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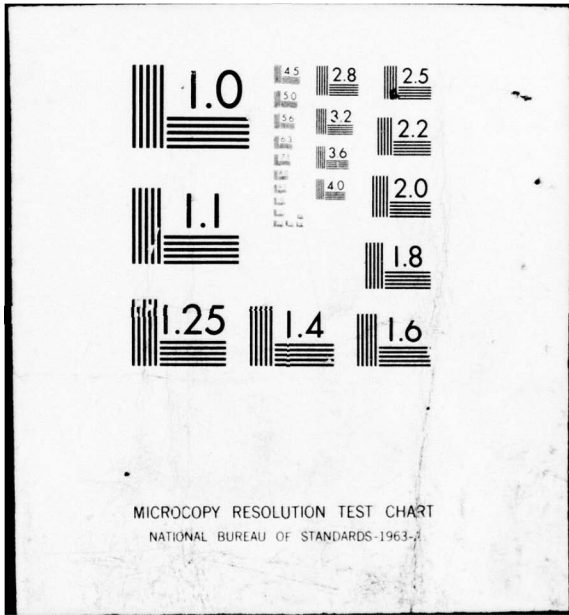
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**DESTROYER ENGINEERED OPERATING CYCLE
(DDEOC)**

System Maintenance Analysis

DDG-37 CLASS

TELETYPE AND FACSIMILE SYSTEMS

SMA 37-302-445

REVIEW OF EXPERIENCE

December 1977

Prepared for
Director, Escort and Cruiser
Ship Logistic Division
Naval Sea Systems Command
Washington, D. C.
under Contract N00024-78-C-4062

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DDOC System Maintenance Analysis
 DDG-37 CLASS MAINTENANCE AND FACILITIES SYSTEMS

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T./Moore
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FOREWORD

This report, the Review of Experience, documents the historical maintenance for the DDG-37 Class Teletype and Facsimile Systems, presents an analysis of the problems encountered, and recommends actions to improve system material condition. It has been developed for NAVSEA 934X, the sponsor of the Destroyer Engineered Operating Cycle (DDEOC) Program, under Contract N00024-78-C-4062.

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SUMMARY

The goal of the Destroyer Engineered Operating Cycle (DDEOC) Program is to effect an early improvement in the material condition of ships, at an acceptable cost, while maintaining or increasing their operational availability during an extended operating cycle. In support of this goal, System Maintenance Analyses (SMAs) are being conducted for selected systems and subsystems of designated surface combatants. The principal element of an SMA is the Review of Experience (ROE). This report documents the ROE for the DDG-37 Class Teletype and Facsimile Systems.

An ROE is an analysis of existing and anticipated problems that affect the operational performance or maintenance program of a ship system. The ROE report serves as a vehicle for assessment of the significance and consequences of identified problems. It also presents specific recommendations and a system maintenance policy for preventing or reducing the impact of problem occurrence, while improving material condition and maintaining or increasing system availability throughout an extended operating cycle.

The Teletype and Facsimile Systems ROE included an analysis of all available maintenance data sources. The documented maintenance experience of the system was reviewed through analysis of Maintenance Data System (MDS) data, Casualty Reports (CASREPs), and system overhaul records. Initial findings from these sources were correlated with Planned Maintenance System (PMS) requirements, system alterations, and system technical manuals to identify maintenance problems. Ship surveys were conducted and discussions were held with appropriate technical codes in order to validate identified problem areas, identify undocumented maintenance problems, and determine the status of current and planned actions affecting the Teletype and Facsimile Systems. All findings were evaluated, and appropriate conclusions were developed. Recommendations were then formulated to implement existing and newly defined corrective actions to minimize the occurrence of identified problems and their impact on the extended operating cycle. The major conclusions resulting from the Review of Experience for the Teletype and Facsimile Systems are summarized below. Specific recommendations resulting from this analysis are presented in Table S-1.

- The DDG-37 Class Facsimile System has not been a significant maintenance burden.

Table S-1. SUMMARY OF PROBLEMS AND RECOMMENDATIONS

Equipment	Problem Description	Recommendation
Reliability and Maintainability Improvements		
Model 28 * Teletypewriter Sets	Ships of the class have a variety of Model 28 Teletypewriter sets with no two ships having the same configuration. Because of the lack of qualified repair personnel and facilities aboard ship, the majority of corrective maintenance is being accomplished at the IMA.	Standardize the Model 28 Teletypewriter suites throughout the class at BOH or as soon thereafter as feasible. Task the IMA to accomplish all major teletypewriter repairs. Establish rotatable pools of teletypewriter equipment components at the IMA. Increase the allowance of teletype repairmen at the IMA level and concurrently reduce allowance on board DDG-37 Class ships.
Teletype Terminal, AN/SGC-1()	Obsolete tube-type equipment will be a maintenance burden for ships in an EOC.	Replace, on a priority basis, obsolete equipment with solid-state CV-2460/SGC for DDG-37 Class ships entering or in an EOC.
Comparator-Converter, AN/URA-8()	Obsolete tube-type equipment will be a maintenance burden for ships in an EOC.	Replace, on a priority basis, obsolete equipment with solid-state AN/URA-17() for DDG-37 Class ships entering or in an EOC.
Teletypewriter Equipment	Low-level requirements for shipboard teletypewriter installations are established by MIL-STD-1680. Not all of the destroyer tenders have the capability to bench-check low-level teletypewriter equipment.	Provide all destroyer tenders with the capability to bench-check low-level teletypewriter equipment.
NAVMACS A+ System	Current teletype system operation requires the performance of many manual functions by highly qualified personnel. NAVMACS A+ automates many of these functions and improves system performance. The NAVMACS A+ ILSP indicates that IMA-level maintenance is not planned for this system. Historically, the IMA has had a significant role in overhaul and repair of teletypewriter equipment.	Install ShipAlt DDG-37-1136K prior to or during BOH. Provide an IMA-level maintenance capability for NAVMACS A+ System teletypewriter components.
Planned Maintenance System Changes		
Model 28 Teletypewriter Sets	Qualified teletype repairmen are required to accomplish PMS. Personnel are not readily available on board each ship to perform PMS.	Provided the recommended revised maintenance philosophy for Model 28 Teletypewriter sets is accepted, MIPs should be altered to reflect the change.
Integrated Logistic Support Requirements		
Model 28 Teletypewriter Sets	Standardization of equipment suites will necessitate review of spare parts requirements.	Concurrent with standardization of equipment suites, update COSALs and ensure that standard equipment spares are adequately stocked on board.
Baseline Overhaul Changes		
Teletype Terminal, CV-2460/SGC	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Telegraph Terminal, AN/UCC-1()	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Converter-Comparator, AN/URA-17()	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Power Supply, PP-3494/3495	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Facsimile Recorder, AN/UXH-2()	No repair requirements have been established for Baseline Overhaul.	Repair or replace at BOH as indicated by results of POT&I and ships' CSMP.

- Reduced system capability, as indicated by CASREPs, has not been frequent or severe; downtime resulting from the few reported failures has not been significant for the Teletype and Facsimile Systems.
- Overhaul of the major components of the Teletype System should be accomplished during the Baseline Overhaul.
- Major restorative maintenance should not be required on these systems during the Engineered Operating Cycle.
- Repairs required during the follow-on ROH are projected to be the same as those identified as necessary for the BOH.
- The maintenance philosophy should be changed so that the IMA will assume all of the major teletypewriter maintenance and rotatable pools of teletypewriter components will be established at the IMA.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

In support of the Destroyer Engineered Operating Cycle (DDEOC) Program, sponsored by NAVSEA 934X, System Maintenance Analyses (SMAs) are being conducted on selected systems and subsystems of program-designated surface combatants. The principal element of an SMA is the Review of Experience (ROE). This report documents the ROE for the DDG-37 Class Teletype and Facsimile Systems.

