind of situation, the R-squared values can be expected to be fairly low due to the many individual ship differences and the randomness which is always a part of material condition.

Some care must be taken in interpreting and using the coefficients. As computed, they are the best estimate of a variable's relationship to a material condition indicator, as evidenced by the data documenting past Navy experience. If past policies and conditions remain the same, the statistically significant ones can be expected to predict well. However, they do not imply a causal connection.

For example, if the coefficient of the fleet variable indicates that ships from one of the fleets have registered better material condition, it does not imply that assigning a ship to that fleet will improve its material condition. It only means that ships in that fleet have on average recorded better material condition. Where a clear causal relationship is known or expected to exist, then a coefficient should indicate the nature of that relationship.

Finally, while the model described above does account for the important factors and seems best under the data and computational restrictions, it does have important limitations. The greatest may be the limitation in accounting for personnel. The actual ability and effect of a crew in dealing with ship equipment may not be well captured by the level of manning and length of service of crew members in the higher paygrades. Also, no account is made of the motivation and leadership of a ship's officers and particularly of the commanding officer.

Equipment condition of a ship upon entering overhaul is also difficult to quantify. It may not be captured well in the preoverhaul condition variable used here since CASREPs just before overhaul can be misleading. Also, the effect of restricted availabilities and technical availabilities is not accounted for. Selected restricted availabilities for submarines have not been included, but neither have observations in the months following such an availability. This means that the months which are included all trace back directly to the last overhaul.

While these are the major limitations in the model, there are some others. Equipment usage may not be fully reflected in the hours steaming underway and cold iron used as variables for operating tempo. Also, the full effect of the overhauling shipyard, the proximity to homeport, and the effect of ships force overhaul work, have not been accounted for. Finally, there is uncertainty in the degree to which the indicators of material condition are accurate in reporting actual material condition.

To the extent that these limitations exist, the model may not fully reflect Navy operations, and particularly the effect of overhaul work. To the extent that they are divorced from the direct impact of overhaul work, the model should reveal the relationships of interest.

The estimates made from the model are statistically the best ones possible from the data. Because of variations in the data itself as well as in the amount of data available, however, the estimates differ considerably in their reliability. Consequently, the statistical significance of the estimates is also presented and discussed.

In the analysis for this study, significance levels of 80 percent and 90 percent are used. An estimate at one of these levels can be taken, with just this probability, as being different from zero, that is, of correctly showing the sign of the actual coefficient. When an estimate has a significance below one of these levels, less confidence must be given to it. It remains as the best possible estimate, but it is unreliable by comparison.

The estimated coefficients may be used to predict the effect of changes in the variables themselves on the material condition indicators. The product of a change in a variable times the coefficient of that variable is the predicted change in the material condition indicator. This kind of prediction is based on the fleet experience data from which the estimates were derived. It does not necessarily imply a causal relationship.

From the coefficients and the average values of the variables and material condition indicators, elasticities may be computed. The elasticity of a variable is the percentage change in the material condition indicator associated with a one percent change in the variable. It is calculated as the coefficient times the average value of the variable divided by the average value of the material condition indicator. Elasticities may be useful in gaining further insight into effects. Also, they help clarify comparisons of systems and ship classes. For these reasons, they are used in the analysis which follows.

All the average values and estimated coefficients are presented in appendix B. Moreover, a careful description of the variables, together with their units of measurement, is also given there. The analysis in the following sections is based on these tables, and frequent reference is made to them.

ANALYSIS AT THE WHOLE SHIP LEVEL

This section interprets and discusses the results of applying, at the whole ship level, the model described earlier. Table B-2 shows the average values of all the variables involved. Tables B-3 through B-5 give the estimated coefficient values for FFs, DDGs, and SSNs, respectively.

In these latter tables, while the extent to which the equations explain the material condition indicator variables differs, it is high enough to make the equations meaningful. Several other general patterns are also apparent. CASREP maintenance downtimes are explained by the model somewhat better than total CASREP downtimes, and both of these are explained considerably better than the numbers of CASREPs reported. IMA hours and SF hours are the most poorly explained.

Effects of Repair Mandays

Our focus on repair costs begins with a calculation of their elasticities. These are shown in table 6, and are calculated at average values of the variables. Given the trends in repair mandays and in CASREPs over the period of the study, these average effects might have occurred at about the middle of the decade. The elasticities therefore estimate the effects of repair work at levels occurring in about 1975 or 1976. They should not be used for current levels.

Of greatest importance in the table is the consistent pattern of effect which repair cost has on the various indicators. A negative sign means that an increase in repair cost is associated with a decrease in the indicator value. The consistent pattern of negative signs in the table demonstrates an unambiguously beneficial effect on material condition. The fact that 10 of the 11

FF-1052 class indicators, 8 of the 11 DDG-2 class indicators, and 9 of the 10 SSN-637 class indicators are negative is evidence that more repair work was associated with fewer material condition problems over the period in the study.

TABLE 6

MATERIAL CONDITION INDICATOR ELASTICITIES FOR REPAIR MANDAYS

Material condition indicator	Elasticity[a]		
	FFs	DDGs	SSNs
CASREP total downtime	-0.33	-0.36*	-0.31
CASREP maintenance downtime	-0.98**	-0.61**	-0.28
CASREP occurrences	-0.56**	-0.37**	-0.33**
CASREP C3-C4 total downtime	-0.85*	-0.10	-0.05
CASREP C3-C4 maintenance downtime	-0.98	-0.99*	-0.25
CASREP C3-C4 occurrences	-1.16**	-0.29	-0.27
IMA hours	+0.03	-0.12	-0.03
SF hours	-0.28	+0.02	-0.24
UNITREP C3-C4 overall status	-0.42*	+0.51**	+0.32
UNITREP C3-C4 equipment status	-0.52*	-0.04	-0.25
INSURV score	-0.93	+0.22	

[a]The elasticities are the percent changes in the material condition indicators associated with a one percent increase in repair mandays, and are calculated at average values of the variables. One star indicates a significance of 80 percent, two stars a significance of 90 percent.

As indicated in the table, the estimates of this effect are statistically more significant for FFs and DDGs than for SSNs. Moreover, the actual magnitude of the effects is greatest for FFs and least for SSNs. For the CASREP indicators, the elasticities (percent of change due to a one percent increase in repair cost) range from -.3 to -1.2 for FFs, from -.1 to -1.0 for DDGs, and from -.1 to -.3 for SSNs.

As an alternative to discussing the effect of repair cost in terms of elasticities, the estimated effect can be assessed directly. In particular, the effect of 500 additional repair mandays on CASREP maintenance downtime, in hours per month, may be estimated using the coefficients for repair cost in tables B-3 to B-5. Such estimates are shown in table 7. The 500 repair mandays are to be taken in the context of an average repair manday overhaul total of 40,000 for FFs, 60,000 for DDGs and 130,000 for SSNs, over the period in this study. The same 500 repair mandays comprise a far smaller fraction of the total overhaul repair manday package for SSNs, and this explains in part why the estimates are lower for SSNs.

TABLE 7

ESTIMATED EFFECT OF 500 ADDITIONAL REPAIR MANDAYS ON CASREP MAINTENANCE DOWNTIME PER MONTH (In Hours)[a]

	FFs	DDGs	SSNs
CASREP maintenance downtime	-39.8	-18.6	-1.1
CASREP C3-C4 maintenance downtime	-6.2	- 4.4	-0.04

[a]These estimates assume an average repair package of 40,000 mandays for FFs, 60,000 mandays for DDGs and 130,000 mandays for SSNs.

Over the period in this study, the number of FF-1052 class and DDG-2 class overhaul repair mandays was correlated with the overhaul year. That is, later years generally meant more repair mandays, as sown in figure 1. To test whether the beneficial relationship observed between repair mandays and material condition is a reflection just of an unrelated improvement in material condition during later years, the model in the study was modified by adding a variable representing the overhaul year.

With this change, the correlation between repair mandays and overhaul year does lead to a reduction in the size of the repair manday coefficients, and ina couple of cases, to a reversal in sign (that is in estimated effect). However, in most cases, and in all cases of statistical significance, the estimated effect of repair mandays does not reverse. This tends to confirm the preceding analysis.

The elasticities for reapir mandays are shown in table 8. They may be compared with those in table 6. The preponderance of negative signs for repair mandays, particularly for the statistically significant cases, again suggests the beneficial relationship between material condition and more repair mandays. The ad hoc addition of the overhaul year variable does lead to a less certain and less strong estimated effect.

TABLE 8

MATERIAL CONDITION INDICATOR ELASTICITIES FOR
REPAIR MANDAYS WHEN THE OVERHAUL YEAR IS INCLUDED

Material Condition Indicator	Elasticity[a] FFs	DDGs
CASREP total downtime	+0.20	-0.32*
CASREP maintenance downtime	-0.69*	-0.53**
CASREP occurrences	+0.04	-0.40**
CASREP C3-C4 total downtime	-0.33	+0.10
CASREP C3-C4 maintenance downtime	-0.32	-0.76
CASREP C3-C4 occurrences	-0.81*	-0.27
IMA hours	-0.06	-0.22
SF hours	+3.42	-0.12
UNITREP C3-C4 overall status	-0.62*	+0.66**
UNITREP C3-C4 equipment status	-0.03	+0.01
INSURV score	-1.15	+0.13

[a]The elasticities are percent changes in the material condition indicators for a one percent increase in repair mandays, calculated at average values of the varaibles. One star indicates a significance of 80 percent, two stars a significance of 90 percent.

Effects of Other Variables

The effect of alteration work on material condition provides a contrast to the effect of the repair work just discussed. It should be noted at the outset that alteration work does not have the same purpose as repair work. Whereas repair work is solely intended to restore or enhance material condition, alteration work is intended to improve capability, safety, or system reliability and maintainability. In particular, somewhat degraded material condition may be an acceptable cost for better capability. Moreover, the analysis can only address the particular alterations made during the period of the study, and may not anticipate the experience of future, different alterations.

Table 9 is similar to table 6, and shows the elasticities of the material condition indicators for alteration work. Here, in fact, there is a noticeably different effect than for repair work. For FFs, there is an absolutely consistent pattern of beneficial effect on material condition due to increased alteration work. As with repair work, this tends to be most significant for C2 CASREPs. However, the magnitude of this effect due to alteration work is much smaller than for repair work. In fact, it is generally less than half as much.

TABLE 9

MATERIAL CONDITION INDICATOR ELASTICITIES
FOR ALTERATION MANDAYS

Material Condition Indicator	Elasticity[a]		
	FFs	DDGs	SSNs
CASREP total downtime	-0.18	+0.29**	+0.05
CASREP maintenance downtime	-0.26*	+0.96**	+0.09
CASREP occurrences	-0.35**	+0.38*	+0.15*
CASREP C3-C4 total downtime	-0.35	+1.11*	-0.30
CASREP C3-C4 maintenance downtime	-0.47	+2.10**	+0.28
CASREP C3-C4 occurrences	-0.21	+0.82**	+0.33
IMA hours	-0.16	-0.14	-0.16*
SF hours	-0.52	-1.22**	+0.50**
UNITREP C3-C4 overall status	-0.17	-0.46*	-0.20
UNITREP C3-C4 equipment status	-0.30*	-0.13	-0.12
INSURV score	-0.53**	-0.09	

[a]The elasticities are the percent changes in the material condition indicators associated with a one percent increase in alteration mandays, and are calculated at average values of the variables. One star indicates a significance of 80 percent, two stars a significance of 90 percent.

In contrast to this beneficial effect for FFs, there are mixed indications of effect for DDGs and SSNs, with at least some indications of detrimental effect on material condition. This is particularly so among the CASREP indicators, and with high statistical significance for the DDGs. The detrimental effect for DDGs is greater in magnitude than for SSNs; this is all the more noteworthy as alterations comprise a far greater portion of the overhaul work package for DDGs.

All three ship classes show a beneficial effect of alteration work on the UNITREP indicators, and with higher statistical significance for the FFs and DDGs. Moreover, for the the FFs and DDGs, the INSURV score also seems to have improved with more alteration work. Still, with the somewhat inconsistent patterns for DDGs and SSNs, and the contrast of these with the FF pattern, no firm conclusion on the effect of alteration work is warranted. Our estimates in any case apply only to the specific alterations accomplished in the period of this study, and do not take account of the differences in alterations between classes or the improvements in capability due to alterations. The most which may be said is that alteration work appears not to have the same beneficial effect on material condition as does repair work.

The effect of our personnel variables on the indicators of material condition is also very unclear. The average length of service variable seems completely ambiguous, with no apparent pattern. The effects of the number of personnel in paygrades E5 to E9 are more systematic, but still mixed. For FFs, higher levels were associated with a consistent pattern of worse reported material condition. For DDGs and SSNs, there seemed to be better C3-C4 CASREP condition, and possibly better C2 CASREP condition for SSNs, but worse reported material condition otherwise. This lower level in reported condition may be due to the greater number of qualified personnel available to properly document material condition problems. The one consistent pattern for all three classes is a greater amount of intermediate and ships force corrective maintenance with higher manning levels.

Of the operating tempo variables, the hours cold iron in the previous month is ambiguous for all three ship classes. However, with high statistical significance for all three classes, it did indicate greater amounts of both intermediate maintenance and ships force maintenance, as might be expected.

In contrast to this, steaming hours underway has a consistent, though different, effect in the three classes. Moreover, the effect is more highly significant statistically. For FFs and DDGs, more steaming underway is associated with better material condition, as shown through the indicators. For SSNs, it is associated with worse material condition. While these associated effects can be predicted by the amounts of steaming, the steaming itself may not cause them. Rather, the steaming may be a proxy for such conditions as deployment and time away from port. Moreover, SSNs are affected by a very different mode of operations and preparation for operations; thus, the effects of increased operating tempo can not be compared betwen ship classes. Nevertheless, the associations described above stand up.

The age variable does not show a strong pattern in its coefficients, but it does suggest that older ships had worse material condition. The fleet variable is not easily interpretable, since it may reflect differences in fleet reporting. It does, however, account for differences in fleet practices.

This last comment also applies to the shipyard variables. A clear pattern in these variables is not evident, and in fact, shipyard performance is based on more than this study analyzed. Consequently, no conclusions on these variables are drawn.

In general, the variables other than repair cost have these characteristics: a number of them enter each equation with significant coefficients; many of them have the anticipated sign; and they tend to be consistent in sign between equations. These characteristics further suggests that the findings on overhaul work are not spurious.

ANALYSIS AT THE SYSTEM LEVEL

The analysis of the systems closely parallels that of the whole ship. In particular, the model used to explain material condition is exactly the same, and the analysis again focuses on overhaul repair work.

However, the analysis at the system level is less dependable than at the whole ship level. In part, this is due to inequivalent system definitions under different classification schemes, so that, for example, repair work and material condition may not cover exactly the same equipments. In part, it is also due to the smaller magnitudes involved; reporting errors have a correspondingly bigger effect at the system level.

Initial insight into overhaul work at the system level may be gained by considering the amount of overhaul work, on average, which each system received. Table 10 shows the average repair (RC) and alteration (AC) mandays expended in overhaul for each system and each ship class.

Not surprisingly, main propulsion receives a substantial fraction of the repair work for all three classes, particularly for the FFs and DDGs. It accounts for just over one quarter of all repair mandays for FFs, and over one third for DDGs. Among the main propulsion subsystems for these two classes, boilers receive more work than any other single equipment. In both cases, they account for just over a third of all main propulsion mandays. In fact, the distribution of main propulsion mandays among its subsystems is nearly identical for FFs and DDGs.

Alteration mandays generally accounted for only a fraction of repair mandays in the systems studied here. Climate control is an exception to this for both FFs and DDGs. A more notable exception in all three classes is sonar. However, there is no reason to expect that future alteration work will be distributed over the systems as it has been in the past.

With regard to later comparison of systems, further insight comes from examining the relative material condition of the systems. The average values of each of the material condition indicators may be compared using the tables in appendix B. Following our emphasis on CASREP maintenance downtime, these downtime averages are summarized in table 11. CASREP occurrences (i.e., the number of CASREP reports) may also be of interest, and these are summarized in table 12.

TABLE 10

AVERAGE REPAIR AND ALTERATION MANDAYS
BY SYSTEM (in thousands)

System	FFs		DDGs		SSNs	
	RC	AC	RC	AC	RC	AC
Hull structure	1.49	3.35	2.26	.23	9.89	2.05
Main propulsion	9.95	.86	20.79	2.08	9.83	.75
Propulsion shafting	.66	.00	1.31	.00	3.06	.00
Main steam piping	.75	.06	1.60	.09	1.34	.00
Feed and condensate	1.70	.26	3.09	.38	2.14	.28
Propulsion boilers	3.54	.16	7.94	.65		
Combustion air	1.00	.03	2.00	.27		
Electrical	1.57	.11	1.37	4.10	3.71	.00
Power generators	.93	.01	.57	3.51	1.22	.00
Sonar	1.31	4.77	.36	4.39	1.05	6.79
Interior communications	.12	.35	.20	.00	.40	.00
Climate control	.77	1.32	1.64	3.74	4.34	.44
Refrigeration	.19	.00	.23	.00	.29	.00
Distilling plant	.54	.01	.61	.00	1.23	.23
Compressed air	.88	.58	.59	1.42	4.26	.20
Steering	.23	.00	.44	.00	1.54	.12
Whole ship	38.41	28.38	58.24	39.30	133.61	28.28

Main propulsion easily accounts for the most downtime in FFs and DDGs, but not in SSNs. There, sonar accounts for the most, being almost one quarter of the ship total. While propulsion boiler repair mandays made up approximately one third of all those for main propulsion, they account for nearly two thirds of the CASREP C3-C4 maintenance downtime for FFs, and over half for DDGs. Moreover, for FF boilers, maintenance downtime from C3-C4 CASREPs is nearly equal to that from C2 CASREPs.

The statistical output again appears in appendix B. It is organized by system, and encompasses tables B-6 through B-67. An explanation of the notation in these tables also appears in this appendix.

A broad look at these tables, i.e., the results of applying the model in Chapter II, shows that most often, the model more poorly explains material condition for the systems than it does for the whole ship. This is evidenced by the lower extent to which the variation in the material condition indicator values is explained,

TABLE 11

AVERAGE CASREP MAINTENANCE DOWNTIME AND CASREP C3-C4 MAINTENANCE DOWNTIME BY SYSTEM (hours per month)

System	FFs		DDGs		SSNs	
	All	C3-C4	All	C3-C4	All	C3-C4
Hull structure	30.0	5.6	26.3	6.5	1.7	0.0
Main propulsion	589.7	183.2	964.4	176.6	33.8	2.6
Propulsion shafting	7.5	1.5	10.6	4.1	4.1	0.2
Main steam piping	10.7	3.6	44.6	14.3	3.3	1.3
Feed and condensate	150.7	27.5	269.1	29.4	2.7	0.1
Propulsion boilers	229.1	113.5	306.1	93.1		
Combustion air	94.5	28.5	97.8	2.3		
Electrical	217.4	49.1	290.7	42.7	33.0	4.3
Power generators	131.6	44.1	145.6	36.1	27.5	3.7
Sonar	203.4	42.7	52.7	7.9	232.1	11.1
Interior communications	9.1	0.0	21.3	0.7	5.7	0.3
Climate control	145.2	10.4	156.9	3.2	116.1	2.6
Refrigeration	7.3	0.8	4.3	0.3	1.1	0.0
Distilling plant	38.3	11.4	19.3	5.0	40.4	0.6
Compressed air	190.8	9.6	150.0	42.7	6.6	0.4
Steering	26.9	5.8	10.5	0.6	1.4	0.9
Whole ship	3119.9	484.4	3521.8	517.6	1076.0	43.3

TABLE 12

AVERAGE CASREP OCCURRENCES AND CASREP C3-C4 OCCURRENCES BY SYSTEM (occurrences per month)

System	FFs		DDGs		SSNs	
	All	C3-C4	All	C3-C4	All	C3-C4
Hull structure	0.04	0.01	0.05	0.01	0.00	0.00
Main propulsion	1.29	0.56	1.96	0.53	0.06	0.01
Propulsion shafting	0.02	0.01	0.03	0.02	0.01	0.00
Main steam piping	0.03	0.02	0.10	0.06	0.00	0.00
Feed and condensate	0.28	0.07	0.43	0.05	0.01	0.00
Propulsion boilers	0.51	0.33	0.77	0.26		
Combustion air	0.15	0.04	0.14	0.01		
Electrical	0.46	0.12	0.37	0.06	0.10	0.03
Power generators	0.28	0.09	0.16	0.03	0.06	0.02
Sonar	0.42	0.10	0.17	0.05	0.44	0.04
Interior communications	0.00	0.00	0.05	0.01	0.01	0.00
Climate control	0.28	0.04	0.25	0.02	0.19	0.01
Refrigeration	0.02	0.00	0.01	0.00	0.01	0.00
Distilling plant	0.09	0.03	0.06	0.01	0.06	0.01
Compressed air	0.28	0.02	0.23	0.02	0.03	0.00
Steering	0.03	0.01	0.03	0.01	0.01	0.00
Whole ship	7.47	1.62	7.93	1.74	2.27	0.20

and the lower statistical significance which these explanations have. As indicated previously, this may be explained in part by inconsistent system definition under different classification schemes, and in part by greater inaccuracy of material condition indicators at the system level.

There is also less consistency in effect on the various material condition indicators at the system level than at the whole ship level. This, however, may be caused by genuinely different effects on the different indicators, which may have a tendency to average out when aggregated to the whole ship level. For example, CASREP supply downtime in contrast to maintenance downtime may be more significant or may be differently affected for a particular system than for the whole ship on average. Moreover, systems undoubtedly vary in the relative prominence of C3-C4 and C2 CASREPs; this is apparent from table 12. The focus on the analysis here is on CASREP maintenance downtime, and to a lesser extent, on CASREP occurrences. In addition to the advantages of CASREPs mentioned earlier, maintenance downtime as opposed to total downtime has the further advantage of differentiating equipment failures based on the amount of time taken for repair, but without including the random effects of supply. Finally, in addition to using all CASREPs, C3-C4 CASREPs alone are also used for FFs and DDGs. They are not, however, broken out for SSNs, because of the very small numbers involved at the system level.

Table 13 shows the effects of increased repair mandays on CASREP maintenance downtime and on CASREP occurrences. These effects are described by way of elasticities, and are especially useful for comparisons among ship classes and sysems. Table 14 shows the same effects but only for C3-C4 CASREPs, while table 15 shows the effects of increased alteration mandays.

With only a few exceptions, the statistically significant effects of increased repair work for systems are beneficial, just as for the whole ship. For main propulsion and its subsystems particularly, all the statistically significant effects indicate a beneficial effect; this is true whether all CASREPs or only C3-C4 CASREPs are regarded, and it is true for all three ship classes.

This pattern is also strongly evident for both interior communications and refrigeration. The magnitude of the beneficial effect appears to be greater for refrigeration.

Apparent exceptions to the pattern of beneficial effect occur in sonar for FFs and DDGs, and in distilling for SSNs. These exceptions could reflect unreliable system level estimation. Alternatively, they might indicate real concerns which the Navy may wish to look into.

TABLE 13

CASREP MAINTENANCE DOWNTIME AND CASREP OCCURRENCE ELASTICITIES FOR REPAIR MANDAYS BY SYSTEM[a]

System	FFs		DDGs		SSNs	
	MNT	OCC	MNT	OCC	MNT	OCC
Hull structure	-0.50	-0.12	0.18	0.13	-0.70	0.47
Main propulsion	-1.20*	-0.74*	0.57	-0.23	-3.32*	-0.96*
Propulsion shafting	0.40	-0.27	0.77	-0.26	-8.63*	-0.70
Main steam piping	-0.09	-0.90*	-2.27*	-0.15	-1.72	-0.60
Feed and condensate	-0.57*	0.11	0.13	0.07	-2.87*	-1.04
Propulsion boilers	-0.24	-0.07	-0.20	-0.64*		
Combustion air	0.20	0.24	-3.14*	-2.35*		
Electrical	-0.33	-0.15	-0.85*	-0.09	-0.64	0.47
Power generators	0.37	-0.02	-0.33	0.50*	-0.37	0.04
Sonar	0.23	0.31*	-0.17	0.29*	-0.11	-0.02
Interior communications	-0.64*	-0.77*	-0.36	-0.58*	-1.95*	-1.31*
Climate control	-0.25	-0.20	-0.92*	-0.39	-0.54	-0.21
Refrigeration	-3.59*	-1.24*	-1.89*	-0.75	-0.45	-0.15
Distilling plant	-0.48	-0.70*	0.03	-0.04	2.55*	1.44*
Compressed air	-0.33	0.26	0.11	0.28	-0.25	0.60
Steering	-0.45	-0.80	0.17	0.12	0.70	-0.14
Whole ship	-0.98*	-0.56*	-0.61*	-0.37*	-0.28	-0.33*

[a]The elasticities are percentage changes in downtime or occurrences for a one percent increase in repair mandays, and are calculated at average values of the variables. A star indicates a significance of at least 80%.

TABLE 14

CASREP C3-C4 MAINTENANCE DOWNTIME AND CASREP C3-C4 OCCURRENCE ELASTICITIES FOR REPAIR MANDAYS BY SYSTEM[a]

System	FFs		DDGs	
	MNT	OCC	MNT	OCC
Hull structure	-1.67*	-1.25*	0.14	0.22
Main propulsion	-2.87*	-1.27*	-1.56*	-0.73
Propulsion shafting	-0.76	-0.51	0.51	-0.66
Main steam piping	-0.58	-1.21*	-1.70	0.21
Feed and condensate	0.63	0.47	-2.12*	-0.82
Propulsion boilers	-0.41	-0.19	-0.03	-0.30
Combustion air	1.20	1.33	0.91	2.00
Electrical	-0.79*	-0.44*	-8.22*	-0.61
Power generators	-0.35	-0.22	-3.56*	-0.02
Sonar	1.22*	0.11	-0.14	0.15
Interior communications	--	--	0.76	-0.55
Climate control	-0.35	-0.55	0.14	-0.84
Refrigeration	-4.72*	-0.00	-1.12	-0.00
Distilling plant	-0.85*	-1.07*	0.40	0.38
Compressed air	2.24	3.65*	0.33	0.11
Steering	-1.78*	-1.02*	-0.10	0.38
Whole ship	-0.98	-1.16*	-0.99	-0.29

[a]The elasticities are percentage changes in downtime or occurrences for a one percent increase in repair mandays, and are calculated at average values of the variables. A star indicates a significance of at least 80%. Two dashes indicate that the average repair work was too small for calculation of an elasticity.

TABLE 15

CASREP MAINTENANCE DOWNTIME AND CASREP OCCURRENCE ELASTICITIES FOR ALTERATION MANDAYS BY SYSTEM[a]

System	FFs		DDGs		SSNs	
	MNT	OCC	MNT	OCC	MNT	OCC
Hull structure	0.16	-0.05	0.06	0.06	0.62	0.59
Main propulsion	0.12	0.00	-0.60*	-0.20*	0.00	0.04
Propulsion shafting	--	--	--	--	--	--
Main steam piping	-0.06	0.07	-0.22	-0.19*	--	--
Feed and condensate	0.10	-0.07	0.05	0.06	0.80	0.34
Propulsion boilers	-0.11	-0.02	-0.20*	-0.09		
Combustion air	0.04	-0.06	-0.10	0.01		
Electrical	0.14	-0.07	-0.60*	0.03	--	--
Power generators	0.07	-0.06	-0.93*	0.34	--	--
Sonar	-0.38	0.05	0.74*	0.53*	-0.10	0.02
Interior communications	1.04*	0.99*	--	--	--	--
Climate control	-0.23	0.02	1.06*	0.47	-0.10*	-0.05*
Refrigeration	--	--	--	--	--	--
Distilling plant	0.01	-0.09*	--	--	-0.22	-0.12
Compressed air	-0.22*	-0.07	-0.03	-0.18	-0.25	-0.23
Steering	--	--	--	--	-0.16	-0.39
Whole ship	-0.26*	-0.35*	0.96*	0.38*	0.09	0.15*

[a]The elasticities are percentage changes in downtime or occurrences for a one percent increase in alteration mandays, and are calculated at average values of the variables. A star indicates a significance of at least 80%. Two dashes indicate that the average alteration work was too small for calculation of an elasiticity.

When regarded at the system level, increased alteration work has generally had a beneficial effect on material condition, but of relatively small magnitudes; this is shown in table 15. The exceptions to this are in auxiliary systems, and are very much class specific. In any case, these results can only apply to the specific alterations accomplished during the period observed in this study.

A final point in the analysis at the system level concerns the engineering log indicators of material condition. It has not been emphasized in this section because of the relative scarcity of data on which this variable is based; the data exists for only relatively few quarters, and only for FFs. It has been used, however, in the same way as the other material condition indicators, and the results appear in appendix B. In general, the effects of repair work on log downtime are similar to the effects on CASREP total downtime. This is especially so for main propulsion, which is the only system in which repair cost is statistically significant for both variables.

CHAPTER IV

SUMMARY AND IMPLICATIONS

The main concern of this study was the effect of overhaul repair work on the postoverhaul material condition of ships. As a means to exploring this concern, a number of variables were developed from a variety of Navy data bases. A major limitation in the study was the unavailability of further data.

In particular, consistent documentation of overhaul planning estimates was unobtainable, while data on overhaul work itself, for surface ships, was awkward to work with. The most serious limitation was the dearth of direct and reliable information on material condition. We could not fully trust 3-M and UNITREP data, because of errors found therein. CASREP data is not designed to measure material condition, and provides only a proxy for it. More detailed readiness and material condition analysis will in general require better maintained and more detailed data sources.

In examining the effect of overhaul repair work on postoverhaul material condition, we used statistical methods and took into account other factors that may affect material condition, particularly crew manning levels and ship operating tempo. Though we found significant relationships between overhaul repair work and postoverhaul material condition, these limitations of the analysis should be kept in mind:

- We examined only three classes of ships: the FF-1052, DDG-2, and SSN-637 classes.

- We used a number of different indicators of material condition, because no single indicator is completely suitable.

- We could not account for the effects of morale and leadership, or for all the aspects of crew experience that may affect material condition.

- To some extent, the effectiveness of overhaul repair work depends on the material condition of a ship going into overhaul. Though we used a measure of preoverhaul material condition, it is not as precise as we would have liked.

- Some other factors which may affect postoverhaul material condition could not be measured. Particularly, these are the amount of ships force work and private vendor repair work during overhaul, restricted and technical availabilities after overhaul, and specific differences between shipyards.

- Alteration work was measured by the number of shipyard mandays involved. The purpose of an alteration, the complexity of new equipment, and the amount of work done by private contractors were not included in the analysis.

- Operating tempo was measured only by the amount of steaming. This measure is probably suitable for a ship as a whole and for main propulsion systems, but should be less accurate for auxiliary systems.

However, despite the crudeness of some of our variables, we were able to account for the critical determinants of material condition. We therefore place confidence in our fundamental results.

Our principal finding is that increased repair work did, in fact, lead to better material condition. This result holds for all three ship classes, and for a wide range of material condition measures. This outcome should answer doubts about the efficacy of overhaul work during the period examined in the study.

The return from overhaul repair work did vary among the ship classes we studied. For material condition measured by number of CASREP occurrences, maintenance downtime due to CASREPs, and UNITREP equipment status, the improvement in material condition from a ten percent increase in repair work was roughly in a range of three percent to eight percent.

It is likely that other ship classes experienced further differences in the extent of benefit. However, the strength of our basic finding suggests that all ships benefitted from overhaul repair work.

Moreover, analysis of the relationship between overhaul work and the condition of ship systems indicates that the benefits of overhaul work were general, and not confined to a few systems. However, increased alteration work and improved material condition were not always in direct association. This finding may be influenced by the specific alterations made to the ships in our analysis. Nevertheless, had we not included alteration work as an explanatory variable, the effects of repair work might have been misestimated.

Due to the impreciseness in our data specifically and in measuring material condition generally, policy implications of our analysis cannot be stated quantitatively. The primary implication is that if the amount of overhaul repair work is reduced, the material condition of ships can be expected to decline. The implication that further increases in repair work will further improve material condition probably holds, but has not been established, because current levels of overhaul work are as high or higher than at any time covered in the study. Moreover, both of these implications must be tempered by the consideration that ship classes or types are influenced to different degrees by changes in overhaul work. Nevertheless, overhaul repair work generally has had a substantial and beneficial effect on ship material condition.

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APPENDIX A

SHIP SYSTEM DEFINITIONS

APPENDIX A

SHIP SYSTEM DEFINITIONS

The systems studied in the Ship Overhaul Effectiveness Study are specifically defined in this appendix. Their definitions are complicated by two factors. One factor is that surface ships and submarines are very different types of ships. Equipments and functions of one type do not always match those of the other. Even highly comparable systems can be expected to differ somewhat in the equipments included in them.

