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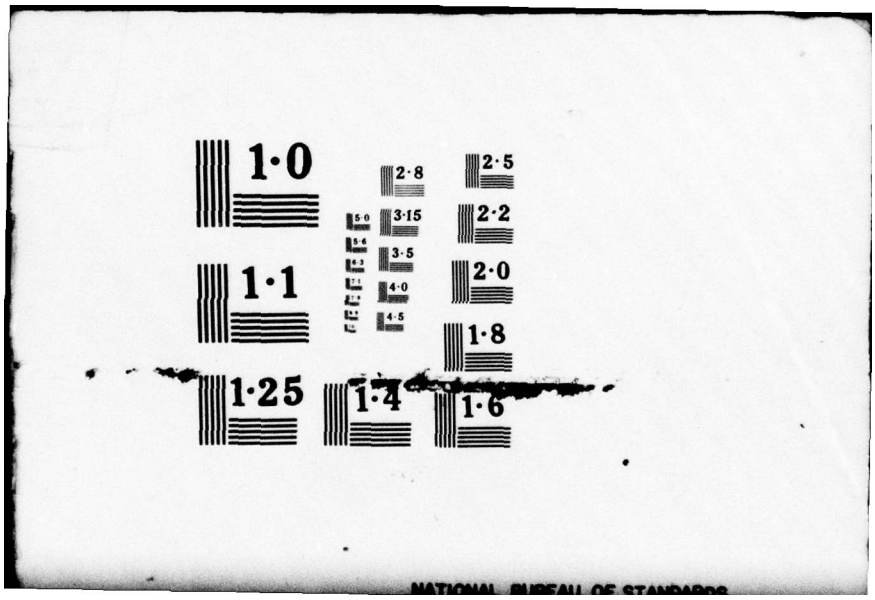
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COST-EFFECTIVENESS COMPARISON OF SHIPBOARD TELEGRAPH TERMINAL EQUIPMENTS

AN/UCC-1C(V) AND AN/UCC-1(V)

November 1967

Prepared for
NAVAL SHIP ENGINEERING CENTER
COMMAND AND SURVEILLANCE DIVISION
Code 6181
Under Contract N00024-67-C-1182

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The report identifies reliability problems of the teletype- communication system and recommends actions to correct them.

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By
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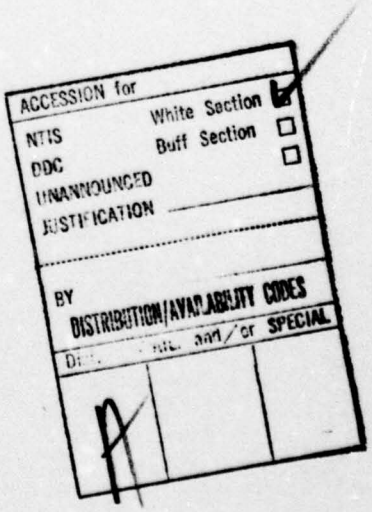
ABSTRACT

A shipboard surveillance and an engineering analysis were performed by ARINC Research Corporation to compare the cost-effectiveness of the microelectronic AN/UCC-1C teletype-communication terminal equipment with that of the AN/UCC-1 transistorized terminal equipment.

The data employed included those obtained from observations made aboard the USS Topeka (CLG-8) and the USS Cavalier (APA-37), data extracted from the Navy Maintenance Data Collection System (MDCS), and procurement-cost data.

Insufficient data were available to identify any difference in effectiveness between the UCC-1C and the UCC-1 terminal equipments. However, there was a reduction in cost in the UCC-1C.

The report identifies reliability problems of the teletype-communication system and recommends actions to correct them.



SUMMARY

The objective of this study was to compare the effectiveness of the AN/UCC-1C with that of a conventional transistorized telegraph terminal (AN/UCC-1). The study comprised four tasks:

(1) Shipboard Surveillance

(2) Data Collection

(3) Cost-Effectiveness Analysis

(4) System Analysis of Overall Communication Network

The major difference between the UCC-1C and the UCC-1 is that the UCC-1 employs transistors in the circuits, while the UCC-1C employs microelectronic integrated circuits. Table S-1 compares components used in the UCC-1C and UCC-1 terminal equipment. In the converters the number of active elements decreased from 35 (14 transistors and 21 diodes) in the UCC-1 to 29 (4 integrated circuits, 6 transistors, and 19 diodes) in the UCC-1C. The number of active elements in the keyers increased, but these elements were added deliberately to provide better frequency stability in the transmit function.

TABLE S-1

COMPARISON OF QUANTITIES OF SEMICONDUCTORS USED IN AN/UCC-1C AND AN/UCC-1

Number of Semiconductors Used						
AN/UCC-1			AN/UCC-1C			
			Integrated Circuits			
Type of Module	Transistors	Diodes	Number of IE Circuits	Number of Active Transistors In IE Circuits	Transistors	Diodes
Keyer	5	5	10	92	2	16
Converter	14	21	4	20	6	19
Control Attenuator	0	0	2	10	2	5
Test Set	7	8	10	102	4	73

Shipboard surveillance was conducted by ARINC Research monitors aboard the USS Topeka from 17 April through 11 August 1967 and aboard the USS Cavalier from 26 June through 18 September, 1967.

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A total of 2800 operating hours were accumulated on the UCC-1C and UCC-1 equipments aboard the USS Topeka and a total of 1100 operating hours were acumulated on the UCC-1C equipment aboard the USS Cavalier. During the entire surveillance period only 2 malfunctions were observed, both of which occurred aboard the USS Topeka. Both malfunctions were similar, one occurring on the UCC-1C and the other on the UCC-1, and required minor adjustments to correct. Based on the maintenance actions (which required 45 minutes and 2 hours, 15 minutes to correct, respectively) the intrinsic availability for both equipments was computed as approximately 1.0.

An analysis of Maintenance Data Collection System (MDCS) operational reports was also conducted to substantiate the shipboard surveillance observations. The MDCS program used in the analysis covered the 15-month period between 1 April 1966 and 30 June 1967 and contained reported events from 75 ships. The results obtained from the analysis are shown in Tables S-2 and S-3. Table S-2 summarizes the maintenance events and corresponding man-hours, including the events and man-hours that could be associated with the installation of the terminal equipments. Since installation activity does not represent malfunctioning of the equipment, nor does it provide an indication of the operational reliability of the equipment, these events and man-hours were subtracted and the results tabulated in Table S-3.

TABLE S-2

SUMMARY OF MDCS MAINTENANCE DATA

Equipment Identification	Total Number Reports	Total Number Events	Total Man-Hours Expended	Number of Ships*
AN/UCC-1	193	110	2012.0	35
AN/UCC-1C	147	108	736.5	46

* Nine ships were identified as having both equipments.