1.2 PURPOSE AND SCOPE

The ROE is an analysis of existing and anticipated problems that affect the operational performance or maintenance program of a ship system. The ROE report serves as a vehicle for assessing the significance and consequences of identified problems. It also presents specific recommendations and a system maintenance policy for preventing or reducing the impact of problem occurrence, while improving material condition and maintaining or increasing system availability throughout an extended operating cycle.

The analysis documented herein is specifically applicable to the DDG-37 Class Teletype and Facsimile Systems equipments listed in Appendix A. Only those equipments that had been installed or were aboard ship as of the fourth quarter of fiscal year 1976 were considered. The analysis used all available documented data sources from which system maintenance problems could be identified and studied. These included Maintenance Data System (MDS) data, Casualty Reports (CASREPs), System Overhaul Records, Planned Maintenance System (PMS) requirements data, system alteration documentation, and system technical manuals. Sources of undocumented data used in the analysis included discussions with Ship's Force and other cognizant technical personnel.

1.3 SYSTEM FUNCTION AND BOUNDARIES

The Teletype System installed on DDG-37 Class ships provides an accurate means of exchanging written record communications between the ship and other similarly equipped locations. The Facsimile System provides a

means for receiving image intelligence such as weather maps, photographs, sketches, and typed, printed, or handwritten text. Both of these systems interface with and use the ship's Exterior Radio Communications System (ERCS) as a single transport vehicle. Figure 1-1 illustrates this relationship.

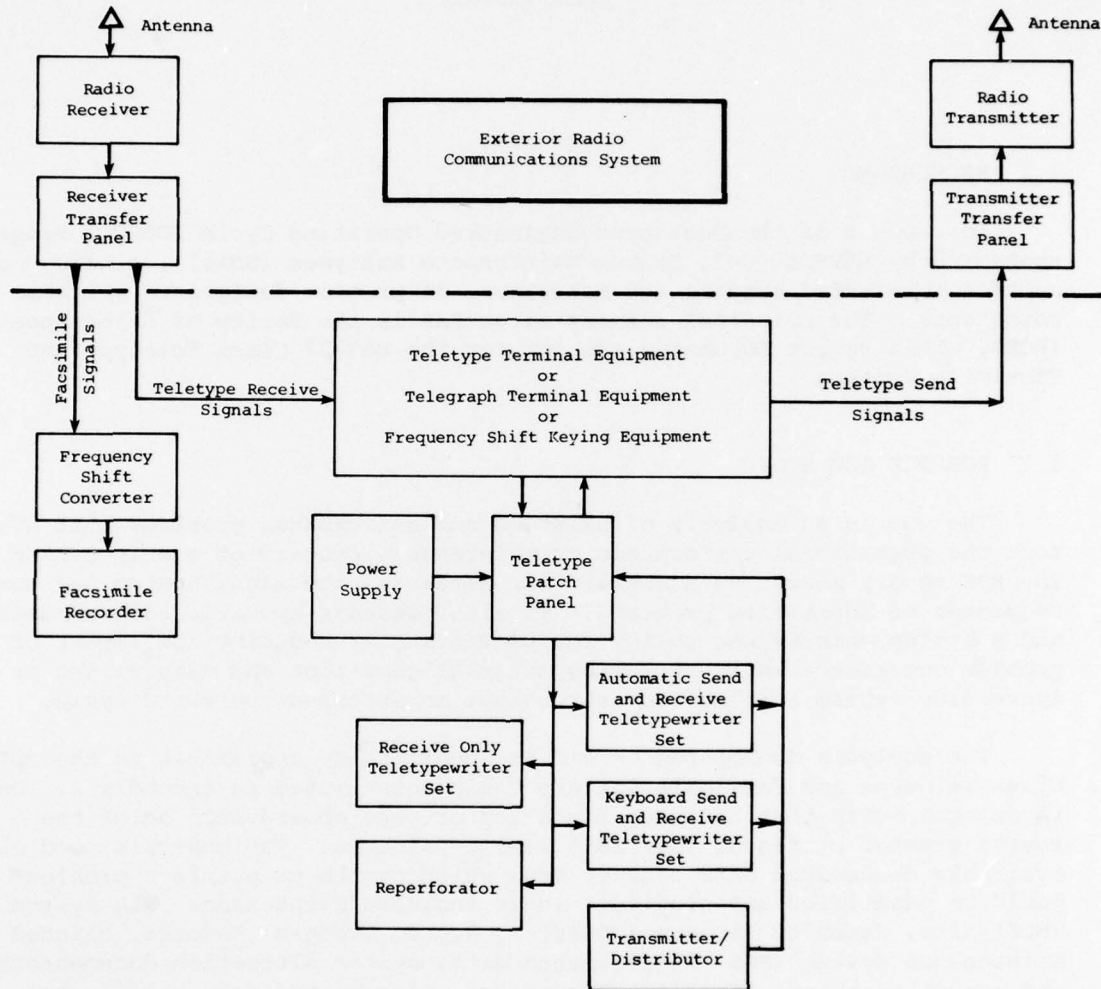


Figure 1-1. RELATIONSHIP BETWEEN TELETYPE AND FACSIMILE SYSTEMS AND EXTERIOR RADIO COMMUNICATIONS SYSTEM

1.4 REPORT FORMAT

The remaining chapters of this report describe the analysis approach utilized (Chapter Two), briefly define significant system maintenance problems encountered and discuss potential problem solutions (Chapter Three), and summarize conclusions and recommendations derived from the analysis (Chapter Four). Specific analyses and evaluations supporting the results of this effort are included as appendixes to this report. A list of selected sources of information precedes the appendixes.

CHAPTER TWO

APPROACH

2.1 OVERVIEW

This chapter describes the approach to the performance of the ROE for the Teletype and Facsimile Systems. Primary data sources are identified in Section 1.2 (Chapter One). The data were used to identify, define, and analyze maintenance problems that significantly affect the maintenance program for the Teletype and Facsimile Systems. A recommended course of action relative to the maintenance program was formulated on the basis of the analysis results.

The analysis was initiated at the component level at which Allowance Parts Lists (APL) numbers are assigned. In some instances, system components with individually assigned APLs but serving similar functions were analyzed generically in APL groups to assess the group impact on the overall maintenance program for the system. Major activities of the analysis were as follows:

- Compilation of documented maintenance history data relevant to the system
- Analysis of these data to identify and define maintenance problems that will have significant impact on the maintenance program of the system during the DDEOC
- Detailed problem analysis and alternative-solution definition for the purpose of recommending a specific system maintenance program

Each of these activities is described in the following sections.

2.2 DATA COMPILATION

The starting point for analysis was the compilation of a comprehensive data base on system maintenance history. The data file consists of three basic elements: an MDS data bank, a CASREP narrative summary, and a system ShipAlt summary. In addition, system overhaul data were extracted from shipyard data files, and a library of appropriate technical manuals was compiled.

All MDS part, labor, and narrative records reported by the DDG-37 Class during the period 1 January 1970 through 30 September 1976 were examined for data pertinent to the Teletype and Facsimile Systems.

2.3 MAINTENANCE PROBLEM DEFINITION

Potential maintenance problems with the system and its equipments were identified by a screening process that involved the use of MDS data and CASREP and overhaul information.