The second factor is that different classification schemes are used to specify equipments and systems in different contexts. Shipyard work is documented by the ship work breakdown structure (SWBS) for surface ships, and more commonly by the ship system index (SSI) for submarines. Each of these uses three numerical digits of which the first specifies a broad ship area.

By contrast, maintenance and equipment casualty actions are documented using the equipment identification code (EIC). This scheme uses four digits, each alphabetic or numeric.

As a result of these two complications, the ship systems must be defined separately for surface ships and submarines, and in each case, by using both classification schemes. The definitions are given in tables A-1 through A-4. The various definitions do not match exactly, but have been made to be as close as possible.

In the tables, an expression ending in zeros and followed by an s represents the expression for any possible replacement of the zeros. For example, "AB00s" indicates any EIC in which the first two digits are "AB." Also, in tables A-3 and A-4, the word "some" is used to indicate that word descriptions were used where possible to further aid the classification.

TABLE A-1

SURFACE SHIP SYSTEMS:
DEFINITION BY SHIP WORK BREAKDOWN STRUCTURE (SWBS)

System	SWBS
Whole ship	All
Hull structure	100s, exept 101-109, 165, 170-172, 179-199
Main propulsion	200s
Propulsion shafting	243, 244, 245
Main steam piping	253
Feed and condensate	255
Propulsion boilers	221
Combustion air	251
Electrical	300s
Power generators	311
Sonar	460-464, 111, 165
Interior communications	430-433
Climate control	510-515
Refrigeration	516, 638
Distilling plant	531
Compressed air	551
Steering	561, 562

TABLE A-2

SURFACE SHIP SYSTEMS:
DEFINITION BY EQUIPMENT IDENTIFICATION CODE (EIC)

System	EIC
Whole ship	all
Hull structure	AA00s, AB00s, AD00s, A000-A600s, A800-A900s
Main propulsion	B000s, C000s, F000s, K000s
Propulsion shafting	B400-B406, C400-C406, FE00-FE05, KD00-KD05
Main steam piping	F700s
Feed and condensate	F300s, K300s, some K700s
Propulsion boilers	F100, F101, F104, some F701, some F703
Combustion air	F400, F401, F403
Electrical	EC00s, KG00s, some 3000s, some 4000s
Power generators	3000, 3100-3107, 310C-310E
Sonar	R000s except R500-R800s, AF00, AF01
Interior communications	M000s, M300s, M400s, 410E, 410F, 410G
Climate control	T100s, T300s, T400s
Refrigeration	T500s
Distilling plant	TK00s
Compressed air	TF00s, N700s
Steering	some TL00s

TABLE A-3

SUBMARINE SYSTEMS:
DEFINITION BY SHIP SYSTEM INDEX (SSI)

System	SSI
Whole ship	all
Hull structure	100s except 156, 178
Main propulsion	200s except 201.4, 236, 237, 246, 248
Propulsion shafting	201 except 201.4, 203
Main steam piping	207, 231
Feed and condensate	208, 233
Propulsion boilers	---
Combustion air	---
Electrical	300s, 236
Power generators	300
Sonar	425, 426
Interior communications	438, 439
Climate control	501, 502
Refrigeration	503
Distilling plant	517, 546
Compressed air	513, 530, 540, 541
Steering	518

TABLE A-4

SUBMARINE SYSTEMS:
DEFINITION BY EQUIPMENT IDENTIFICATION CODE (EIC)

System	EIC
Whole ship	all
Hull structure	AA00s, AB00s, AD00s, 1106, A000-A600s, A800-A900s
Main propulsion	AA00s, F000s, T30K, 1106
Propulsion shafting	FE00s
Main steam piping	F700s
Feed and condensate	F300s, some K700s
Propulsion boilers	---
Combustion air	---
Electrical	EC00s, KG00s, some 3000s, some 4000s
Power generators	3000, 3100, some 3000s
Sonar	R000s except R500-R800s, AF00, AF01
Interior communications	M000s, M300s, M400s, M700s
Climate control	T100s, T300s, T400s, some T000s
Refrigeration	T500s
Distilling plant	TK00s
Compressed air	TF00s
Steering	TL00s except TL08, TL0C, TL0D

APPENDIX B

STATISTICAL OUTPUT FOR SHIP CLASSES AND SYSTEMS

APPENDIX B

STATISTICAL OUTPUT FOR SHIP CLASSES AND SYSTEMS

This appendix presents the numerical results of applying, for each ship class and system, the model described in Chapter III and summarized by the equation therein. Specifically, it presents statistical estimates for the average value of each variable, and for the coefficients in the equation.

The equation, in somewhat more detail, is as follows:

$$MC = a_0 + a_1 RC + a_2 AC + a_3 PP + a_4 PQ + a_5 CI + a_6 ST + a_7 PC + a_8 AGE$$

$$+ a_9 FL + a_{10} SYL1 + a_{11} SYL2 + a_{12} SYL3 + a_{13} SYP + a_{14} OH$$

With this notation, a_0, $a_1, \ldots, a_{14}$ are the coefficients which are estimated statistically and which are shown in the tables of this appendix.

The material condition variable MC actually represents any of the indicators of material condition developed in the study. These indicators, with the notation used for them in this appendix, are as follows. The CASREP indicators are total downtime hours (CASDWN), maintenance downtime hours (CASMNT), occurrences or reports (CASREP), C3-C4 total downtime hours (C34DWN), C3-C4 maintenance downtime hours (C34MNT), and C3-C4 occurrences or reports (C34REP). Then there are intermediate maintenance activity hours (IMA) and ships force hours (SF). The UNITREP indicators are the overall percentage of time in a C3-C4 readiness state (UREPR), and the percentage of time for equipment in a C3-C4 readiness state (UREPE). All of the above variables are computed by month. The engineering log out of commission days (ENGLOG) are by quarter. The first of the indicators from examination results is the INSURV inspection score (INSURV). Then, finally, there are the PEB examination results, both the sum (PEBS) of the fail (0) or pass (1) for the LOE and postoverhaul OPPE, and the minimum (PEBM) of these. These indicators do not generally all apply to each ship class and system.

The independent variables appearing on the right hand side of the equation are as follows. First there are repair cost (RC) and alteration cost (AC), both in thousands of mandays. The personnel variables are percentage of personnel in rates E5 through E9 actually onboard relative to the ship manning document requirement (PP), and the average length of service in months among those in rates E4 through E9 (PQ). The operating tempo variables are the cold iron hours per month (CI) for the previous month, and the average of steaming hours underway per month (ST) for the previous quarter. Preoverhaul condition (PC) is a weighted sum of CASREP maintenance downtime in hours per month over the nine months prior to overhaul. The age of the ship at the end of overhaul (AGE) is in months from the commissioning date. The fleet (FL) is zero if CINCLANTFLT and one if CINCPACFLT. The type of overhaul (OH) only applies to submarines, and is one for a regular overhaul, two for a refueling overhaul. The time of the inspection in months after overhaul (IM) applies only to the surface ship INSURV inspections.

The final variables are those for shipyard, and they vary by ship class. In a few cases, a shipyard was not assigned a variable, because it did not have enough overhauls to sufficiently distinguish it. Each shipyard variable is zero unless the overhaul took place in that shipyard, in which case it is one. Table B-1 shows the values that the fleet and each of the shipyard variables will have in order to designate any particular shipyard.

TABLE B-1

SHIPYARD VARIABLE VALUES

	FFs			DDGs				SSNs				
Shipyard	FL	SYL	SYP	FL	SYL1	SYL2	SYP	FL	SYL1	SYL2	SYL3	SYP
Norfolk				0	1	0	0	0	1	0	0	0
Charleston	0	1	0	0	0	1	0	0	0	1	0	0
Philadelphia	0	0	0	0	0	0	0					
Portsmouth								0	0	0	1	0
Long Beach	1	0	1	1	0	0	1					
Puget Sound				1	0	0	0	1	0	0	0	1
Pearl Harbor	1	0	0	1	0	0	0	1	0	0	0	0
Mare Island								1	0	0	0	0
private yard								0	0	0	0	0

Tables B-2 through B-67 in this appendix present the fundamental statistical output from the study. Among this output, for each ship class and system, are the average values and standard deviations for each of the variables. The average values are particularly valuable for two reasons. First, they make possible direct comparison of magnitudes between systems and between ship classes. This comparison may be particularly insightful for the variables representing repair and alteration costs, personnel levels, and the indicators of material condition. Second, the average values are the values at which the elasticities in Chapter III are calculated. These elasticities will therefore represent effects on an average or typical ship.

The remaining statistical output includes the coefficients estimated for the above equation. There is a table for each ship class and system. Within each table, there is a row of coefficients for each indicator of material condition. These coefficients estimate the effects of the variables on the material condition indicators, and are the basis for computing the elasticities in Chapter III.

In parentheses below each coefficient, the absolute value for the t-statistic of the coefficient is shown. This statistic indicates the reliability of the estimated coefficient. A t-statistic of 1.3 or above indicates a statistical significance of at least 80 percent, while a value of 1.7 or above indicates a significance of at least 90 percent.

Finally, for each row of coefficients, there is given an R-squared and F-statistic. The R-squared value estimates the amount of variation in the material condition indicator explained by the equation. The F-statistic indicates the reliability with which the equation explains this amount of variation. An F-statistic of 1.9 or above indicates a statistical significance of at least 95 percent, while a value of 2.4 or above indicates a significance of at least 99 percent.

In the tables, there are a few cases of missing entries. These are caused by a variable being always zero, or by a variable being totally insignificant in its effect on a material condition indicator.

TABLE B-2

WHOLE SHIP AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	6058.75 (3649.94)	6628.03 (4214.39)	1810.54 (1664.01)
CASMNT	3119.95 (2532.31)	3571.76 (2712.13)	1076.00 (1221.33)
CASREP	7.47 (4.58)	7.94 (4.84)	2.27 (2.26)
C34DWN	784.54 (1180.20)	976.08 (1470.06)	63.60 (197.44)
C34MNT	404.42 (931.72)	517.59 (977.39)	43.30 (151.15)
C34REP	1.62 (2.07)	1.74 (1.93)	0.20 (0.54)
INA	1158.89 (1640.75)	1777.99 (2250.22)	1635.53 (1960.19)
SF	1661.19 (9892.24)	1082.11 (2359.03)	267.74 (615.00)
UREPR	49.38 (42.20)	54.75 (41.10)	13.52 (33.25)
UREPE	42.75 (40.02)	47.46 (40.23)	7.85 (21.11)
INSURV	17.45 (4.42)	18.86 (4.86)	0 (0)
NC	38.41 (10.61)	58.24 (14.32)	133.61 (42.19)
AC	28.38 (7.72)	39.30 (7.93)	23.26 (11.94)
PP	89.33 (10.10)	81.95 (9.50)	105.29 (12.32)
PQ	87.57 (4.71)	84.93 (4.79)	75.73 (4.16)
CI	362.49 (237.12)	330.84 (242.26)	325.60 (257.85)
ST	229.30 (116.67)	224.25 (124.15)	211.16 (149.22)
PC	313.06 (337.71)	301.40 (385.08)	100.27 (127.93)
AGE	67.90 (11.66)	160.40 (19.72)	71.46 (22.77)
FL	0.55 (0.50)	0.53 (0.50)	0.36 (0.48)
SYL1	0.17 (0.38)	0.22 (0.42)	0.23 (0.42)
SYL2	0 (0)	0.07 (0.25)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.34 (0.47)	0.36 (0.48)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)
IM	22.40 (9.52)	22.14 (10.62)	0 (0)

TABLE B-3

FF-1052 CLASS
WHOLE SHIP

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP	IN
CASDWN	7240.	-52.15	-38.86	27.38	-27.10	-1.623	-1.296	.2442	48.94	-1657.	-664.2	1056.	
	(1.3)	(1.1)	(1.1)	(1.1)	(0.5)	(4.2)	(1.0)	(0.4)	(1.2)	(2.3)	(0.8)	(1.3)	
R-SQUARED= .545		F= 2.8											
CASMNT	3109.	-79.50	-29.00	28.09	-23.65	-.6085	-.8031	-.3199	53.73	-249.4	-267.6	1454.	
	(0.9)	(2.6)	(1.3)	(1.7)	(0.7)	(2.4)	(1.0)	(0.7)	(2.0)	(0.5)	(0.5)	(2.7)	
R-SQUARE= .585		F= 3.5											
CASREP	8.915	-.1080	-.0926	.0009	-.0028	.0016	-.0061	-.0001	.1067	-2.229	-1.177	1.624	
	(1.6)	(2.8)	(3.0)	(0)	(0.1)	(2.2)	(3.3)	(0.2)	(3.1)	(3.4)	(1.6)	(2.1)	
R-SQUARED= .206		F= 4.9											
C34DWN	-838.3	-17.29	-9.804	21.80	23.18	-.2273	-.9377	.3852	-17.04	-176.4	-370.3	244.3	
	(0.5)	(1.4)	(1.0)	(2.9)	(1.6)	(1.6)	(2.2)	(1.9)	(1.5)	(0.9)	(1.6)	(1.0)	
R-SQUARED= .470		F= 6.2											
C34MNT	-1281.	-12.39	-7.943	19.88	15.06	-.0980	-.3339	.2392	-9.904	-18.86	-175.7	361.2	
	(1.0)	(1.2)	(1.0)	(3.3)	(1.3)	(1.0)	(1.0)	(1.5)	(1.1)	(0.1)	(0.9)	(1.9)	
R-SQUARED= .533		F= 4.3											
C34REP	.6096	-.0490	-.0821	.0179	.0328	-.0002	-.0035	.0005	-.0035	-.6492	-.7210	.5418	
	(0.3)	(3.4)	(1.1)	(1.9)	(1.8)	(0.5)	(4.5)	(1.9)	(0.3)	(2.7)	(2.7)	(1.9)	
R-SQUARED= .102		F= 9.3											
INA	-1250.	1.012	-6.733	6.609	13.54	1.254	-.4917	-.3240	9.557	26.40	-320.1	-169.3	
	(0.8)	(0.1)	(0.8)	(0.9)	(1.0)	(4.3)	(0.8)	(1.5)	(1.0)	(0.1)	(1.6)	(0.8)	
R-SQUARED= .071		F= 4.0											
SF	-4945.	-12.12	-30.57	66.58	38.34	2.018	4.368	.6216	-54.40	87.46	-320.0	1205.	
	(0.4)	(0.1)	(0.4)	(1.1)	(0.3)	(1.3)	(1.1)	(0.4)	(0.6)	(0.1)	(0.2)	(0.6)	
R-SQUARED= .226		F= 0.7											
UREPA	91.61	-.5457	-.2871	.0213	.3508	.0026	-.0227	.0200	-.4905	-19.90	-27.49	4.697	
	(1.5)	(1.3)	(0.8)	(0.1)	(0.6)	(0.5)	(1.4)	(2.7)	(1.3)	(2.8)	(3.4)	(0.6)	
R-SQUARED= .393		F= 3.9											
UREPE	-35.90	-.5806	-.4564	.4148	1.092	.0082	-.0050	.0089	-.2724	-12.44	-8.028	10.10	
	(0.7)	(1.5)	(1.5)	(1.7)	(2.2)	(1.5)	(0.3)	(1.3)	(0.8)	(1.9)	(1.1)	(1.3)	
R-SQUARED= .328		F= 3.8											
INSURV	94.35	-.4206	-.3281	-.2030	-.7528	-.0059	.0001	-.0049	.5872	4.690	-1.389	1.434	-.1529
	(1.7)	(1.2)	(2.1)	(1.4)	(1.8)	(0.9)	(0)	(0.7)	(2.3)	(1.2)	(0.3)	(0.5)	(0.5)
R-SQUARED= .782		F= 1.6											

TABLE B-4

DDG-2 CLASS
WHOLE SHIP

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP	IN
CASDWN	-9401.	-41.12	116.7	-.9294	98.19	-1.259	-1.540	1.357	42.10	311.4	11242.	-1809.	-1615.	
	(1.3)	(1.6)	(2.1)	(0)	(1.7)	(2.9)	(1.1)	(2.1)	(1.8)	(0.2)	(1.3)	(1.5)	(1.9)	
	R-SQUARED=	.522	F= 3.7											
CASMNT	-9108.	-37.12	85.83	22.44	79.79	-.2801	-1.302	.9033	14.58	1578.	-74.46	-1190.	-430.0	
	(2.0)	(2.2)	(2.4)	(1.2)	(2.1)	(0.9)	(1.4)	(2.1)	(1.0)	(1.8)	(0.1)	(1.5)	(0.8)	
	R-SQUARED=	.468	F= 2.6											
CASREP	-4.187	-.0504	.0758	-.0087	.0811	.0014	-.0072	.0012	.0484	-.3990	-.9798	-2.003	-1.349	
	(0.7)	(2.4)	(1.7)	(0.3)	(1.5)	(1.9)	(4.3)	(2.0)	(2.7)	(0.4)	(1.3)	(2.0)	(2.1)	
	R-SQUARED=	.222	F= 8.0											
C34DWN	-1395.	-1.643	27.52	-7.064	19.36	.0758	-1.395	.5913	2.055	282.6	-6.956	-413.7	-50.25	
	(0.8)	(0.2)	(1.6)	(0.7)	(1.0)	(0.4)	(2.6)	(2.7)	(0.3)	(0.7)	(0)	(1.1)	(0.2)	
	R-SQUARED=	.344	F= 2.9											
C34MNT	-1292.	-8.778	27.63	-5.189	9.669	.1516	-.9353	.3817	3.941	322.5	106.7	-353.1	245.2	
	(0.8)	(1.6)	(2.3)	(0.8)	(0.7)	(1.3)	(2.7)	(2.6)	(0.8)	(1.1)	(0.5)	(1.3)	(1.4)	
	R-SQUARED=	.402	F= 3.6											
C34REP	-.1764	-.0086	.0369	-.0193	.0030	.0006	-.0028	.0006	.0127	.7596	.5363	-.1096	-.0145	
	(0.1)	(1.3)	(1.9)	(1.7)	(0.1)	(2.0)	(3.9)	(2.4)	(1.7)	(1.7)	(1.6)	(0.3)	(0.1)	
	R-SQUARED=	.177	F= 4.7											
INA	1134.	-3.516	-6.372	24.40	-23.17	2.182	-.7208	-.1235	4.727	-316.6	120.5	366.7	-279.6	
	(0.4)	(0.4)	(0.3)	(2.1)	(1.0)	(6.2)	(0.9)	(0.5)	(0.6)	(0.7)	(0.4)	(0.9)	(1.0)	
	R-SQUARED=	.143	F= 6.9											
SF	-1073.	.3494	-33.52	35.06	-11.66	.5011	.0472	-.2179	10.40	-470.6	66.56	182.7	25.22	
	(0.4)	(0)	(1.7)	(2.9)	(0.5)	(1.3)	(0.1)	(0.8)	(1.3)	(1.0)	(0.2)	(0.4)	(0.1)	
	R-SQUARED=	.094	F= 4.3											
UREAR	73.95	.4791	-.6362	-.1879	.5163	.0055	-.0429	.0051	-.2240	-22.36	-8.803	9.602	13.31	
	(1.1)	(2.1)	(1.3)	(0.7)	(0.9)	(1.1)	(2.9)	(0.8)	(1.1)	(2.0)	(1.0)	(0.9)	(1.8)	
	R-SQUARED=	.379	F= 2.4											
UREPE	-33.87	-.0361	-.1544	.1562	.7532	.0093	.0010	.0086	.0760	-4.427	-6.473	-4.754	-3.247	
	(0.5)	(0.2)	(0.3)	(0.6)	(1.3)	(1.6)	(0.1)	(1.4)	(0.4)	(0.4)	(0.8)	(0.4)	(0.4)	
	R-SQUARED=	.252	F= 0.9											
INSURV	28.89	.0701	-.0434	-.1249	-.1822	.0059	-.0101	.0003	.0545	.4310	-1.250		-6.234	.2848
	(1.1)	(1.0)	(0.29	(0.9)	(0.6)	(0.5)	(0.4)	(0.1)	(0.6)	(0.1)	(0.3)		(2.5)	(1.0)
	R-SQUARED=	.834	F= 2.9											

TABLE B-5

SSGN-637 CLASS
WHOLE SHIP

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	BH
CASDWN	-798.3	-4.230	3.005	13.92	2.434	-.2210	1.883	-.5393	11.51	1752.	-374.0	-325.8	-146.4	-1374.	135.5
	(0.7)	(1.1)	(0.3)	(0.6)	(0.1)	(1.5)	(4.6)	(0.8)	(0.9)	(4.6)	(1.2)	(0.8)	(0.5)	(3.9)	(0.7)
R-SQUARED=	.558	F=	5.9												
CASMNT	96.94	-2.235	3.693	3.293	4.038	-.1036	1.072	-1.667	13.70	1479.	-625.0	-580.1	-318.0	-1498.	-435.5
	(0.1)	(0.8)	(0.5)	(0.2)	(0.2)	(1.0)	(3.7)	(3.3)	(1.4)	(5.4)	(2.7)	(1.9)	(1.4)	(5.9)	(0.9)
R-SQUARED=	.593	F=	7.2												
CASREP	1.137	-.0056	.0120	.0576	-.0580	.0004	.0012	-.0008	.0101	1.142	-.4984	-.3000	-.5925	-.2127	.5435
	(1.0)	(1.7)	(1.4)	(2.6)	(2.8)	(1.3)	(2.3)	(1.1)	(0.9)	(3.6)	(1.9)	(0.8)	(2.1)	(0.7)	(0.9)
R-SQUARED=	.148	F=	8.4												
C34DWN	-22.96	-.0222	-.6718	-1.873	1.850	-.0085	.1716	.0910	3.083	9.316	-3.410	-.3637	3.376	79.86	-170.8
	(0.1)	(0.1)	(0.6)	(1.4)	(0.7)	(0.3)	(3.0)	(1.0)	(2.1)	(0.2)	(0.1)	(0)	(0.1)	(2.2)	(2.3)
R-SQUARED=	.212	F=	1.8												
C34MNT	-49.09	-.0796	.4354	-.9009	1.468	.0138	.1036	-.0787	2.265	43.57	9.216	12.61	2.065	8.626	-138.6
	(0.3)	(0.2)	(0.5)	(1.5)	(0.7)	(0.7)	(2.6)	(1.2)	(1.9)	(1.4)	(0.3)	(0.4)	(0.1)	(0.3)	(1.9)
R-SQUARED=	.217	F=	1.2												
C34REP	.4476	-.0004	.0023	-.0020	-.0005	.0001	.0004	0	.0001	.0622	-.1443	-.0873	-.1078	.0862	-.0991
	(1.0)	(0.5)	(1.1)	(1.3)	(0.1)	(2.0)	(2.7)	(0.1)	(0)	(0.8)	(2.2)	(1.0)	(1.5)	(1.2)	(0.7)
R-SQUARED=	.051	F=	3.0												
INA	1649.	-.4172	-9.418	2.874	19.29	.8362	-.4176	-.5215	6.142	-87.36	-201.5	-191.2	-99.77	35.07	-1625.
	(1.0)	(0.1)	(1.3)	(0.5)	(1.0)	(3.3)	(0.9)	(0.8)	(0.6)	(0.3)	(0.9)	(0.6)	(0.4)	(3.1)	(3.1)
R-SQUARED=	.116	F=	7.5												
SF	-576.9	-.4866	4.699	.7295	15.31	.0907	-.2226	-.0496	-.0433	-213.0	-82.02	-90.09	-129.4	46.14	-265.0
	(1.1)	(0.5)	(1.9)	(0.4)	(2.5)	(1.1)	(1.5)	(0.2)	(0)	(2.4)	(1.1)	(0.9)	(1.6)	(0.6)	(1.5)
R-SQUARED=	.051	F=	2.8												
UREAR	7.459	.0437	-.1303	0	-.0044	.0027	-.0029	.0471	-.0724	-4.643	1.821	12.15	1.080	20.29	3.952
	(0.2)	(0.6)	(0.7)	(0)	(0)	(0.7)	(0.3)	(3.0)	(0.3)	(0.6)	(0.3)	(1.5)	(0.2)	(3.0)	(0.3)
R-SQUARED=	.300	F=	2.3												
UREAE	9.677	-.0147	-.0329	.0318	-.1282	-.0005	.0117	.0021	.1475	2.955	-1.041	-.1484	2.753	5.925	-7.129
	(0.4)	(0.3)	(0.3)	(0.4)	(0.5)	(0.2)	(1.9)	(0.2)	(1.0)	(0.7)	(0.3)	(0)	(3.7)	(1.6)	(3.9)
R-SQUARED=	.136	F=	1.1												

TABLE B-6

HULL STRUCTURE AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	42.83 (154.91)	30.37 (123.32)	1.72 (30.56)
CASMNT	30.05 (129.56)	26.22 (114.06)	1.72 (30.56)
CASREP	0.04 (0.22)	0.05 (0.23)	0.00 (0.05)
C34DWN	5.85 (52.81)	6.47 (54.15)	0 (0)
C34MNT	5.63 (52.81)	6.47 (54.15)	0 (0)
C34REP	0.01 (0.10)	0.01 (0.10)	0 (0)
IMA	20.77 (87.23)	30.39 (78.21)	57.59 (148.93)
SF	19.76 (306.53)	32.65 (301.76)	3.09 (8.24)
RC	1.49 (0.96)	2.26 (1.20)	9.89 (2.47)
AC	3.35 (3.43)	0.23 (0.65)	2.05 (2.03)
PP	63.17 (24.06)	79.97 (27.95)	0 (0)
PQ	82.49 (20.91)	79.78 (17.83)	0 (0)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	2.87 (12.20)	2.58 (13.78)	0.03 (0.53)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-7

FF-1052 CLASS
HULL STRUCTURE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL	SVP
CASOWN	13.61	.5422	-.6853	.1071	.0285	.0022	.0010	-.4178	.3385	20.07	-19.62	-29.07
	(0.1)	(0)	(0.2)	(0.1)	(0)	(0.1)	(0)	(0.5)	(0.3)	(0.6)	(0.5)	(0.9)
	R-SQUARED=	.438	F= 0.3									
CASNNT	12.30	-10.13	1.409	-.3766	.1711	.0033	.0175	-.4699	.6708	25.76	-10.16	-50.33
	(0.1)	(0.7)	(0.4)	(0.4)	(0.3)	(0.2)	(0.4)	(0.7)	(0.7)	(1.0)	(0.3)	(1.9)
	R-SQUARED=	.419	F= 0.6									
CASREP	.0768	-.0036	-.0007	.0004	-.0001	.0001	-.0001	-.0003	-.0004	-.0343	.0022	-.0249
	(0.9)	(0.3)	(0.2)	(0.5)	(0.2)	(1.6)	(0.8)	(0.5)	(0.4)	(1.5)	(0.1)	(1.1)
	R-SQUARED=	.019	F= 1.6									
C34OWN	24.09	-6.246	-.8238	-.0963	.1921	.0048	-.0079	-.1301	-.1945	2.299	-1.805	-11.02
	(1.1)	(1.4)	(0.8)	(0.9)	(1.6)	(0.6)	(0.4)	(0.6)	(0.7)	(0.3)	(0.2)	(1.4)
	R-SQUARED=	.101	F= 0.8									
C34NNT	23.84	-6.310	-.8299	-.0945	.1923	.0049	-.0078	-.1300	-.1919	2.349	-1.938	-11.07
	(1.1)	(1.5)	(0.8)	(0.9)	(1.6)	(0.6)	(0.4)	(0.6)	(0.7)	(0.3)	(0.2)	(1.4)
	R-SQUARED=	.101	F= 0.8									
C34REP	.0392	-.0084	-.0001	-.0001	.0002	0	0	0	-.0002	.0008	.0041	-.0178
	(1.2)	(1.4)	(0.1)	(0.6)	(1.4)	(0.4)	(1.0)	(0)	(0.5)	(0.1)	(0.3)	(1.6)
	R-SQUARED=	.011	F= 0.9									
IMA	-12.69	-3.353	-.5620	.1077	-.3599	.0361	.0432	-.0120	.7015	-9.567	-9.564	2.544
	(0.5)	(0.6)	(0.4)	(0.8)	(2.5)	(2.4)	(1.5)	(0)	(2.0)	(1.1)	(0.9)	(0.3)
	R-SQUARED=	.023	F= 1.5									
SF	38.63	27.12	3.207	.4972	-.7488	-.0184	.0442	.4261	-.7718	-8.506	59.80	7.951
	(0.4)	(1.4)	(0.7)	(1.1)	(1.5)	(0.3)	(0.4)	(0.5)	(0.6)	(0.3)	(1.6)	(0.2)
	R-SQUARED=	.013	F= 1.1									

TABLE B-8

DDG-2 CLASS
HULL STRUCTURE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL1	SVL2	SVP
CASOWN	160.2	8.082	7.564	-.5083	.4178	.0026	-.0790	-.2325	-.5452	-42.00	-28.77	-60.84	-3.783
	(1.8)	(1.0)	(0.6)	(0.9)	(1.0)	(0.1)	(1.6)	(0.5)	(1.1)	(1.3)	(1.2)	(2.2)	(0.1)
R-SQUARED= .201		F= 1.0											
CASNMT	158.7	2.054	6.869	-.6607	.5938	.0035	-.0768	-.2403	-.5086	-40.44	-25.10	-57.38	1.892
	(2.0)	(0.3)	(0.7)	(1.3)	(1.6)	(0.2)	(1.6)	(0.6)	(1.2)	(1.4)	(1.2)	(2.4)	(0.1)
R-SQUARED= .176		F= 8.4											
CASREP	.1237	.0028	.0832	-.0002	0	0	0	-.0003	-.0003	-.0428	-.0028	-.0660	-.0065
	(1.1)	(0.3)	(0.9)	(0.3)	(0)	(1.0)	(0.2)	(0.4)	(0.5)	(1.1)	(0.1)	(2.0)	(0.2)
R-SQUARED= .013		F= 0.8											
C34OWN	76.96	.4001	-.6881	-.0239	-.2136	.0096	-.0250	-.0700	-.2420	-21.78	-4.351	-17.23	8.321
	(2.2)	(0.1)	(0.1)	(0.2)	(1.2)	(1.1)	(1.1)	(0.3)	(1.2)	(1.5)	(0.4)	(1.5)	(0.7)
R-SQUARED= .179		F= 1.1											
C34NMT	76.96	.4001	-.6881	-.0239	-.2136	.0096	-.0250	-.0700	-.2420	-21.78	-4.351	-17.23	8.321
	(2.2)	(0.1)	(0.1)	(0.2)	(1.2)	(1.1)	(1.1)	(0.3)	(1.2)	(1.5)	(0.4)	(1.5)	(0.7)
R-SQUARED= .179		F= 1.1											
C34REP	.0724	.0010	.0012	-.0001	-.0005	0	0	-.0001	-.0001	-.0166	.0143	-.0187	.0057
	(1.6)	(0.2)	(0.2)	(0.8)	(2.1)	(0.8)	(0.3)	(0.3)	(0.3)	(0.9)	(1.1)	(1.3)	(2.4)
R-SQUARED= .022		F= 1.4											
INA	-28.83	.5745	-.2367	.0973	-.0885	.0281	-.0279	-.2786	.4167	-15.00	-9.978	-12.54	-7.404
	(0.8)	(0.2)	(0)	(0.8)	(0.5)	(2.0)	(1.0)	(1.2)	(2.0)	(1.0)	(0.9)	(1.0)	(0.6)
R-SQUARED= .046		F= 2.6											
SF	-33.43	-.6493	-9.680	-.1959	-.2713	.0041	-.0306	2.237	.7703	-23.98	-21.84	-22.05	3.193
	(0.2)	(0)	(0.5)	(0.5)	(0.4)	(0.1)	(0.3)	(2.7)	(1.0)	(0.5)	(0.6)	(0.5)	(0.1)
R-SQUARED= .016		F= 8.4											