TABLE S-3

SUMMARY OF MDCS MAINTENANCE DATA EXCLUDING INSTALLATION ACTIVITY

Equipment Identification	Total Number Events	Total Man-Hours Expended	Average Man-Hours Per Event	Man-Hour Range	
				Maximum Per Event	Minimum Per Event
AN/UCC-1	106	546.6	5.2	116.8	0.1
AN/UCC-1C	105	545.0	5.2	34.0	0.2

The analysis of the MDCS shows no appreciable difference in the maintenance support required for the two terminal equipments. Also, in view of the length of the period (15 months) for which data were provided, the number of events reported, and the man-hours expended for a population of 75 ships, both equipments appear to be operationally satisfactory.

COST ANALYSIS

The results of the cost analysis showed that, with the exception of procurement costs, the costs of installation and ownership of both systems were the same. The acquisition cost data showed a significant reduction in the cost of procuring the UCC-1C.

Figure S-1 reveals that the cost of UCC-1C converters becomes fairly constant when 50 or more cabinets are bought and increases rapidly when fewer than 50 are purchased. The curve representing the UCC-1 converter costs follows a trend similar to that of the UCC-1C. It appears that the cost levels out when approximately 60 or more are bought. The costs increases rapidly when fewer than 60 cabinets are bought. In addition, UCC-1 converters cost more than UCC-1C converters. For example, there is approximately a $1,000 difference in the price of

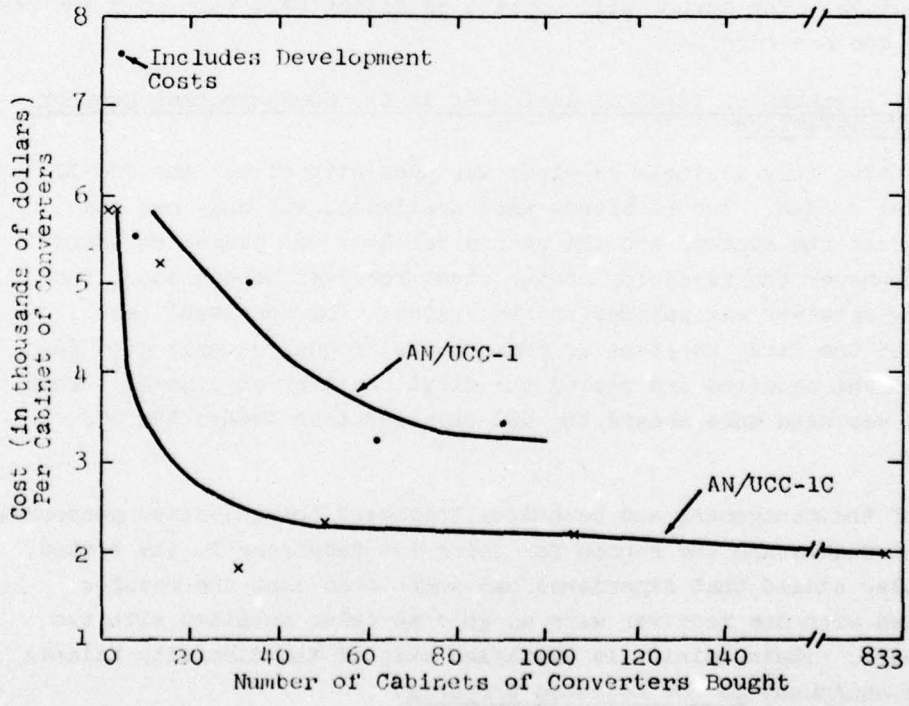

FIGURE S-1

PROCUREMENT COST OF AN/UCC-1C AND AN/UCC-1 CONVERTERS VS NUMBER OF CABINETS BOUGHT

a cabinet of UCC-1C and UCC-1 converters when about 80 cabinets are bought. This cost difference is even more significant when it is considered that development costs were all lumped in the first purchase of UCC-1 equipment and were distributed in the purchases of UCC-1C equipment.

PROBLEM IDENTIFICATION

Five major operational problems were identified during the evaluation. These were generally inter-related and are described as follows:

(1) Improper Diversity Balance

The diversity balance of every channel of telegraph terminal equipment aboard the USS Topeka and the USS Cavalier was improperly adjusted. With the improper adjustment, the advantage of using the frequency-diversity/space-diversity or frequency-diversity/R-F-diversity is lost. In a four-converter system, when the diversity is not balanced -- that is, automatic gain-control voltage of one of the converters is set higher than the other three converters -- regardless of which converter receives the strongest input signal, the converter with the highest AGC setting will produce the output signal to key the telegraph d-c loops. The other three converters and one of the receivers in the system are ineffective. The system will operate as effectively with only one converter and one receiver.

(2) Utilization of Terminal Equipment in the Communication Network Not Optimized

Frequently, only a single receiver was used with either the UCC-1C or UCC-1 system. Two receivers were available, but only one was patched to the system, and the second receiver was placed on standby. Whenever the reception on the first receiver became poor, the standby receiver was patched to the system. The operators then adjusted the first receiver or changed the frequency until good reception was obtained and placed the first receiver on standby. This method was used more aboard the USS Cavalier than aboard the USS Topeka.

Many of the management and technical shipboard communication personnel did not understand the reason for using two receivers in the system. They also stated that experience had shown them that the results obtained with one receiver were as good as those obtained with two receivers. Their opinion is justified only if the diversity balance of the equipment is not adjusted properly.

(3) Lack of Visual Malfunction Indication

There is no convenient indication of improperly operating or malfunctioning keyers and converters. If one of the keyers on a two-keyer transmit system is not operating, or up to three converters on a four-converter receive system are not operating, the radio operator is unaware of it unless he tests each module. Such tests are not periodically required; therefore, the condition will remain undetected unless the equipment fails completely.

(4) Test and Checkout Procedures Are Not Clearly Understood

There were four different opinions as to how the UCC-1C and its peripheral equipment should be set up to check and adjust the diversity balance according to the NAVSHIP Technical Manual. Only one of the four methods is correct. The improper methods observed can be attributed to a lack of understanding of the function of the telegraph terminal equipment, to the fact that the Technical Manual does not present the test procedures in terms fully understandable by the technicians, and to the fact that the manual is written with the assumption that when he conducts a test, the technical will read parts of the manual other than the one that describes the test.

(5) Test-Equipment Difficulties

The test set is not a completely self-contained unit for checking the receive-only system. To perform the diversity-balance test on the converters of UCC-1C equipment, keyers are required along with the test set to generate a test signal to the receive system. The test also requires disconnecting keyers and converters from the system and reconnecting them to each other back-to-back. After the test is completed, the keyers and converters must be disconnected and reconnected to return the system to operation. Keyers are not normally available aboard the ships that have receive capabilities only. These ships must depend on external signal sources to obtain the test signal.