The MDS data were the initial and primary source of information used in the screening process. This data base includes all part, labor, and narrative records comprising maintenance actions (Job Control Numbers) reported against particular system equipments. These data were initially screened to identify those maintenance actions reported against the EICs and APLs pertaining to the Teletype and Facsimile Systems.

Various computer-assisted analyses were then performed to develop historical corrective man-hour and part-expenditure burdens. Equipments were screened according to these burden figures on both an individual level and, if applicable, a generic level. Equipments were selected for in-depth analysis if they had individually or generically contributed significantly to the system historical burden. All CASREPs reported against the Teletype and Facsimile Systems during the period 1 July 1973 through 30 June 1976 were also reviewed to determine the types of casualties reported. All ShipAlts were examined to determine their applicability to reducing the Teletype and Facsimile Systems maintenance problems identified by the analysis. Additional equipments were subjected to in-depth analysis if other sources of information (e.g., overhaul experience, technical discussions, etc.) indicated significant concern over maintenance problems for these equipments.

The detailed analysis of selected equipment included the identification of repetitive parts replacements, identification and correlation of reported maintenance codes (status, deferral reason, etc.), detailed analysis of selected narrative records, and the development of equipment burden trend information.

Several factors associated with maintenance problems were then identified. These factors included the effect of the problem on the equipment and system, the repetitiveness of the problem, the redundancy of the affected equipment within the system, the criticality of the equipment to the system, the resources (man-hours, piece parts, outside assistance, etc.) required to perform the maintenance necessary to correct the problem, and the expected component or system downtime.

2.4 ANALYSIS OF EQUIPMENT MAINTENANCE AND DEFINITION OF SOLUTIONS

Once the equipment maintenance problems and causes were identified, several factors were correlated to establish solutions. The following questions were asked about the relationship of the factors to individual maintenance problems:

- Is the problem known to the Navy technical community, and has a solution been proposed or established?
- Can a design change reduce or eliminate the problem?
- Is the problem PMS-related? Can it be reduced or eliminated by changes to PMS? (These changes could include adding or deleting requirements, changing requirement periodicity, or developing material-condition assessment tests and procedures.)
- Can the problem be reduced or eliminated by improving the system's Integrated Logistic Support (ILS)?
- Can the problem be reduced or eliminated by improving Ship's Force, IMA, or depot-level capabilities?
- Can the problem be reduced or eliminated by periodically performing restorative maintenance? Should this be accomplished by Ship's Force, IMA, or depot-level facilities?
- Is the run-to-failure concept a viable maintenance strategy for the associated equipment?

An affirmative answer to any question resulted in analysis of the effects of the solution and an estimate, when possible, of the cost to implement the solution. A negative answer prompted the analyst to go to the next question. After all the questions concerning an individual problem were asked, the alternative near-term and long-term solutions were evaluated and the most acceptable alternatives defined and documented as recommendations. "Near-term" recommended solutions, as used in this report, are those that are likely to be and should be accomplished prior to completion of the initial DDG-37 Baseline Overhauls. "Long-term" recommended solutions are those not likely to be accomplished until some or all of the DDG-37 Class Baseline Overhauls have been completed.

Next, the DDEOC constraints were correlated with the recommended problem solutions. The Baseline Overhaul, intracycle, and follow-on ROH maintenance requirements for each selected equipment were then evaluated and defined.

CHAPTER THREE

RESULTS

3.1 OVERVIEW

This chapter presents the results of the System Maintenance Analysis of the DDG-37 Class Teletype and Facsimile Systems (references are made, as appropriate, to detailed supporting data in the appendixes). The analysis described in Chapter Two resulted in the identification of 20 equipments as the major contributors to the corrective maintenance burden of the Teletype System. Table 3-1 summarizes MDS data for these equipments. Collectively, these 20 equipments of the Teletype System accounted for 95 percent of the reported parts cost burden and 76 percent of the man-hour burden. Two equipments were identified in the Facsimile System which contributed to 95 percent of the parts cost burden and 100 percent of the man-hour burden.

Analysis of parts usage for the Teletype and Facsimile Systems disclosed no significant problems. All parts used were consumables or routine maintenance items, such as felt washers, wire rope, springs, and screws; this is indicative of PMS routine performance and minor corrective maintenance. Neither the cost nor the quantity of these parts was significant, and further analysis was not warranted.

3.2 CURRENT IMPROVEMENT PROGRAMS

Continuous efforts have been in progress in the Navy to correct reported deficiencies and to improve equipment reliability and maintainability. These improvements are implemented by the use of field changes to existing equipment, as well as by providing improved models of the various equipments. This latter technique is evident in such equipment as the AN/UGC-6(), which has been supplied in models A through L. Predominant among the DDG-37 Class ships is the AN/UGC-6(K), a recent configuration of the equipment. This improvement technique is also evident in the Comparator-Converter Group AN/URA-17, which is available in series A through D. Other system improvements are accomplished by providing replacement equipments incorporating state-of-the-art technology. Ongoing improvement efforts affecting specific equipments of the Teletype and Facsimile Systems are discussed in subsequent sections of this report.

Table 3-1. MOS DATA SUMMARY OF SELECTED TELETYPE AND FACSIMILE SYSTEMS EQUIPMENTS FOR DDG-37 CLASS

APL	Nomenclature	Applicable Ships	Equipment per Ship	Total Equipment Population	Total Ship Operating Time (Ship-Years)	Ships Reported	JCNs	Ship's Force Man-Hours	IMA Man-Hours	Total Man-Hours	Parts Cost (Dollars)	Average Man-Hours/Equipment Operating Year
Teletype System												
	Model 28 Teletypewriter Sets											
58138200	AN/UCC-6	5	1	5	27.0	5	151	33	37	70	1,483	2.6
58138250	AN/UCC-6 Adapter	1	1	1	5.4	1	2	6	0	6	300	1.2
58138242	AN/UCC-6(K)	10	2	20	54.0	9	136	460	204	664	12,344	6.1
58138900	AN/UCC-13 (NTDS)	10	2	20	54.0	10	129	869	52	921	3,624	8.5
58139050	AN/UCC-16	1	1	1	5.4	1	9	121	54	175	694	32.4
58139031	AN/UCC-20	7	2	14	37.8	7	53	285	133	418	7,686	5.5
58139029	AN/UCC-20(A)	3	3	9	16.2	2	23	113	137	250	371	5.1
58139036	AN/UCC-25	10	5	50	54.0	10	385	1,253	748	2,001	24,178	7.4
58139025	AN/UCC-25(A)	10	4	40	54.0	8	181	464	205	669	2,605	3.1
92832700	TT-176/UG	4	1	4	21.6	3	35	362	137	499	2,766	23.1
92839412	TT-253(D)/UG	4	1	4	21.6	1	1	0	0	0	1,650	0
				Subtotal		Subtotal	1,105	3,966	1,707	5,673	57,701	
Frequency Shift Keying Equipment												
58430705	AN/URA-8(B)	9	2	18	48.6	9	61	206	0	206	3,492	2.1
58431601	AN/URA-17C	5	2	10	27.0	5	23	94	0	94	3,459	1.7
58431608	AN/URA-17D	1	2	2	5.4	1	7	14	0	14	2,212	1.3
				Subtotal		Subtotal	91	314	0	314	9,163	
Teletype Terminal Equipment and Power Supplies												
5688501	AN/SGC-1(A)	10	2	20	54.0	10	71	387	2	389	8,513	3.6
62765213	CV-2460/SGC	2	1	2	10.8	2	5	132	0	132	1,723	12.2
79736500	PP-3495	5	8	40	27.0	5	26	61	0	61	826	0.3
31062100	PP-3495(A)	5	4	20	27.0	5	14	42	0	42	246	0.4
				Subtotal		Subtotal	116	622	2	624	11,308	
				Selected Equipment Totals		Selected Equipment Totals	1,312	4,902	1,709	6,611	78,172	
				System Totals		System Totals	1,759	6,499	2,244	8,743	82,459	
				Percent of Totals		Percent of Totals	75	75	76	76	95	
Facsimile System												
Facsimile Recorders												
58724803	AN/UXH-2(C)	2	1	2	10.8	1	2	22	74	96	672	8.9
58724801	AN/UXH-2(A)	4	1	4	21.6	4	8	18	0	18	426	0.8
				Selected Equipment Totals		Selected Equipment Totals	10	40	74	114	1,098	
				System Totals		System Totals	11	40	74	114	1,160	
				Percent of Totals		Percent of Totals	91	100	100	100	95	