TABLE B-9

SSN-637 CLASS
HULL STRUCTURE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	OH
CASDWN	3.131	-.1266	.5870			-.0050	-.0030	-.4494	.0766	-1.016	2.341	.3629	3.258	1.942	-5.003
	(0.4)	(0.2)	(1.0)			(1.2)	(0.4)	(0.2)	(0.5)	(0.2)	(0.6)	(0.1)	(0.8)	(0.5)	(0.6)
R-SQUARED=	.007	F=	0.4												
CASNNT	3.131	-.1266	.5870			-.0050	-.0030	-.4494	.0766	-1.016	2.341	.3629	3.258	1.942	-5.003
	(0.4)	(0.2)	(1.0)			(1.2)	(0.4)	(0.2)	(0.5)	(0.2)	(0.6)	(0.1)	(0.8)	(0.5)	(0.6)
R-SQUARED=	.007	F=	0.4												
CASREP	-.0040	.0002	.0005			0	0	-.0003	.0002	-.0005	-.0009	-.0002	.0063	.0078	-.0153
	(0.3)	(0.2)	(0.6)			(0.9)	(0.1)	(0.1)	(1.1)	(0.1)	(0.1)	(0)	(1.1)	(1.4)	(1.3)
R-SQUARED=	.006	F=	0.5												
INA	120.8	2.705	-.2264			.0624	-.0469	.8105	-1.459	-4.469	4.750	-1.229	-29.78	16.18	7.135
	(3.0)	(0.9)	(0.1)			(3.2)	(1.3)	(0.1)	(2.0)	(0.2)	(0.3)	(0.1)	(1.6)	(0.9)	(0.2)
R-SQUARED=	.049	F=	3.7												
SF	7.505	.1378	.0874			.0015	-.0027	.0863	-.1119	-1.514	-.3199	-.7208	-.9764	.2889	2.481
	(3.3)	(0.8)	(0.6)			(1.3)	(1.3)	(0.2)	(2.8)	(1.4)	(0.3)	(0.6)	(1.0)	(0.3)	(1.1)
R-SQUARED=	.043	F=	3.4												

TABLE B-10

MAIN PROPULSION AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	801.38 (958.05)	1223.62 (1516.28)	38.79 (155.58)
CASMNT	589.72 (853.87)	964.47 (1241.78)	33.79 (147.46)
CASREP	1.29 (1.71)	1.96 (2.42)	0.06 (0.26)
C34DWN	210.66 (485.99)	214.24 (600.72)	3.12 (37.81)
C34MNT	183.25 (469.04)	176.62 (469.56)	2.62 (33.50)
C34REP	0.56 (0.98)	0.53 (1.11)	0.01 (0.12)
ENGLOG	195.80 (164.31)	0 (0)	0 (0)
IMA	265.12 (481.16)	659.30 (1106.37)	141.38 (543.31)
SF	270.86 (2048.25)	323.92 (1181.28)	17.38 (50.45)
PEBS	1.62 (0.50)	1.33 (0.50)	0 (0)
PEBM	.62 (0.50)	0.39 (0.50)	0 (0)
INSURV	2.60 (0.67)	2.89 (0.46)	0 (0)
RC	9.95 (4.24)	20.79 (4.45)	9.83 (3.41)
AC	0.86 (0.49)	2.08 (1.37)	0.75 (0.44)
PP	77.55 (12.27)	60.67 (9.10)	105.72 (17.74)
PQ	82.06 (9.56)	79.43 (9.64)	72.88 (6.22)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	56.42 (86.60)	90.04 (163.36)	4.86 (15.29)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)
IN	23.45 (9.75)	21.42 (11.81)	0 (0)

TABLE B-11

FF-1052 CLASS
MAIN PROPULSION

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL	SYP	IN
CASDWN	312.0	-60.31	91.40	4.770	.0486	-.0949	-.0339	.7220	8.900	-17.07	-314.1	135.5	
	(0.4)	(1.6)	(0.5)	(0.5)	(0.1)	(1.0)	(0.1)	(1.0)	(0.8)	(0.1)	(1.4)	(0.6)	
R-SQUARED= .536			F= 1.1										
CASMNT	240.8	-70.87	80.40	1.291	1.643	-.0911	-.2471	.3581	10.54	217.6	-208.5	102.6	
	(0.4)	(2.2)	(0.6)	(0.2)	(0.3)	(1.1)	(0.9)	(0.6)	(1.1)	(1.1)	(1.1)	(0.5)	
R-SQUARED= .559			F= 2.3										
CASREP	1.148	-.0960	.0039	-.0065	.0002	0	-.0018	.0005	.0316	-.3679	-.5835	.5586	
	(1.4)	(2.5)	(0)	(0.5)	(0)	(0.2)	(2.9)	(0.6)	(2.6)	(1.5)	(2.6)	(2.1)	
R-SQUARED= .092			F= 4.4										
C34DWN	461.2	-49.04	111.7	-1.030	-2.244	.0121	.0218	.1740	5.666	93.04	-192.8	-42.11	
	(1.2)	(2.7)	(1.4)	(0.4)	(0.7)	(0.2)	(0.1)	(0.5)	(1.0)	(0.9)	(1.9)	(0.4)	
R-SQUARED= .496			F= 2.0										
C34MNT	416.6	-52.88	108.7	-1.226	-2.597	.0070	.0159	.0235	7.173	121.0	-138.2	-58.19	
	(1.1)	(3.0)	(1.3)	(0.5)	(0.9)	(0.1)	(0.1)	(0.1)	(1.3)	(1.1)	(1.4)	(0.5)	
R-SQUARED= .526			F= 2.0										
C34REP	.3004	-.0714	.0991	-.0003	.0001	0	-.0011	0	.0178	-.1183	-.2879	.2711	
	(0.6)	(3.4)	(1.0)	(0.1)	(0)	(0.2)	(3.1)	(0.1)	(2.7)	(0.9)	(2.4)	(1.9)	
R-SQUARED= .082			F= 5.8										
ENGLOG	1152.	-14.81	-19.79	-.2572	-4.822	-.2001	-.6469	.9137	-2.857	57.65	-6.536	-66.41	
	(3.5)	(1.5)	(0.4)	(0.2)	(2.7)	(2.6)	(4.3)	(2.4)	(0.7)	(0.7)	(0.1)	(0.9)	
R-SQUARED= .493			F= 6.8										
IMA	-337.4	2.213	85.87	1.828	.8567	.3589	.0330	-.2233	3.433	-126.0	-107.1	95.11	
	(1.3)	(0.2)	(1.8)	(1.2)	(0.4)	(4.5)	(0.2)	(1.0)	(1.0)	(1.9)	(1.8)	(1.4)	
R-SQUARED= .076			F= 4.2										
SF	-51.14	-98.30	-251.6	4.874	-7.457	.2230	.0196	-.2148	22.52	423.6	-36.93	-188.3	
	(0)	(1.8)	(1.0)	(0.6)	(0.7)	(0.7)	(0)	(0.2)	(1.3)	(1.2)	(0.1)	(0.5)	
R-SQUARED= .111			F= 1.0										
PEBS	-2.159	.1530	.5016	.0059	.0068	.0020	.0005	-.0011	-.0026	-.5701	1.329	1.312	
	(0.8)	(2.2)	(0.7)	(0.4)	(0.5)	(1.6)	(0.2)	(0.6)	(0.1)	(1.2)	(2.6)	(1.5)	
R-SQUARED= .744			F= 2.4										
PEWM	-3.159	.1530	.5016	.0059	.0068	.0020	.0005	-.0011	-.0024	-.5701	1.329	1.312	
	(1.2)	(2.2)	(0.7)	(0.4)	(0.5)	(1.6)	(0.2)	(0.6)	(0.1)	(1.2)	(2.6)	(1.5)	
R-SQUARED= .744			F= 2.4										
INSURV	5.416	-.1574	.9245	.0293	-.0296	-.0020	-.0018	.0031	-.0114	-.4617	-.1454	-.5633	.0195
	(4.2)	(3.4)	(5.2)	(3.6)	(5.0)	(3.5)	(1.9)	(1.7)	(0.8)	(1.9)	(0.6)	(1.5)	(2.1)
R-SQUARED= .880			F= 9.8										

TABLE B-12

DDG-2 CLASS
MAIN PROPULSION

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP	IM
CASDWN	-732.5	11.72	-226.7	49.25	-14.64	-.3383	-1.447	2.135	-.7225	-590.4	-165.4	-152.1	143.5	
	(0.5)	(0.3)	(1.9)	(3.0)	(1.1)	(1.6)	(2.5)	(3.4)	(0.1)	(1.4)	(0.5)	(0.4)	(0.4)	
R-SQUARED=	.414		F= 2.7											
CASMNT	-279.7	26.36	-277.8	39.33	-14.07	-.1779	-.9721	2.005	-3.394	-445.5	-187.0	-94.09	265.8	
	(0.2)	(0.8)	(2.7)	(2.9)	(1.2)	(1.2)	(2.1)	(3.8)	(0.5)	(1.3)	(0.7)	(0.3)	(0.8)	
R-SQUARED=	.450		F= 3.0											
CASREP	1.041	-.0213	-.1871	.0383	-.0345	.0005	-.0038	.0014	.0115	-.3416	-.5162	-.1015	-.0003	
	(0.7)	(0.5)	(1.4)	(1.9)	(2.1)	(1.2)	(4.0)	(1.9)	(1.3)	(0.8)	(1.5)	(0.2)	(0)	
R-SQUARED=	.140		F= 4.0											
C34DWN	610.2	-17.66	39.23	-1.694	1.351	.1156	-.6638	.4594	-.3673	-30.72	62.33	-92.67	56.43	
	(1.2)	(1.5)	(1.1)	(0.4)	(0.4)	(1.2)	(2.7)	(2.5)	(0.1)	(0.2)	(0.4)	(0.8)	(0.5)	
R-SQUARED=	.208		F= 2.4											
C34MNT	395.8	-13.29	6.938	-1.444	3.005	.1172	-.4649	.4959	-.5055	-28.40	-8.668	-80.70	79.71	
	(0.9)	(1.3)	(0.2)	(0.5)	(1.0)	(1.8)	(2.5)	(2.9)	(0.2)	(0.3)	(0.1)	(0.8)	(0.8)	
R-SQUARED=	.327		F= 3.2											
C34REP	.5980	-.0186	.0303	-.0055	.0029	.0004	-.0014	.0004	.0029	.0722	.0825	-.1560	.0441	
	(0.8)	(1.0)	(0.5)	(0.9)	(0.5)	(2.1)	(3.3)	(1.2)	(0.7)	(0.4)	(0.5)	(0.8)	(0.3)	
R-SQUARED=	.097		F= 3.3											
IMA	1057.	25.35	3.883	-7.391	-4.495	1.224	-.0347	-.5451	-1.684	-469.3	-74.18	136.9	69.51	
	(1.3)	(1.4)	(0.1)	(1.3)	(0.8)	(6.6)	(0.1)	(1.7)	(0.4)	(2.3)	(0.5)	(0.7)	(0.4)	
R-SQUARED=	.161		F= 6.1											
SF	-1402.	17.57	-62.39	3.862	.3115	.1480	-.1677	.2823	6.218	107.9	228.1	309.7	211.6	
	(1.9)	(1.0)	(1.2)	(0.7)	(0.1)	(0.7)	(0.4)	(1.0)	(1.8)	(0.6)	(1.6)	(1.8)	(1.4)	
R-SQUARED=	.020		F= 1.2											
PEBS	5.844	-.1152	.0612	.0367	-.0388	.0005	-.0020	-.0013	-.0036	-.1781	-.2678	-.6257	.1738	
	(2.2)	(1.4)	(0.5)	(1.0)	(2.4)	(0.5)	(0.8)	(1.0)	(0.3)	(0.2)	(0.5)	(1.2)	(0.3)	
R-SQUARED=	.812		F= 1.5											
PEBM	4.008	-.0958	.0032	.0349	-.0238	.0008	-.0024	-.0009	-.0057	-.1962	-.5521	-.6723	-.1748	
	(2.0)	(1.5)	(0)	(1.3)	(2.0)	(1.1)	(1.3)	(1.0)	(0.6)	(0.3)	(1.5)	(1.7)	(0.4)	
R-SQUARED=	.847		F= 1.9											
INSURV	2.559	-.0823	.1869	.0105	.0227	-.0012	.0028	.0006	-.0048	-.0069	.1096		.0226	.0136
	(0.9)	(1.5)	(1.3)	(0.5)	(0.9)	(1.0)	(0.9)	(0.4)	(0.7)	(0)	(0.3)		(0)	(3.7)
R-SQUARED=	.816		F= 2.5											

TABLE B-13

SSN-637 CLASS
MAIN PROPULSION

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	OH
CASDWN	6.553	-10.38	3.524	1.073	-.0646	.0026	.0792	-1.916	-.7901	130.6	-29.33	82.67	-74.39	-141.8	64.50
	(0.1)	(2.1)	(0.1)	(0.4)	(0)	(0.2)	(1.8)	(3.6)	(0.6)	(3.6)	(0.9)	(1.6)	(2.1)	(4.3)	(3.9)
R-SQUARED= .385		F= 3.8													
CASMNT	32.38	-11.40	.0832	.7686	-.0314	.0036	.0772	-2.175	-.6386	138.4	-27.12	89.73	-71.40	-166.4	66.06
	(0.4)	(2.3)	(0)	(0.3)	(0)	(0.2)	(1.9)	(4.3)	(0.5)	(3.8)	(0.8)	(1.8)	(2.0)	(5.0)	(1.0)
R-SQUARED= .436		F= 6.8													
CASREP	-.0911	-.0059	.0830	.0047	-.0029	0	0	0	-.0003	.0687	-.0145	.0270	-.0636	-.0310	.0391
	(1.1)	(1.3)	(0.1)	(2.0)	(1.3)	(0)	(0.5)	(0.1)	(0.2)	(2.1)	(0.5)	(0.6)	(1.9)	(1.8)	(0.6)
R-SQUARED= .033		F= 2.3													
C34DWN	-62.25	.8352	.0893	.0139	.7645	.0081	.0027	.1695	.0175	-6.337	-2.445	-9.089	-5.361	11.71	-3.331
	(2.3)	(0.9)	(0.2)	(0.1)	(2.4)	(1.6)	(0.3)	(1.6)	(0.1)	(1.0)	(0.4)	(1.0)	(0.8)	(2.0)	(0.3)
R-SQUARED= .101		F= 1.4													
C34MNT	-54.86	.8291	.5920	-.0037	.6419	.0074	.0051	.1133	.0194	-4.092	-.6143	-7.425	-2.820	11.10	-2.281
	(2.2)	(1.0)	(0.1)	(0)	(2.2)	(1.7)	(0.5)	(1.1)	(0.1)	(0.7)	(0.1)	(0.9)	(3.5)	(2.0)	(0.2)
R-SQUARED= .136		F= 1.2													
C34REP	-.0366	.0006	.0114	.0002	.0007	0	0	0	-.0003	-.0202	-.0230	-.0362	-.0265	.0185	.0136
	(0.6)	(0.3)	(1.0)	(0.7)	(0.9)	(0.1)	(1.1)	(0)	(0.6)	(1.3)	(1.6)	(1.7)	(1.8)	(1.3)	(0.4)
R-SQUARED= .016		F= 2.1													
IMA	-93.22	-19.28	33.51	.7322	6.520	.0352	.0172	-.3009	.5594	-100.6	-69.19	29.64	-131.9	-57.17	-97.33
	(0.3)	(2.0)	(0.6)	(0.7)	(1.9)	(0.5)	(0.1)	(0.2)	(0.2)	(1.4)	(1.0)	(0.3)	(1.9)	(0.9)	(0.7)
R-SQUARED= .030		F= 2.1													
SF	29.67	.8112	-10.37	-.0680	.0514	.0017	-.0090	.0112	-.0317	.8568	9.965	2.714	12.67	-2.076	-10.68
	(1.0)	(0.9)	(2.1)	(0.4)	(0.2)	(0.3)	(0.8)	(0.1)	(0.1)	(0.1)	(1.6)	(0.3)	(1.9)	(0.3)	(0.8)
R-SQUARED= .030		F= 1.9													

TABLE B-14

PROPULSION SHAFTING AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	11.87 (80.11)	10.81 (68.78)	5.83 (60.50)
CASMNT	7.52 (57.75)	10.59 (68.38)	4.07 (49.36)
CASREP	0.02 (0.14)	0.03 (0.16)	0.01 (0.10)
C34DWN	3.95 (45.97)	4.33 (37.86)	0.19 (5.92)
C34MNT	1.50 (17.15)	4.11 (37.08)	0.19 (5.92)
C34REP	0.01 (0.10)	0.02 (0.13)	0 (0.03)
IMA	2.52 (18.43)	6.66 (40.70)	11.82 (67.29)
SF	1.10 (6.47)	4.90 (39.02)	0.74 (3.63)
RC	0.66 (0.32)	1.31 (0.66)	3.06 (1.09)
AC	0 (0)	0 (0)	0 (0)
PP	82.51 (14.63)	63.74 (12.24)	105.77 (16.65)
PQ	80.24 (12.00)	81.34 (11.38)	70.01 (5.59)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	1.57 (7.94)	0.01 (0.08)	0.49 (4.48)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-15

FF-1052 CLASS
PROPULSION SHAFTING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	-.0846	-35.36		-1.162	1.021	.0081	.0375	-.2890	.7121	6.242	8.281	-23.32
	(0)	(1.7)		(1.9)	(2.3)	(0.8)	(1.2)	(0.5)	(1.5)	(0.4)	(0.4)	(1.6)
R-SQUARED= .318 F= 1.7												
CASMNT	.8381	4.470		-.1053	.0597	.0134	.0227	-.1418	.0672	-7.201	-6.008	-2.960
	(0)	(0.3)		(0.3)	(0.2)	(1.5)	(1.0)	(0.4)	(0.2)	(0.8)	(0.5)	(0.3)
R-SQUARED= .177 F= 0.5												
CASREP	.0874	-.0083		-.0002	-.0003	0	0	-.0002	-.0002	-.0300	-.0026	.0083
	(1.4)	(0.4)		(0.4)	(0.6)	(0.6)	(0.1)	(0.4)	(0.4)	(2.0)	(0.1)	(0.6)
R-SQUARED= .007 F= 0.6												
C34DWN	-1.182	-6.341		.1182	.0461	.0037	-.0077	-.2217	.0519	-12.42	-3.189	2.882
	(0)	(0.5)		(0.6)	(0.2)	(0.7)	(0.4)	(0.6)	(0.2)	(1.4)	(0.3)	(0.3)
R-SQUARED= .380 F= 0.4												
C34MNT	.9712	-1.744		.0428	.0216	0	-.0105	-.1151	.0243	-5.085	-1.672	1.803
	(0.1)	(0.7)		(1.0)	(0.4)	(0)	(1.7)	(1.5)	(0.4)	(2.7)	(0.7)	(1.0)
R-SQUARED= .015 F= 1.3												
C34REP	.0125	-.0[illegible]7		-.0003	.0064	0	0	-.0006	-.0001	-.0304	-.0066	.0120
	(0.3)	(0.5)		(1.2)	(1.5)	(1.7)	(0.2)	(1.4)	(0.3)	(2.8)	(0.5)	(1.2)
R-SQUARED= .014 F= 1.3												
IMA	6.759	-.9563		-.0167	-.0180	.0019	-.0060	-.0854	.0273	-1.667	-.9744	-1.862
	(0.9)	(0.3)		(0.4)	(0.3)	(0.6)	(0.9)	(0.9)	(0.4)	(0.8)	(0.4)	(0.9)
R-SQUARED= .014 F= 0.7												
SF	1.095	.1523		.0263	-.0135	0	-.0008	-.0154	-.0106	.6906	-.4671	-1.814
	(0.4)	(0.1)		(1.6)	(0.6)	(0)	(0.3)	(0.5)	(0.4)	(0.9)	(0.5)	(2.5)
R-SQUARED= .018 F= 1.2												

TABLE B-16

DDG-2 CLASS
PROPULSION SHAFTING

	CONST	RC	AC	PP	PG	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASBWN	34.53	6.351		-.3149	.3346	-.0161	.0213	87.43	-.1767	-8.947	-1.919	-22.50	13.74
	(0.8)	(0.9)		(0.5)	(0.7)	(1.4)	(0.8)	(1.9)	(0.8)	(0.6)	(0.2)	(1.3)	(1.1)
R-SQUARED=	.132		F= 1.0										
CASMNI	34.25	6.191		-.3539	.3616	-.0166	.0208	86.53	-.1665	-8.426	-2.635	-22.45	13.23
	(0.9)	(0.9)		(0.6)	(0.7)	(1.5)	(0.7)	(1.9)	(0.8)	(0.6)	(0.2)	(1.3)	(1.0)
R-SQUARED=	.136		F= 1.0										
CASREP	.0315	-.0055		.0005	.0006	0	-.0001	.0715	-.0004	.0128	.0196	.0254	.0026
	(0.5)	(0.5)		(0.5)	(0.7)	(0.6)	(1.2)	(0.9)	(1.1)	(0.6)	(1.1)	(0.9)	(0.1)
R-SQUARED=	.011		F= 0.7										
C34BWN	16.01	1.714		.2194	-.1211	-.0028	.0098	-5.695	-.1401	2.759	6.490	-2.489	2.692
	(0.7)	(0.4)		(1.3)	(0.7)	(0.4)	(0.6)	(0.2)	(1.3)	(0.4)	(1.1)	(0.3)	(0.4)
R-SQUARED=	.127		F= 0.5										
C34MNI	13.57	1.594		.2302	-.1095	-.0033	.0092	-6.168	-.1324	2.892	5.569	-2.310	2.507
	(0.6)	(0.4)		(1.4)	(0.6)	(0.5)	(0.6)	(0.2)	(1.2)	(0.4)	(0.9)	(0.2)	(0.4)
R-SQUARED=	.138		F= 0.5										
C34REP	.0615	-.0100		.0008	-.0004	0	0	-.0722	-.0003	.0249	.0101	.0233	-.0139
	(1.1)	(1.1)		(2.0)	(1.1)	(0.2)	(0.9)	(1.2)	(1.2)	(1.4)	(0.7)	(1.1)	(0.9)
R-SQUARED=	.016		F= 1.1										
INA	.7045	-4.240		.3113	-.0098	.0167	.0078	11.67	-.0789	-.3775	1.307	.8796	-1.594
	(0)	(1.4)		(2.4)	(0.1)	(1.5)	(0.5)	(0.6)	(0.9)	(0.1)	(0.3)	(0.1)	(0.3)
R-SQUARED=	.017		F= 1.2										
SF	-10.68	.2251		.0886	-.0857	.0027	-.0139	32.19	.0908	3.137	7.620	7.502	-.8613
	(0.6)	(0.1)		(0.7)	(0.6)	(0.4)	(1.0)	(1.6)	(1.1)	(0.6)	(1.7)	(1.1)	(0.2)
R-SQUARED=	.016		F= 1.4										

TABLE B-17

SSN-637 CLASS
PROPULSION SHAFTING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	OH
CASDWN	66.18	-8.529	5460.	-1.099	.8600	-.0048	-.0063	-3.851	-.0596	25.65	-6.530	10.41	-14.84	-27.34	3.538
	(1.5)	(1.5)	(0.5)	(1.5)	(1.1)	(0.7)	(0.4)	(5.9)	(0.1)	(1.8)	(0.5)	(0.5)	(1.1)	(1.9)	(0.1)
R-SQUARED=	.354	F=	4.2												
CASMNT	92.61	-11.48	7047.	-1.473	1.024	-.0016	-.0163	-4.392	.0731	28.77	-7.776	14.65	-15.21	-36.80	.5612
	(2.4)	(2.2)	(0.9)	(2.2)	(1.5)	(0.3)	(1.2)	(8.1)	(0.2)	(2.3)	(0.6)	(0.8)	(1.3)	(2.9)	(0)
R-SQUARED=	.394	F=	8.3												
CASREP	-.0717	-.0017	-1.648	.0014	-.0007	0	0	.0003	-.0001	.0116	.0128	.0015	-.0028	-.0035	.0048
	(1.7)	(0.3)	(0.1)	(2.1)	(1.0)	(1.2)	(0.6)	(0.4)	(0.2)	(1.0)	(1.1)	(0.1)	(0.2)	(0.3)	(0.2)
R-SQUARED=	.015	F=	1.0												
C34DWN	.7550	.0440	79.23	.0260	-.0500	.0004	-.0003	-.0062	-.0126	.3225	.7809	-.3000	-.0844	-.2111	.5794
	(0.3)	(0.1)	(0.1)	(2.0)	(1.2)	(0.5)	(0.2)	(0.1)	(0.4)	(0.4)	(1.1)	(0.3)	(0.1)	(0.3)	(0.4)
R-SQUARED=	.009	F=	0.6												
C34MNT	.7550	.0440	79.23	.0260	-.0500	.0004	-.0003	-.0062	-.0126	.3225	.7809	-.3000	-.0844	-.2111	.5794
	(0.3)	(0.1)	(0.1)	(2.0)	(1.2)	(0.5)	(0.2)	(0.1)	(0.4)	(0.4)	(1.1)	(0.3)	(0.1)	(0.3)	(0.4)
R-SQUARED=	.009	F=	0.6												
C34REP	.0044	.0002	.4358	.0001	-.0003	0	0	0	-.0001	.0018	.0043	-.0016	-.0005	-.0012	.0032
	(0.3)	(0.1)	(0.1)	(2.0)	(1.2)	(0.5)	(0.2)	(0.1)	(0.4)	(0.4)	(1.1)	(0.3)	(0.1)	(0.3)	(0.4)
R-SQUARED=	.009	F=	0.6												
IMA	14.40	5.050	-3250.	.2622	-.5071	.0115	.0040	-.0663	-.3057	9.164	10.27	-4.973	2.592	-6.788	2.296
	(0.4)	(1.5)	(0.4)	(1.8)	(1.1)	(1.3)	(0.3)	(0.1)	(1.0)	(1.1)	(1.3)	(0.4)	(0.3)	(0.8)	(0.1)
R-SQUARED=	.018	F=	1.2												
SF	-5.248	-.0083	-79.09	-.0012	.0801	.0006	-.0009	.0114	.0547	-.0019	.0506	.0763	.5528	.7209	-3.265
	(2.9)	(0)	(0.2)	(0.2)	(3.1)	(1.2)	(1.1)	(0.4)	(3.1)	(0)	(1.9)	(0.1)	(1.3)	(1.6)	(3.2)
R-SQUARED=	.033	F=	2.1												

TABLE B-18

MAIN STEAM PIPING AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	12.12 (78.14)	50.88 (178.62)	3.36 (45.69)
CASMNT	10.74 (73.24)	44.54 (159.54)	3.31 (44.76)
CASREP	0.04 (0.22)	0.10 (0.34)	0.00 (0.05)
C34DWN	4.04 (41.18)	19.19 (95.52)	1.31 (27.67)
C34MNT	3.64 (36.67)	14.26 (78.65)	1.27 (26.69)
C34REP	0.02 (0.19)	0.06 (0.24)	0 (0.03)
IMA	19.00 (66.06)	46.46 (160.83)	45.29 (490.98)
SF	13.86 (237.88)	11.11 (27.87)	4.11 (31.90)
RC	0.75 (0.41)	1.60 (0.68)	1.34 (0.68)
AC	0.06 (0.11)	0.09 (0.12)	0 (0)
PP	77.55 (12.27)	60.67 (9.10)	105.72 (17.74)
PQ	82.86 (9.56)	79.43 (9.64)	72.88 (6.22)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	2.89 (11.00)	2.95 (10.99)	0.26 (1.34)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.39 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.16 (0.39)

TABLE B-19

FF-1052 CLASS
MAIN STEAM PIPING

	CONST	RC	AC	PP	PQ	CI	SF	PC	AGE	FL	SYL	SYP
CASDMN	-3.237	.7099	-10.39	-.0285	.0413	-.0012	-.0082	.1308	.1099	.2113	-2.994	27.24
	(0.1)	(0)	(0.2)	(0)	(0.1)	(0.1)	(0.3)	(0.3)	(0.2)	(0)	(0.2)	(1.9)
R-SQUARED=		.193	F= 4.1									
CASMNT	-6.799	-1.230	-11.45	.2110	-.1048	-.0047	-.0061	.0533	.0617	1.402	-.3808	24.62
	(0.1)	(0.1)	(0.2)	(0.3)	(0.2)	(0.4)	(0.2)	(0.1)	(0.1)	(0.1)	(0)	(1.7)
R-SQUARED=		.226	F= 1.0									
CASREP	-.0489	-.0430	.0636	.0005	0	0	0	.0036	.0010	-.0201	-.0029	.0366
	(0.5)	(1.5)	(0.5)	(0.4)	(0)	(0.3)	(0.5)	(4.9)	(1.0)	(0.7)	(0.1)	(1.4)
R-SQUARED=		.047	F= 3.9									
C34DMN	32.05	-2.299	24.95	-.1081	-.1130	.0005	-.0062	.4055	-.1064	-7.835	-3.471	6.649
	(1.7)	(0.4)	(1.4)	(0.9)	(0.7)	(0.1)	(0.4)	(3.0)	(0.6)	(1.5)	(0.7)	(1.4)
R-SQUARED=		.021	F= 1.8									
C34MNT	30.64	-2.779	18.78	-.1031	-.1071	.0065	-.0047	.2184	-.0982	-6.330	-3.403	5.463
	(1.8)	(0.6)	(1.2)	(1.0)	(0.8)	(0.1)	(0.4)	(1.8)	(0.6)	(1.3)	(0.7)	(1.2)
R-SQUARED=		.015	F= 1.2									
C34REP	.1193	-.0322	.0828	-.0005	-.0007	0	-.0001	.0028	.0004	-.0226	.0020	.0243
	(1.6)	(1.4)	(1.1)	(1.1)	(1.0)	(0)	(0.8)	(4.8)	(0.5)	(1.0)	(0.1)	(1.2)
R-SQUARED=		.040	F= 3.4									
IMA	-26.48	12.05	30.91	.1377	.3121	.0246	-.0169	.0771	-.0189	-15.23	-8.388	13.53
	(0.8)	(1.3)	(1.6)	(0.7)	(1.1)	(2.2)	(0.7)	(0.3)	(0.1)	(1.6)	(0.9)	(1.6)
R-SQUARED=		.029	F= 1.4									
SF	117.2	17.93	134.3	.2314	-.4062	-.0119	-.1106	-.4131	-1.110	-26.80	-9.717	35.23
	(1.8)	(0.6)	(1.3)	(0.3)	(0.5)	(0.3)	(1.3)	(0.5)	(1.0)	(0.9)	(0.3)	(1.2)
R-SQUARED=		.007	F= 0.6									

TABLE B-20

DDG-2 CLASS
MAIN STEAM PIPING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASDWN	133.0	-36.27	-128.2	-1.931	1.745	.0425	-.1168	.4028	.0685	26.84	90.51	7.173	-13.45
	(1.0)	(0.9)	(1.0)	(1.0)	(1.1)	(1.8)	(1.7)	(0.3)	(0.1)	(0.5)	(1.1)	(0.1)	(0.3)
	R-SQUARED= .387		F= 1.2										
CASMNT	95.79	-63.12	-109.9	-.9492	1.279	.0477	-.1177	.6473	.0991	45.24	113.1	4.557	-11.64
	(0.8)	(1.8)	(1.0)	(0.6)	(0.9)	(2.3)	(1.9)	(0.6)	(0.1)	(0.9)	(1.7)	(0.1)	(0.3)
	R-SQUARED= .373		F= 1.8										
CASREP	.1779	-.0092	-.2044	0	-.0012	.0001	-.0002	.0003	.0005	-.0575	-.0387	-.0345	-.0222
	(1.1)	(0.2)	(1.4)	(0)	(0.6)	(1.3)	(1.3)	(0.2)	(0.6)	(0.9)	(0.4)	(0.6)	(0.4)
	R-SQUARED= .039		F= 1.4										
C34DWN	.1782	6.449	34.36	-.9976	1.098	.0244	-.0739	-.0733	-.0268	-15.01	-20.28	-2.614	16.80
	(0)	(0.4)	(0.7)	(1.6)	(1.9)	(1.6)	(1.9)	(0.1)	(0.1)	(0.6)	(0.6)	(0.1)	(3.9)
	R-SQUARED= .183		F= 1.5										
C34MNT	30.95	-15.20	9.330	-.6826	.5628	.0292	-.0504	.1200	.0038	4.467	6.147	-7.175	6.259
	(0.5)	(1.2)	(0.2)	(1.5)	(1.3)	(2.2)	(1.6)	(0.3)	(0)	(0.3)	(0.3)	(0.5)	(0.5)
	R-SQUARED= .110		F= 2.0										
C34REP	.0451	.0078	.0867	-.0011	.0014	.0001	-.0002	-.0002	0	-.0409	-.0650	.0049	.0278
	(0.3)	(0.3)	(0.4)	(1.0)	(1.4)	(1.6)	(2.1)	(0.2)	(0.1)	(1.0)	(1.1)	(0.1)	(0.9)
	R-SQUARED= .028		F= 1.8										
INA	19.09	16.54	21.76	.1928	-.0817	.0595	-.0446	2.544	-.1034	-16.49	-20.50	4.767	23.08
	(0.2)	(0.8)	(0.3)	(0.2)	(0.1)	(2.1)	(0.8)	(3.9)	(0.2)	(0.6)	(0.5)	(0.2)	(1.0)
	R-SQUARED= .054		F= 8.6										
SF	3.846	-4.501	-2.974	-.0781	.0017	0	-.0158	.1464	.1102	2.403	10.24	7.108	1.377
	(0.2)	(1.1)	(0.2)	(0.5)	(0)	(0)	(1.5)	(1.2)	(1.4)	(0.4)	(1.3)	(1.4)	(0.3)
	R-SQUARED= .041		F= 0.8										