ANALYSIS OF SYSTEM OUTAGES

An analysis of the communication network system in terms of unsatisfactory communications (i.e., garbled messages) was made. The record of these system outages is presented in Table S-4. On both the UCC-1C and the UCC-1 systems, 30 percent of outages were reportedly attributed to the cryptographic equipment. Approximately 45 percent of the otages involved the receiver.

TABLE S-4

SUMMARY OF COMMUNICATION NETWORK SYSTEMS OUTAGES

Deficient Equipment Identification	Total Number of Garbled Teletype Messages		
	USS Topeka		USS Cavalier
	UCC-1C System	UCC-1 System	UCC-1C System
Receiver	16	20	5
Terminal	1	1	0
Transmitter	-	3	-
Teletype	-	1	-
Cryptographic Equipment	17	17	5
Cryptographic Equipment/Receiver Combination	5	5	1
Other (Equipment un-identified - no adjustment performed)	8	5	7
Total	47	52	18
		(48 in the receive network)	

Using the hours at sea as a basis for computing MTBSO provides a better comparison of the reliability of the network system containing the UCC-1C equipment with that of the system containing the UCC-1 equipment. The following MTBSO values are obtained:

	UCC-1 Network USS Topeka	UCC-1C Network USS Topeka	UCC-1C Network USS Cavalier	UCC-1C Network Combined USS Topeka and USS Cavalier
Mean Time Between System Outages (MTBSO)	17.5 hours	16 hours	29.8 hours	20 hours

Statistical tests of significance for the differences in the MTBSO of the UCC-1 system aboard the USS Topeka, the UCC-1C system aboard the USS Topeka, and the UCC-1C aboard the USS Cavalier were performed with the F-distribution. The purpose of these tests was to determine whether the MTBSO of the UCC-1C system aboard the USS Topeka was significantly different from the UCC-1 system aboard the USS Topeka and to show quantitatively the effect of ship operations and duty at sea on the system's reliability.

From the analysis the following deductions can be drawn:

- The UCC-1C and UCC-1 system networks aboard the USS Topeka have the same MTBSO.
- The MTBSO of the UCC-1C system network aboard the USS Cavalier was higher than the one aboard the USS Topeka.
- Operational data for the systems do not indicate that the reliability of the UCC-1C system is significantly different from that of the UCC-1 system.
- The type of ship, the under-way activities aboard the ship, and the amount of communication traffic handled by the ship affect the reliability of the communication-network system.

When the ships are under way, communication activities are at maximum, and this affects the operation of the UCC-1C and UCC-1 systems. The environmental conditions -- shock, vibrations, temperature variations, ship movement, gun fire, and power interruptions -- during ship maneuvers also affect the operation of these systems.

Figure S-2 presents the nonparametric-reliability-function curves for the UCC-1C network systems and the UCC-1 network system obtained from the system-outage data.

The reliability value is plotted against the hours of system operation at sea. The graph shows the probability of no outage, i.e., the probability that the message printout on the teletype will be satisfactory for a given number of hours following a previous unsatisfactory printout.

RECOMMENDATIONS

The following recommendations resulted from the evaluation:

(1) Microelectronic Application

- A continuation study should be made with the equipment in proper configuration and properly adjusted to evaluate advantages attributable to microelectronic design.
- Microelectronic applications should be continued in future developments and modifications of the communication telegraph terminal equipment. It is recommended that a comparative review of manufacturer procedures or techniques be conducted to establish guidelines for future procurements.

(2) Technical Manual Instructions on the Method of Operation and Testing of Terminal Equipment

- An application manual, directed to supervisory personnel and describing the advantages and proper method of operation, should be prepared.
- Test and adjustment procedures should be clarified in the technical manual for telegraph-terminal equipments.

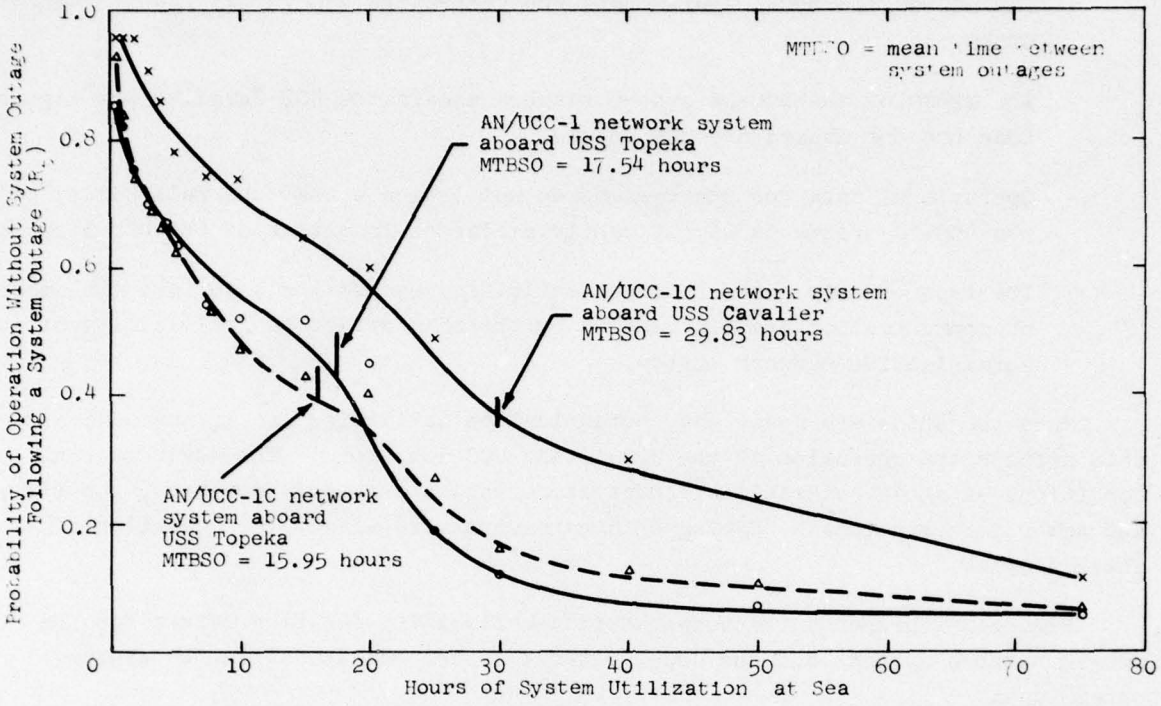

FIGURE S-2

NONPARAMETRIC RELIABILITY FUNCTIONS

- Each test procedure described in the technical manual should reference the test book or other appropriate instructions, if they have been previously discussed, or redescribe them. In general, the technical manual should be reviewed and revised so that each set of instructions is an entity and does not assume that the technician has read previous or following sections.

(3) Terminal Equipment Problems

- The feasibility of incorporating a visual indication of operation mode and malfunction should be studied. An indicator should be considered for future procurements as well as for modification to existing equipments.
- PMR cards for periodic testing and balancing should be initiated. This maintenance could be performed quarterly.