Newly introduced to the Teletype System is the Naval Modular Automated Communications System (NAVMACS), designated AN/SYQ-7(). In varying degrees according to level of installation, NAVMACS automates the operation of the Teletype System. No NAVMACS A+ systems were installed in DDG-37 Class ships during the data period examined. However, it is the configuration scheduled for installation on DDG-37 Class ships beginning in FY77. NAVMACS A+ equipments are identified in Appendix A and discussed further in Section 3.8.

3.3 GENERAL SYSTEM CONSIDERATIONS

For ease of discussion, the equipments listed in Table 3-1 can be grouped and identified as follows:

<u>Equipment</u>	<u>Nomenclature</u>
Model 28 Teletypewriter Sets	AN/UGC-6/13/16 AN/UGC-25() AN/UGC-20() TT-176/253()
Teletype Terminal Equipment	AN/SGC-1() CV-2460/SGC
Frequency Shift Keying Equipment	AN/URA-8/17()
Power Supply	PP-3495()
Facsimile Recorder	AN/UXH-2()

Detailed analysis of these equipments revealed that the Model 28 Teletypewriter sets as listed in Table 3-1 were responsible for 70 percent of the reported parts cost burden and 65 percent of the man-hour burden of the entire Teletype System. The remaining equipment had fewer maintenance actions over the data period, fewer man-hours, and lower expenditures for repair parts. From the data presented in Table 3-2, the Teletype System had a total 1079 repairs, with 82 percent (887) of these repairs requiring parts. Normal wear and tear was the cause of failure in 62 percent (664) of the repairs. The Facsimile System had 9 repairs reported, with 89 percent (8) of these repairs requiring parts. Normal wear and tear accounted for 67 percent (6) of these repairs to equipment of the Facsimile System.

Analysis of CASREPs submitted on Teletype and Facsimile Systems equipments revealed that only five CASREPs were reported by ships of the DDG-37 Class during the period 1 July 1973 to 30 June 1976 (see Table B-1, Appendix B). This low number of CASREPs leads to the conclusion that individual equipment malfunctions within the Teletype System do not significantly degrade system performance. In addition, CASREPs were submitted only on telegraph and teletype terminal equipment and frequency shift keying equipment. No CASREPs were reported on teletypewriter sets, power supplies, or facsimile recorders. Specifically, the power supply PP-3495() and the

Table 3-2. SELECTED MDS DATA FOR TELETYPE AND FACSIMILE SYSTEMS

Item	Description	Teletype		Facsimile	
		Total	Percent of Total	Total	Percent of Total
A	Number of Repairs	1079	100	9	100
B	Number of Repairs Requiring Parts	887	82	8	88
C	When Discovered				
	During Operation	412	38	1	11
	During Inspection	242	22	1	11
	During PMS or System Test	170	16	0	0
	When Lighting Off	77	7	7	78
	Not Applicable	180	17	0	0
D	Cause				
	Normal Wear and Tear	664	62	6	66
	Manufacture/Installation Defects	23	2	0	0
	Inadequate Instruction/Design	31	3	1	11
	Abnormal Environment	18	2	1	11
	Not Applicable	330	31	1	11
E	Capability				
	Operational	345	32	1	11
	Nonoperational	296	27	7	78
	Reduced Capability	287	27	1	11
	Other	151	14	0	0
F	Deferrals				
	Lack of Material	174	16	4	44
	Outside Assistance	459	43	0	0
	Work Backlog/Operational Priority	70	6	3	33
	Other	44	4	0	0

facsimile equipment AN/UXH-2() accounted for less than three percent of the combined systems' total dollar burden and 2 percent of the combined systems' total man-hour burden. Historically, these equipments have not presented a maintenance burden and will not require major restorative maintenance during an extended operating cycle.

3.4 MODEL 28 TELETYPEWRITER SETS

3.4.1 Background

Model 28 Teletypewriter sets are found in many variations on ships of the class as shown in Table A-1 (Appendix A). In the compilation of Table A-1 for this analysis, every effort was made to reflect accurately the types and quantities of Model 28 Teletypewriter sets installed on each ship of the class. However, not all inconsistencies among available data sources could be resolved. Therefore, Table A-1 represents the best estimate of the individual ship configurations and depicts the variations in equipment modes found throughout the class.

It is considered that a standardized teletypewriter suite among ships of the class would facilitate maintenance and repair at both the ship and the IMA level. Standardization will reduce the logistic support requirements by reducing the range of spare parts required to be carried on board individual ships of the class and by the IMA. The range of training required for teletype repairmen would also be reduced by adopting a standard suite of equipment.

In discussions with NAVELEX technical codes, it was learned that a standard suite of Model 28 Teletypewriter sets has been developed. These equipments are presented in Table 3-3. Two of the Model 28 Teletypewriter sets -- AN/UGC-16 and TT-176/UG (shown in Table 3-1) -- that reflect a relatively large maintenance burden in terms of average man-hours per equipment operating year are not included in the standardized suite. Therefore, adopting standardization would eliminate the maintenance burden associated with these equipments. Standardization should be accomplished at BOH or as soon thereafter as feasible. Determination of standard equipment quantities per ship is considered a function of the Type Commander in conjunction with the appropriate NAVELEX codes.

3.4.2 Discussion

The Model 28 Teletypewriter sets accounted for 70 percent of the total Teletype System parts cost and 65 percent of the reported man-hours. A review of MDS narratives revealed that many of the required PMS actions on teletypewriter sets are not accomplished because the ships do not have qualified teletype repairmen (NEC 2342) on board. Maintenance (overhaul) of teletypewriter equipment is then accomplished by the IMA (tender), which not only has the qualified personnel but also has the necessary facilities. Except for the Model 28 Teletypewriter sets, all other equipments listed in Table 3-1 were maintained by the Electronic Technician (ET) ratings and

Table 3-3. MODEL 28 TELETYPEWRITER
STANDARD EQUIPMENT LIST

Automatic Send and Receive

(HL)* AN/UGC-6K
(LL)* AN/UGC-48A

NTDS

(HL) AN/UGC-13 with Adapter
(LL) AN/UGC-49

Keyboard Send and Receiver

(HL) AN/UGC-20B
(LL) AN/UGC-77

Receive Only

(HL) AN/UGC-25A
(LL) AN/UGR-9

Reperforator

(HL) TT-192C
(LL) TT-605

Transmitter Distributor

(HL) TT-187C
(LL) TT-603

*HL = High Level; LL = Low Level.

were not routinely sent to the tender for repair. Similar circumstances surrounding the PMS and corrective maintenance of teletypewriter equipment were found in the FF-1052 Class Teletype and Facsimile Systems Review of Experience. As an alternative to improving individual ship teletypewriter repair capability, it was recommended that a rotatable pool concept for teletypewriter components be established, reducing the number of qualified teletype repairmen aboard ship and improving the IMA (tender) repair capability. Since the IMA (tenders) serve both the FF-1052 Class and DDG-37 Class, the same alternative (rotatable pool concept) would be applicable for the DDG-37 Class as well. Standardization, as discussed previously, will greatly enhance a transition to the IMA-level maintenance philosophy and rotatable pool concept.