TABLE B-21

SSN-637 CLASS
MAIN STEAM PIPING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	UH
CASDWN	26.36	-4.220		-.2481	.0274	.0047	.0012	-.1657	.0987	14.89	-.2666	2.965	-5.821	-8796	-6.724
	(1.1)	(0.7)		(0.3)	(0)	(1.0)	(0.1)	(0.1)	(0.3)	(1.3)	(0)	(0.2)	(0.5)	(0.9)	(0.2)
R-SQUARED= .413			F= 0.4												
CASMNT	26.07	-4.244		-.2416	.0264	.0041	.0010	-.1719	.0972	14.69	-.2465	3.004	-6.974	-8.903	-6.606
	(1.1)	(0.7)		(0.3)	(0)	(0.9)	(0.1)	(0.1)	(0.3)	(1.3)	(0)	(0.2)	(0.5)	(0.9)	(0.2)
R-SQUARED= .421			F= 0.4												
CASREP	.0135	-.0017		0	0	0	0	-.0003	-.0001	.0079	-.0016	.0024	-.0038	-.0048	.0014
	(0.8)	(0.5)		(0.1)	(0.1)	(1.4)	(0.8)	(0.3)	(0.2)	(1.3)	(0.3)	(0.3)	(0.7)	(0.9)	(0.1)
R-SQUARED= .008			F= 0.6												
C34DWN	-48.38	3.583		-.0608	.6043	.0059	.0089	-.2208	.0821	-2.828	.3963	-3.748	.0452	8.601	-2.619
	(2.8)	(1.2)		(0.7)	(2.2)	(1.8)	(1.1)	(0.3)	(0.4)	(0.5)	(0.1)	(0.5)	(0)	(1.6)	(0.2)
R-SQUARED= .276			F= 1.0												
C34MNT	-46.46	3.446		-.0597	.5825	.0054	.0088	-.2132	.0781	-2.733	.3770	-3.570	.0629	8.271	-2.441
	(2.0)	(1.1)		(0.7)	(2.2)	(1.7)	(1.1)	(0.3)	(0.4)	(0.5)	(0.1)	(0.5)	(0)	(1.5)	(0.2)
R-SQUARED= .287			F= 0.9												
C34REP	-.0425	.0032		0	.0005	0	0	-.0004	0	-.0032	-.0001	-.0031	-.0006	.0062	0
	(2.3)	(1.5)		(0.1)	(2.5)	(1.0)	(1.1)	(0.7)	(0.1)	(0.7)	(0)	(0.6)	(0.2)	(1.6)	(0)
R-SQUARED= .015			F= 1.1												
INA	-154.6	-34.71		.7358	3.875	.0199	.0115	1.442	1.770	-83.58	-94.26	-38.37	-100.2	-28.79	-140.3
	(0.5)	(1.0)		(0.7)	(1.2)	(0.3)	(0.1)	(0.1)	(0.7)	(1.3)	(1.6)	(0.5)	(1.7)	(0.5)	(1.0)
R-SQUARED= .012			F= 0.9												
SF	47.18	2.124		-.0892	-.3381	-.0062	-.0019	-.0140	-.4369	-4.424	-1.925	-.7643	2.406	-.3354	18.91
	(2.6)	(1.0)		(1.2)	(1.6)	(1.5)	(0.3)	(0)	(2.6)	(1.0)	(0.5)	(0.1)	(0.6)	(0.1)	(2.1)
R-SQUARED= .020			F= 1.5												

TABLE B-22

FEED AND CONDENSATE AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASOWN	204.63 (353.22)	351.09 (643.67)	2.89 (35.24)
CASMNT	150.77 (296.90)	269.10 (568.74)	2.67 (34.97)
CASREP	0.28 (0.59)	0.43 (0.91)	0.01 (0.09)
C34OWN	32.33 (157.28)	36.28 (238.40)	0.09 (2.04)
C34MNT	27.52 (140.51)	29.36 (208.26)	0.09 (2.04)
C34REP	0.07 (0.32)	0.05 (0.33)	0 (0.03)
ENGLOG	56.70 (66.09)	0 (0)	0 (0)
INA	65.37 (163.01)	142.88 (342.36)	23.12 (78.91)
SF	74.81 (773.51)	73.03 (540.39)	3.60 (16.83)
RC	1.70 (0.80)	3.09 (1.21)	2.14 (1.03)
AC	0.26 (0.19)	0.38 (0.46)	0.28 (0.20)
PP	77.55 (12.27)	60.67 (9.10)	105.72 (17.74)
PO	82.86 (9.56)	79.43 (9.64)	72.88 (6.22)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	10.92 (25.20)	20.78 (42.21)	0.36 (1.88)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
DH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-23

FF-1052 CLASS
FEED AND CONDENSATE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	566.4	-53.60	153.5	-4.412	1.739	.0363	-.1742	.7864	-1.178	27.57	-82.42	-11.98
	(2.2)	(1.2)	(1.1)	(1.2)	(0.7)	(0.9)	(1.3)	(0.9)	(0.4)	(0.4)	(1.0)	(0.2)
R-SQUARED=	.396	F=	1.5									
CASMNT	417.5	-50.36	57.58	-4.031	2.267	.0082	-.2109	.3751	-.7645	97.16	-38.97	-32.53
	(2.0)	(1.4)	(0.5)	(1.4)	(1.2)	(0.2)	(1.9)	(0.5)	(0.3)	(1.6)	(0.6)	(0.6)
R-SQUARED=	.367	F=	2.C									
CASREP	.4584	.0181	-.0727	-.0060	.0022	.0001	-.0003	0	.0022	-.0603	-.0257	.0946
	(1.6)	(0.4)	(0.5)	(1.5)	(0.8)	(1.4)	(1.5)	(0)	(0.8)	(0.8)	(0.3)	(1.2)
R-SQUARED=	.021	F=	1.4									
C34DWN	137.1	8.525	-32.35	.2282	-.6807	-.0024	-.0669	.0670	-1.108	8.287	15.50	25.27
	(1.2)	(0.5)	(0.6)	(0.3)	(0.7)	(0.1)	(1.1)	(0.2)	(1.0)	(0.3)	(0.5)	(0.9)
R-SQUARED=	.274	F=	0.9									
C34MNT	160.7	10.25	-44.91	.0287	-.7673	-.0013	-.0630	.0613	-1.229	10.37	23.50	22.03
	(1.6)	(0.7)	(0.9)	(0)	(0.9)	(0.1)	(1.2)	(0.2)	(1.2)	(0.4)	(0.8)	(0.9)
R-SQUARED=	.302	F=	1.1									
C34REP	.1138	.0195	-.0367	.0006	-.0002	0	-.0003	.0001	-.0007	.0081	.0348	.0530
	(0.7)	(0.9)	(0.5)	(0.7)	(0.2)	(0.6)	(2.5)	(0.1)	(0.5)	(0.2)	(0.9)	(1.4)
R-SQUARED=	.018	F=	1.4									
ENGLOO	383.9	16.95	-39.63	1.159	-1.799	-.0869	-.2765	1.140	-2.991	40.42	15.78	-44.85
	(3.3)	(1.1)	(0.9)	(1.8)	(2.2)	(2.5)	(4.1)	(0.8)	(2.5)	(1.1)	(0.7)	(1.3)
R-SQUARED=	.363	F=	3.5									
IMA	39.57	37.37	-8.416	.2021	-.5768	.0793	-.1300	-.0358	.0094	-15.23	16.48	9.067
	(0.4)	(2.9)	(0.2)	(0.4)	(0.7)	(3.0)	(2.1)	(0.1)	(0)	(0.7)	(0.7)	(0.4)
R-SQUARED=	.118	F=	3.9									
SF	83.10	17.50	-118.8	2.830	.2659	.0684	-.1679	-.1746	-2.994	-7.103	10.61	72.41
	(0.1)	(0.2)	(0.4)	(0.6)	(0.1)	(0.7)	(0.5)	(0.1)	(0.5)	(0)	(0.1)	(0.5)
R-SQUARED=	.297	F=	0.3									

TABLE B-24

DDG-2 CLASS
FEED AND CONDENSATE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASDWN	412.2	-1.286	-2.445	15.79	-6.806	-.1114	-.3567	1.156	-3.860	-305.7	-36.80	-30.16	128.0
	(0.8)	(0)	(0)	(2.3)	(1.2)	(1.3)	(1.4)	(1.1)	(1.2)	(1.8)	(0.3)	(0.2)	(0.8)
R-SQUARED= .390		F=	1.1										
CASMNT	957.1	11.09	33.04	7.174	-3.150	-.0201	-.1147	1.271	-5.874	-294.9	-127.5	-33.80	151.1
	(2.1)	(0.3)	(0.3)	(1.2)	(0.6)	(0.3)	(0.5)	(1.3)	(2.0)	(1.8)	(1.0)	(0.2)	(1.0)
R-SQUARED= .479		F=	0.7										
CASREP	1.395	.0093	.0650	.0070	-.0070	.0001	-.0008	.0010	-.0053	-.3094	-.1168	.0423	.1273
	(3.2)	(0.2)	(0.7)	(1.1)	(1.3)	(0.6)	(2.3)	(1.1)	(2.1)	(2.2)	(1.1)	(0.3)	(1.0)
R-SQUARED= .037		F=	1.9										
C34DWN	137.1	-16.53	3.607	-.8504	-.9041	.0190	-.0526	-.0302	.4830	-15.42	-16.78	66.57	20.66
	(0.6)	(1.0)	(0.1)	(0.5)	(0.6)	(0.6)	(0.5)	(0.1)	(0.5)	(0.3)	(0.4)	(1.1)	(0.4)
R-SQUARED= .289		F=	0.5										
C34MNT	99.38	-20.11	26.76	-.8259	.6367	.0331	.0414	.1715	-.1468	-43.36	-68.59	70.91	43.32
	(0.5)	(1.3)	(0.8)	(0.5)	(0.4)	(1.3)	(0.5)	(0.5)	(0.1)	(0.8)	(1.5)	(1.3)	(0.9)
R-SQUARED= .415		F=	1.0										
C34REP	.3510	-.0132	.0210	-.0027	-.0015	0	-.0002	-.0001	.0004	-.0002	.0040	.0313	.0182
	(1.8)	(0.9)	(0.6)	(1.7)	(1.0)	(0.1)	(2.0)	(0.4)	(0.5)	(0)	(0.1)	(0.6)	(3.4)
R-SQUARED= .020		F=	0.9										
INA	14.06	16.72	36.84	.0105	-1.920	.3152	-.0579	-.6943	.9404	25.01	24.64	58.28	-136.8
	(0.1)	(1.0)	(1.0)	(0)	(1.2)	(5.4)	(0.4)	(1.8)	(0.9)	(0.4)	(0.5)	(1.0)	(2.8)
R-SQUARED= .122		F=	5.1										
SF	-59.89	-6.893	98.26	-1.080	-1.940	-.0490	-.0273	.2537	1.862	44.10	46.40	60.58	57.14
	(0.2)	(0.3)	(2.0)	(0.4)	(0.9)	(0.5)	(0.1)	(0.5)	(1.4)	(0.6)	(0.8)	(0.8)	(0.9)
R-SQUARED= .024		F=	1.5										

TABLE B-25

SSN-637 CLASS
FEED AND CONDENSATE

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SFP	OH
CASDWN	-3.864	-3.357	7.671	.0574	.0789	-.0023	.0045	-.0447	.1174	-2.706	-6.415	-3.557	-7.992	-.6727	-5.378
	(0.2)	(1.5)	(0.7)	(0.1)	(0.2)	(0.5)	(0.5)	(0.1)	(0.5)	(0.4)	(1.2)	(0.5)	(1.5)	(0.1)	(0.5)
R-SQUARED= .067			F= 0.5												
CASMNT	-3.186	-3.580	7.810	.0570	.0672	-.0014	.0063	-.1449	.1265	-3.016	-6.307	-2.928	-7.864	.0581	-5.945
	(0.2)	(1.6)	(0.7)	(0.1)	(0.2)	(0.3)	(0.7)	(0.2)	(0.5)	(0.5)	(1.2)	(0.4)	(1.5)	(0)	(0.5)
R-SQUARED= .068			F= 0.5												
CASREP	-.0400	-.0041	.0104	.0009	-.0006	0	0	.0001	-.0002	.0078	.0058	-.0053	-.0060	.0019	.0366
	(1.2)	(0.9)	(0.5)	(1.1)	(0.7)	(0.3)	(0.9)	(0)	(0.5)	(0.6)	(0.5)	(0.4)	(0.6)	(0.2)	(1.3)
R-SQUARED= .012			F= 0.8												
C34DWN	.6187	.0252	-.3764	-.0064	-.0045	0	-.0001	-.0221	-.0200	.1465	.2350	-.0320	.0119	.1925	1.553
	(0.4)	(0.2)	(0.5)	(1.0)	(0.2)	(0.1)	(0.2)	(0.4)	(1.2)	(0.3)	(0.6)	(0.1)	(0)	(0.5)	(1.9)
R-SQUARED= .221			F= 0.6												
C34MNT	.6187	.0252	-.3764	-.0064	-.0045	0	-.0001	-.0221	-.0200	.1465	.2350	-.0320	.0119	.1925	1.553
	(0.4)	(0.2)	(0.5)	(1.0)	(0.2)	(0.1)	(0.2)	(0.4)	(1.2)	(0.3)	(0.6)	(0.1)	(0)	(0.5)	(1.9)
R-SQUARED= .221			F= 0.6												
C34REP	.0059	.0001	-.0041	-.0001	-.0001	0	0	-.0004	-.0002	.0030	.0030	-.0004	.0002	.0030	.0197
	(0.3)	(0.1)	(0.5)	(1.1)	(0.3)	(1.4)	(0.1)	(0.7)	(1.4)	(0.7)	(0.8)	(0.1)	(0.1)	(0.7)	(2.2)
R-SQUARED= .016			F= 1.1												
INA	6.008	.1553	3.045	-.2509	.7273	.0050	.0137	-1.682	-.3900	-10.46	20.12	9.821	2.010	.4938	8.806
	(0.1)	(0)	(0.2)	(1.4)	(1.3)	(0.5)	(0.7)	(1.1)	(0.9)	(0.9)	(2.0)	(0.7)	(0.2)	(0)	(0.4)
R-SQUARED= .046			F= 2.7												
SF	8.319	1.164	-9.062	.0127	.0239	.0037	-.0023	-.1416	-.0833	-1.478	2.673	.5278	.7516	-.3618	-2.237
	(0.9)	(1.3)	(2.2)	(0.3)	(0.2)	(1.6)	(0.6)	(0.5)	(0.9)	(0.6)	(1.3)	(0.2)	(0.4)	(0.2)	(0.5)
R-SQUARED= .023			F= 1.6												

TABLE B-26

PROPULSION BOILERS AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	285.87 (461.78)	376.36 (616.23)	0 (0)
CASMNT	229.16 (427.10)	306.11 (489.35)	0 (0)
CASREP	0.52 (0.81)	0.76 (1.22)	0 (0)
C34DWN	126.52 (288.38)	103.17 (354.83)	0 (0)
C34MNT	113.54 (277.72)	93.13 (329.22)	0 (0)
C34REP	0.33 (0.64)	0.26 (0.73)	0 (0)
ENGLOG	53.87 (42.72)	0 (0)	0 (0)
IMA	109.57 (334.39)	264.66 (538.42)	0 (0)
SF	72.73 (579.40)	121.42 (500.31)	0 (0)
RC	3.54 (2.03)	7.94 (2.41)	0 (0)
AC	0.16 (0.13)	0.65 (0.75)	0 (0)
PP	75.74 (16.90)	63.73 (10.74)	0 (0)
PQ	83.77 (13.73)	73.45 (10.41)	0 (0)
CI	364.61 (235.33)	327.22 (240.85)	0 (0)
ST	226.79 (118.58)	226.78 (122.59)	0 (0)
PC	17.61 (33.12)	13.43 (23.84)	0 (0)
AGE	65.42 (12.95)	160.68 (20.89)	0 (0)
FL	0.63 (0.48)	0.47 (0.50)	0 (0)
SYL1	0.13 (0.34)	0.26 (0.44)	0 (0)
SYL2	0 (0)	0.10 (0.31)	0 (0)
SYL3	0 (0)	0 (0)	0 (0)
SYP	0.38 (0.49)	0.26 (0.44)	0 (0)
OH	0 (0)	0 (0)	0 (0)

TABLE B-27

FF-1052 CLASS
PROPULSION BOILERS

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	178.0	-20.77	-238.5	5.180	.0646	-.0805	-.0985	-.4819	-.8062	-149.7	-199.8	118.4
	(0.6)	(0.7)	(0.8)	(1.3)	(0)	(1.4)	(0.6)	(0.6)	(0.2)	(1.5)	(1.6)	(1.2)
	R-SQUARED=	.468	F= 1.5									
CASMNT	195.6	-15.45	-158.7	3.064	.8443	-.0787	-.1495	-.7530	-1.690	-39.93	-110.6	97.04
	(0.7)	(0.6)	(0.6)	(0.8)	(0.4)	(1.6)	(0.9)	(1.0)	(0.4)	(0.4)	(0.9)	(1.1)
	R-SQUARED=	.498	F= 1.6									
CASREP	.4221	-.0097	-.0745	-.0073	.0040	0	-.0005	.0003	.0080	-.1341	-.2662	.3220
	(1.3)	(0.3)	(0.2)	(1.6)	(1.5)	(0.3)	(1.6)	(0.3)	(1.7)	(1.3)	(2.1)	(3.1)
	R-SQUARED=	.053	F= 2.6									
C34DWN	240.9	-16.16	.8593	1.175	-.2719	-.0076	-.0083	-.9187	-1.275	19.26	-113.2	-43.52
	(1.2)	(0.9)	(0)	(1.1)	(0.2)	(0.2)	(0.1)	(1.7)	(0.5)	(0.3)	(1.5)	(0.7)
	R-SQUARED=	.402	F= 1.1									
C34MNT	258.1	-13.23	-11.62	1.149	-.6317	-.0113	-.0174	-.9981	-1.430	30.80	-91.76	-48.06
	(1.3)	(0.7)	(0.1)	(1.1)	(0.5)	(0.3)	(0.2)	(1.9)	(0.6)	(0.5)	(1.2)	(0.8)
	R-SQUARED=	.420	F= 1.2									
C34REP	.1467	-.0181	.1364	.0013	.0005	0	-.0004	0	.0030	-.1427	-.1436	.2178
	(0.5)	(0.7)	(0.5)	(0.9)	(0.3)	(0.3)	(1.7)	(0)	(0.8)	(1.8)	(1.5)	(2.8)
	R-SQUARED=	.039	F= 2.0									
ENGLOG	22.08	12.32	-250.8	.2519	-.4717	-.0194	-.0373	.2992	.2739	54.98	25.62	9.013
	(0.1)	(1.0)	(1.3)	(0.6)	(0.9)	(0.8)	(0.8)	(0.7)	(0.2)	(0.9)	(0.4)	(0.4)
	R-SQUARED=	.450	F= 2.5									
IMA	-219.1	-17.38	251.2	1.073	.8907	.1526	.2413	-.6266	2.181	-50.95	-99.05	-4.853
	(1.4)	(1.3)	(1.9)	(1.3)	(0.9)	(2.5)	(1.9)	(1.5)	(1.2)	(1.2)	(2.0)	(0.1)
	R-SQUARED=	.042	F= 2.3									
SF	218.0	13.97	-218.1	.5544	-1.060	-.0011	-.3219	.0153	-.3910	-65.81	-21.07	77.82
	(0.9)	(0.7)	(1.0)	(0.4)	(0.6)	(0)	(1.5)	(0)	(0.1)	(1.0)	(0.3)	(1.2)
	R-SQUARED=	.009	F= 0.6									

TABLE B-28

DDG-2 CLASS
PROPULSION BOILERS

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASDWN	-150.8	-6.734	-120.8	13.65	-6.603	-.0908	-.7070	.2265	.9287	-62.34	-197.9	-95.94	108.4
	(0.3)	(0.3)	(2.0)	(2.5)	(1.7)	(1.1)	(2.9)	(0.1)	(0.3)	(0.4)	(1.3)	(0.6)	(0.7)
R-SQUARED= .396		F= 1.7											
CASMNT	43.93	-7.748	-93.46	9.389	-5.383	-.0367	-.7227	.0898	.5344	38.23	-107.2	-30.26	81.92
	(0.1)	(0.5)	(2.0)	(2.3)	(1.8)	(0.5)	(3.7)	(0.1)	(0.3)	(0.4)	(1.0)	(0.2)	(0.7)
R-SQUARED= .298		F= 2.5											
CASREP	.5181	-.0612	-.1099	.0057	-.0052	.0003	-.0015	.0020	.0065	.0081	-.4820	-.1694	-.1014
	(0.7)	(2.0)	(1.2)	(0.7)	(0.9)	(1.2)	(3.1)	(0.8)	(1.6)	(0)	(2.4)	(0.7)	(0.5)
R-SQUARED= .081		F= 2.8											
C34DWN	-121.0	-.2023	-14.73	3.297	2.358	-.0087	-.4094	-.2260	-.4889	55.03	5.005	-53.69	29.57
	(0.4)	(0)	(0.4)	(1.8)	(1.1)	(0.2)	(2.8)	(0.3)	(0.3)	(0.7)	(0.1)	(0.6)	(0.4)
R-SQUARED= .267		F= 1.6											
C34MNT	-110.2	-.3581	-7.047	3.052	2.011	.0031	-.3820	-.3457	-.5318	70.52	29.18	-33.37	26.34
	(0.4)	(0)	(0.2)	(1.8)	(1.0)	(0.1)	(2.8)	(0.5)	(0.4)	(1.0)	(0.4)	(0.4)	(0.4)
R-SQUARED= .249		F= 1.9											
C34REP	-.4128	-.0098	-.0208	.0057	.0046	.0002	-.0006	.0006	.0003	.1636	-.0191	-.0921	.0233
	(0.9)	(0.5)	(0.4)	(1.9)	(1.4)	(1.7)	(2.1)	(0.5)	(0.1)	(1.4)	(0.2)	(0.7)	(0.2)
R-SQUARED= .077		F= 2.2											
INA	-174.8	17.50	11.84	-2.157	4.784	.5295	.1891	.9280	-.8386	-205.1	53.28	213.6	165.0
	(0.5)	(1.3)	(0.3)	(1.0)	(1.9)	(5.6)	(0.9)	(0.9)	(0.5)	(2.3)	(0.6)	(2.1)	(1.7)
R-SQUARED= .118		F= 4.7											
SF	-418.4	-10.44	-33.11	1.708	1.017	-.0546	-.3605	.6259	3.282	53.38	13.46	92.08	-47.68
	(1.5)	(0.9)	(1.0)	(0.9)	(0.5)	(0.6)	(2.0)	(0.7)	(2.2)	(0.7)	(0.2)	(1.1)	(0.6)
R-SQUARED= .021		F= 1.2											

TABLE B-29

COMBUSTION AIR AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	120.01 (363.32)	126.81 (368.33)	0 (0)
CASMNT	94.51 (319.45)	97.80 (311.66)	0 (0)
CASREP	0.16 (0.52)	0.14 (0.57)	0 (0)
C34DWN	29.37 (234.53)	2.91 (34.79)	0 (0)
C34MNT	28.53 (233.88)	2.33 (26.14)	0 (0)
C34REP	0.04 (0.27)	0.01 (0.08)	0 (0)
C2DWN	90.64 (285.27)	123.91 (365.67)	0 (0)
ENGLOG	28.25 (48.55)	0 (0)	0 (0)
SF	34.06 (574.78)	21.19 (263.99)	0 (0)
RC	1.00 (0.53)	2.09 (0.37)	0 (0)
AC	0.83 (0.07)	0.27 (0.32)	0 (0)
PP	70.72 (15.73)	57.46 (10.81)	0 (0)
PQ	87.40 (16.06)	77.93 (12.96)	0 (0)
CI	364.61 (235.33)	327.22 (240.85)	0 (0)
ST	226.79 (118.58)	226.78 (122.59)	0 (0)
PC	8.62 (38.49)	7.87 (27.12)	0 (0)
AGE	65.42 (12.95)	160.68 (20.89)	0 (0)
FL	0.63 (0.48)	0.47 (0.50)	0 (0)
SYL1	0.13 (0.34)	0.26 (0.44)	0 (0)
SYL2	0 (0)	0.10 (0.31)	0 (0)
SYL3	0 (0)	0 (0)	0 (0)
SYP	0.38 (0.49)	0.26 (0.44)	0 (0)
OH	0 (0)	0 (0)	0 (0)

AD-A109 654 CENTER FOR NAVAL ANALYSES ALEXANDRIA VA INST OF NAVAL--ETC F/G 15/5

SHIP OVERHAUL EFFECTIVENESS,(U)

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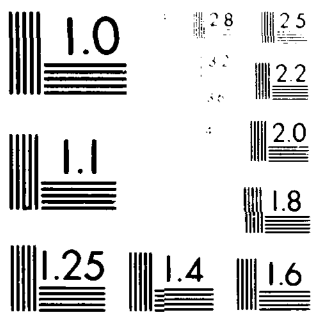

MICROCOPY RESOLUTION TEST CHART

TABLE B-30

FF-1052 CLASS
COMBUSTION AIR

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SYL	SYP
CASONN	321.4	31.48	67.73	.3946	-2.018	-.0331	-.1626	-.5086	-.8059	-72.21	-37.84	109.3
	(1.5)	(0.4)	(0.1)	(0.1)	(1.2)	(0.8)	(1.2)	(0.6)	(0.3)	(0.8)	(0.4)	(1.2)
R-SQUARED=	.460	F=	0.5									
CASMNT	214.4	19.32	126.1	.3672	-1.255	-.0282	-.1550	-.2993	-.3594	-74.54	-70.99	133.7
	(1.1)	(0.3)	(0.3)	(0.1)	(0.8)	(0.8)	(1.3)	(0.4)	(0.1)	(1.0)	(0.8)	(1.7)
R-SQUARED=	.406	F=	0.7									
CASREP	.3614	.0367	-.2950	.0003	-.0012	-.0001	-.0005	-.0005	.0001	-.1325	-.1410	.1660
	([illegible].8)	(0.5)	(0.8)	(0.1)	(0.7)	(0.6)	(2.4)	(0.6)	(0)	(1.7)	(1.7)	(2.2)
R-SQUARED=	.051	F=	1.7									
C34DNN	15.47	38.46	122.8	.9350	.2244	.0268	-.0486	-.1260	-1.712	-6.934	-51.44	31.32
	(0.1)	(0.7)	(0.4)	(1.0)	(0.2)	(1.1)	(0.6)	(0.2)	(0.9)	(0.1)	(0.8)	(0.5)
R-SQUARED=	.544	F=	0.6									
C34MNT	34.52	34.34	79.44	.0217	.0267	.0253	-.0435	-.0960	-1.591	-5.506	-41.75	30.69
	(0.2)	(0.6)	(0.3)	(0.9)	(0)	(1.0)	(0.5)	(0.2)	(0.8)	(0.1)	(0.6)	(0.5)
R-SQUARED=	.550	F=	0.5									
C34REP	.1146	.0530	-.0047	.0010	.0002	0	-.0002	-.0003	-.0022	-.0441	-.0681	.0577
	(1.0)	(1.4)	(0.5)	(1.5)	(0.4)	(0)	(2.4)	(0.8)	(1.8)	(1.2)	(1.7)	(1.6)
R-SQUARED=	.044	F=	2.3									
ENGLOG	315.5	13.16	271.8	.6416	-.4303	-.0239	-.1574	1.140	-3.555	-51.67	-28.56	-13.45
	(3.5)	(0.5)	(1.3)	(1.4)	(0.9)	(0.8)	(2.7)	(0.9)	(2.7)	(1.7)	(1.2)	(0.4)
R-SQUARED=	.309	F=	1.9									
IMA	-46.28	-7.171	-9.974	.0639	.1246	.0256	.0169	-.0082	.5474	3.708	6.519	-5.942
	(2.8)	(1.4)	(0.4)	(0.5)	(1.3)	(3.4)	(1.1)	(0.2)	(3.1)	(0.7)	(1.1)	(1.2)
R-SQUARED=	.039	F=	2.7									
SF	-160.4	-119.0	-294.4	1.167	-.1066	.0437	.3834	.5076	1.496	62.84	38.62	-5.421
	(0.5)	(1.1)	(0.5)	(0.6)	(0.1)	(0.5)	(1.6)	(0.5)	(0.4)	(0.6)	(0.3)	(0.1)
R-SQUARED=	.164	F=	0.5									

TABLE B-31

DDG-2 CLASS
COMBUSTION AIR

	CONST	NC	AC	PP	PO	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASDMN	79.62	-246.8	15.71	3.049	-.7997	-.0007	-.2646	1.094	3.086	-53.46	-68.92	-119.8	-210.5
	(0.3)	(2.4)	(0.2)	(1.1)	(0.3)	(0)	(1.9)	(1.3)	(1.7)	(0.5)	(0.9)	(1.1)	(1.9)
R-SQUARED=	.438	F=	1.8										
CASMNT	-125.1	-153.5	-36.11	4.327	-2.067	-.0021	-.2844	1.310	2.631	-34.79	-63.10	-20.71	-116.7
	(0.5)	(1.8)	(0.5)	(1.9)	(1.0)	(0)	(2.3)	(1.9)	(1.8)	(0.4)	(0.6)	(0.2)	(1.3)
R-SQUARED=	.390	F=	2.1										
CASREP	.1143	-.1659	.0059	.0018	-.0007	.0001	-.0064	.0022	.0024	-.0323	-.0828	-.1163	-.1674
	(0.4)	(1.7)	(0.1)	(0.6)	(0.3)	(0.9)	(1.9)	(2.5)	(1.4)	(0.4)	(1.1)	(1.2)	(1.6)
R-SQUARED=	.051	F=	2.4										
C34DMN	-51.24	4.116	-8.321	.2767	.1168	.0113	-.0011	.1360	.1078	.0651	1.004	2.549	2.765
	(2.4)	(0.6)	(1.4)	(1.8)	(0.9)	(1.8)	(0.1)	(2.3)	(1.0)	(0)	(0.2)	(0.4)	(0.4)
R-SQUARED=	.077	F=	1.9										
C34MNT	-33.58	1.063	-5.610	.0894	.1252	.0063	-.0071	.1316	.1027	1.528	2.700	3.053	2.473
	(1.8)	(0.2)	(1.1)	(0.7)	(1.1)	(1.4)	(0.7)	(2.5)	(1.1)	(0.3)	(0.6)	(0.5)	(0.4)
R-SQUARED=	.175	F=	1.7										
C34REP	-.0924	.0100	-.0228	.0004	.0001	0	0	.0003	.0003	.0028	.0061	.0091	.0116
	(2.1)	(0.8)	(1.9)	(1.3)	(0.2)	(1.9)	(0.2)	(2.2)	(1.2)	(0.2)	(0.6)	(0.7)	(0.8)
R-SQUARED=	.033	F=	2.0										
IMA	337.4	-18.32	27.32	-1.945	-.6535	.1195	-.0383	-.1244	-.3654	-120.1	-67.18	-86.47	11.81
	(2.2)	(0.4)	(0.6)	(1.8)	(0.7)	(2.2)	(0.4)	(0.3)	(0.5)	(2.7)	(1.8)	(1.8)	(0.2)
R-SQUARED=	.029	F=	1.8										
SF	-169.5	7.296	-20.86	.9939	.3688	.0267	-.0733	2.193	.3880	18.19	28.72	46.70	12.09
	(1.3)	(0.2)	(0.6)	(1.1)	(0.4)	(0.6)	(0.8)	(5.9)	(0.6)	(0.5)	(0.9)	(1.2)	(0.3)
R-SQUARED=	.068	F=	6.4										