(4) Test Equipment

A completely self-contained unit should be obtained so that the recieve-only system can be tested without separate keyer modules. It is

understood that the Naval Electronic Systems Command is currently investigating this problem.

(5) Reliability of the System

A detailed study should be conducted to evaluate and define communication problems caused by receivers and cryptograph and transmitting equipments. The evaluation should quantitatively measure the effects of these equipments on system reliability and maintainability and should result in specific recommendations for corrective actions. This study could be conducted in conjunction with the microelectronic performance evaluation.

(6) MDCS Data

Better instructions should be provided to the fleet personnel for completing the MDCS forms, particularly with regard to accurate identification of the specific malfunctioning parts.

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1. INTRODUCTION

1.1 Background

The AN/UCC-1C telegraph terminal equipment was designed to employ microelectronic integrated-circuit devices. The purpose of the microelectronic application was to achieve maximum performance, reliability, and maintainability at minimum equipment cost*. Since the AN/UCC-1C is one of the first applications of microelectronic circuitry in Fleet service, it is important to the Navy to evaluate the advantages it offers and problems associated with it early in its operational phase.

1.2 Objective

The objective of this study was to compare the costs and effectiveness of the AN/UCC-1C with those of a conventional transistorized telegraph terminal (AN/UCC-1). The study comprised four tasks:

(1) Shipboard Surveillance

(2) Data Collection

(3) Cost-Effectiveness Analysis

(4) System Analysis of Overall Communication Network

1.3 Description of Terminal Equipment

1.3.1 Function

The UCC-1C and the UCC-1 are functionally the same. They are multichannel voice-frequency-carrier telegraph terminal equipments employing a frequency-division multiplex system over single-sideband radio circuits, voice-frequency wire lines, and microwave circuits.

These terminal equipments provide up to 16 different narrowband voice-frequency tone channels, each channel passing a different band of frequencies.

Associated with each channel is an oscillator which, keyed by a telegraph loop, generates one frequency representing a mark and another representing a space. These two frequencies are symmetrical with respect to the center of the channel pass band. The output from any set of different channels can be combined on a single line for transmission over a single 3-kHz bandwidth communication link**.

*See Military Specification, Carrier Telegraph Terminal Equipment, AN/UCC-1C(V), MIL-C-2361B (Ships), November 1965.

**For a 32-channel operation, multiplexer-demultiplexer units are used for transmission over a 6-kHz bandwidth communication link. Most U.S. Naval Ships, including the ships that were used during shipboard surveillance, are on a 3-kHz bandwidth communication link which requires no multiplex-demultiplexer units. Therefore, the operation of a 6-kHz bandwidth link is not discussed here.

The UCC-1 and UCC-1C equipments consist of frequency-shift keyers, converters, and control attenuators. Each frequency-shift keyer provides one channel that accepts d-c telegraph signals from an external loop, supplying the appropriate voice-frequency mark-space frequency-tone signal. The keyers are used only in the transmitting operation. Each frequency-shift converter used in the receiving operation has one channel that accepts a particular frequency tone signal, and it produces a keying signal to operate a d-c telegraph loop. The control attenuator has switches and fuses for the line power to the converters and keyers. The unit also incorporates an amplifier that maintains the composite output power at a constant level when the tones are combined.

Figure 1 is a schematic of a terminal equipment as it should be configured to obtain frequency-diversity/space-diversity or frequency-diversity/r-f-diversity for the application of a four-converter module per channel. This application is common to most U.S. Naval ships. At the transmitting location, two keyer modules are assigned to accept one d-c telegraph signal. The keyers supply two different

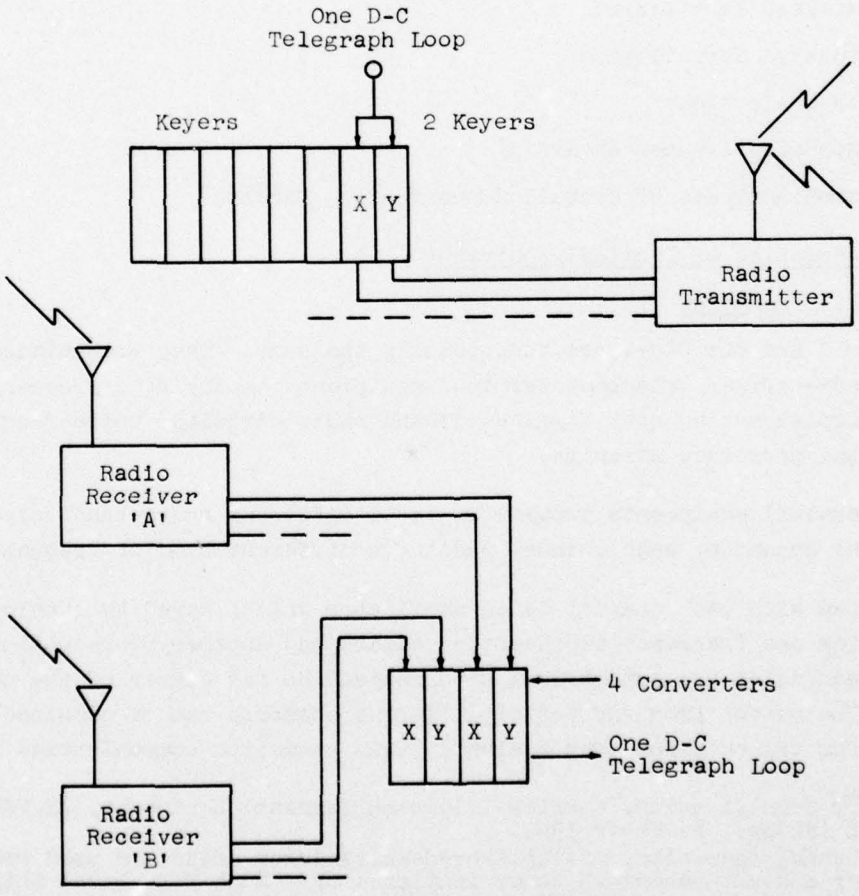


FIGURE 1

SCHEMATIC OF AN/UCC-1 AND AN/UCC-1C TERMINAL EQUIPMENT

voice frequency tone signals for transmission. At the receiving location two pairs of converter modules are assigned to each channel. One pair of converter modules (for each channel) processes signals from one radio receiver (designated Radio Receiver A), and the other pair processes signals from another receiver (designated Radio Receiver B).

In this system, the converter module receiving the strongest signal produces the keying signal to operate the d-c telegraph loop when the converters are properly balanced.

1.3.2 Physical Description

Both the UCC-1C and the UCC-1 telegraph terminals are modular carrier-telegraph equipment. Each comprises a cabinet that houses one control-attenuator module and eight frequency-shift converter modules or eight frequency-shift keyer modules (or any combination of pairs totaling eight modules of the latter two components). These will be referred to as attenuators, converters, or keyers in the remainder of this report.