3.4.3 Recommendations

For the near term, the Model 28 Teletypewriter suites should be standardized throughout the class at BOH or as soon thereafter as feasible. Until that action is accomplished, existing teletypewriter equipments should be maintained in accordance with current PMS requirements, as modified by recommendations of this report.

For the long term, the following actions should be taken:

- Expand teletype repair capability at the IMA level and have the IMA assume all responsibility for major teletypewriter maintenance. Establish rotatable pools for components of teletypewriter sets.
- Revise Maintenance Index Pages for Model 28 Teletypewriter sets to reflect the rotatable pool concept (MIPs C-89/1-66, C-368/1-66, and C-58/1-66).
- Reduce allowance of teletype repairmen (NEC 2342) in applicable Ship Manning Documents (SMDs) for DDG-37 Class ships.

3.5 TELETYPE TERMINAL EQUIPMENT

3.5.1 Background

The purpose of the Teletype Terminal is to make possible the transmission and reception of teletypewriter messages by radio communication between similarly equipped stations.

When messages are transmitted, typing on the local teletypewriter causes a direct-current series loop to open intermittently, thus forming pulses of current. Each letter has its own characteristic pattern of current pulses. These pulses are converted by the local Teletype Terminal into corresponding audio tones that modulate the local radio transmitter. Conversion of the current pulses to audio tones is accomplished by an audio oscillator in the Teletype Terminal that operates at 700 Hz when the teletypewriter loop is in a closed-circuit condition, and at 500 Hz when the loop is in an open-circuit condition. The closed-circuit condition of the loop and its related 700 Hz tone are known as "Mark". The open-circuit condition and its related 500 Hz tone are known as "Space".

When receiving messages, the terminal accepts the incoming mark and space tones from an associated radio receiver and converts the intelligence of the tones to dc pulses that actuate the teletypewriter sets.

3.5.2 Discussion

As shown in Table 3-1, the reported replacement parts cost over the data period for the AN/SGC-1(A) Teletype Terminal totaled \$8,513, total maintenance man-hours expended were reported as 389, and an average of 3.6 man-hours was expended per equipment operating year. From Table B-2 (Appendix B) one CASREP was reported on the AN/SGC-1(A) as having a total

of 22.6 days down. A review of MDS narratives revealed that the primary reasons for repair were faulty relays and failure of electron tubes. However, no particular relay or tube exhibited a replacement pattern indicative of a problem component.

From discussions with NAVEX technical personnel, it was learned that the CV-2460/SGC is replacing the AN/SGC-1(A) terminal equipment as the older equipment becomes uneconomical to repair. The CV-2460/SGC is a solid-state design, using transistors instead of tubes and relays. It is considered that this transistorized version will provide increased equipment availability for ships in or entering an EOC. As shown in Table 3-1, the CV-2460/SGC reported an average 12.2 man-hours per equipment operating year. From analysis of MDS data, it was determined that this figure reflects the man-hour burden attributed to installation of the equipment rather than to corrective maintenance actions; it is therefore not indicative of a maintenance burden. During the data period examined, no corrective maintenance actions were reported against this equipment.

3.5.3 Recommendation

For the near term, the AN/SGC-1(A) Teletype Terminal equipment should be replaced with the CV-2460/SGC on a priority basis for ships of the DDG-37 Class entering or in an EOC. Until this action is accomplished, the existing AN/SGC-1() Teletype Terminal equipment should continue to be maintained in accordance with current PMS requirements.

3.6 FREQUENCY SHIFT KEYING EQUIPMENT

3.6.1 Background

The Comparator-Converter Groups AN/URA-8() and AN/URA-17() provide a link in the receiving end of a frequency shift communications system. In this system, teletype mark and space characters are transmitted as shifts above and below a center frequency of an RF carrier. These frequency-shift-keyed (FSK) signals are translated by a standard communications receiver into frequency variations about a center frequency of 1000 or 2000 Hz. The Comparator-Converter Groups change these FSK audio signals into dc pulses for the teletype mark and space condition for teletypewriter set operation.

3.6.2 Discussion

The AN/URA-8(B) frequency shift keying equipment is the predominant model installed in the DDG-37 Class ships. From Table 3-1, the AN/URA-8(B) accounted for a reported parts cost total of \$3492 and 206 repair man-hours over the data period. Although MDS data for the DDG-37 Class on the AN/URA-17(D) were not sufficient to provide a meaningful analysis, the AN/URA-17() model is installed throughout the 46 ships of the FF-1052 Class. Analysis of MDS data for the FF-1052 Class on the AN/URA-17() equipment revealed that the equipment did not contribute significantly to the maintenance burden of the Teletype System installed on that class. From

discussions with NAVEXLEX technical personnel, it was learned that as the AN/URA-8() equipment becomes uneconomical to repair, it is being replaced with the AN/URA-17() equipment. The AN/URA-17() is a solid-state device with substantial technical improvements over the tube-type AN/URA-8(). It is considered that the AN/URA-17() will provide increased equipment availability for ships entering or in an EOC.

3.6.3 Recommendation

For the near term, the existing AN/URA-8() equipment on DDG-37 Class ships should be replaced with AN/URA-17() equipment prior to or during BOH. Until this action is accomplished, the existing AN/URA-8() equipment should continue to be maintained in accordance with current PMS requirements.

3.7 IMA TELETYPEWRITER REPAIR CAPABILITY

3.7.1 Discussion

As a part of this analysis, a visit was made to the destroyer tender USS PUGET SOUND (AD-38), and from discussions with technicians of the ship repair force, it was learned that the teletype repair shop did not have the capability to bench-check teletypewriter sets converted to use low-level keying (20 milliamperes). Conversion to low-level keying is being accomplished as specified in MIL-STD-1680. Repairs made to low-level teletypewriter sets could not be checked aboard the tender, and the sets had to be returned to the ship submitting the equipment for repair for final checkout. If repairs were found to be inadequate, the equipment was returned to the tender for rework, then back to the originating ship for bench check until the repair work checked out satisfactorily. As additional destroyers are converted to use low-level keying, it becomes increasingly important for all destroyer tenders to have the capability to repair and bench-check these equipments.

3.7.2 Recommendations

For the near term, it should be determined whether the destroyer tenders and repair ships have the capability to bench-check low-level teletypewriter sets; if they do not, this capability should be provided.

3.8 NAVMACS A+ SYSTEM

3.8.1 Background

Current shipboard methods of processing teletype message traffic involve numerous manual functions requiring many technically trained personnel. Newly introduced to the Teletype System is the Naval Modular Automated Communications System (NAVMACS), designated AN/SYQ-7(). In varying degrees according to level of installation, NAVMACS automates the majority of the previously manual functions, vastly improving the entire Teletype System.

NAVMACS A+ is the configuration being installed on the DDG-37 Class in addition to but not as a replacement for the existing teletypewriter system. The installation of NAVMACS A+ will not significantly alter the equipments required to operate the existing teletypewriter system. Since the NAVMACS A+ System is new, no MDS data were generated on the "system" during the data period examined in the preparation of this report.