TABLE B-32

ELECTRICAL AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	357.21 (500.68)	457.08 (676.98)	50.02 (166.94)
CASMNT	217.36 (383.31)	290.70 (525.98)	33.02 (133.46)
CASREP	0.46 (0.75)	0.37 (0.73)	0.10 (0.34)
C34DWN	68.20 (212.49)	59.13 (279.12)	6.84 (47.83)
C34MNT	49.10 (173.71)	42.71 (259.68)	4.33 (31.16)
C34REP	0.12 (0.38)	0.06 (0.31)	0.03 (0.17)
ENGLOG	86.63 (64.38)	0 (0)	0 (0)
IMA	53.74 (438.98)	58.03 (126.33)	58.73 (136.24)
SF	44.80 (347.12)	39.87 (241.63)	24.84 (268.37)
INSURV	1.45 (0.51)	1.58 (0.69)	0 (0)
RC	1.57 (0.75)	1.37 (0.72)	3.71 (1.33)
AC	0.11 (0.10)	4.10 (2.93)	0 (0)
PP	105.55 (15.24)	80.03 (12.52)	104.21 (13.19)
PQ	82.13 (7.98)	85.28 (9.89)	68.78 (5.00)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (112.09)	227.81 (121.79)	211.16 (149.22)
PC	13.37 (28.49)	16.13 (40.11)	2.96 (11.97)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)
IM	23.45 (9.75)	21.42 (11.81)	0 (0)

TABLE B-33

FF-1052 CLASS
ELECTRICAL

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL	SVP	IN
CASOWN	368.4	-25.12	311.8	5.484	-1.399	-.0666	.0308	-1.362	-4.649	-178.2	-211.7	144.1	
	(0.9)	(0.4)	(0.8)	(1.4)	(0.5)	(1.1)	(0.2)	(1.4)	(1.2)	(1.8)	(1.6)	(1.5)	
	R-SQUARED=	.410	F= 1.4										
CASMNT	-66.40	-45.35	272.8	3.648	-.9308	.0223	.0467	-.8128	.1955	-41.22	-114.4	179.9	
	(0.2)	(1.0)	(0.9)	(1.3)	(0.5)	(0.5)	(0.3)	(1.1)	(0.1)	(0.6)	(1.2)	(2.5)	
	R-SQUARED=	.372	F= 1.8										
CASREP	.5241	-.0423	-.2858	.0015	-.0027	-.0001	-.0005	-.0015	.0037	-.0790	-.0187	.2533	
	(1.4)	(0.8)	(0.8)	(0.4)	(1.0)	(0.8)	(1.8)	(1.5)	(1.1)	(0.9)	(0.2)	(3.0)	
	R-SQUARED=	.026	F= 1.9										
C34OWN	292.4	-38.38	9.485	-.5441	-1.695	-.0198	-.0874	.4773	.6085	3.499	-42.01	46.88	
	(1.7)	(1.5)	(0.1)	(0.7)	(1.1)	(0.7)	(1.1)	(1.2)	(0.4)	(0.1)	(0.8)	(1.2)	
	R-SQUARED=	.368	F= 1.2										
C34MNT	165.4	-24.58	-27.58	-.0592	-1.011	-.0164	-.1035	.1015	1.200	5.602	-26.31	67.55	
	(0.8)	(1.3)	(0.2)	(0.1)	(0.8)	(0.7)	(1.5)	(0.3)	(1.0)	(0.2)	(0.7)	(2.2)	
	R-SQUARED=	.312	F= 1.7										
C34REP	-.0813	-.0333	-.0895	-.0008	.0039	-.0001	-.0005	-.0003	.0021	-.0586	-.0687	.1553	
	(0.4)	(1.3)	(0.1)	(0.9)	(2.2)	(0.8)	(3.8)	(0.6)	(1.2)	(1.4)	(1.3)	(3.8)	
	R-SQUARED=	.052	F= 4.1										
ENGLOG	407.0	14.64	88.78	-.5651	-1.340	.0157	-.0640	.1560	-2.676	-8.110	-10.51	19.42	
	(2.6)	(0.9)	(0.5)	(0.9)	(1.3)	(0.4)	(0.9)	(0.6)	(1.0)	(0.2)	(0.3)	(0.5)	
	R-SQUARED=	.310	F= 2.8										
INA	99.69	17.34	-6.761	-.0208	.2634	-.0247	-.0772	-.2858	.3035	39.99	-5.969	-56.64	
	(0.5)	(0.6)	(0)	(0.8)	(0.1)	(0.3)	(0.5)	(0.5)	(0.2)	(0.8)	(0.1)	(1.2)	
	R-SQUARED=	.007	F= 0.5										
SF	-96.91	13.31	-108.4	-.0811	.4486	.1080	.0126	-.0332	.6440	-7.138	49.58	42.31	
	(0.6)	(0.6)	(0.6)	(0.1)	(0.3)	(1.8)	(0.1)	(0.1)	(0.4)	(0.2)	(1.0)	(1.1)	
	R-SQUARED=	.007	F= 0.6										
INSURV	-.1266	.2936	-.7327	.0069	.0040	-.0008	.0004	-.0076	.0106	-.2665	.6710	.3590	-.0125
	(0)	(0.8)	(0.1)	(0.6)	(6.2)	(0.7)	(0.2)	(0.6)	(0.4)	(0.6)	(1.2)	(0.7)	(0.6)
	R-SQUARED=	.568	F= 1.1										

TABLE B-34

DDG-2 CLASS
ELECTRICAL

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL1	SVL2	SVP	IN
CASOWN	573.7	-173.2	-33.50	-18.82	9.779	-.0561	-.0724	1.932	6.333	253.8	-8.819	315.1	-139.3	
	(1.0)	(1.8)	(1.7)	(2.4)	(1.5)	(0.9)	(0.3)	(1.9)	(2.0)	(1.3)	(0.1)	(1.6)	(0.7)	
R-SQUARED=	.615		F= 1.8											
CASMNT	390.4	-180.4	-42.71	-19.46	5.764	-.0671	-.0385	1.656	5.590	183.7	-77.09	-60.14	-13.75	
	(2.3)	(2.4)	(2.8)	(3.1)	(1.1)	(1.2)	(0.2)	(2.0)	(2.4)	(1.3)	(0.6)	(0.4)	(0.1)	
R-SQUARED=	.551		F= 3.2											
CASREP	.3584	-.0228	.0023	-.0001	-.0022	.0001	-.0004	-.0001	.0016	.0358	.0338	.0711	-.0851	
	(0.9)	(0.3)	(0.2)	(0)	(0.5)	(0.6)	(1.5)	(0.1)	(0.9)	(0.3)	(0.4)	(0.6)	(0.8)	
R-SQUARED=	.020		F= 0.8											
C34OWN	289.8	-237.6	-41.52	-6.193	2.262	.0535	-.1290	.2019	3.769	19.25	-144.5	-145.0	45.46	
	(1.2)	(6.3)	(5.0)	(4.6)	(1.2)	(2.4)	(1.7)	(0.5)	(2.7)	(0.2)	(2.1)	(1.8)	(0.6)	
R-SQUARED=	.719		F= 9.3											
C34MNT	223.0	-256.4	-47.31	-6.579	1.780	.0463	-.0018	.2386	4.794	.0744	-150.7	-156.9	76.72	
	(1.0)	(7.2)	(6.0)	(5.3)	(1.0)	(2.3)	(1.2)	(0.6)	(3.7)	(0)	(2.3)	(2.1)	(1.0)	
R-SQUARED=	.727		F= 11.2											
C34REP	.0905	-.0269	.0021	-.0019	-.0006	0	-.0001	.0001	.0011	.0830	.0147	-.0073	-.0586	
	(0.5)	(1.0)	(0.4)	(1.8)	(0.5)	(0.8)	(0.9)	(0.2)	(1.5)	(1.8)	(0.4)	(0.2)	(1.5)	
R-SQUARED=	.018		F= 1.1											
IMA	-10.95	-12.26	-4.513	.2162	.0747	.1094	-.0181	-.0264	.3228	-15.37	.9074	10.97	11.28	
	(0.2)	(1.1)	(2.2)	(0.5)	(0.1)	(4.9)	(0.4)	(0.2)	(1.1)	(0.8)	(0.1)	(0.6)	(0.7)	
R-SQUARED=	.066		F= 3.7											
SF	-30.80	2.757	-2.651	.3134	-.2807	.0266	-.0853	-.1320	.4905	-5.926	15.04	15.39	25.92	
	(0.2)	(0.1)	(0.7)	(0.4)	(0.3)	(0.6)	(1.0)	(0.6)	(0.9)	(0.2)	(0.5)	(0.4)	(0.9)	
R-SQUARED=	.011		F= 0.7											
INSURV	1.909	.5535	.1462	.0189	-.0215	0	-.0035	-.0020	-.0075	-.1681	.6744		-.0031	.0188
	(1.0)	(1.3)	(1.6)	(0.4)	(1.9)	(0)	(0.9)	(0.3)	(0.4)	(0.4)	(2.5)		(0)	(0.6)
R-SQUARED=	.918		F= 5.9											

TABLE B-35

SSN-637 CLASS
ELECTRICAL

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	STL1	STL2	STL3	STP	DM
CASOWN	-39.97	10.82	3733.	2.678	-3.198	.0075	.0665	-.2399	-.4995	26.58	45.13	2.736	27.23	98.14	58.51
	(0.3)	(1.0)	(1.4)	(1.1)	(1.3)	(0.4)	(1.0)	(0.3)	(0.4)	(0.7)	(1.1)	(0)	(0.8)	(2.7)	(0.8)
R-SQUARED=	.363	F=	2.1												
CASMNT	-10.80	-5.711	4392.	1.388	-1.667	-.0108	.0556	.0689	-.8289	29.32	44.61	25.17	10.29	66.12	82.25
	(0.1)	(0.6)	(2.1)	(0.7)	(0.8)	(0.8)	(1.5)	(0.1)	(0.8)	(1.0)	(1.4)	(0.6)	(0.4)	(2.3)	(1.5)
R-SQUARED=	.387	F=	2.8												
CASREP	-.1948	.0126	9.486	.0019	-.0012	0	.0001	-.0006	.0001	.0832	.0640	-.0494	.0695	.0505	.0612
	(1.1)	(0.9)	(2.5)	(0.6)	(0.4)	(0.2)	(1.3)	(0.6)	(0)	(1.9)	(1.3)	(0.7)	(1.2)	(1.2)	(0.7)
R-SQUARED=	.035	F=	2.2												
C34OWN	24.31	7.589	-715.0	-.1003	-.5620	.0048	-.0077	.0129	.3081	4.294	-14.22	-27.47	4.451	5.469	-13.87
	(0.6)	(3.1)	(1.1)	(0.6)	(1.1)	(0.8)	(0.6)	(0.1)	(1.0)	(0.5)	(1.7)	(2.3)	(0.6)	(0.7)	(0.8)
R-SQUARED=	.126	F=	2.0												
C34MNT	1.103	2.171	-190.1	-.0570	-.0040	.0041	.0002	.0012	.0915	6.004	-5.092	-9.198	-.0290	-.8083	-5.706
	(0.1)	(1.6)	(0.5)	(0.6)	(0)	(1.0)	(0)	(0.8)	(0.5)	(1.3)	(1.0)	(1.4)	(0)	(0.2)	(0.6)
R-SQUARED=	.043	F=	1.8												
C34REP	.0386	.0089	.6353	.0003	-.0009	0	.0001	0	.0006	.0165	-.0318	-.0353	-.0098	.0253	-.0428
	(0.3)	(1.3)	(0.3)	(0.7)	(0.7)	(1.2)	(1.4)	(0)	(0.4)	(0.7)	(1.4)	(1.1)	(0.5)	(1.2)	(0.9)
R-SQUARED=	.020	F=	1.3												
INA	31.92	3.000	-182.2	.4746	-.2694	.0243	.0497	-.0563	-.2337	50.47	63.02	25.47	49.37	-11.04	-20.14
	(0.4)	(0.5)	(0.1)	(0.5)	(0.2)	(1.3)	(1.5)	(0.1)	(0.3)	(2.7)	(2.2)	(0.9)	(2.8)	(0.6)	(0.5)
R-SQUARED=	.045	F=	2.3												
SF	225.6	-11.38	-2421.	.0567	-1.268	-.0211	-.0218	-.0479	.5417	-47.70	-45.06	-5.705	-57.65	-2.957	-51.74
	(1.4)	(1.1)	(0.8)	(0.1)	(0.6)	(0.6)	(0.3)	(0.1)	(0.4)	(1.4)	(1.2)	(0.1)	(1.8)	(0.1)	(0.7)
R-SQUARED=	.009	F=	0.6												

TABLE B-36

POWER GENERATORS AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	199.03 (391.28)	202.74 (558.87)	38.09 (153.78)
CASMNT	131.67 (292.29)	145.60 (470.25)	27.43 (128.68)
CASREP	0.27 (0.63)	0.16 (0.55)	0.06 (0.27)
C34DWN	55.24 (201.73)	49.88 (277.38)	5.70 (44.83)
C34MNT	44.15 (170.74)	36.10 (257.90)	3.66 (28.86)
C34REP	0.09 (0.35)	0.03 (0.26)	0.02 (0.14)
ENGLOG	54.39 (53.76)	0 (0)	0 (0)
IMA	32.97 (459.34)	18.13 (57.97)	58.73 (136.24)
SF	18.49 (254.88)	18.20 (238.58)	24.84 (268.37)
RC	0.93 (0.48)	0.57 (0.60)	1.22 (0.61)
AC	0.01 (0.02)	3.51 (3.01)	0 (0)
PP	107.50 (15.56)	77.19 (12.17)	108.74 (15.26)
PQ	83.49 (8.62)	90.01 (11.59)	67.56 (4.74)
CI	367.97 (233.99)	327.22 (240.85)	325.60 (257.85)
ST	226.08 (118.16)	226.78 (122.59)	211.16 (149.22)
PC	5.81 (14.11)	11.21 (31.82)	0.01 (0.09)
AGE	65.78 (12.87)	160.68 (20.89)	71.46 (22.77)
FL	0.64 (0.48)	0.47 (0.50)	0.36 (0.48)
SYL1	0.13 (0.34)	0.26 (0.44)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.31)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.37 (0.48)	0.27 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-37

FF-1052 CLASS
POWER GENERATORS

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	393.5	180.1	-995.8	-1.556	2.388	-.0167	-.0729	-2.275	-5.899	-14.26	-113.4	92.72
	(1.3)	(2.3)	(0.6)	(0.5)	(1.0)	(0.3)	(0.5)	(1.3)	(1.8)	(0.2)	(1.2)	(1.2)
R-SQUARED=	.427	F= 1.6										
CASMNT	-49.97	52.06	859.2	.3842	.7208	.0150	-.1266	-.1044	-.2876	26.07	-30.82	134.2
	(0.2)	(1.0)	(0.8)	(0.2)	(0.5)	(0.4)	(1.1)	(0.1)	(0.1)	(0.5)	(0.5)	(2.6)
R-SQUARED=	.334	F= 2.4										
CASREP	.4786	-.0066	-1.688	-.0011	-.0046	0	-.0005	-.0013	.0064	-.0277	-.1159	.2432
	(1.7)	(0.1)	(1.2)	(0.4)	(2.1)	(0.2)	(2.3)	(0.8)	(2.3)	(0.4)	(1.5)	(3.6)
R-SQUARED=	.039	F= 2.9										
C34DWN	346.0	-17.95	-197.9	-.5485	-2.503	-.0143	-.0659	.7939	-.2623	15.47	-7.608	55.98
	(2.2)	(0.5)	(0.3)	(0.7)	(1.7)	(0.5)	(0.8)	(0.9)	(0.2)	(0.4)	(0.2)	(1.5)
R-SQUARED=	.342	F= 1.5										
C34MNT	223.6	-16.47	-180.9	-.3495	-2.186	-.0110	-.0738	.4985	.5982	16.76	6.070	68.92
	(1.7)	(0.5)	(0.3)	(0.6)	(1.8)	(0.5)	(1.0)	(0.7)	(0.5)	(0.5)	(0.2)	(2.3)
R-SQUARED=	.323	F= 1.8										
C34REP	-.0448	-.0217	-.4404	-.0011	.0029	-.0001	-.0004	.0001	.0021	-.0632	-.0921	.1575
	(0.3)	(0.6)	(0.6)	(1.3)	(1.7)	(1.1)	(2.9)	(0.1)	(1.4)	(1.5)	(1.9)	(4.1)
R-SQUARED=	.046	F= 3.2										
ENGLUG	214.6	14.89	-945.5	.1743	-1.322	.0226	.0027	.0836	-1.460	15.74	-12.91	39.46
	(1.4)	(0.4)	(1.1)	(0.3)	(1.4)	(0.6)	(0)	(0.1)	(0.8)	(0.4)	(0.4)	(1.0)
R-SQUARED=	.386	F= 2.5										
INA	242.4	34.93	-1071.	-.0014	-1.676	-.0624	-.0749	-.7133	.1324	85.96	.0066	-64.37
	(1.1)	(0.7)	(1.1)	(0.7)	(0.8)	(0.7)	(0.4)	(0.6)	(0.1)	(1.6)	(0)	(1.3)
R-SQUARED=	.009	F= 0.6										
SF	-97.33	14.58	-484.9	-.1218	.3385	.0880	.1123	-.2544	.3965	-3.164	-.0015	34.33
	(0.8)	(0.5)	(0.9)	(0.2)	(0.3)	(1.9)	(1.2)	(0.4)	(0.3)	(0.1)	(0)	(1.2)
R-SQUARED=	.008	F= 0.5										

TABLE B-38

DDG-2 CLASS
POWER GENERATORS

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SFP
CASBWN	1408.	-78.89	-24.88	-14.40	7.242	-.0176	-.2230	.9544	-1.984	-37.79	-112.8	-183.8	32.93
	(3.2)	(0.6)	(1.1)	(2.3)	(1.3)	(0.3)	(1.3)	(0.9)	(0.8)	(0.2)	(0.8)	(1.1)	(0.2)
R-SQUARED=		.654	F= 1.7										
CASMNT	1178.	-85.09	-38.54	-15.64	7.987	-.0188	-.0836	.9543	-.5853	-54.78	-40.03	-218.3	65.92
	(3.2)	(0.8)	(2.1)	(3.0)	(1.7)	(0.4)	(0.6)	(1.0)	(0.3)	(0.4)	(0.3)	(1.6)	(0.5)
R-SQUARED=		.650	F= 2.4										
CASREP	.5741	.1427	.0856	-.0065	.0001	.0001	-.0003	.0012	0	.0618	.0171	-.0474	-.1238
	(2.2)	(2.0)	(1.3)	(1.5)	(0)	(1.1)	(1.5)	(1.7)	(0)	(0.8)	(0.2)	(0.6)	(1.5)
R-SQUARED=		.027	F= 1.6										
C34BWN	567.8	-210.2	-49.90	-5.955	2.474	.6570	-.1117	.5733	.6829	-88.07	-157.8	-191.3	15.00
	(2.5)	(3.7)	(4.7)	(4.7)	(1.6)	(2.8)	(1.6)	(1.2)	(0.5)	(1.1)	(2.1)	(2.5)	(0.2)
R-SQUARED=		.772	F= 8.6										
C34MNT	542.2	-227.3	-53.24	-6.262	1.920	.0536	-.0850	.6213	1.296	-104.8	-148.4	-189.3	45.30
	(2.5)	(4.2)	(5.3)	(5.1)	(1.3)	(2.8)	(1.3)	(1.4)	(1.1)	(1.4)	(2.1)	(2.6)	(0.6)
R-SQUARED=		.757	F= 9.2										
C34REP	.0835	-.0011	.0002	-.0013	0	.0001	-.0001	.0001	.0003	.0492	-.0060	-.0189	-.0640
	(0.6)	(0)	(0)	(1.3)	(0)	(1.2)	(0.9)	(0.2)	(0.5)	(1.4)	(0.2)	(0.5)	(1.8)
R-SQUARED=		.019	F= 1.1										
IMA	-21.61	-17.32	-3.152	.0666	-.0234	.0487	.0095	.0305	.2102	3.262	8.748	9.632	1.938
	(0.7)	(2.2)	(2.5)	(0.3)	(0.1)	(4.6)	(0.4)	(0.4)	(1.4)	(0.4)	(1.2)	(1.0)	(0.2)
R-SQUARED=		.053	F= 3.1										
SF	-65.05	-11.25	-4.967	.4545	.1803	.0019	-.0906	-.1771	.4024	-.7069	17.79	8.206	32.37
	(0.5)	(0.4)	(1.0)	(0.5)	(0.2)	(0)	(1.0)	(0.6)	(0.7)	(0)	(0.6)	(0.2)	(1.0)
R-SQUARED=		.009	F= 0.5										

TABLE B-39

SSN-637 CLASS
POWER GENERATORS

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SVP	OH
CASDMN	-244.5	13.77	7588.	3.232	-2.161	.0024	.0366	-8.379	.3485	17.14	52.74	-25.44	34.56	108.8	51.56
	(2.8)	(0.6)	(0.3)	(1.4)	(0.9)	(0.2)	(0.9)	(0.1)	(0.3)	(0.5)	(1.4)	(0.5)	(1.0)	(3.1)	(0.8)
R-SQUARED= .422		F= 2.7													
CASMNT	-130.6	-8.317	13790	-.6119	1.212	-.0028	.0366	-8.061	-.3552	33.62	32.20	-6.942	1.217	60.69	77.29
	(1.3)	(0.4)	(0.5)	(0.3)	(0.6)	(0.2)	(1.0)	(0.1)	(0.3)	(1.1)	(1.0)	(0.2)	(0)	(2.1)	(1.4)
R-SQUARED= .432		F= 2.0													
CASREP	-.0036	.0020	-22.40	.0034	-.0044	0	0	-.0175	.0019	.0080	.0135	-.0933	-.0011	.0398	.0181
	(0)	(0.1)	(0.8)	(1.4)	(1.8)	(0.8)	(0.1)	(0.2)	(1.5)	(0.2)	(0.4)	(1.8)	(0)	(1.2)	(0.2)
R-SQUARED= .051		F= 3.1													
C34DMN	21.83	12.71	-1606.	-.4715	-.3159	.0029	-.0121	-18.19	.2540	4.054	-2.857	-17.91	9.619	2.265	-8.364
	(0.6)	(2.6)	(0.3)	(1.3)	(0.7)	(0.5)	(1.0)	(0.8)	(0.9)	(0.5)	(0.4)	(1.7)	(1.3)	(0.3)	(0.6)
R-SQUARED= .103		F= 1.9													
C34MNT	13.86	4.020	-2318.	-.1098	-.0587	.0042	-.0020	-9.016	.0539	5.492	-2.677	-6.868	1.008	-2.336	-3.604
	(0.7)	(1.5)	(0.7)	(1.5)	(0.2)	(1.1)	(0.3)	(0.7)	(0.3)	(1.2)	(0.6)	(1.2)	(0.2)	(0.6)	(0.4)
R-SQUARED= .031		F= 1.1													
C34REP	.0868	.0076	-11.78	-.0004	-.0007	0	0	-.0389	.0005	.0177	-.0133	-.0153	-.0004	.0023	-.0266
	(1.0)	(0.7)	(0.8)	(1.1)	(0.6)	(0.4)	(0.4)	(0.7)	(0.8)	(0.9)	(0.7)	(0.6)	(0)	(0.1)	(0.7)
R-SQUARED= .016		F= 0.9													
INA	30.85	5.126	11414	.1398	-.3181	.0231	.0486	-37.67	-.1818	55.89	53.45	32.37	58.45	-11.13	-18.92
	(0.3)	(0.4)	(0.7)	(0.4)	(0.3)	(1.3)	(1.4)	(0.7)	(0.3)	(2.8)	(2.7)	(1.2)	(3.0)	(0.6)	(0.5)
R-SQUARED= .046		F= 2.4													
SF	237.7	-4.279	-46474	-.1393	-.8309	-.0187	-.0286	-11.34	.2109	-73.04	-81.42	-37.20	-72.46	.5145	-60.98
	(1.4)	(0.2)	(1.6)	(0.2)	(0.4)	(0.5)	(0.5)	(0.1)	(0.2)	(2.0)	(2.3)	(0.7)	(2.0)	(0)	(0.8)
R-SQUARED= .010		F= 0.7													

TABLE B-40

SONAR AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASOWN	452.73 (612.59)	135.75 (322.37)	453.84 (606.08)
CASMNT	203.35 (408.76)	52.72 (176.21)	232.09 (441.36)
CASREP	0.42 (0.79)	0.17 (0.46)	0.43 (0.77)
C34OWN	86.89 (245.35)	20.23 (94.86)	16.16 (110.17)
C34MNT	42.67 (170.95)	7.89 (53.89)	11.05 (96.95)
C34REP	0.10 (0.40)	0.05 (0.22)	0.04 (0.22)
INA	16.27 (62.20)	5.98 (23.16)	58.30 (195.74)
SF	38.62 (270.88)	14.56 (256.14)	15.78 (57.94)
RC	1.31 (0.87)	0.36 (0.42)	1.05 (1.01)
AC	4.77 (2.26)	4.39 (4.37)	6.79 (6.16)
PP	103.16 (23.16)	98.22 (22.22)	118.88 (26.79)
PQ	63.54 (8.60)	64.40 (11.63)	62.50 (9.80)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.35)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	27.08 (42.76)	5.76 (15.11)	26.74 (38.17)
AGE	66.86 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-41

FF-1052 CLASS
SONAR

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDMN	603.0	118.5	-6.381	-2.575	1.532	-.0806	-.1205	.9290	-.6321	-172.5	-33.02	67.07
	(1.8)	(2.0)	(0.3)	(0.9)	(0.6)	(1.0)	(0.5)	(1.1)	(0.1)	(1.4)	(0.3)	(0.6)
R-SQUARED=	.326	F= 0.9										
CASMNT	253.0	35.51	-16.27	-1.131	1.630	.0338	.0206	-.1839	-.7385	-167.6	-15.72	150.8
	(1.1)	(0.9)	(1.1)	(0.6)	(0.9)	(0.6)	(0.1)	(0.3)	(0.3)	(2.1)	(0.2)	(2.1)
R-SQUARED=	.321	F= 0.8										
CASREP	.3953	.0976	.0048	-.0037	.0028	.0003	.0001	.0005	-.0007	-.1672	-.1634	.0163
	(1.4)	(2.1)	(0.3)	(1.6)	(1.2)	(2.0)	(0.3)	(0.7)	(0.2)	(1.8)	(1.7)	(0.2)
R-SQUARED=	.017	F= 1.3										
C34DMN	182.3	46.42	12.26	-.0761	1.693	-.0261	-.1027	.0913	-4.193	17.72	-69.88	-11.10
	(1.1)	(1.8)	(1.3)	(0.1)	(0.9)	(0.9)	(1.2)	(0.3)	(2.2)	(0.3)	(1.2)	(0.2)
R-SQUARED=	.448	F= 1.0										
C34MNT	19.64	39.74	7.905	-.2031	1.639	.0116	.0081	.2939	-2.637	3.863	-23.71	37.16
	(0.2)	(2.2)	(1.1)	(0.4)	(1.3)	(0.7)	(0.1)	(1.2)	(1.9)	(0.1)	(0.5)	(1.1)
R-SQUARED=	.524	F= 1.5										
C34REP	.1704	.0086	.0836	-.0010	.0022	.0001	0	.0006	-.0022	-.0269	-.0356	-.0375
	(1.1)	(0.4)	(0.4)	(1.4)	(1.2)	(2.0)	(0.3)	(1.7)	(1.3)	(0.5)	(0.7)	(0.8)
R-SQUARED=	.022	F= 1.5										
IMA	-6.003	4.360	2.665	.0695	.0335	.0310	.0193	-.0633	-.3331	18.22	-8.800	-18.62
	(0.3)	(1.3)	(2.2)	(0.7)	(0.1)	(2.9)	(0.9)	(1.2)	(1.3)	(2.6)	(1.2)	(2.8)
R-SQUARED=	.033	F= 2.0										
SF	-65.37	17.20	10.33	.2693	.2987	.0995	.0810	-.0866	-.8949	4.197	-45.02	-1.555
	(0.6)	(1.2)	(1.9)	(0.5)	(0.2)	(2.1)	(0.8)	(0.4)	(0.8)	(0.1)	(1.4)	(0.1)
R-SQUARED=	.013	F= 1.0										

TABLE B-42

DDG-2 CLASS
SONAR

	CONST	RC	AC	PP	PO	C1	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASOWN	-342.1	-19.17	15.78	.7581	.7712	-.0451	-.0188	-.5588	1.474	87.96	26.41	176.4	-115.0
	(1.5)	(0.3)	(2.3)	(0.5)	(0.5)	(1.1)	(0.2)	(0.4)	(1.2)	(1.1)	(0.4)	(2.1)	(1.6)
R-SQUARED= .432		F= 2.7											
CASNNT	-286.6	-25.25	8.942	-.1166	.7127	.0124	-.0127	-.2039	1.345	111.2	26.28	-50.73	-95.52
	(2.7)	(0.9)	(2.8)	(0.1)	(0.9)	(0.5)	(0.2)	(0.3)	(2.4)	(3.1)	(0.9)	(1.3)	(2.8)
R-SQUARED= .223		F= 2.5											
CASREP	-.1879	.1325	.0195	-.0805	.0007	-.0001	-.0003	-.0012	.0016	.0422	.0832	.1724	-.0137
	(0.9)	(2.3)	(3.2)	(0.3)	(0.5)	(0.7)	(1.5)	(1.0)	(1.3)	(0.6)	(1.5)	(2.3)	(0.2)
R-SQUARED= .059		F= 3.1											
C34OWN	13.38	6.998	2.291	.2839	-.3567	-.0115	-.0389	-.0262	.1252	-26.47	-10.89	-34.47	3.467
	(0.2)	(0.4)	(1.2)	(1.0)	(0.7)	(0.8)	(1.0)	(0.1)	(0.4)	(1.3)	(0.6)	(1.5)	(0.2)
R-SQUARED= .238		F= 6.7											
C34NNT	-53.45	-3.078	-.3582	.0507	.3139	.0053	-.0186	-.0341	.2126	7.860	8.689	15.38	-.2979
	(1.9)	(0.4)	(0.4)	(0.4)	(1.4)	(0.6)	(0.9)	(0.2)	(1.5)	(0.9)	(1.2)	(1.5)	(0)
R-SQUARED= .061		F= 0.9											
C34REP	-.0343	.0205	.0025	-.0001	.0008	-.0001	-.0002	.0002	.0004	.0121	.0315	.0010	-.0228
	(0.4)	(0.8)	(1.0)	(0.2)	(1.1)	(1.5)	(2.2)	(0.5)	(0.9)	(0.4)	(1.3)	(0)	(3.8)
R-SQUARED= .021		F= 1.3											
INA	10.62	-1.534	-.0760	-.0103	-.0464	.0034	.0058	.1314	-.0154	-1.592	.4978	-3.337	1.825
	(1.0)	(0.6)	(0.2)	(0.2)	(0.6)	(0.8)	(0.7)	(2.1)	(0.3)	(0.5)	(0.2)	(0.9)	(0.6)
R-SQUARED= .012		F= 0.7											
SF	74.10	10.04	.0300	.1600	-1.484	.0109	-.1401	.1959	.1815	2.022	12.84	9.544	35.98
	(0.7)	(0.3)	(0)	(0.3)	(1.7)	(0.2)	(1.5)	(0.3)	(0.3)	(0.1)	(0.4)	(0.2)	(1.1)
R-SQUARED= .013		F= 0.8											