The control attenuator provides the power ON-OFF switch, fuses, and blown-fuse indicator for the equipment. The keyer and the converter each consist of two sub-modules, the front and the back. The keyer is a complete self-contained, single-channel, FSK (frequency-shift keying)-tone, telegraph-transmit unit. All active circuit components of the keyer are contained on a plug-in printed-circuit board in the front sub-module. The front sub-module is completely interchangeable with the front sub-modules of all other keyers regardless of the keyers' transmitting frequencies. The converter consists of a complete single-channel FSK-tone telegraph-receive unit. All active circuit components of the converter are contained on a plug-in printed-circuit board in the front sub-module. It is also completely interchangeable with the front sub-modules of all other converters regardless of the converters' receiving frequencies.

All frequency-determining elements of both the keyers and converters are contained in their respective back sub-modules. The back sub-modules are not interchangeable.

1.3.3 Differences Between AN/UCC-1C and AN/UCC-1

The major difference between the UCC-1C and the UCC-1 is that the UCC-1 employs transistors in the circuits, while the UCC-1C employs microelectronic integrated circuits. Table 1 compares components used in the UCC-1C and UCC-1 terminal equipment.

In the converters the number of active elements decreased from 35 (14 transistors + 21 diodes) in the UCC-1 to 29 (4 integrated circuits + 6 transistors + 19 diodes) in the UCC-1C. The number of active elements in the keyers increased, but these elements were added deliberately to provide better frequency stability in the transmit function.

TABLE 1

COMPARISON OF QUANTITES OF SEMICONDUCTORS USED IN AN/UCC-1C AND AN/UCC-1

Number of Semiconductors Used						
AN/UCC-1			AN/UCC-1C			
			Integrated Circuits			
Type of Module	Transistors	Diodes	Number of IE Circuits	Number of Active Transistors In IE Circuits	Transistors	Diodes
Keyer	5	5	10	92	2	16
Converter	14	21	4	20	6	19
Control Attenuator	0	0	2	10	2	5
Test Set	7	8	10	102	4	73

To increase the transmitting frequency stability, the UCC-1C keyers make use of a seven-stage-divider flip-flop circuit, which is not available in the UCC-1 keyers. The mark-space oscillators of UCC-1C keyers operate at frequencies that are 128 times the mark-space frequencies of the broadcast channel. The oscillator frequency is divided by 128 in the divider circuit to obtain the broadcast-channel frequency. This design dampens the variations in the tone-frequency signal and is an improvement over the UCC-1 equipment.

The UCC-1C control attenuator, in addition to the power ON-OFF switch and fuse, contains a constant-level amplifier and an amplifier blown-fuse indicator on the front panel. The addition of the amplifier increased the number of active elements in the UCC-1C attenuator.

On each of the UCC-1C converters, keyers, and control attenuators, a single multiple-contact connector on the front panel mates with the cable connector of the test set. The connector provides a means of connecting module test points to the test set quickly and easily. On each of the UCC-1 converters, keyers, and control attenuators, separate test points are provided on the front panel. Separate connections from the module test points to the test set must be made when tests are being performed on the modules.

2. METHOD OF EVALUATION

2.1 Definition of Terms

Terms used throughout this report are defined as follows:

Communication Network System - UCC-1C or UCC-1 system network containing the telegraph terminal equipment, the transmitter or receiver, the transmitting medium between the transmitting and receiving stations, cryptographic equipment, and the teletypewriters.

Failure - An unsatisfactory printing output -- i.e., no copy or garbled printing, caused by a verified deficiency in the terminal equipment itself.

System Outage - Production of an unsatisfactory message output -- i.e., no copy or garbled messages as observed by, and in the judgment of, monitoring engineers.

Maintenance Action - A specific maintenance event necessary to keep an item in, or restore it to, a specified operational condition by repair or adjustment, or both.

Patched - The condition in which an equipment is electrically connected into the communication network system.

Available Time - The time the equipment is available for operation aboard the ship.

Energization Time - The calendar hours during which power was applied to the communication system network.

Utilization Time - The portion of energized time during which the telegraph terminal equipment is patched into the communication system network and is available to receive or transmit messages.

In-Port Utilization Time - The portion of utilization time during which the ship is docked.

Sea Utilization - The portion of utilization time during which the ship is under way.

The following computations are obtained from the ratios of the previously defined time periods and incidents:

$$\text{Percent Utilization} = \frac{\text{Utilization time}}{\text{Available time}}$$

$$\text{Mean Time Between System Outages During Utilization} = \frac{\text{Total Utilization Time}}{\text{Total System-Outage Incidents}}$$

$$\text{Mean Time Between System Outages During Utilization at Sea} = \frac{\text{Total Utilization-At-Sea Time}}{\text{System-Outage Incidents at Sea}}$$

2.2 Description of Monitored Terminal Equipments

The USS Topeka and the USS Cavalier were assigned by the Naval Ship Systems Command to provide the facilities necessary for shipboard surveillance. During the surveillance period both ships were performing crew-training missions.

The USS Topeka, a CLG-class crusier, had extensive communication traffic via ship-to-shore/ship-to-ship, multi-channel communication network, and voice communication systems. The training missions of the USS Topeka involved active maneuvers, gun firing, missile firing, and continuous movement at sea.

The USS Cavalier, an APA-class troop carrier, had one channel of ship-to-shore and a multi-channel communication network system. In its training missions, the USS Cavalier took on troops and, after being under way a short period, anchored not more than 20 miles from shore facilities for the disembarking and re-embarking of troops for training exercises. Upon completion of the troop training exercise, the ship would return to port.

UCC-1C equipment capable of receiving eight channels and UCC-1 equipment capable of transmitting and receiving four channels were installed aboard the USS Topeka. UCC-1C equipment capable of receiving six channels was installed aboard the USS Cavalier.

The UCC-1C system layout aboard the USS Topeka is presented in Figure 2. The UCC-1C equipment rack contained four cabinets, each cabinet holding 8 converters and one control attenuator. Thus each cabinet contained modules assigned to two communication channels. Only four channels were patched to the cryptographic equipment and the teletypewriters to receive messages. The other four channels were energized but not utilized.

The UCC-1C and UCC-1 modules, with associated equipments, for both ships are identified in Appendix A.