3.8.2 Discussion

NAVELEX Instruction P4110.110 is the Integrated Logistics Support Plan (ILSP) for the NAVMACS A+ System. In accordance with the ILSP, IMA-level maintenance is not planned. Although none of the ships visited had NAVMACS A+ installed, discussions with the NAVELEX Equipment Acquisition Manager and personnel from MOTU indicated that on the basis of data available from other users of the equipment, the TT-624 medium-speed printer may be a maintenance burden for the DDG-37 Class. TT-624 equipments are being introduced to the DDG-37 Class with the installation of NAVMACS A+ (ShipAlt DDG-37-1136K). The installation schedule through calendar year 1978, as presented in the ILSP, shows that only the USS LUCE (DDG-38) will be fitted with NAVMACS A+. A schedule beyond that date was not available. As stated previously, maintenance data from the DDG-37 Class have not been generated on system-unique equipments. However, on the basis of the maintenance history of other teletypewriter sets [AN/UGC-6(), AN/UGC-20(), and AN/UGC-25()], it appears necessary to prepare for IMA-level maintenance of the TT-624 medium-speed printer.

3.8.3 Recommendations

For the near term, the following actions are recommended:

- Provide an IMA-level maintenance capability for teletypewriter components of the NAVMACS A+ System. This recommendation coincides with a similar recommendation for ships of the FF-1052 Class.*
- Install ShipAlt DDG-37-1136K, if possible, prior to or during Baseline Overhaul.

3.9 BASELINE OVERHAUL REQUIREMENTS

The Baseline Overhaul concept of the DDEOC Program is designed to ensure that ships entering an extended operating cycle are in a state of material condition readiness such that there is a high probability of operating throughout the extended operating cycle without major restorative maintenance. In keeping with this policy and on the basis of the analysis described in this report, recommendations for maintenance during BOH on equipments of

*DDEOC System Maintenance Analysis, FF-1052 Class Teletype and Facsimile Systems, SMA 309-445, Review of Experience, ARINC Research Publication 1652-30-2-1675, October 1977.

the Teletype and Facsimile Systems were developed. A review of the DDEOC Repair Requirements for BOH (DDG-37 Class), dated February 1977, was made to determine if the document satisfied the maintenance requirements identified by the analysis.

As a result of this review, it has been determined that the items listed in Table 3-4 should be added to the Repair Requirements for BOH (DDG-37 Class) to satisfactorily address the maintenance requirements of the total system. In addition, the Model 28 Teletypewriter equipment suites should be standardized, as discussed in Section 3.4, at BOH or as soon thereafter as feasible.

Table 3-4. RECOMMENDED CHANGES TO REPAIR REQUIREMENTS FOR BOH (DDG-37 CLASS)		
SWBS	Repair Item	Change
445	Teletype and Facsimile Systems	<ol style="list-style-type: none"> 1. Add Item 2: Teletype Terminal Equipment, CV-2460/SGC -- repair as indicated by results of POT&I and CSMP. 2. Add Item 3: Telegraph Terminal Equipment, AN/UCC-1() -- repair as indicated by results of POT&I and CSMP. 3. Add Item 4: Comparator-Converter Group, AN/URA-17() -- repair as indicated by results of POT&I and CSMP. 4. Add Item 5: Power Supply, PP-3494/3495 -- repair as indicated by results of POT&I and CSMP. 5. Add Item 6: Facsimile Recorder, AN/UXH-2() -- repair or replace as indicated by results of POT&I and CSMP.

3.10 INTRACYCLE AND FOLLOW-ON ROH MAINTENANCE REQUIREMENTS

Existing Maintenance Index Pages (MIPs) and Maintenance Requirements Cards (MRCs) for the equipments of the Teletype and Facsimile Systems have been reviewed as a part of this analysis. With the exception of the Model 28 Teletypewriter sets, the existing intracycle PMS actions are considered appropriate and adequate for maintaining the equipment during the Engineered Operating Cycle. Recommended changes to PMS requirements for intracycle maintenance of teletypewriter sets have been discussed in Section 3.4.

Intracycle corrective maintenance for teletypewriter sets should be accomplished by the tender, and corrective maintenance on other equipments of the Teletype and Facsimile Systems should be accomplished by the Ship's Force. ROH maintenance requirements for equipment of the Teletype and Facsimile Systems are determined to be the same as those for the BOH, as shown in Table 3-5.

Table 3-5. RECOMMENDED REPAIR REQUIREMENTS FOR
BOH AND FOLLOW-ON ROH (DDG-37 CLASS)

Equipment	Repair
Model 28 Teletypewriter Sets Automatic Send and Receive (HL) * AN/UGC-6K (LL) * AN/UGC-48A	Class "B" Overhaul
NTDS (HL) AN/UGC-13 with Adapter () (LL) AN/UGC-49()	Class "B" Overhaul
Keyboard Send and Receive (HL) AN/UGC-20B (LL) AN/UGC-77	Class "B" Overhaul
Receive Only (HL) AN/UGC-25A (LL) AN/UGR-9	Class "B" Overhaul
Reperforator (HL) TT-192C (LL) TT-605	Class "B" Overhaul
Transmitter Distributor (HL) TT-187C (LL) TT-603	Class "B" Overhaul
Teletype Terminal Equipment CV-2460/SGC	Repair as indicated by results of POT&I and CSMP.
Telegraph Terminal Equipment AN/UCC-1()	Repair as indicated by results of POT&I and CSMP.
Comparator-Converter Group AN/URA-17()	Repair as indicated by results of POT&I and CSMP.
Power Supply PP-3494/3495	Repair as indicated by results of POT&I and CSMP.
Facsimile Recorder AN/UXH-2()	Repair or replace as indicated by results of POT&I and CSMP.
*HL = High Level; LL = Low Level.	

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CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The following significant conclusions resulted from this Review of Experience:

- The DDG-37 Class Facsimile System has not been a significant maintenance burden.
- Reduced system capability, as indicated by CASREPs, has not been frequent or severe; downtime resulting from the few reported failures has not been significant for the Teletype and Facsimile Systems.
- Overhaul of the major equipments of the Teletype System should be accomplished during the Baseline Overhaul.
- Major restorative maintenance should not be required on these systems during the Engineered Operating Cycle.
- Repairs required during the follow-on ROH are projected to be the same as those identified as necessary for the BOH.
- The maintenance philosophy should be changed so that the IMA will assume all of the major teletypewriter maintenance and rotatable pools of teletypewriter components will be established at the IMA.

4.2 RECOMMENDATIONS

Specific recommendations of this Review of Experience are summarized in Table 4-1. Action items resulting from these recommendations are listed in Appendix C.