TABLE B-43

SSN-637 CLASS
SONAR

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL1	SVL2	SVL3	SVP	OH
CASDWN	3.592	-38.96	-7.810	-7.495	8.064	.0194	.4682	.2773	3.659	332.9	-148.6	-377.9	-36.04	-433.9	-39.17
	(0)	(0.9)	(0.9)	(1.5)	(2.2)	(0.3)	(2.9)	(0.3)	(0.7)	(2.2)	(1.1)	(2.2)	(0.3)	(3.0)	(0.1)
R-SQUARED=	.473		F= 2.5												
CASMNT	316.3	-23.30	-3.260	-3.556	2.085	.0639	.2262	-1.760	5.537	206.8	-282.8	-192.0	-41.31	-394.5	-218.4
	(1.6)	(0.7)	(0.6)	(1.0)	(0.8)	(1.5)	(2.0)	(2.3)	(1.5)	(2.0)	(3.1)	(1.6)	(0.4)	(3.9)	(1.1)
R-SQUARED=	.488		F= 3.0												
CASREP	.1897	-.0073	.0012	.0001	-.0012	.0002	.0003	-.0005	.0025	.0605	-.1346	-.0921	-.0634	.0181	.0860
	(0.8)	(0.2)	(0.2)	(0)	(0.4)	(1.8)	(1.8)	(0.5)	(0.6)	(0.6)	(1.6)	(0.7)	(0.6)	(0.2)	(0.4)
R-SQUARED=	.029		F= 1.7												
C34DWN	36.73	-8.219	-1.897	-.2952	.2625	-.0039	.0596	-.1204	.2713	-14.87	-16.01	9.379	-17.59	-6.203	4.933
	(0.8)	(1.2)	(1.5)	(1.4)	(0.4)	(0.3)	(1.9)	(0.7)	(0.3)	(0.7)	(0.8)	(0.4)	(0.8)	(0.3)	(0.1)
R-SQUARED=	.208		F= 1.1												
C34MNT	24.43	-5.735	-1.272	-.2798	.2875	.0065	.0418	-.1704	-.4886	-4.493	-14.50	16.09	-25.00	-16.05	49.03
	(0.6)	(0.9)	(1.1)	(1.5)	(0.5)	(0.5)	(1.5)	(1.1)	(0.7)	(0.2)	(0.8)	(0.7)	(1.6)	(0.9)	(1.3)
R-SQUARED=	.228		F= 1.2												
C34REP	.1226	-.0175	-.0005	-.0003	-.0005	0	.0001	-.0003	-.0001	-.0171	-.0649	-.0287	-.0607	-.0225	.0224
	(1.8)	(1.7)	(0.3)	(0.9)	(0.6)	(0.8)	(2.1)	(1.2)	(0.1)	(0.5)	(2.3)	(0.8)	(2.0)	(0.8)	(0.4)
R-SQUARED=	.025		F= 1.2												
INA	96.70	-7.083	-3.060	-.0957	.2341	.0650	.0271	-.1669	.3643	-24.66	1.626	17.13	-12.85	-3.289	-37.65
	(1.6)	(0.8)	(1.9)	(0.3)	(0.3)	(1.7)	(0.6)	(0.7)	(0.4)	(0.9)	(0.1)	(0.5)	(0.5)	(0.1)	(0.7)
R-SQUARED=	.029		F= 1.7												
SF	2.484	.0097	.9590	.0384	.4838	.0134	-.0261	-.1391	-.1633	-5.766	-4.301	-6.842	5.099	-1.847	-7.219
	(0.1)	(0)	(2.0)	(0.5)	(2.1)	(1.7)	(1.9)	(2.0)	(0.5)	(0.7)	(0.6)	(0.7)	(0.7)	(0.2)	(0.4)
R-SQUARED=	.043		F= 2.6												

TABLE B-44

INTERIOR COMMUNICATIONS AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	14.70 (117.18)	55.25 (244.37)	18.26 (102.52)
CASMNT	9.07 (99.12)	21.27 (139.09)	5.68 (49.31)
CASREP	0.00 (0.06)	0.04 (0.26)	0.02 (0.12)
C34DWN	0 (0)	0.75 (13.07)	0.31 (9.40)
C34MNT	0 (0)	0.66 (12.86)	0.28 (8.75)
C34REP	0 (0)	0.01 (0.07)	0 (0.03)
IMA	13.27 (142.29)	13.02 (43.66)	12.97 (37.59)
SF	12.25 (236.06)	24.60 (310.01)	2.05 (7.31)
RC	0.12 (0.20)	0.20 (0.14)	0.40 (0.29)
AC	0.35 (0.83)	0 (0)	0 (0.01)
PP	95.80 (46.62)	115.12 (42.04)	78.84 (28.11)
PQ	76.11 (25.16)	59.54 (14.85)	78.00 (20.62)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	0 (0)	0.16 (0.75)	0 (0.05)
AGE	66.66 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-45

FF-1052 CLASS
INTERIOR COMMUNICATIONS

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	-7.981	-50.51	24.12	-.0363	.3142	-.0127	-.0314		.4204	-21.73	-22.48	-5.569
	(0.1)	(1.3)	(2.2)	(0.1)	(1.1)	(1.1)	(0.9)		(0.6)	(1.0)	(0.9)	(0.2)
R-SQUARED=	.576	F=	1.2									
CASMNT	-77.48	-48.70	26.93	.2262	-.1251	-.0082	-.0288		1.055	-.0239	1.733	13.00
	(1.5)	(1.5)	(3.1)	(0.9)	(0.5)	(0.8)	(0.8)		(1.8)	(0)	(0.1)	(0.7)
R-SQUARED=	.479	F=	1.7									
CASREP	-.0244	-.0215	.0095	0	0	0	0		.0085	-.0037	-.0024	.0065
	(1.4)	(2.1)	(3.4)	(0.4)	(0.6)	(0.4)	(1.9)		(2.8)	(0.7)	(0.4)	(1.0)
R-SQUARED=	.030	F=	2.8									
INA	-46.97	-10.80	5.460	.0172	.0798	.0474	.0473		.3123	21.00	-6.817	-23.00
	(1.1)	(0.4)	(0.8)	(0.2)	(0.4)	(1.9)	(1.0)		(0.7)	(1.6)	(0.4)	(1.4)
R-SQUARED=	.011	F=	1.0									
SF	-1.662	-28.64	-19.31	.3565	-.2434	.0806	.1810		-.9552	-1.006	-6.265	28.63
	(0)	(0.6)	(1.6)	(2.1)	(0.7)	(2.0)	(1.9)		(1.2)	(0)	(0.2)	(1.1)
R-SQUARED=	.017	F=	1.5									

TABLE B-46

DDG-2 CLASS
INTERIOR COMMUNICATIONS

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SFL1	SFL2	SFP
CASDWN	260.3	-213.3	2235.	-1.864	.4790	-.0298	-.1807	-115.8	.8116	-16.92	-57.78	62.42	-63.78
	(1.2)	(1.3)	(0.2)	(2.2)	(0.7)	(1.1)	(2.0)	(4.3)	(0.8)	(0.3)	(1.1)	(0.9)	(1.0)
R-SQUARED= .479		F= 2.9											
CASMNT	25.32	-38.26	-875.7	-.3089	.3097	.0083	-.0526	-12.50	.1828	-9.299	-20.96	24.72	-13.90
	(0.3)	(0.5)	(0.2)	(0.7)	(0.9)	(0.4)	(0.9)	(1.1)	(0.4)	(0.3)	(0.6)	(0.8)	(0.5)
R-SQUARED= .175		F= 0.7											
CASREP	-.0869	-.1194	1.885	-.0010	.0008	.0001	.0001	-.0064	.0010	-.0130	-.0084	-.0167	-.0520
	(0.7)	(1.3)	(0.3)	(2.0)	(1.9)	(2.8)	(0.6)	(0.5)	(1.8)	(0.3)	(0.3)	(0.4)	(1.6)
R-SQUARED= .037		F= 2.4											
C34DWN	-3.057	1.519	9.874	-.0068	-.0192	.0007	-.0064	-.6329	.0497	-1.272	-.8080	-1.605	-1.331
	(0.6)	(0.3)	(0)	(0.6)	(0.5)	(0.3)	(1.4)	(0.9)	(1.7)	(0.7)	(0.5)	(0.9)	(0.8)
R-SQUARED= .017		F= 1.1											
C34MNT	-2.031	2.528	5.020	-.0037	-.0171	.0002	-.0073	-.5697	.0620	-1.472	-1.309	-1.620	-1.297
	(0.4)	(0.5)	(0)	(0.3)	(0.5)	(0.1)	(1.6)	(0.8)	(1.4)	(0.8)	(0.8)	(0.9)	(0.8)
R-SQUARED= .016		F= 1.0											
C34REP	-.0325	-.0274	.0682	-.0001	-.0002	0	0	-.0040	.0004	.0029	.0137	-.0041	-.0052
	(1.1)	(1.0)	(0)	(2.0)	(0.8)	(0.8)	(0.7)	(1.0)	(2.5)	(0.3)	(1.5)	(0.4)	(0.6)
R-SQUARED= .027		F= 1.7											
INA	20.13	29.31	-1809.	-.0410	-.0613	.0158	-.0139	1.429	-.0537	3.536	1.128	5.904	-.0783
	(1.1)	(1.7)	(1.5)	(1.1)	(0.5)	(2.0)	(0.9)	(0.6)	(0.5)	(0.5)	(0.2)	(0.9)	(0)
R-SQUARED= .027		F= 1.8											
SF	5.657	-81.43	-2031.	-.5203	-.6943	.0293	-.0115	-17.40	.9727	-19.72	-27.21	-45.06	-16.25
	(0)	(0.7)	(0.2)	(1.9)	(0.8)	(0.5)	(0.1)	(1.0)	(1.4)	(0.4)	(0.7)	(1.0)	(0.4)
R-SQUARED= .012		F= 0.8											

TABLE B-47

SSN-637 CLASS
INTERIOR COMMUNICATIONS

	CONST	RC	AC	PP	PQ	CI	SF	PC	AGE	FL	SFL1	SFL2	SFL3	SFP	DM
CASDWN	-60.72	-47.44	-306.6	.7963	-.5609	.0210	.0353	22.08	2.092	32.29	3.894	25.43	22.10	-15.07	-85.59
	(1.5)	(1.7)	(0.4)	(1.3)	(1.0)	(2.2)	(1.3)	(0.2)	(2.3)	(1.4)	(0.2)	(0.9)	(1.0)	(0.6)	(1.9)
R-SQUARED= .499		F= 1.4													
CASMNT	-16.21	-27.72	-170.8	.5556	-.6666	.0082	.0012	2.446	.5957	5.585	4.626	-9.565	6.002	-1.108	-5.881
	(0.9)	(2.4)	(0.6)	(2.0)	(2.8)	(1.3)	(0.1)	(0.1)	(1.6)	(0.6)	(0.5)	(0.8)	(0.7)	(0.1)	(0.3)
R-SQUARED= .208		F= 1.5													
CASREP	-.0378	-.0521	-.6829	.0008	-.0008	0	0	-.0260	.0016	.0192	.0088	-.0166	.0311	.0038	-.0491
	(1.2)	(2.6)	(1.5)	(1.7)	(1.9)	(0.2)	(0.3)	(0.3)	(2.5)	(1.3)	(0.6)	(0.9)	(2.1)	(0.2)	(1.5)
R-SQUARED= .020		F= 1.4													
C34DWN	-1.017	.2431	-36.30	-.0064	.0220	.0007	.0005	1.003	-.0122	-.4616	-.0106	-.2572	1.276	.5976	.3616
	(0.4)	(0.2)	(1.0)	(0.5)	(1.3)	(0.6)	(0.2)	(0.2)	(0.3)	(0.4)	(0)	(0.2)	(1.1)	(0.5)	(0.1)
R-SQUARED= .007		F= 0.5													
C34MNT	-.9471	.2263	-33.79	-.0059	.0205	.0006	.0005	.9337	-.0114	-.4110	-.0174	-.2394	1.187	.5563	.3364
	(0.4)	(0.2)	(1.0)	(0.5)	(1.3)	(0.6)	(0.2)	(0.2)	(0.3)	(0.4)	(0)	(0.2)	(1.1)	(0.5)	(0.1)
R-SQUARED= .007		F= 0.5													
C34REP	-.0035	.0008	-.1250	0	.0001	0	0	.0035	0	-.0015	-.0001	-.0009	.0044	.0021	.0013
	(0.4)	(0.2)	(1.0)	(0.5)	(1.3)	(0.6)	(0.2)	(0.2)	(0.3)	(0.4)	(0)	(0.2)	(1.1)	(0.5)	(0.1)
R-SQUARED= .007		F= 0.5													
INA	34.90	1.211	-196.1	-.0876	-.0865	.0034	-.0082	-17.66	.1603	-1.910	7.622	8.550	6.605	9.546	-20.56
	(3.5)	(0.2)	(1.3)	(1.0)	(1.3)	(0.7)	(0.9)	(0.7)	(0.8)	(0.4)	(1.6)	(1.4)	(1.4)	(2.0)	(2.0)
R-SQUARED= .033		F= 2.4													
SF	6.571	-.0257	-45.88	-.0238	-.0036	.0005	-.0022	-.3755	-.0466	-1.005	.5730	1.396	1.522	.7367	.8675
	(3.1)	(0)	(1.5)	(2.3)	(0.3)	(0.5)	(1.2)	(0.1)	(1.1)	(1.0)	(0.6)	(1.1)	(1.5)	(0.7)	(0.4)
R-SQUARED= .049		F= 2.1													

TABLE B-48

CLIMATE CONTROL AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	243.21 (400.73)	239.63 (477.33)	198.94 (378.78)
CASMNT	165.17 (304.69)	156.89 (372.19)	116.04 (258.74)
CASREP	0.27 (0.64)	0.25 (0.66)	0.19 (0.50)
C34DWN	20.56 (113.39)	3.33 (31.27)	3.76 (38.52)
C34MNT	10.39 (74.27)	3.20 (30.70)	2.57 (32.09)
C34REP	0.04 (0.24)	0.02 (0.13)	0.01 (0.13)
ENGLDG	37.25 (35.93)	0 (0)	0 (0)
INA	45.76 (110.40)	109.98 (217.13)	107.93 (343.34)
SF	54.29 (484.89)	69.31 (406.80)	23.04 (112.72)
INSURV	1.73 (0.46)	2.05 (0.71)	0 (0)
RC	0.77 (0.50)	1.64 (1.07)	4.34 (1.33)
AC	1.32 (1.15)	3.74 (1.97)	0.44 (2.06)
PP	107.04 (14.97)	76.85 (12.17)	108.74 (15.26)
PQ	83.23 (8.58)	89.87 (11.50)	67.56 (4.74)
CI	361.07 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	10.37 (24.67)	7.21 (22.96)	9.84 (21.25)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.45)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)
IN	23.45 (9.75)	2.05 (11.81)	0 (0)

TABLE B-49

FF-1052 CLASS
CLIMATE CONTROL

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SVL	SVP	IN
CASOMN	606.0	-8.035	21.88	-4.493	2.570	-.1118	-.3235	-.0738	-.0484	-115.7	-98.15	73.89	
	(2.1)	(0.1)	(0.7)	(1.5)	(1.1)	(2.2)	(2.1)	(0.1)	(0)	(1.3)	(1.2)	(0.8)	
R-SQUARED= .362			F= 1.4										
CASMNT	24.22	-48.02	-25.48	-.9369	2.224	-.0264	-.1876	-.2867	1.396	71.93	40.15	-6.895	
	(0.1)	(1.0)	(1.2)	(0.4)	(1.4)	(0.6)	(1.6)	(0.4)	(0.7)	(1.2)	(0.7)	(0.1)	
R-SQUARED= .261			F= 1.1										
CASREP	.1558	-.0700	.0845	-.0008	-.0002	.0001	-.0004	-.0010	.0047	-.0821	.0767	.1644	
	(0.5)	(1.1)	(0.2)	(0.3)	(0.1)	(0.8)	(1.9)	(1.0)	(1.8)	(1.0)	(1.0)	(1.8)	
R-SQUARED= .025			F= 1.8										
C34OMN	-33.61	-3.067	7.861	-.3457	1.757	-.0166	.0035	-.0426	-.3753	-58.04	-68.70	26.42	
	(0.4)	(0.2)	(0.9)	(0.8)	(2.2)	(1.2)	(0.1)	(0.2)	(0.5)	(2.4)	(2.1)	(1.0)	
R-SQUARED= .372			F= 1.2										
C34MNT	-25.22	-4.713	-7.887	.0548	.3766	-.0040	-.0097	-.0415	.3941	-13.61	-9.840	-.0209	
	(0.5)	(0.4)	(1.7)	(0.2)	(0.8)	(0.4)	(0.3)	(0.3)	(0.9)	(1.0)	(0.8)	(0)	
R-SQUARED= .188			F= 0.8										
C34REP	.0098	-.0288	-.0004	-.0003	.0014	-.0001	-.0002	-.0001	.0007	-.0315	.0048	.0265	
	(0.1)	(1.1)	(0)	(0.5)	(1.2)	(1.6)	(2.2)	(0.4)	(0.7)	(1.0)	(0.2)	(0.7)	
R-SQUARED= .030			F= 1.1										
ENGLOG	-171.8	40.61	-9.626	-.0973	-.0974	.0181	-.0202	-.3771	2.587	53.68	34.60	15.64	
	(2.2)	(2.0)	(1.3)	(0.3)	(0.2)	(0.8)	(0.5)	(2.6)	(2.7)	(1.9)	(2.1)	(0.7)	
R-SQUARED= .183			F= 1.4										
INA	-196.8	-6.344	2.526	.1406	1.810	.0503	-.0773	-.1453	1.304	-20.30	-13.38	19.41	
	(3.5)	(0.5)	(0.5)	(0.5)	(3.4)	(2.7)	(1.9)	(0.8)	(2.8)	(1.4)	(1.0)	(1.2)	
R-SQUARED= .065			F= 3.9										
SF	-11.92	39.58	-13.31	1.134	-.6498	.1081	.1426	-.3099	-1.190	-42.90	-20.32	72.47	
	(0)	(0.7)	(0.5)	(0.8)	(0.2)	(1.3)	(0.8)	(0.3)	(0.5)	(0.6)	(0.3)	(0.9)	
R-SQUARED= .062			F= 0.6										
INSURV	.8380	.5155	.2106	.0045	.0029	-.0013	-.0024	-.0043	.0021	-.1806	-.1046	.6639	.0136
	(0.4)	(1.6)	(1.2)	(0.6)	(0.2)	(2.6)	(2.3)	(0.6)	(0.1)	(0.4)	(0.3)	(1.7)	(0.7)
R-SQUARED= .694			F= 1.6										

TABLE B-50

DDG-2 CLASS
CLIMATE CONTROL

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SFP	IN
CASDWN	-1423.	-123.0	71.15	1.016	3.541	-.0036	.5228	-.0393	6.865	[illegible]59.9	-11.65	-135.2	-522.0	
	(2.5)	(2.1)	(3.4)	(0.3)	(0.8)	(0.1)	(2.9)	(0.7)	(2.6)	(1.4)	(0.1)	(1.1)	(2.0)	
R-SQUARED= .414		F= 3.7												
CASMNT	-967.2	-88.02	44.49	2.335	4.869	.0303	.2511	-.7663	2.765	[illegible]	8[illegible].80	-21.27	-364.7	
	(2.2)	(1.9)	(2.7)	(0.5)	(1.3)	(0.6)	(1.7)	(0.8)	(1.3)	([illegible])	(0.9)	(0.2)	(2.5)	
R-SQUARED= .329		F= 1.9												
CASREP	-.3670	-.0589	.0318	-.0019	-.0009	.0001	0	-.0015	.0050	.1464	.0350	-.1140	-.2931	
	(0.7)	(1.1)	(1.7)	(0.4)	(0.2)	(0.8)	(0.1)	(1.3)	(2.3)	(0.9)	(0.3)	(1.1)	(1.8)	
R-SQUARED= .031		F= 1.5												
C34DWN	19.48	.1235	-1.025	-.1893	-.0032	.0040	-.0175	.0112	.0300	-1.105	3.708	-.9065	-1.040	
	(0.9)	(0.1)	(1.3)	(1.7)	(0)	(0.7)	(1.5)	(0.2)	(0.3)	(0.1)	(0.7)	(0.2)	(0.1)	
R-SQUARED= .018		F= 1.0												
C34MNT	15.05	.2757	-.0586	-.1633	.0086	.0046	-.0173	.0094	.0307	-.9077	3.142	-.5626	-.0800	
	(0.7)	(0.1)	(1.1)	(1.5)	(0.1)	(0.8)	(1.5)	(0.2)	(0.3)	(0.1)	(0.6)	(0.1)	(0.1)	
R-SQUARED= .017		F= 0.9												
C34REP	.0857	-.0102	-.0032	-.0007	-.0004	0	-.0001	0	.0004	.0145	.0320	-.0039	-.0248	
	(0.9)	(0.9)	(1.0)	(1.4)	(0.7)	(0.2)	(1.5)	(0.1)	(0.8)	(0.4)	(1.4)	(0.2)	(3.8)	
R-SQUARED= .034		F= 0.9												
INA	-63.40	26.41	13.70	.3655	-.3880	.1477	-.0802	.0985	.1180	29.90	12.70	106.5	34.58	
	(0.4)	(1.5)	(2.2)	(0.4)	(0.4)	(3.9)	(1.0)	(0.2)	(0.2)	(0.5)	(0.3)	(2.9)	(0.6)	
R-SQUARED= .088		F= 3.6												
SF	-93.29	11.20	3.877	1.743	-.3326	.1284	.0779	-.0790	-.3445	-29.87	83.79	33.21	67.74	
	(0.3)	(0.3)	(0.3)	(1.1)	(0.2)	(1.8)	(0.5)	(1.1)	(0.2)	(0.3)	(1.1)	(0.5)	(0.6)	
R-SQUARED= .042		F= 0.9												
INSURV	-2.587	-.9484	.1447	.0128	-.0114	-.0031	.0012	-.0033	.0356	2.151	1.655		-2.646	.0241
	(0.4)	(1.1)	(0.7)	(0.3)	(0.3)	(1.4)	(0.2)	(0.3)	(2.0)	(1.1)	(1.1)		(1.1)	(0.5)
R-SQUARED= .681		F= 0.8												

TABLE B-51

SSN-637 CLASS
CLIMATE CONTROL

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	DH
CASBWN	-226.6	-23.61	-31.64	.5352	2.772	-.0577	.2706	1.202	5.235	204.8	-93.44	-190.7	-40.00	-153.6	-189.9
	(0.8)	(1.2)	(3.1)	(0.1)	(0.5)	(1.6)	(2.8)	(1.3)	(1.6)	(2.5)	(1.2)	(1.8)	(0.5)	(1.9)	(1.1)
R-SQUARED= .514			F= 3.2												
CASMNT	-153.8	-14.46	-25.83	3.775	-1.447	-.0542	.0977	.9592	4.885	120.0	-66.71	-134.9	-13.39	-131.7	-217.8
	(0.8)	(1.1)	(3.7)	(1.0)	(0.4)	(2.1)	(1.4)	(1.5)	(2.2)	(2.2)	(1.3)	(1.9)	(0.3)	(2.4)	(1.9)
R-SQUARED= .448			F= 3.4												
CASREP	.1170	-.0094	-.0899	.0024	-.0015	0	.0002	.0013	-.0012	.0890	-.1151	-.0483	-.1758	.0036	.1010
	(0.5)	(0.6)	(2.0)	(0.4)	(0.3)	(0)	(2.0)	(1.5)	(0.5)	(1.4)	(1.9)	(0.6)	(2.8)	(0.1)	(0.7)
R-SQUARED= .051			F= 3.3												
C34BWN	8.496	.1134	.0579	.1860	-.3829	-.0060	.0185	-.0193	-.2828	.9132	5.565	-2.050	-1.563	1.153	14.72
	(0.3)	(0.1)	(0.1)	(1.6)	(0.9)	(1.2)	(1.7)	(0.2)	(1.0)	(0.1)	(0.9)	(0.3)	(0.3)	(0.2)	(1.0)
R-SQUARED= .100			F= 0.7												
C34MNT	9.257	-.1657	-.0582	.1572	-.4012	-.0033	.0160	-.0132	-.2188	2.687	6.331	-1.921	-1.943	-.8600	13.37
	(0.4)	(0.1)	(0.1)	(1.5)	(1.1)	(0.8)	(1.7)	(0.2)	(0.9)	(0.5)	(1.2)	(0.3)	(0.4)	(3.2)	(1.1)
R-SQUARED= .146			F= 0.8												
C34REP	.0405	-.0019	.0001	0	.0002	0	0	.0006	-.0009	-.0134	-.0219	-.0182	-.0303	-.0063	.0379
	(0.5)	(0.5)	(0)	(0)	(0.2)	(0.4)	(0.4)	(2.1)	(1.4)	(0.8)	(1.5)	(0.9)	(2.0)	(0.3)	(1.1)
R-SQUARED= .011			F= 0.7												
IMA	303.2	-6.273	-7.485	-1.124	.0763	.0693	-.0450	-.4257	.7441	18.23	9.885	-25.10	-5.892	12.19	-99.98
	(1.5)	(0.6)	(1.1)	(1.4)	(0)	(1.5)	(0.6)	(0.7)	(0.4)	(0.4)	(0.2)	(0.5)	(0.1)	(0.3)	(1.0)
R-SQUARED= .018			F= 1.2												
SF	95.61	-2.356	.5231	.0081	-.4435	.0072	-.0085	.6488	-1.199	10.22	-1.294	2.522	-10.48	-13.76	39.75
	(1.4)	(0.7)	(0.2)	(0)	(0.5)	(0.5)	(0.3)	(3.4)	(1.9)	(0.7)	(0.1)	(0.1)	(0.8)	(1.8)	(1.2)
R-SQUARED= .024			F= 1.5												

TABLE B-52

REFRIGERATION AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	11.85 (80.07)	8.51 (62.11)	5.07 (45.61)
CASMNT	7.26 (58.07)	4.31 (42.65)	1.12 (14.36)
CASREP	0.02 (0.14)	0.02 (0.13)	0.01 (0.10)
C34DWN	0.85 (20.66)	0.32 (8.70)	0 (0)
C34MNT	0.77 (20.22)	0.32 (8.70)	0 (0)
C34REP	0 (0.06)	0 (0.04)	0 (0)
ENGLDG	6.92 (15.72)	0 (0)	0 (0)
IMA	3.65 (19.91)	8.57 (52.72)	9.83 (48.72)
SF	9.53 (235.02)	16.26 (213.11)	1.62 (11.55)
RC	0.19 (0.10)	0.23 (0.13)	0.29 (0.22)
AC	0 (0.01)	0 (0)	0 (0)
PP	107.84 (14.97)	76.85 (12.17)	108.74 (15.26)
PQ	83.23 (8.58)	89.87 (11.50)	67.56 (4.74)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	1.50 (7.29)	0 (0)	0.14 (0.99)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
QH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-53

FF-1052 CLASS
REFRIGERATION

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL	SVP
CASDMN	-83.31	-144.9	-745.3	-.3058	-.0821	.0200	.0081	-.6519	1.981	35.47	15.76	-7.110
	(1.5)	(2.2)	(1.4)	(0.6)	(0.2)	(1.7)	(0.3)	(1.1)	(3.6)	(2.7)	(1.1)	(0.5)
R-SQUARED=	.193	F= 2.6										
CASMNT	-87.71	-137.0	-487.7	.0317	-.1219	.0167	.0262	-.4787	1.552	27.14	14.69	-10.25
	(2.2)	(2.9)	(1.3)	(0.1)	(0.4)	(1.9)	(1.1)	(1.1)	(4.0)	(2.9)	(1.5)	(1.0)
R-SQUARED=	.183	F= 3.2										
CASREP	-.1515	-.1313	-1.247	-.0001	0	0	.0001	-.0002	.0022	.0397	.0196	.0062
	(2.1)	(1.6)	(1.9)	(0.2)	(0.1)	(1.9)	(1.7)	(0.3)	(3.2)	(2.5)	(1.2)	(0.4)
R-SQUARED=	.029	F= 2.3										
C34DMN	-12.00	-20.06	-47.38	-.0807	.1167	.0052	.0010	-.0401	.1466	-.3043	2.360	2.778
	(1.2)	(1.7)	(0.5)	(1.6)	(1.3)	(1.4)	(0.1)	(0.4)	(1.9)	(0.1)	(0.9)	(1.2)
R-SQUARED=	.015	F= 1.2										
C34MNT	-12.17	-19.31	-47.84	-.0785	.1215	.0043	.0002	-.0391	.1849	-.3437	1.734	2.863
	(1.2)	(1.7)	(0.5)	(1.6)	(1.4)	(1.2)	(0)	(0.4)	(1.9)	(0.2)	(0.7)	(1.2)
R-SQUARED=	.015	F= 1.2										
C34REP	-.0190	-.0223	-.1286	0	.0002	0	0	-.0002	.0001	-.0014	.0078	.0062
	(0.7)	(0.7)	(0.5)	(0.3)	(0.9)	(1.4)	(0)	(0.5)	(0.3)	(0.2)	(1.1)	(0.9)
R-SQUARED=	.069	F= 0.7										
ENGLOG	17.34	18.27	-137.7	.2615	-.5312	-.0135	.0084	1.483	-.0293	7.413	2.325	3.900
	(0.4)	(0.4)	(0.6)	(1.6)	(2.1)	(1.4)	(0.5)	(2.3)	(0.1)	(0.7)	(0.3)	(0.4)
R-SQUARED=	.271	F= 1.5										
INA	-27.20	9.507	-154.3	.0674	.1391	.0061	-.0023	-.0379	.1257	1.231	-2.523	.5015
	(2.8)	(0.8)	(1.7)	(1.4)	(1.6)	(1.8)	(0.3)	(0.4)	(1.3)	(0.6)	(1.0)	(0.2)
R-SQUARED=	.027	F= 2.2										
SF	-34.15	180.3	-139.6	-.1892	1.302	.0213	-.0910	2.093	-.9361	-29.40	-20.30	41.63
	(0.3)	(1.4)	(0.1)	(0.3)	(1.3)	(0.5)	(1.1)	(1.7)	(0.9)	(1.2)	(0.7)	(1.6)
R-SQUARED=	.013	F= 1.4										

TABLE B-54

DDG-2 CLASS
REFRIGERATION

	CONST	MC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SFP
CASDWN	-59.47	-39.52		.7754	-.1293	.0134	-.0003		.0829	8.512	20.43	1.053	-14.06
	(1.7)	(1.3)		(1.3)	(0.3)	(1.2)	(0)		(0.5)	(0.8)	(2.0)	(0.1)	(1.3)
R-SQUARED= .086		F=	1.2										
CASMNT	-38.72	-35.36		.8307	-.4238	.0131	-.0045		.0426	7.732	8.962	2.885	-8.436
	(1.7)	(1.8)		(2.1)	(1.3)	(1.7)	(0.3)		(0.4)	(1.1)	(1.3)	(0.4)	(1.2)
R-SQUARED= .063		F=	1.4										
CASREP	-.0469	-.0516		.0007	-.0001	0	0		.0001	.0071	.0295	-.0060	-.0144
	(0.8)	(1.0)		(0.6)	(0.1)	(0.4)	(0.3)		(0.4)	(0.4)	(1.7)	(0.3)	(0.8)
R-SQUARED= .014		F=	0.7										
C34DWN	5.328	-1.558		-.0039	-.0177	-.0009	-.0039		-.0127	-.0520	1.613	.1146	.1384
	(1.2)	(0.5)		(0.1)	(0.6)	(0.6)	(1.3)		(0.7)	(0)	(1.4)	(0.1)	(0.1)
R-SQUARED= .008		F=	0.6										
C34MNT	5.378	-1.558		-.0039	-.0177	-.0009	-.0039		-.0127	-.0520	1.613	.1146	.1384
	(1.2)	(0.5)		(0.1)	(0.6)	(0.6)	(1.3)		(0.7)	(0)	(1.4)	(0.1)	(0.1)
R-SQUARED= .008		F=	0.6										
C34REP	.0225	-.0065		0	-.0001	0	0		-.0001	-.0002	.0067	.0005	.0006
	(1.2)	(0.5)		(0.1)	(0.6)	(0.6)	(1.3)		(0.7)	(0)	(1.4)	(0.1)	(0.1)
R-SQUARED= .008		F=	0.6										
IMA	-14.32	-3.386		.3185	-.0179	.0116	-.0329		-.0043	3.502	5.165	1.892	8.401
	(0.5)	(0.2)		(1.8)	(0.1)	(1.2)	(1.7)		(0)	(0.5)	(0.7)	(0.2)	(1.2)
R-SQUARED= .028		F=	2.6										
SF	224.6	282.6		.1992	-1.708	.0088	-.0349		-.8343	-27.49	12.92	.2652	56.30
	(1.5)	(2.7)		(0.2)	(1.7)	(0.3)	(0.4)		(1.4)	(0.7)	(0.3)	(0)	(1.5)
R-SQUARED= .141		F=	1.6										