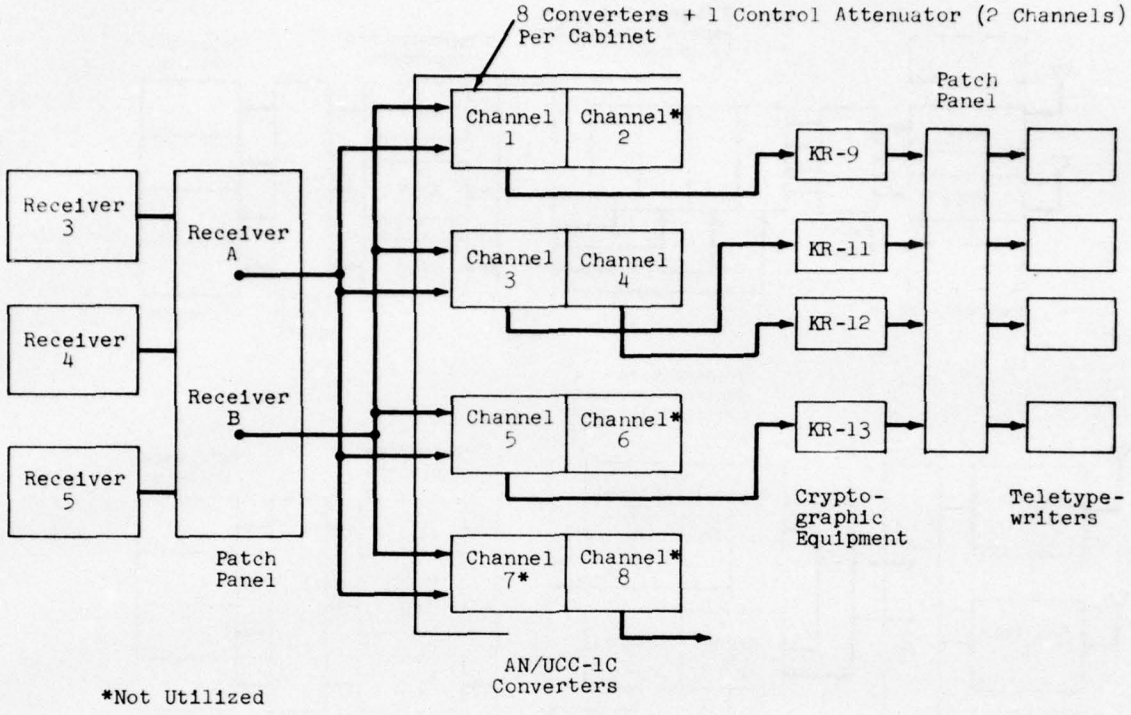


FIGURE 2

AN/UCC-1C RECEIVE SYSTEM ABOARD THE USS TOPEKA

The UCC-1 system layout aboard the USS Topeka is shown in Figure 3. The UCC-1 equipment rack contained three cabinets. One cabinet contained 8 keyers and one control attenuator for transmitting signals on four channels. Eight converters and one control attenuator were placed in each of the other two cabinets for receiving four channels. This equipment was patched into the network system only as required during ship movements.

The UCC-1C system layout aboard the USS Cavalier is shown in Figure 4. The UCC-1C equipment rack contained three cabinets, each cabinet holding 8 converters and one control attenuator. Thus each cabinet contained modules assigned to two communication channels. Only two channels were patched to the cryptographic equipment and the teletypewriters for receiving messages.

2.3 Task 1: Shipboard Surveillance

Shipboard surveillance was conducted by ARINC Research monitors aboard the USS Topeka from 17 April through 11 August 1967 and aboard the USS Cavalier from 26 June through 18 September 1967.

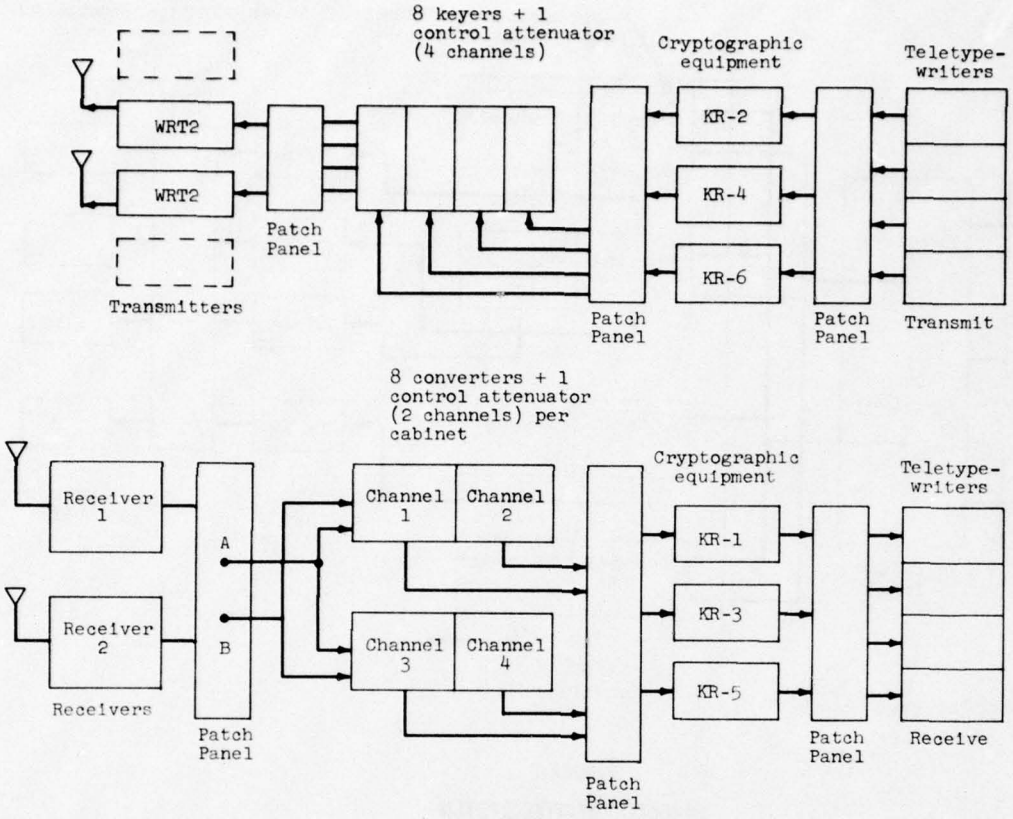
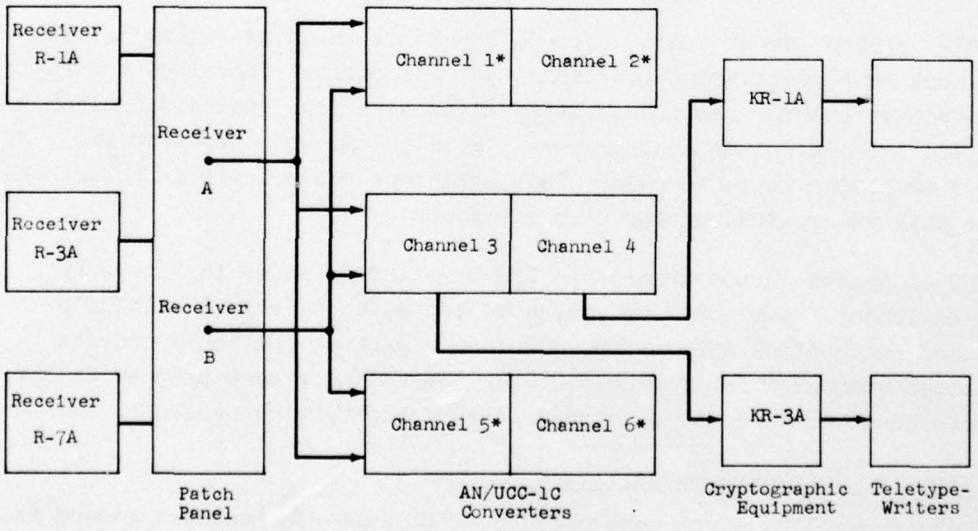


FIGURE 3

AN/UCC-1 RECEIVE-AND-TRANSMIT SYSTEM ABOARD THE USS TOPEKA



*Channels Not Utilized

FIGURE 4

AN/UCC-1C RECEIVE SYSTEM ABOARD THE USS CAVALIER

This task consisted of an initial briefing of ship personnel and the performance of the monitoring procedures and associated reporting.