Table 4-1. SUMMARY OF PROBLEMS AND RECOMMENDATIONS

Equipment	Problem Description	Recommendation
Reliability and Maintainability Improvements		
Model 28 Teletypewriter Sets	Ships of the class have a variety of Model 28 Teletypewriter sets with no two ships having the same configuration. Because of the lack of qualified repair personnel and facilities aboard ship, the majority of corrective maintenance is being accomplished at the IMA.	Standardize the Model 28 Teletypewriter suites throughout the class at BOH or as soon thereafter as feasible. Task the IMA to accomplish all major teletypewriter repairs. Establish rotatable pools of teletypewriter equipment components at the IMA. Increase the allowance of teletype repairmen at the IMA level and concurrently reduce allowance on board DDG-37 Class ships.
Teletype Terminal, AN/SGC-1()	Obsolete tube-type equipment will be a maintenance burden for ships in an EOC.	Replace, on a priority basis, obsolete equipment with solid-state CV-2460/SGC for DDG-37 Class ships entering or in an EOC.
Comparator-Converter, AN/URA-8()	Obsolete tube-type equipment will be a maintenance burden for ships in an EOC.	Replace, on a priority basis, obsolete equipment with solid-state AN/URA-17() for DDG-37 Class ships entering or in an EOC.
Teletypewriter Equipment	Low-level requirements for shipboard teletypewriter installations are established by MIL-STD-1680. Not all of the destroyer tenders have the capability to bench-check low-level teletypewriter equipment.	Provide all destroyer tenders with the capability to bench-check low-level teletypewriter equipment.
NAVMACS A+ System	Current teletype system operation requires the performance of many manual functions by highly qualified personnel. NAVMACS A+ automates many of these functions and improves system performance. The NAVMACS A+ ILSP indicates that IMA-level maintenance is not planned for this system. Historically, the IMA has had a significant role in overhaul and repair of teletypewriter equipment.	Install ShipAlt DDG-37-1136K prior to or during BOH. Provide an IMA-level maintenance capability for NAVMACS A+ System teletypewriter components.
Planned Maintenance System Changes		
Model 28 Teletypewriter Sets	Qualified teletype repairmen are required to accomplish PMS. Personnel are not readily available on board each ship to perform PMS.	Provided the recommended revised maintenance philosophy for Model 28 Teletypewriter sets is accepted, MIPs should be altered to reflect the change.
Integrated Logistic Support Requirements		
Model 28 Teletypewriter Sets	Standardization of equipment suites will necessitate review of spare parts requirements.	Concurrent with standardization of equipment suites, update COSALS and ensure that standard equipment spares are adequately stocked on board.
Baseline Overhaul Changes		
Teletype Terminal, CV-2460/SGC	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Telegraph Terminal, AN/UCC-1()	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Converter-Comparator, AN/URA-17()	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Power Supply, PF-3494/3495	No repair requirements have been established for Baseline Overhaul.	Repair at BOH as indicated by results of POT&I and ships' CSMP.
Facsimile Recorder, AN/UXH-2()	No repair requirements have been established for Baseline Overhaul.	Repair or replace at BOH as indicated by results of POT&I and ships' CSMP.

SOURCES OF INFORMATION

Specific sources of information used as the basis for the Review of Experience of the Teletype and Facsimile Systems are listed below.

1. NAVSHIPS Technical Manuals: See listing in Tables A-2 and A-3 (Appendix A).
2. CASREP Narrative Summaries for the period 1 July 1973 through 30 June 1976, FMSO Report 4400.28 Series.
3. Maintenance Requirement Cards (MRCs) as listed on Teletype and Facsimile System equipment MIPs.
4. Generation IV MDS Part and Maintenance Data for DDG-37 Class for the period 1 January 1970 through 31 October 1976.
5. DDEOC Repair Requirements for BOH (DDG-37 Class) dated February 1977.
6. Applicable DDG-37 Class Ship Alterations.
7. Type Commander's COSAL, SURFLANT and SURFPAC, dated 28 April 1976 and 23 June 1976, respectively.
8. Allowance Parts List (APLs) for selected components of the DDG-37 Class Teletype and Facsimile Systems.
9. NAVELEX Instruction P4110.110, dated November 1976, Integrated Logistics Support Plan (ISLP) for the Naval Modular Automated Communications System (NAVMACS A+).

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APPENDIX A

DDG-37 CLASS TELETYPE AND FACSIMILE SYSTEMS BOUNDARIES

The systems discussed in this report consist of the equipments listed in Table A-1. The table also lists APL numbers and APL quantities per ship. In the development of this table, an attempt was made to resolve inconsistencies among Type Commander's COSAL and MDS reporting data, but not all inconsistencies could be resolved. This configuration is the best estimate from all available data sources. Table A-2 is a list of equipment and the applicable NAVSHIPS Technical Manuals. Table A-3 is a list of equipment for the NAVMACS A+ System, the quantity intended to be installed on each ship of the DDG-37 Class, and the applicable NAVSHIPS Technical Manuals.

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Table A-1. CONFIGURATION DATA FOR THE TELETYPE AND FACSIMILE SYSTEMS
(DDG-37 CLASS)

Teletype System											
Nomenclature	APL/CID	Hull Numbers									
		DDG-37	DDG-38	DDG-39	DDG-40	DDG-41	DDG-42	DDG-43	DDG-44	DDG-45	DDG-46
Automatic Send & Receive											
AN/UGC-6(K)	58138242	3	6	3	2	1	1	2	3	1	1
AN/UGC-8A	58138405										1
AN/UGC-13(NTDS)	58138900	2	2	2	2	2	2	2	2	3	1
AN/UGC-16()	58139050										2
AN/SGA-3(Model 19)	56885600CL	1						1	1		
Keyboard Send & Receive											
AN/UGC-20	58139031			1							
AN/UGC-20(A)	58139029	2	3		3			1	1	3	2
AN/UGC-20B	58139038					1	1				
TT-70A	92822501								4		
TT-176A	92832705	1							2		
TT-176B	92832710				1						
TT-234/SGA-3	92838500	1				1		1	1		
TT-358	92854701		1								
TT-437	92863700	1	1			3			4		
Receive Only											
AN/UGC-25	58139025						3	1		5	4
AN/UGC-25A	58139036	9	9	9	9	9	6	8	9	4	5

(continued)

Table A-1. (continued)

Teletype System										
Nomenclature	APL/CID	Hull Numbers								
		DDG-37	DDG-38	DDG-39	DDG-40	DDG-41	DDG-42	DDG-43	DDG-44	DDG-45
Reperforator										
TT-192	92834300	1			1				2	
TT-192 (A)	92834305			2	3					2 1
TT-192 (C)	92834307		6	4	4	6	6	6	4	6 7
TT-253	92839400	2							1	1 1
TT-266	92818102		1							
Transmitter/Distributor										
TT-187	92833800				1				2	
TT-187 (A)	92833805									1 3
TT-187 (C)	92833811				1	1				1
TT-311	92847600		2	2	2					3 1
TT-439	92856102		1							
Power Supplies										
PP-3494	79736400		1			1				
PP-3495	79736500						6			
PP-3495 (A)	31062100			4	4	6			6	1 3
PP-3495 (B)	31062102			2						3 3
PP-3495 (C)	79736520	6	6				6			2
PP-3494B	31062101SA									
										3

(continued)

Table A-1. (continued)

Teletype System											
Nomenclature	APL/CID	Hull Numbers									
		DDG-37	DDG-38	DDG-39	DDG-40	DDG-41	DDG-42	DDG-43	DDG-44	DDG-45	DDG-46
Teletype Terminal											
AN/SGC-1 (A)	56888501	3	1	2	2	2	2	2	2	2	3
CV-2460/SGC	62765213		2							1	
Telegraph Terminal											
AN/UCC-1 (A)	58123151CL				1			1	1	1	
AN/UCC-1 (C)	58123153CL										1
AN/UCC-1 (D)	58123154CL	1	1	1		1	1				
Frequency Shift Keying Equipment											
AN/URA-8A	58430701										1
AN/URA-8B	58430705	2		1	2			2	2	1	1
AN/URA-17	58431600		2	1							1
AN/URA-17 (C)	58431601	2				2	2			1	4
Patch Panels											
SB-1203/UG	85220300	5	3	4				4	4	4	
SB-1203 (A) /UG	85220301		2		4	4	4				
SB-1210/UG	85221000		3	2	2	1	1	5	1	3	
SB-1210 (A) /UG	85221001	4	1	2	2	3	2		2		

(continued)

Table A-1. (continued)