TABLE B-55

SSN-637 CLASS
REFRIGERATION

	CONST	RC	AC	PP	PQ	CI	SF	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	UM
CASDWN	9.435	-14.63		.0443	-.1241	.0039	-.0008	-3.710	-.2396	17.67	-1.486	-4.462	-7.351	-12.61	15.78
	(0.2)	(1.1)		(0.3)	(0.2)	(0.8)	(0.1)	(1.3)	(0.7)	(1.8)	(0.2)	(0.4)	(0.8)	(1.3)	(0.8)
R-SQUARED=	.328	F=	0.9												
CASMNT	29.42	-1.734		.0205	-.4624	.0004	-.0016	-1.514	-.1871	5.716	.4267	-.0263	-.8727	-2.688	11.42
	(2.5)	(0.5)		(0.4)	(2.8)	(0.2)	(0.4)	(1.9)	(1.9)	(2.1)	(0.2)	(0)	(0.4)	(1.0)	(2.1)
R-SQUARED=	.191	F=	1.7												
CASREP	.1553	-.0052		-.0002	-.0015	0	0	-.0037	-.0005	.0283	-.0073	.0027	-.0037	-.0177	.0190
	(2.5)	(0.3)		(0.9)	(1.7)	(0.1)	(1.9)	(0.9)	(1.0)	(2.1)	(0.6)	(0.2)	(0.3)	(1.4)	(0.7)
R-SQUARED=	.032	F=	1.6												
INA	15.12	12.65		.0514	.0556	.0087	-.0013	.9898	-.4265	-1.495	-3.903	2.467	.9085	3.849	8.190
	(0.5)	(1.3)		(0.4)	(0.1)	(1.3)	(0.1)	(6.5)	(1.6)	(0.2)	(0.6)	(0.3)	(0.1)	(0.5)	(0.5)
R-SQUARED=	.046	F=	1.1												
SF	.2109	-1.508		.0025	.0866	.0006	-.0024	-.2476	.0170	-3.450	-2.407	-2.835	-1.642	1.400	-2.581
	(0)	(0.7)		(0.1)	(0.9)	(0.4)	(0.9)	(0.6)	(0.3)	(2.4)	(1.8)	(1.6)	(1.2)	(1.0)	(0.8)
R-SQUARED=	.012	F=	0.9												

TABLE B-56

DISTILLING PLANT AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	58.71 (206.18)	27.27 (117.01)	54.84 (184.49)
CASMNT	38.26 (153.91)	19.36 (96.59)	40.39 (157.26)
CASREP	0.09 (0.33)	0.06 (0.26)	0.06 (0.24)
C34DWN	15.08 (106.19)	6.02 (65.50)	0.64 (11.26)
C34MNT	11.40 (83.79)	5.03 (61.81)	0.56 (10.43)
C34REP	0.03 (0.21)	0.01 (0.13)	0.01 (0.07)
ENGLOG	29.57 (35.72)	0 (0)	0 (0)
INA	25.93 (80.12)	54.86 (373.52)	61.53 (267.83)
SF	25.52 (333.85)	23.45 (339.78)	13.96 (207.02)
RC	0.54 (0.28)	0.61 (0.38)	1.23 (0.40)
AC	0.01 (0.03)	0 (0.02)	0.23 (0.40)
PP	79.22 (12.79)	63.79 (9.26)	101.65 (16.03)
PO	81.10 (8.98)	76.94 (8.68)	73.42 (6.34)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	0.51 (1.87)	1.90 (6.61)	4.89 (16.44)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
DH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-57

FF-1052 CLASS
)ISTILLING PLANT

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL	SYP
CASDWN	-391.7	4.855	-344.8	3.138	-.8408	-.0058	-.0423	-5.197	3.816	-28.30	8.363	109.1
	(2.7)	(0.1)	(0.6)	(1.6)	(0.6)	(0.2)	(0.6)	(0.9)	(2.9)	(0.7)	(0.2)	(2.6)
R-SQUARED= .415		F= 1.6										
CASMNT	20.10	-34.27	23.04	-1.274	.5666	-.0207	-.0929	-6.395	1.573	6.174	-7.348	59.47
	(0.2)	(1.0)	(0.1)	(0.9)	(0.6)	(1.0)	(1.6)	(1.5)	(1.8)	(0.2)	(0.2)	(2.2)
R-SQUARED= .274		F= 1.5										
CASREP	.3607	-.1148	-.8039	-.0025	-.0013	.0001	-.0001	-.0051	.0015	-.0633	-.0064	.0593
	(2.4)	(2.3)	(1.4)	(1.2)	(0.9)	(1.6)	(0.6)	(0.7)	(1.1)	(1.6)	(0.1)	(1.4)
R-SQUARED= .042		F= 2.1										
C34DWN	52.00	-28.75	-195.7	-.2824	.3623	-.0087	-.0864	-2.133	-.0386	-10.73	-4.398	19.81
	(0.8)	(1.5)	(0.9)	(0.7)	(0.6)	(0.5)	(2.1)	(0.8)	(0.1)	(0.7)	(0.2)	(1.3)
R-SQUARED= .136		F= 1.4										
C34MNT	15.69	-18.18	-189.8	-.0510	.6111	-.0209	-.0797	-1.187	-.1648	-8.972	-.2995	12.98
	(0.3)	(1.3)	(1.2)	(0.2)	(1.6)	(1.5)	(2.5)	(0.6)	(0.5)	(0.9)	(0)	(1.2)
R-SQUARED= .063		F= 1.7										
C34REP	.1165	-.0594	-.4406	-.0008	.0016	0	-.0001	-.0011	-.0011	-.0430	-.0270	.0016
	(1.1)	(1.9)	(1.3)	(1.3)	(1.8)	(0.9)	(1.5)	(0.3)	(1.4)	(1.9)	(0.9)	(0.1)
R-SQUARED= .037		F= 2.1										
ENGLOG	115.6	-14.55	142.7	-.3576	-.4567	.0101	-.0421	-.1589	-.2062	10.17	-21.04	7.684
	(1.6)	(1.0)	(0.7)	(0.9)	(0.8)	(0.5)	(1.1)	(0)	(0.4)	(0.5)	(1.1)	(0.4)
R-SQUARED= .279		F= 2.2										
INA	-8.421	.9781	-66.93	-.3188	.2055	.0376	-.0124	-1.326	.5614	-5.707	-3.458	-.9033
	(0.2)	(0.1)	(0.5)	(1.4)	(0.6)	(2.7)	(0.4)	(0.8)	(1.9)	(0.7)	(0.3)	(0.1)
R-SQUARED= .033		F= 1.8										
SF	-172.6	-47.66	-188.0	.8384	1.370	.0599	.1529	-.5819	-.0707	-20.45	-15.96	31.52
	(0.7)	(0.7)	(0.2)	(0.6)	(0.7)	(1.3)	(1.2)	(0.1)	(0)	(0.4)	(0.2)	(0.5)
R-SQUARED= .247		F= 0.4										

TABLE B-58

DDG-2 CLASS
DISTILLING PLANT

	CONST	RC	AC	PP	PB	CI	ST	PC	AGE	FL	SVL1	SVL2	SVP	IN
CASOWN	-48.62	-11.17	-181.6	1.241	-1.062	.0220	-.0236	-.1676	.3593	-4.726	13.72	-19.54	-15.62	
	(0.6)	(0.6)	(0.5)	(1.1)	(1.2)	(1.1)	(0.5)	(0.2)	(1.0)	(3.2)	(0.7)	(0.7)	(0.7)	
	R-SQUARED= .144		F= 1.1											
CASMNT	-60.05	1.079	-211.2	1.276	-1.005	.0168	-.0415	-.2272	.2916	1.638	16.26	-1.621	-11.28	
	(0.9)	(0.1)	(0.7)	(1.3)	(1.3)	(1.1)	(1.0)	(0.3)	(1.0)	(0.1)	(1.0)	(0.1)	(0.6)	
	R-SQUARED= .163		F= 1.1											
CASREP	-.0248	-.0040	.3459	.0032	-.0019	.0001	.0001	-.0012	-.0005	-.0250	.0191	-.0197	-.0132	
	(0.2)	(0.1)	(0.5)	(1.6)	(1.2)	(1.5)	(1.5)	(0.7)	(0.9)	(0.7)	(0.6)	(0.4)	(3.4)	
	R-SQUARED= .025		F= 1.2											
C34OWN	60.56	3.420	12.43	-.3575	-.5158	.0104	-.0270	-.0837	.0406	8.345	6.253	-1.996	-11.32	
	(1.4)	(0.4)	(0.1)	(1.1)	(1.5)	(0.9)	(1.1)	(0.2)	(0.3)	(0.8)	(0.7)	(0.2)	(1.2)	
	R-SQUARED= .030		F= 0.7											
C34MNT	58.93	3.306	-.3060	-.2782	-.5310	.0075	-.0279	-.1210	.0338	5.528	6.396	-1.615	-9.983	
	(1.5)	(0.4)	(0)	(0.9)	(1.7)	(0.7)	(1.2)	(0.3)	(0.2)	(0.6)	(0.8)	(0.1)	(1.2)	
	R-SQUARED= .017		F= 0.7											
C34REP	.1238	.0063	.4741	-.0007	-.0006	0	0	-.0005	-.0002	.0131	.0023	-.0027	-.0147	
	(1.4)	(0.4)	(1.4)	(1.0)	(0.9)	(1.3)	(0)	(0.5)	(0.7)	(0.7)	(0.1)	(0.1)	(3.0)	
	R-SQUARED= .030		F= 0.6											
IMA	-212.2	11.89	-1089.	2.795	-1.746	.0601	.1234	.5203	.9766	33.19	61.16	16.63	-73.78	
	(1.0)	(0.3)	(1.3)	(1.6)	(1.0)	(0.9)	(0.9)	(0.2)	(1.2)	(0.7)	(1.4)	(0.3)	(1.5)	
	R-SQUARED= .016		F= 1.0											
SF	-347.5	14.78	-706.2	1.156	-.5287	.0086	.0551	.6823	1.533	42.41	24.15	33.92	-7.298	
	(1.6)	(0.4)	(0.9)	(0.7)	(0.3)	(0.1)	(0.5)	(0.3)	(2.2)	(0.9)	(0.6)	(0.6)	(0.2)	
	R-SQUARED= .012		F= 0.4											

TABLE B-59

SSN-637 CLASS
DISTILLING PLANT

	CONST	RC	AC	PP	PO	CI	ST	PC	AGE	FL	SVL1	SVL2	SVL3	SVP	OH
CASDMN	52.93	94.69	-50.31	-1.626	1.162	-.0221	.0060	-.7289	1.609	91.27	-62.25	-16.42	-37.67	-116.4	-142.5
	(0.5)	(2.5)	(1.4)	(0.5)	(0.4)	(1.2)	(0.1)	(1.2)	(1.0)	(2.2)	(1.1)	(0.3)	(0.9)	(2.7)	(1.7)
R-SQUARED= .461		F= 2.4													
CASMNT	40.25	83.62	-37.95	-1.920	1.692	-.0005	.0265	-.8336	1.814	97.60	-60.79	-38.55	-37.12	-121.6	-159.3
	(0.4)	(2.5)	(1.2)	(0.8)	(0.7)	(0)	(0.6)	(1.5)	(1.3)	(2.8)	(1.2)	(0.8)	(1.1)	(3.4)	(2.2)
R-SQUARED= .460		F= 3.1													
CASREP	.1027	.0700	-.0317	-.0005	0	0	-.0001	.0001	.0002	.0362	.0011	.0375	-.0615	-.8328	-.0521
	(1.1)	(2.4)	(1.1)	(0.2)	(0)	(0.8)	(1.5)	(0.2)	(0.2)	(1.2)	(0)	(0.9)	(1.3)	(1.1)	(0.7)
R-SQUARED= .027		F= 1.7													
C34DMN	2.754	3.009	.1798	.0298	-.1000	-.0020	-.0032	-.0001	.0134	2.994	.1104	-2.062	.2272	-2.569	-1.349
	(0.4)	(2.3)	(0.1)	(1.2)	(1.4)	(1.3)	(1.2)	(0)	(0.2)	(2.2)	(0.1)	(1.2)	(0.2)	(1.8)	(0.4)
R-SQUARED= .025		F= 1.7													
C34MNT	2.519	2.858	.2876	.0296	-.0948	-.0018	-.0032	.0015	.0096	2.875	.0549	-1.959	.2030	-2.655	-1.153
	(0.4)	(2.4)	(0.2)	(1.3)	(1.4)	(1.3)	(1.3)	(0.1)	(0.2)	(2.3)	(0)	(1.2)	(0.2)	(2.1)	(0.4)
R-SQUARED= .027		F= 1.8													
C34REP	.0428	.0095	-.0022	.0002	-.6008	0	0	-.0001	0	.0145	-.0008	-.0066	-.0016	-.0071	-.0069
	(1.1)	(1.1)	(0.3)	(1.3)	(1.7)	(1.0)	(0)	(0.4)	(0.1)	(1.7)	(0.1)	(0.6)	(0.2)	(0.8)	(0.3)
R-SQUARED= .013		F= 0.8													
IMA	-52.39	24.83	-42.57	.1730	1.434	.0192	-.0678	-.1976	.7192	50.65	21.18	-17.27	3.322	-50.21	-71.46
	(0.4)	(0.8)	(1.4)	(0.3)	(0.8)	(0.5)	(1.1)	(0.3)	(0.5)	(1.8)	(0.7)	(0.4)	(0.1)	(1.0)	(0.9)
R-SQUARED= .022		F= 1.5													
SF	-91.21	47.00	-18.21	.2975	.7146	.0006	-.0422	.0828	-.2919	-10.04	35.68	-26.83	-8.113	3.535	-3.222
	(0.8)	(1.9)	(0.7)	(0.6)	(0.5)	(0)	(0.9)	(0.2)	(0.2)	(0.4)	(1.4)	(0.8)	(0.3)	(0.1)	(0.1)
R-SQUARED= .011		F= 0.8													

TABLE B-60

COMPRESSED AIR AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASOWN	380.46 (521.81)	304.30 (484.15)	15.39 (97.55)
CASMNT	190.81 (337.08)	149.98 (338.65)	6.62 (57.33)
CASREP	0.29 (0.57)	0.23 (0.52)	0.03 (0.19)
C34DWN	15.93 (104.22)	62.29 (245.75)	0.40 (9.87)
C34MNT	9.64 (81.17)	42.67 (220.89)	0.40 (9.87)
C34REP	0.02 (0.18)	0.05 (0.25)	0 (0.05)
ENGLOG	104.99 (95.81)	0 (0)	0 (0)
INA	22.54 (69.65)	24.57 (109.20)	35.73 (109.54)
SF	21.05 (274.27)	10.93 (36.56)	6.29 (25.92)
RC	0.88 (0.36)	0.59 (0.25)	4.26 (1.85)
AC	0.58 (0.67)	1.42 (1.00)	0.20 (0.32)
PP	107.84 (14.97)	76.85 (12.17)	108.74 (15.26)
PO	83.23 (8.58)	89.87 (11.50)	67.56 (4.74)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	26.24 (44.75)	12.27 (31.00)	0.99 (4.92)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)

TABLE B-61

FF-1052 CLASS
COMPRESSED AIR

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SVL	SYP
CASDWN	630.3	-6.938	-177.3	-5.681	7.729	-.2108	.1177	1.459	-3.158	-67.84	-50.00	-36.33
	(1.5)	(0)	(1.9)	(1.4)	(2.7)	(4.0)	(0.7)	(2.1)	(0.7)	(0.5)	(0.4)	(0.3)
R-SQUARED= .543		F= 4.8										
CASMNT	119.2	-72.00	-73.46	-2.612	3.895	-.0990	.0114	.3667	.5331	104.3	40.06	7.945
	(0.5)	(0.8)	(1.3)	(1.0)	(2.1)	(2.4)	(0.1)	(0.8)	(0.2)	(1.4)	(0.6)	(0.1)
R-SQUARED= .395		F= 2.3										
CASREP	.3135	.0842	-.0333	.0002	.0005	0	-.0003	.0005	-.0007	-.1211	-.1164	.1200
	(1.2)	(1.0)	(0.6)	(0.1)	(0.2)	(0.1)	(1.4)	(1.2)	(0.3)	(1.8)	(1.8)	(1.8)
R-SQUARED= .016		F= 1.3										
C34DWN	70.44	45.46	-22.17	1.026	-.6968	-.0296	-.0335	.2128	-1.730	-4.859	-19.40	.6648
	(0.8)	(1.5)	(1.3)	(2.6)	(0.9)	(2.4)	(0.9)	(1.5)	(1.9)	(0.2)	(0.8)	(0)
R-SQUARED= .409		F= 2.0										
C34MNT	70.72	24.56	-15.56	.5620	-.8140	-.0155	.0075	.0948	-.9664	4.739	-5.388	-.5669
	(1.1)	(1.1)	(1.2)	(1.8)	(1.4)	(1.5)	(0.2)	(0.9)	(1.5)	(0.3)	(0.3)	(0)
R-SQUARED= .316		F= 1.4										
C34REP	-.0123	.0029	-.0255	.0013	.0004	0	-.0001	.0001	-.0022	-.0377	-.0375	.0225
	(0.1)	(3.0)	(1.6)	(3.1)	(0.5)	(0.6)	(1.7)	(0.8)	(2.7)	(1.8)	(1.8)	(1.2)
R-SQUARED= .030		F= 2.5										
ENGLOG	216.1	238.1	-14.97	1.343	-3.351	-.0432	-.1561	-.6240	-2.296	111.1	-10.44	-20.50
	(1.3)	(2.5)	(0.5)	(1.8)	(2.7)	(0.8)	(1.5)	(2.0)	(1.3)	(1.7)	(0.3)	(0.3)
R-SQUARED= .340		F= 3.3										
INA	-10.54	-5.603	6.142	.1430	.7211	.0053	-.0510	-.0647	-.1916	-24.48	-13.31	-.5919
	(0.3)	(0.4)	(0.8)	(0.7)	(1.9)	(0.5)	(1.9)	(0.9)	(0.5)	(2.3)	(1.2)	(0.1)
R-SQUARED= .102		F= 1.6										
SF	-69.57	11.95	5.396	.0033	.7472	-.0228	.0137	.5519	.1181	-31.78	-7.105	49.25
	(0.5)	(0.3)	(0.2)	(0)	(0.6)	(0.5)	(0.1)	(2.4)	(0.1)	(1.0)	(0.2)	(1.6)
R-SQUARED= .011		F= 0.9										

TABLE B-62

DDG-2 CLASS
COMPRESSED AIR

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYP
CASDWN	187.2	-8.441	6.848	4.773	-1.465	-.0426	.1352	-.5371	-.4535	-18.25	-153.6	-159.1	-186.5
	(0.4)	(0)	(0.2)	(0.8)	(0.3)	(0.8)	(0.8)	(0.5)	(0.2)	(0.1)	(1.3)	(1.1)	(1.4)
R-SQUARED= .544		F= 0.8											
CASMNT	133.5	27.19	-3.568	2.759	-.9706	.0521	.0980	.0368	-.8724	43.30	-166.2	-51.07	-79.41
	(0.5)	(0.2)	(0.1)	(0.7)	(0.3)	(1.4)	(0.8)	(0.1)	(0.6)	(0.5)	(2.3)	(0.5)	(0.9)
R-SQUARED= .510		F= 1.1											
CASREP	.1540	.1100	-.0207	.0007	-.0005	.0001	-.0001	-.0006	.0003	-.0380	-.0640	-.0570	.0720
	(0.6)	(1.1)	(1.1)	(0.2)	(0.2)	(0.8)	(0.3)	(0.8)	(0.2)	(0.5)	(1.0)	(0.7)	(1.0)
R-SQUARED= .015		F= 0.7											
C34DWN	-89.52	-6.649	-18.62	1.689	.0113	.0341	-.0083	.5788	.2980	-32.50	-39.85	-12.77	48.34
	(0.4)	(0.1)	(0.8)	(1.3)	(0)	(1.4)	(0.1)	(1.2)	(0.3)	(0.5)	(0.6)	(0.2)	(0.7)
R-SQUARED= .593		F= 0.6											
C34MNT	-68.37	24.30	-19.11	1.035	.2983	.0284	.0336	.5789	.0389	-40.22	-46.73	-20.67	72.79
	(0.3)	(0.3)	(1.0)	(0.9)	(0.2)	(1.3)	(0.5)	(1.3)	(0)	(0.7)	(0.8)	(0.3)	(1.2)
R-SQUARED= .600		F= 0.6											
C34REP	.0045	.0094	-.0245	-.0012	-.0001	0	-.0001	.0003	.0011	-.0086	-.0004	-.0101	.0563
	(0)	(0.2)	(1.8)	(1.2)	(0.1)	(0.4)	(0.7)	(0.8)	(1.6)	(0.2)	(0)	(0.2)	(1.5)
R-SQUARED= .046		F= 1.3											
INA	-70.06	-3.114	-6.003	.3402	-.1654	.0546	-.0720	-.0739	.5423	11.37	4.008	10.11	-6.075
	(1.2)	(0.1)	(1.1)	(0.9)	(0.4)	(2.8)	(1.8)	(0.5)	(2.1)	(0.8)	(0.3)	(0.6)	(0.4)
R-SQUARED= .045		F= 2.2											
SF	-29.92	11.62	.4621	.1719	-.1869	.0056	-.0076	-.0699	.2259	1.391	.6038	8.685	-1.541
	(1.5)	(1.6)	(0.3)	(1.3)	(1.4)	(0.8)	(0.6)	(1.5)	(2.6)	(0.3)	(0.1)	(1.5)	(0.3)
R-SQUARED= .042		F= 2.5											

TABLE B-63

SSN-637 CLASS
COMPRESSED AIR

	CONST	RC	AC	PP	PO	CI	SI	PC	AGE	FL	SVL1	SVL2	SVL3	SFP	ON
CASDWN	-32.27	1.208	-24.14	2.324	-2.776	-.0106	-.0303	-2.316	.4030	22.30	27.01	3.913	52.76	17.73	36.70
	(0.5)	(0.3)	(1.2)	(1.7)	(2.0)	(0.9)	(1.1)	(2.2)	(0.6)	(1.1)	(1.4)	(0.2)	(2.7)	(0.9)	(0.9)
R-SQUARED= .254		F= 2.7													
CASMNT	-29.54	-.3876	-8.329	.0200	-1.050	-.0063	-.0055	-1.142	.5396	17.69	15.04	-2.742	25.63	4.619	8.290
	(0.7)	(0.2)	(0.7)	(1.0)	(1.3)	(0.9)	(0.3)	(1.9)	(1.3)	(1.5)	(1.3)	(0.2)	(2.2)	(0.4)	(0.4)
R-SQUARED= .255		F= 2.4													
CASREP	-.0519	.0042	-.0330	.0033	-.0029	0	-.0001	-.0013	0	.0161	-.0099	-.0006	.0176	.0209	.0118
	(0.5)	(0.7)	(1.2)	(1.6)	(1.4)	(0.2)	(1.2)	(0.8)	(0)	(0.6)	(0.4)	(0)	(0.6)	(0.8)	(0.2)
R-SQUARED= .049		F= 1.0													
C34DWN	-6.052	-.0334	-.1944	-.0029	.1073	-.0008	-.0020	-.0334	.1183	-1.264	-.3651	-.3444	.2466	2.081	-6.912
	(0.8)	(0.1)	(0.1)	(0.1)	(1.0)	(0.6)	(0.7)	(0.4)	(1.9)	(0.7)	(0.2)	(0.2)	(0.2)	(1.8)	(2.0)
R-SQUARED= .085		F= 0.7													
C34MNT	-6.052	-.0334	-.1944	-.0029	.1073	-.0008	-.0020	-.0334	.1183	-1.264	-.3651	-.3444	.2466	2.081	-6.912
	(0.8)	(0.1)	(0.1)	(0.1)	(1.0)	(0.6)	(0.7)	(0.4)	(1.9)	(0.7)	(0.2)	(0.2)	(0.2)	(1.8)	(2.0)
R-SQUARED= .085		F= 0.7													
C34REP	-.0483	.0014	.0005	-.0001	.0011	0	0	-.0002	.0009	-.0353	-.0168	-.0139	-.0159	.0416	-.0597
	(1.1)	(0.7)	(0.1)	(0.5)	(2.0)	(0.8)	(0.2)	(0.4)	(2.4)	(3.4)	(1.8)	(1.1)	(1.7)	(4.3)	(3.0)
R-SQUARED= .276		F= 2.6													
INA	21.85	.3893	-18.86	-.0372	1.010	.0145	.0001	-.8674	-.9350	7.294	-6.980	-5.704	8.291	-16.34	13.74
	(0.3)	(0.1)	(1.4)	(0.1)	(1.1)	(1.0)	(0)	(1.1)	(1.7)	(0.5)	(0.5)	(0.3)	(0.6)	(1.2)	(0.5)
R-SQUARED= .034		F= 2.3													
SF	27.42	-.4424	-4.098	-.0513	-.1178	.0048	.0013	-.0599	.1349	2.677	-.0221	.3910	2.361	-4.638	-12.52
	(1.6)	(1.2)	(1.2)	(0.8)	(0.5)	(1.3)	(0.2)	(0.3)	(1.0)	(0.7)	(0.2)	(0.1)	(0.7)	(1.3)	(1.7)
R-SQUARED= .029		F= 1.1													

TABLE B-64

STEERING AVERAGES

	FF-1052 CLASS	DDG-2 CLASS	SSN-637 CLASS
CASDWN	32.64 (136.08)	13.58 (84.44)	3.17 (32.18)
CASMNT	26.89 (122.14)	10.51 (71.21)	1.39 (17.83)
CASREP	0.03 (0.18)	0.03 (0.20)	0.01 (0.10)
C34DWN	9.52 (74.88)	2.03 (38.81)	0.99 (17.19)
C34MNT	5.78 (53.93)	0.57 (8.09)	0.85 (15.72)
C34REP	0.01 (0.11)	0.01 (0.10)	0 (0.06)
ENGLOG	1.73 (4.78)	0 (0)	0 (0)
IMA	3.01 (22.95)	4.99 (32.38)	15.18 (115.06)
SF	1.77 (9.63)	2.17 (12.71)	1.43 (10.40)
INSURV	1.41 (0.59)	1.47 (0.61)	0 (0)
RC	0.23 (0.15)	0.44 (0.35)	1.54 (1.17)
AC	0 (0)	0 (0)	0.12 (0.10)
PP	102.38 (15.98)	73.82 (11.38)	108.74 (15.26)
PQ	81.50 (9.36)	89.36 (11.47)	67.56 (4.74)
CI	361.87 (235.78)	325.44 (242.15)	325.60 (257.85)
ST	227.76 (117.09)	227.81 (121.79)	211.16 (149.22)
PC	0.21 (1.43)	0.05 (0.30)	0.23 (1.65)
AGE	66.46 (12.15)	161.72 (21.02)	71.46 (22.77)
FL	0.59 (0.49)	0.45 (0.50)	0.36 (0.48)
SYL1	0.16 (0.36)	0.25 (0.43)	0.23 (0.42)
SYL2	0 (0)	0.10 (0.30)	0.08 (0.27)
SYL3	0 (0)	0 (0)	0.21 (0.41)
SYP	0.35 (0.48)	0.26 (0.44)	0.23 (0.42)
OH	0 (0)	0 (0)	1.18 (0.39)
IN	23.45 (9.75)	21.42 (11.81)	0 (0)

TABLE B-64

FF-1052 CLASS
STEERING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	STL	STP	IN
CASOMM	164.5	-98.02	-39.06	-1.918	1.375	.0041	.0034	-5.528	-.1272	-42.34	-69.40	-22.57	
	(1.6)	(1.5)	(0)	(1.9)	(1.8)	(0.3)	(0.1)	(1.0)	(0.1)	(1.7)	(2.4)	(0.8)	
R-SQUARED=	.454	F=	1.8										
CASMMT	155.9	-52.29	1048.	-1.671	1.059	.0067	-.0062	-5.769	-.4204	-38.24	-66.92	-33.37	
	(1.7)	(0.9)	(0.2)	(1.6)	(1.5)	(0.5)	(0.1)	(1.1)	(0.5)	(1.7)	(2.5)	(1.3)	
R-SQUARED=	.458	F=	1.8										
CASREP	.0226	-.1042	3.342	-.0064	.0007	0	-.0001	.0008	.0007	.0096	-.0252	-.0154	
	(0.3)	(2.2)	(0.6)	(0.5)	(1.1)	(1.0)	(1.6)	(0.2)	(1.1)	(0.5)	(1.2)	(0.7)	
R-SQUARED=	.016	F=	1.2										
C34DMM	18.44	-67.61	-908.2	-.0188	-.2564	.0084	.0403	-.0179	.2679	-9.675	1.082	15.16	
	(0.3)	(1.9)	(0.2)	(0.1)	(0.5)	(0.9)	(1.4)	(0)	(0.5)	(0.7)	(0.1)	(1.0)	
R-SQUARED=	.336	F=	0.6										
C34MMT	22.78	-44.26	-706.0	-.0938	-.2847	.0098	.0278	.0441	.2108	-2.511	2.314	9.785	
	(0.7)	(2.0)	(0.3)	(0.5)	(0.9)	(1.2)	(1.3)	(0)	(0.7)	(0.3)	(0.2)	(1.1)	
R-SQUARED=	.191	F=	0.7										
C34REP	.1049	-.0443	2.881	0	0	0	-.0001	.0002	-.0007	-.0059	-.0129	-.0151	
	(2.1)	(1.5)	(0.6)	(0.1)	(0)	(0.9)	(1.8)	(0.1)	(1.7)	(0.5)	(1.0)	(1.2)	
R-SQUARED=	.024	F=	1.1										
ENGLOG	13.55	4.015	252.7	.0490	-.1000	-.0100	-.0089	-.2777	-.0625	.0383	.7550	-1.114	
	(1.0)	(0.7)	(0.5)	(1.0)	(1.5)	(3.4)	(1.6)	(0.5)	(0.4)	(0)	(0.3)	(0.3)	
R-SQUARED=	.206	F=	1.7										
INA	-10.04	-7.090	-787.7	.1401	-.1004	.0099	.0124	.1461	.0738	-4.490	-3.465	1.512	
	(0.9)	(1.0)	(0.9)	(2.4)	(1.0)	(2.5)	(1.5)	(0.2)	(0.8)	(1.7)	(1.1)	(0.5)	
R-SQUARED=	.048	F=	2.0										
SF	-4.994	-6.643	-105.1	.0142	-.0181	-.0006	-.0054	-.0207	.1406	.0253	.2704	1.132	
	(1.2)	(2.6)	(0.3)	(0.7)	(0.5)	(0.4)	(1.6)	(0.1)	(3.9)	(0)	(0.2)	(1.1)	
R-SQUARED=	.025	F=	2.4										
INSURV	.3894	1.385	222.1	-.0068	-.0036	.0005	-.0001		.0201	-.5086	-.5720	-.2417	.0260
	(6.2)	(1.7)	(2.6)	(1.0)	(0.3)	(0.6)	(0.1)		(1.3)	(1.3)	(1.4)	(0.7)	(2.1)
R-SQUARED=	.791	F=	3.1										

TABLE B-66

DDG-2 CLASS
STEERING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SFP	IN
CASOWN	6.086	7.716		.8881	-1.235	-.0157	-.0621	.3701	.3044	-19.06	-5.709	-8.805	9.486	
	(0.1)	(0.6)		(1.1)	(1.7)	(1.1)	(1.8)	(0)	(1.1)	(1.2)	(0.4)	(0.5)	(0.6)	
R-SQUARED= .141			F= 0.9											
CASMNT	.5032	4.055		.5735	-.8781	-.0094	-.0425	-.9412	.2399	-7.648	1.848	-5.010	7.963	
	(0)	(0.3)		(0.8)	(1.4)	(0.8)	(1.4)	(0.1)	(1.0)	(0.5)	(0.3)	(0.3)	(0.6)	
R-SQUARED= .148			F= 0.6											
CASREP	-.0170	.0079		.0029	-.0023	0	0	-.0138	0	-.0427	-.0256	.0083	.0388	
	(0.2)	(0.3)		(1.9)	(1.8)	(0.1)	(0.5)	(0.5)	(0.1)	(1.5)	(1.1)	(0.3)	(1.4)	
R-SQUARED= .010			F= 0.6											
C34OWN	7.196	2.648		-.2625	.0787	-.0042	-.0258	1.711	.1157	-6.223	-7.365	-5.654	-1.165	
	(0.3)	(0.5)		(1.5)	(0.5)	(0.6)	(1.7)	(0.3)	(1.0)	(1.0)	(1.4)	(0.8)	(0.2)	
R-SQUARED= .058			F= 0.9											
C34MNT	3.290	-.1406		-.0520	.0333	-.0014	-.0074	-.1794	.0061	-.4920	-1.119	-.0351	-.4557	
	(0.7)	(0.1)		(1.7)	(1.1)	(1.0)	(2.5)	(0.2)	(0.3)	(0.4)	(1.2)	(0)	(0.4)	
R-SQUARED= .021			F= 1.3											
C34REP	.0325	.0086		-.0006	.0004	0	-.0001	.0001	0	-.0137	-.0095	.0131	.0010	
	(0.5)	(0.7)		(1.5)	(0.9)	(0.8)	(1.6)	(0)	(0)	(0.9)	(0.7)	(0.8)	(0.1)	
R-SQUARED= .032			F= 1.2											
IMA	-3.383	2.981		.1034	.0456	.0018	-.0134	-.7291	-.0074	3.057	-1.025	-.3186	-7.789	
	(0.2)	(0.6)		(0.9)	(0.4)	(0.3)	(1.2)	(0.2)	(0.1)	(0.7)	(0.3)	(0.1)	(1.9)	
R-SQUARED= .013			F= 0.9											
SF	8.554	1.177		.0082	-.0234	.0058	.0031	-.7561	-.0393	-3.987	-.4214	-.6868	1.372	
	(1.3)	(0.8)		(0.2)	(0.5)	(2.5)	(0.7)	(0.4)	(1.3)	(2.4)	(0.3)	(0.4)	(0.9)	
R-SQUARED= .022			F= 1.5											
INSURV	-1.784	.6689		.0491	.0423	.0021	.0036	-.5043	-.0295	-1.521	-1.237	.4113		-.0063
	(0.5)	(1.3)		(1.7)	(1.7)	(1.3)	(1.1)	(1.2)	(1.7)	(2.0)	(2.4)	(0.7)		(0.2)
R-SQUARED= .737			F= 1.7											