2.3.1 Personnel Briefing

Before the surveillance was started, ARINC Research engineers explained the purpose of the study to the ship's communications officers and personnel and described the monitoring procedures to be conducted. The briefing helped to assure that the objectives of the evaluation program would be attained with a minimum of disruption to shipboard operations and was useful in obtaining the necessary cooperation from the communications personnel.

2.3.2 Monitoring Procedures

An ARINC Research engineer aboard each ship was stationed in the communication center, where the terminal equipment was in operation. During regular day watches or during maximum communication activity and special ship movements, the engineers obtained first-hand observations of the operation of, and maintenance performed on, major equipments in the telegraph communication network system.

If the ARINC Research monitors were absent from the location of equipment when an anomaly occurred, the monitors relied on the shipboard personnel to observe the incident and report the details. These reports were verified by discussions with the officer in charge and the Chief Petty Officers and by a review of the normal written reports maintained by the ship.

To accomplish their objectives, the monitors correlated data obtained from the ships personnel with their own observed data and recorded these data in the following reports:

Initial Report. Before the evaluation was started, assembly code numbers were assigned to all telegraph-terminal components and to the interfacing equipments, and embossed tags containing the numbers were attached to components and equipments. A list was made of the code numbers, and the information was tabulated and forwarded to ARINC Research, Annapolis, during the first week of the evaluation aboard each ship. The assigned codes are given in Appendix A.

Daily Log. Daily events and conditions that could affect the operation of the telegraph terminal equipment or interface equipments were recorded in a daily log. Copies of the daily logs were forwarded to ARINC Research, Annapolis, on a weekly basis. These logs are summarized in Appendix B.

Weekly Activities Report. Weekly activity reports summarizing significant events and conditions that occurred during the preceding week were also submitted. These reports contained

a summary of the daily log entries and an analysis of the effects of events that may not have been apparent when the daily entries were made.

Incident Report. Incident reports were used for the systematic tabulation of detail data on maintenance actions performed on telegraph terminal equipment.

Work Sheet. Work Sheets were used by the observers to record general information and draw sketches or diagrams to clarify comments made on the incident reports.

Examples of these reports, with an explanation of their content and the procedures for surveillance and preparation of report forms, are given in the appendixes.

2.4 Task 2: Additional Data Collections

Data from the 3M Maintenance Data Collection System (MDCS) was evaluated to analyze further the Fleet experience with the UCC-1C and UCC-1 communication terminal equipment. A computer run of the MDCS General Data Retrieval Program, Catalog Number MDCS-11-0-06304, was obtained. This program lists maintenance and parts-use data.

2.5 Task 3: Cost Analysis

A cost-of-ownership evaluation was performed to determine the differences in development, procurement, and installation costs of the UCC-1C and UCC-1. The development and procurement costs were obtained from the procurement contracts issued for the purchase of UCC-1C and UCC-1 equipments. Installation costs were obtained from the Long Beach Naval Shipyard in Long Beach, California.

2.6 Task 4: System Analysis of Communication Network

The objective of the system analysis was threefold: (1) to evaluate the effectiveness of the microelectronic UCC-1C equipment and compare it with the transistorized UCC-1 equipment, (2) to acquaint Navy management with the sources of communication network problems, (3) to provide a quantitative guide as to where future effort could be most profitably expended to improve the fleet communication system.

Unsatisfactory communications due directly to deficiencies in terminal equipment produce unsatisfactory printouts on the teletypewriter. These have been previously defined as system outages. Unsatisfactory printout also results from a deficiency in any of the interfacing equipments. The record of these system outages constituted the data used to perform the system analysis.

To determine any interactions between UCC-1C or UCC-1 equipment and the interfacing equipments in the system, it was necessary to evaluate the observed system outages in terms of the effectiveness of the communication network.

3. DISCUSSION OF DATA

3.1 Shipboard Data, USS Topeka

A total of 2800 operating hours was accumulated on the UCC-1C and UCC-1 equipments from the start of the evaluation on 17 April 1967 through the completion of surveillance on 11 August 1967.

3.1.1 Equipment Failures

There were no failures requiring repair or replacement of failed parts of UCC-1 equipment during the surveillance period. Therefore, no failed parts were collected for failure analyses.

3.1.2 Terminal-Equipment Maintenance Actions

A maintenance action consisting of adjustments to the UCC-1C converter was performed on 6 July 1967. Excessive garbling of channel 1 of the UCC-1C system was observed, and a teletype technician* who was familiar with the UCC-1C equipment was called to perform the maintenance. The loop-current output of converter CV-17 of the UCC-1C was checked with the telegraph distortion analyzer, and the output was found to have a distortion between 25 percent and 45 percent.

The maintenance action taken consisted of centering the delay-control screw and adjusting the bias control until the distortion was minimum. The total inoperative time of channel 1 was 45 minutes.

A similar problem on channel 3 of the UCC-1 system was observed on 7 August 1967, and a similar maintenance action was performed by the same technician. Total inoperative time of channel 3 was 2 hours, 15 minutes.

The incident report describing both of these maintenance actions is given in Appendix D.

3.1.3 Diversity-Balance Test

During a dicussion on 15 June 1967 between ARINC Research engineers and Code 6621D, NAVSEC, NORDIV, the problem of improper adjustment of diversity balance of converters on most U.S. Naval ships was reported. The ARINC Research engineer aboard the USS Topeka then requested that a diversity-balance test be conducted so that he could identify the method of testing used by the technician and determine the condition of the diversity-balance setting on the terminal equipment. This test was conducted on 21 June 1967.

*The school-trained UCC-1 technician was attending the San Diego Naval Electronic School and was not available to perform the maintenance action.

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The method of testing used by the technician is discussed in Section 4.3.4 of this report. The diversity balance of each UCC-1C channel was improperly adjusted. This was apparent because the adjustment screw on each converter was turned to the maximum clockwise setting and each had to be reset in an attempt to balance the equipment.