Facsimile System											
Nomenclature	APL/CID	Hull Numbers									
		DDG-37	DDG-38	DDG-39	DDG-40	DDG-41	DDG-42	DDG-43	DDG-44	DDG-45	DDG-46
Facsimile Recorder											
AN/UXH-2	58724300		1								
AN/UXH-2(C)	58724803					1		1			
Facsimile Converter											
CV-1066	62766600		1			1		1			

Table A-2. TELETYPE AND FACSIMILE SYSTEM EQUIPMENTS	
Nomenclature	Technical Manual Number
Teletype System	
Automatic Send and Receive (ASR) AN/UGC-6 () AN/UGC-13 () (NTDS) AN/UGC-16 ()	0967-173-6010/20/30 0967-972-7010/20/30 0967-173-6010/20/30
Key Card Send and Receive (KSR) AN/UGC-20 () TT-176 ()/UG	0967-059-9010/20/30/40 0967-059-9010-20/30/40
Receive Only (R/O) AN/UGC-25 ()	0967-059-9010/20/30/40
Reperforator TT-192 () TT-253 ()/UG	0967-LP-173-9010/20/30 0967-LP-173-9010/20/30
Transmitter/Distributor TT-187 ()/UG	0967-061-0000
Power Supply PP-3494 () PP-3495 ()	0967-880-0010 0967-880-0010
Teletype Terminal Set AN/SGC-1 () CV-2460/SGC	0967-116-2010/20/30 0967-116-3010 0967-386-3010
Telegraph Terminal Set AN/UCC-1 ()	0967-239-4010
Frequency Shift Keying Equipments AN/URA-8 () AN/URA-17 ()	0967-340-0010 0967-438-4010
Communications Patch Panel SB-1203 ()/UG (Low Level) SB-1210 ()/UGQ (High Level)	0281-071-0500 0281-071-0500
Facsimile System	
Facsimile Recorder AN/UXH-2 ()	0967-287-9010
Facsimile Converter CV-1066 () RO-160/UX	0967-871-5230

Table A-3. NAVMACS A+ EQUIPMENT CONFIGURATION

Nomenclature	APL Number	Quantity per Ship	Technical Manual Number
Data Processing Set AN/UYK-20X(V)	58735726CL	1	0967-LP-598-1000/10/ 20/30/40/50/60/90
Interconnecting Group ON-143(V)4/USQ	Not Assigned	1	TP 507
Converter Patch Panel CV-3022/UG	62765466	1	0967-LP-438-7010
Teleprinter TT-624(V)5/UG	92818120	2	0967-LP-544-0010/20
Recorder-Reproducer RD-396(V)/U RD-397/U	81674324 81674323	1 1	TP 506 TP 914
Reperforator TT-192C	92834307	1	0967-LP-968-3010
Teletypewriter Set AN/UGC-20(A)	58139029 58139038	1	0967-059-9010/20/30
Distributor-Transmitter TT-187/UG	92833800	1	0967-061-0000

APPENDIX B

CASREP SUMMARY ANALYSIS

CASREPs for the DDG-37 Class, covering the period 1 July 1973 through 30 June 1976, were analyzed to determine the types of critical failures experienced by the Teletype and Facsimile Systems. A total of five CASREPs were reported. Table B-1 shows the number and percentage of the total CASREPs reported against the various equipments that constitute the Teletype System.

Table B-1. DDG-37 CLASS TELETYPE AND FACSIMILE SYSTEMS CASREP SUMMARY		
Equipment	CASREPs Reported	
	Number	Percent of System Total
AN/SGC-1()	1	20
AN/URA-17B	2	40
AN/URA-17D	1	20
CV-2460/SGC	1	20
Total	5	100

APPENDIX C

DDEOC ACTION TABLE

DDEOC action items are presented in the table of this appendix. The table is formatted to provide the implementation status of changes through completion of the Class Maintenance Plan and to serve as a ready reference to specific sections in Chapter Three that address in detail the problem involved.

DDEOC ACTION

1 ACTION ITEM*		2 DDEOC EVALUATION**	3 ACTION ITEM DESCRIPTION	4 REPORT REFERENCE (PARA.)
a NO.	b TITLE			
	Model 28 Teletypewriter Sets		Standardize Model 28 Teletypewriter suites through the class.	3.4
			Update COSALS and ensure spares for standard equipment are adequately stocked on board.	3.4
			Investigate feasibility of establishing rotatable pools for components of teletypewriter sets.	3.4
			Expand teletype repair capability at the IMA level and establish rotatable pools for components of teletypewriter sets.	3.4
			Revise MIPs if rotatable pool is established.	3.4
			Reduce allowance of teletype repairmen RM (NEC 2342) on DDG-37 Class ships if IMA capability is expanded.	3.4
			Accomplish Class B overhaul at BOH.	3.9
	Teletype Terminal Equipment AN/SGC-1()		Replace with CV-2460/SGC.	3.5
	Comparator-Converter (AN/URA-8()		Replace with AN/URA-17().	3.6
	Teletypewriter Repair Capability		Provide the IMA with capability to bench-check low-level teletypewriter sets.	3.7
	NAVMACS A+ System		Provide IMA-level maintenance for teletype components of NAVMACS A+ System.	3.8
			Accomplish ShipAlt DDG-371136K prior to or during BOH.	3.9
	Comparator-Converter AN/URA-17()		Add to Repair Requirements for BOH (DDG-37 Class).	3.9
	Teletype Terminal CV-2460/SGC		Add to Repair Requirements for BOH (DDG-37 Class).	3.9
	Telegraph Terminal AN/UCC-1()		Add to Repair Requirements for BOH (DDG-37 Class).	3.9
	Power Supply PP-3494/3495		Add to Repair Requirements for BOH (DDG-37 Class).	3.9
	Facsimile Recorder AN/UXH-2()		Add to Repair Requirements for BOH (DDG-37 Class).	3.9

* NOTE 1: DEVELOPING ACTIVITY FILL IN THE FOLLOWING BLOCKS: 1a, b; 3; 4; 5 (IF KNOWN); 6a, IF REQUIRED FOR CONTINUATION

** NOTE 2: DDEOC EVALUATION - APPROVED, FURTHER STUDY REQ'D, ETC.

† NOTE 3: RESPONSIBILITY - ACTIVITY RESPONSIBLE FOR TAKING THE ACTION.

SHIP CLASS: DDG-37 ClassSMA NO: 37-302-445SYSTEM: Teletype and Facsimile**DDEOC ACTION TABLE**

	4 REPORT REFERENCE (PARA.)	5 RESPONSIBILITY †	6 SCHEDULING DATES			7 REMARKS, FUNDING IMPLICATIONS, ETC.	8 ACTUAL ACTION TAKEN
			a REQD.	b START	c COMP.		
r stan- ked on	3.4	NAVSEA/NAVELEX/ TYCOM					
	3.4	NAVSEA					
shing	3.4	NAVSEA/NAVELEX					
at the ols ets.	3.4	NAVSEA/NAVELEX					
lished.	3.4	NAVSEA/NAVELEX					
rmen s if	3.4	NAVSEA/BUPERS					
	3.9	NAVSEA/NAVELEX					
	3.5	NAVSEA/NAVELEX					
	3.6	NAVSEA/NAVELEX					
o bench- ts.	3.7	NAVSEA/NAVELEX					
tele- tem.	3.8	NAVSEA/NAVELEX					
lor to	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					
H	3.9	NAVSEA/NAVELEX					

REQUIRED FOR CONTINUATION OF DEVELOPING ACTIVITY TASK; 7, AS NECESSARY.