TABLE B-67

SSN-637 CLASS
STEERING

	CONST	RC	AC	PP	PQ	CI	ST	PC	AGE	FL	SYL1	SYL2	SYL3	SYP	DH
CASBWN	-13.20	.1981	-.0358	.3324	.1096	.0028	.0061	.0491	-.0369	-.9540	5.075	-.9340	.6943	5.234	-.5193
	(0.6)	(0.1)	(0)	(0.1)	(0.3)	(0.6)	(0.7)	(0.1)	(0.2)	(0.2)	(1.0)	(0.1)	(0.1)	(1.0)	(0)
R-SQUARED=	.076		F= 0.4												
CASNNT	13.24	.6297	-1.896	-.2099	.1162	.0010	.0058	-.0716	-.0520	.5481	.9244	.1011	-1.061	2.029	-.5322
	(1.3)	(0.7)	(0.2)	(1.2)	(0.6)	(0.4)	(1.2)	(0.2)	(0.5)	(0.2)	(0.4)	(0)	(0.4)	(0.8)	(0.1)
R-SQUARED=	.037		F= 0.6												
CASREP	.0510	-.0009	-.0327	.0006	-.0010	0	0	-.0002	.0001	.0069	.0014	.0051	.0025	.0193	-.0227
	(1.0)	(0.2)	(0.8)	(0.7)	(1.1)	(1.3)	(1.3)	(0.1)	(0.3)	(0.5)	(0.1)	(0.3)	(0.2)	(1.5)	(0.8)
R-SQUARED=	.013		F= 0.9												
C34BWN	12.11	.6620	-.2685	-.0358	-.1090	.0005	.0043	-.0929	-.0255	.4019	1.636	.5426	1.341	1.066	-.9949
	(0.9)	(0.7)	(0)	(0.7)	(0.6)	(0.2)	(0.9)	(0.2)	(0.2)	(0.1)	(0.6)	(0.2)	(0.5)	(0.4)	(0.2)
R-SQUARED=	.039		F= 0.8												
C34NNT	11.62	.6441	-2.628	-.0280	-.1059	-.0001	.0047	-.0641	-.0370	.4442	1.542	.5070	.4458	.8615	-.3536
	(1.0)	(0.7)	(0.3)	(0.6)	(0.7)	(0)	(1.1)	(0.1)	(0.3)	(0.2)	(0.6)	(0.2)	(0.2)	(0.3)	(0.1)
R-SQUARED=	.055		F= 0.4												
C34REP	.0496	.0014	.0254	-.0001	-.0006	0	0	-.0006	.0001	.0027	.0039	.0028	.0091	.0059	-.0115
	(1.4)	(0.5)	(1.2)	(0.7)	(1.3)	(0.3)	(0.4)	(0.5)	(0.3)	(0.4)	(0.6)	(0.3)	(1.3)	(0.8)	(0.7)
R-SQUARED=	.007		F= 0.5												
INA	99.42	-5.120	-51.54	.1666	-.9336	-.0038	-.0156	-3.189	-.8487	31.64	-7.443	2.827	-10.99	-38.42	35.18
	(1.3)	(0.9)	(1.1)	(0.6)	(0.9)	(0.2)	(0.5)	(1.2)	(1.2)	(1.9)	(0.5)	(0.1)	(0.7)	(2.6)	(1.0)
R-SQUARED=	.023		F= 1.0												
SF	4.087	-.5053	2.438	.0074	-.0274	.0019	-.0017	.3328	.0171	-1.930	-1.142	-1.319	-.0703	.3135	-1.409
	(0.6)	(0.9)	(0.5)	(0.3)	(0.3)	(1.3)	(0.6)	(1.3)	(0.3)	(1.3)	(0.8)	(0.7)	(0)	(0.2)	(3.4)
R-SQUARED=	.029		F= 0.9												

APPENDIX C

MATERIAL CONDITION INDICATOR TRENDS

APPENDIX C

MATERIAL CONDITION INDICATOR TRENDS

This appendix presents figures which graph the average material condition for each ship during its postoverhaul period against the fiscal year of the overhaul. In computing the average material condition values of the various indicators, material condition in certain months was not included. These months are: the first three months following an overhaul; for SSNs, the months following a selected restricted availability; and any months from the beginning of 1980 and beyond.

Each of the material condition indicators is shown separately. Figures C-1 to C-3 show CASREP total downtime, CASREP maintenance downtime, and CASREP occurrences. Figures C-4 and C-5 show intermediate maintenance and ships force maintenance. Finally, figures C-6 and C-7 show UNITREP overall C3-C4 status and UNITREP equipment C3-C4 status. By agreement with Op-04C, individual values of INSURV scores are not shown.

The overwhelming characteristic of each of the figures is the high degree of variability within each year for the various material condition indicators and ship classes. The import of this is that while a trend may not be insignificant, it leaves a great deal still to be accounted for.

Beyond this, there was a general improvement in all the CASREP variables and in all three ship classes, over the period observed in the study. This was generally on the order of five to six percent improvement per year.

This consistency does not hold up with the other indicators. In fact, no other consistent pattern seems apparent.

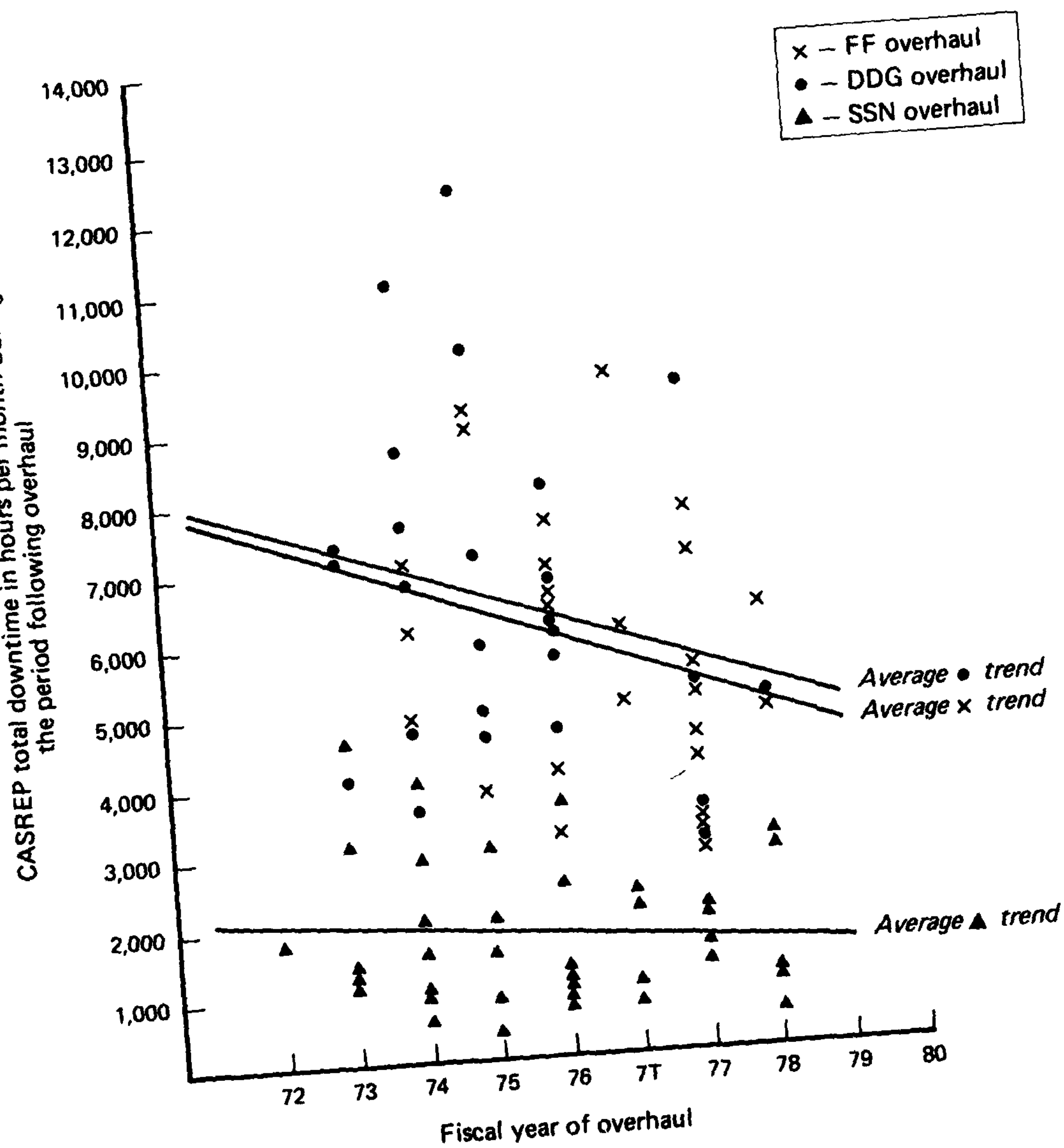

FIG. C-1: FISCAL YEAR vs. CASREP TOTAL DOWNTIME

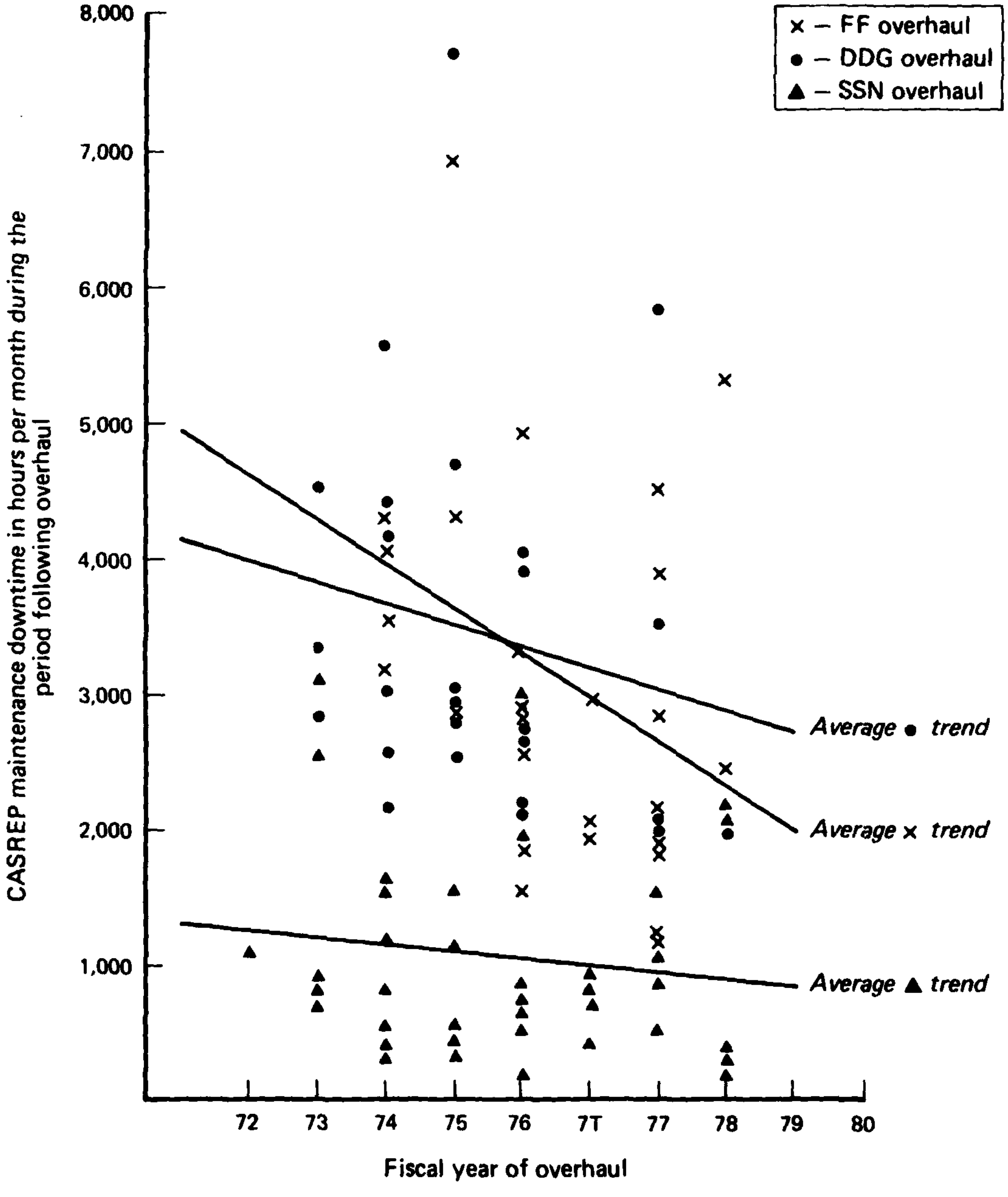

FIG. C-2: FISCAL YEAR vs. CASREP MAINTENANCE DOWNTIME

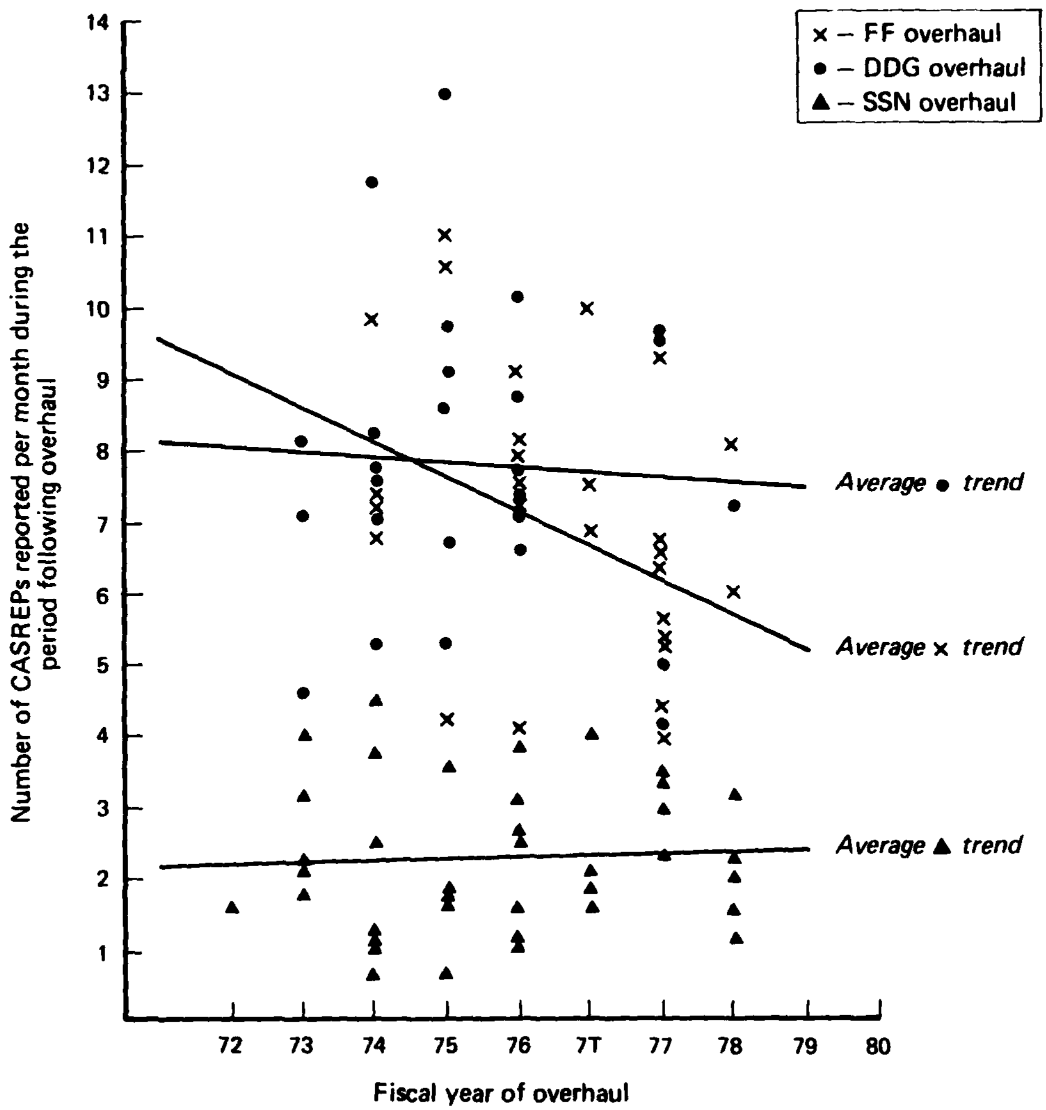

FIG. C-3: FISCAL YEAR vs. CASREP OCCURRENCES

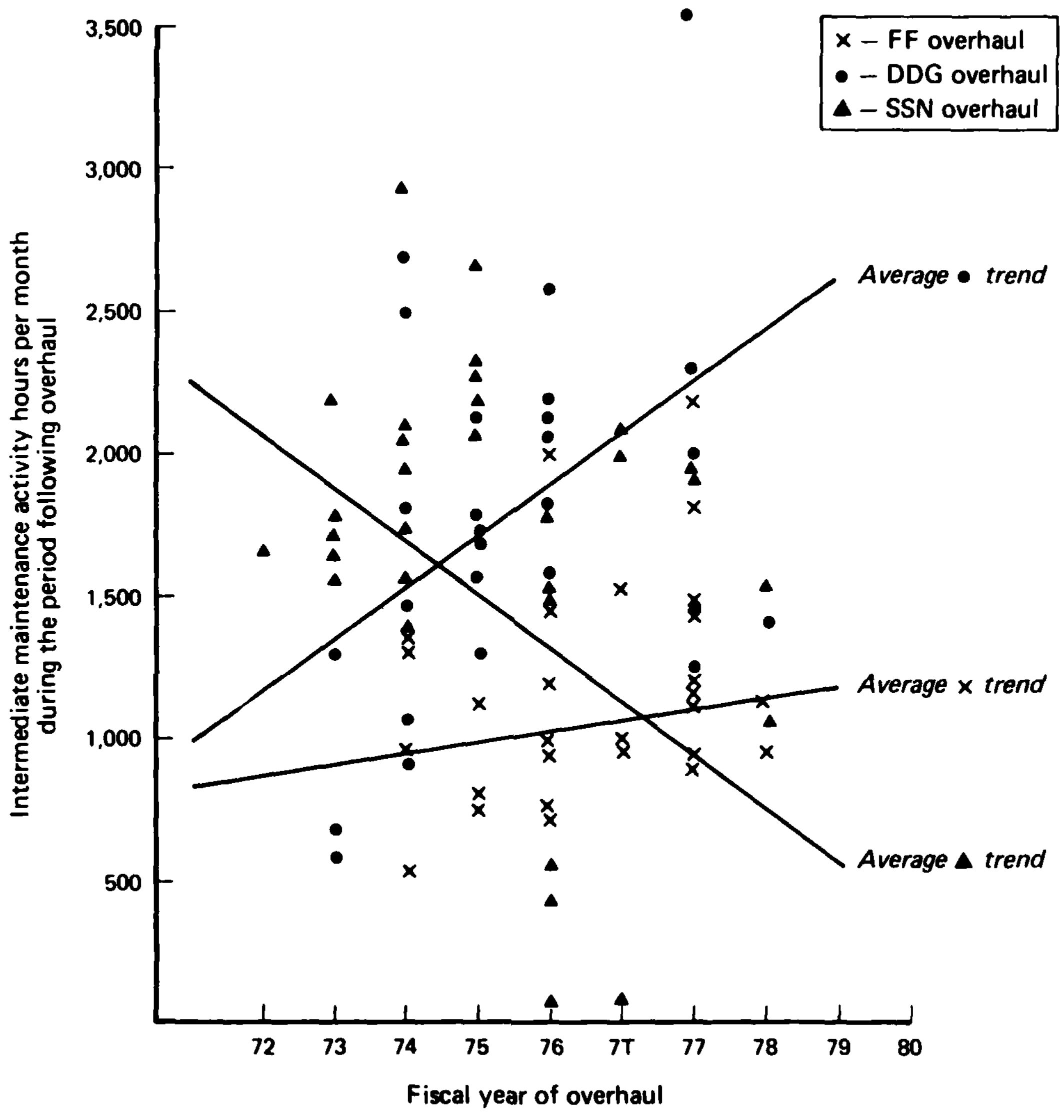

FIG. C-4: FISCAL YEAR vs. IMA HOURS

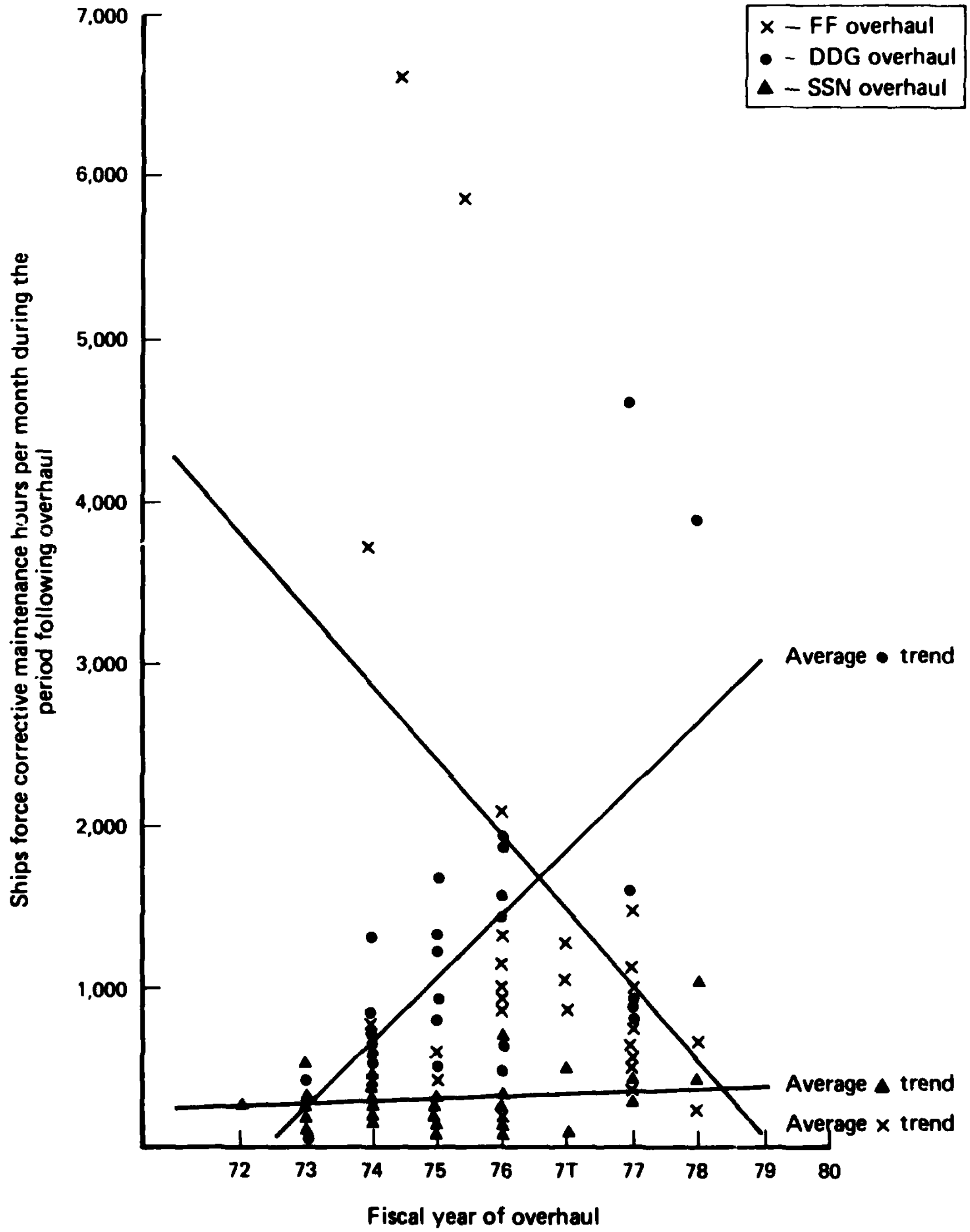

FIG. C-5: FISCAL YEAR vs. SHIPS FORCE HOURS

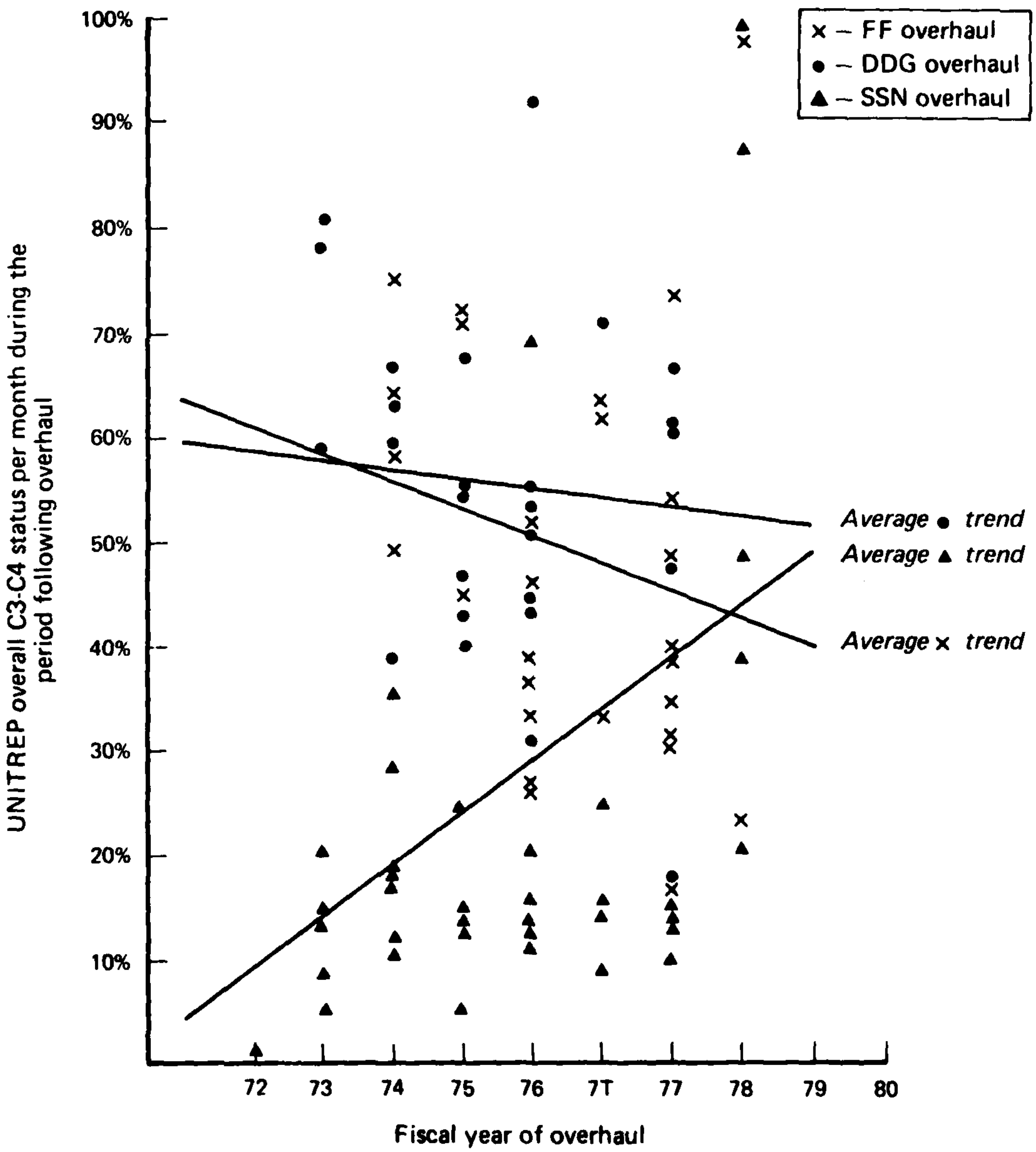

FIG. C-6: FISCAL YEAR vs. UNITREP OVERALL C3-C4 STATUS

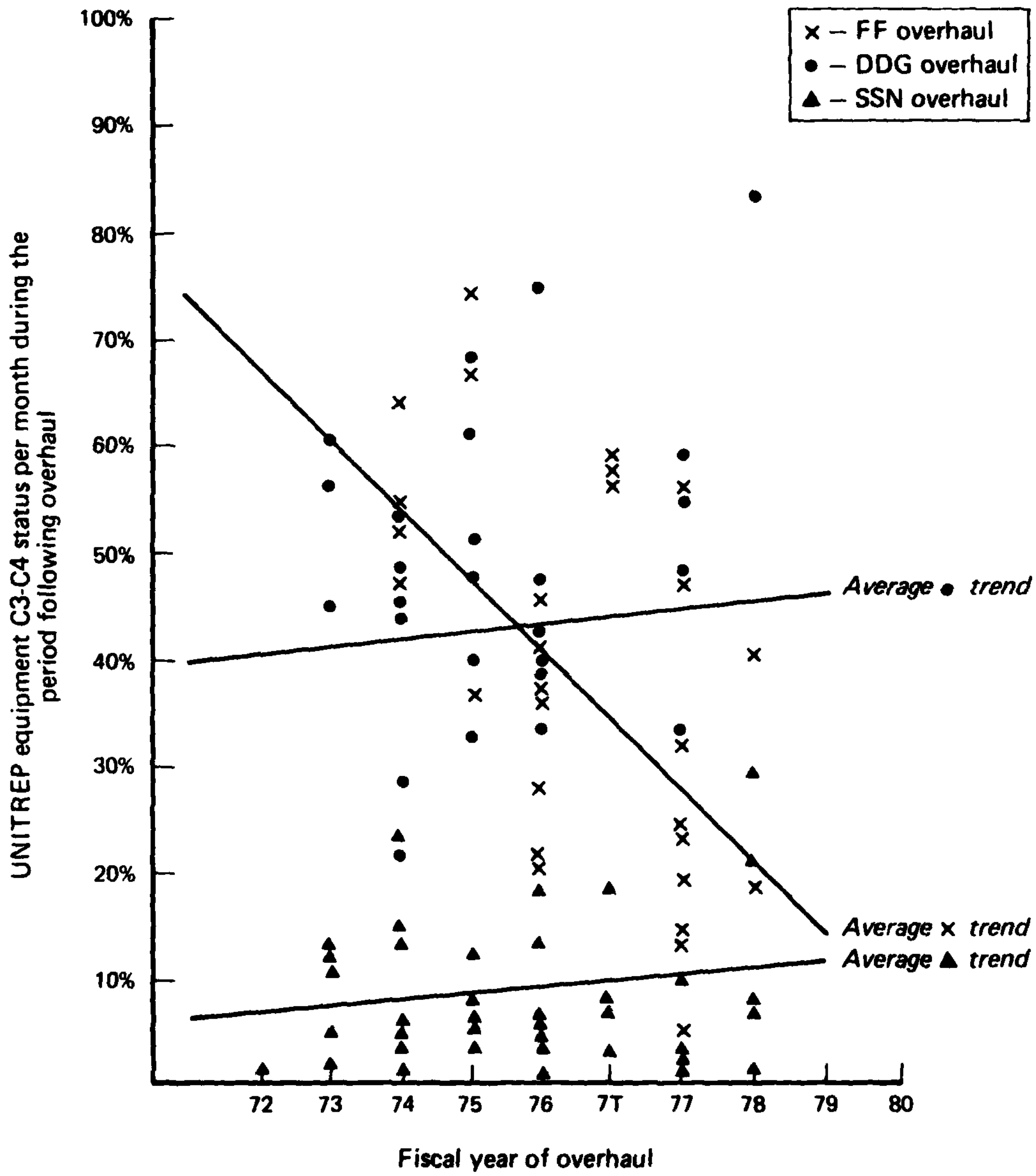

FIG. C-7: FISCAL YEAR vs. UNITREP EQUIPMENT C3-C4 STATUS

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