The technician attempted to balance the diversity; however, because of the method employed and the test equipment used, it is doubtful that the proper diversity balance was actually achieved.

Diversity-balance tests were not repeated during the remaining surveillance period. It should be noted, however, that it is possible under certain conditions to maintain communication traffic with improperly balanced equipment.

3.1.4 Unsatisfactory Communications

Incidents of unsatisfactory communications resulting in garbled messages are presented in Table 2 for the UCC-1C network system on board the USS Topeka and in Table 3 for the UCC-1 network system on board the USS Topeka. These tables identify the interfacing equipments associated with the system that were adjusted to correct the problem of unsatisfactory communications.

TABLE 2

OUTAGES OF COMMUNICATION NETWORK SYSTEM UTILIZING THE AN/UCC-1C TELEGRAPH TERMINAL ABOARD THE USS TOPEKA, 17 April to 11 August 1967

Equipment* Identification	Number of Garbled Messages on Teletype					
	April	May	June	July	August	Total
Receiver	-	7	-	5	4	16
AN/UCC-1C Telegraph Terminal	-	-	-	1	-	1
Cryptographic Equipment	2	12	-	2	1	17
Cryptographic Equipment/ Receiver Combination	-	5	-	-	-	5
Other (Equipment unidentified - no adjustment performed)	-	6	1	-	1	8
Total	2	30	1	8	6	47

*Equipment involved in corrective action.

TABLE 3

OUTAGES OF COMMUNICATION NETWORK SYSTEM UTILIZING THE AN/UCC-1 TELEGRAPH TERMINAL ABOARD THE USS TOPEKA, 17 April to 11 August 1967

Equipment*	Number of Garbled Messages on Teletype					
	April	May	June	July	August	Total
Receiver	2	10	1	1	6	20
AN/UCC-1 Telegraph Terminal					1	1
Transmitter (AN/UCC-1 Transmit System)	1	1		1		3
Cryptographic Equipment	7	8		1	1	17
Cryptographic Equipment/ Receiver Combination		1			4	5
Other (Equipment unidentified - no adjustment performed)		1			4	5
Teletype (AN/UCC-1 Transmit System)		1				1
Total	10	22	1	3	16	52

*Equipment involved in corrective action.

3.1.5 Experience of USS Topeka Personnel

The experience of maintenance technicians and radio operators who worked on the telegraph-terminal equipment aboard the USS Topeka is given in Table 4.

3.2 Shipboard Data, USS Cavalier

A total of 1100 operating hours was accumulated on the UCC-1C equipment from the start of the evaluation on 26 June 1967 through the completion of surveillance on 11 September 1967.

3.2.1 Equipment Failures

There were no failures requiring repairs or replacement of failed parts of UCC-1C equipment during the surveillance period. Therefore, no failed parts were collected for failure analysis.

TABLE 4

EXPERIENCE OF USS TOPEKA PERSONNEL

Type of Personnel	Rate	Training	Years of Service in the Navy
Radio Operator	RM2	Radioman School, Class A	4
Radio Operator	RM3	Radioman School, Class A; Teletype Maintenance School	5
Radio Operator	RM3	Radioman School, Class A	3
Maintenance Technician	ET2	Electronic Technician School, Class A & Class B; UCC-1 Maintenance School	4
Maintenance Technician	ET2	Electronic Technician School (Transistor); UCC-1C Maintenance School	(4-1/2 years of Naval Reserve)
Maintenance Technician	ET2	Radar School; Crypto School	6

3.2.2 Terminal-Equipment Maintenance Actions

No maintenance action was performed on the UCC-1C equipment.

3.2.3 Diversity-Balance Test

A shipboard technician was requested by the ARINC Research engineers to conduct the diversity-balance test. Each of the diversity-balance adjustment screws was found turned to the maximum clockwise setting, indicating that the UCC-1C channels were improperly adjusted; each had to be reset in an attempt to balance the equipment.

The technician was not able to balance the diversity of UCC-1C channels because of the lack of proper test equipment. The USS Cavalier has receive capability only in its teletype communication network system, and no keyers were available for the test.

3.2.4 Unsatisfactory-Communication

Incidents of unsatisfactory communications resulting in garbled messages are presented in Table 5 for the UCC-1C network system on board the USS Cavalier. The table identifies the interfacing equipments associated with the system that were adjusted to correct the problem of unsatisfactory communications.

TABLE 5

OUTAGES OF COMMUNICATION NETWORK SYSTEM UTILIZING THE AN/UCC-1C TELEGRAPH TERMINAL ABOARD THE USS CAVALIER, 26 June to 11 September 1967

Equipment* Identification	Number of Garbled Messages on Teletype				
	June	July	August	September	Total
Receiver	1	1	2	1	5
Cryptographic Equipment	1	3	-	1	5
Cryptographic Equipment/ Receiver Combination	-	1	-	-	1
Other (Equipment unidentified - no adjustment performed)	-	-	2	5	7
Total	2	5	4	7	18

*Equipment involved in corrective action.

3.2.5 Experience of USS Cavalier Personnel

The experience of the maintenance technicians and the radio operators* who worked on the telegraph-terminal equipment aboard the USS Cavalier is given in Table 6.

3.3 MDCS-Data Analysis

So that the history of Fleet experience with the UCC-1C and UCC-1 communication terminal equipments could be analyzed further, ARINC Research requested a 3M Maintenance Data Collection System (MDCS) computer run of maintenance events recorded by Navy personnel aboard ships using these equipments. The computer run requested was an MDCS General Data Retrieval Program, Catalog Number MDCS-11-0-06304. This program lists data elements concerning maintenance and parts use on equipments. To use the UCC-1 and UCC-1C data furnished in this program, several additional sources of information were necessary:

- Allowance Parts Lists
- Manufacturer's Procurement Contracts
- NAVSHIPS 0967-006-1003 and -0004 Active Fleet Compilation of Equipment Assignments
- ARINC Research Monitor's Daily Logs and Equipment Identification Reports

*All of the radio operators aboard the USS Cavalier were authorized to operate the UCC-1C system. The listing in Table 6 represents the operators who worked on the system most of the time during surveillance.

TABLE 6

EXPERIENCE OF USS CAVALIER PERSONNEL

Type of Personnel	Rate	Training	Years of Service in the Navy
Radio Operator	RM1	Radioman School, Class A, Class B; Teletype Maintenance School; Crypto Maintenance School	7-1/2
Radio Operator	RM2	Radioman School, Class A; Teletype Maintenance School	4
Radio Operator	RM2	Radioman School, Class A	3-1/2
Radio Operator	RM2	Radioman School, Class A	3-1/2
Radio Operator	RM3	Radioman School, Class A	3
Radio Operator	RM3	Radioman School, Class A	2-1/2
Maintenance Technician	ET2	AN/UCC-1C Maintenance School; Crypto Maintenance School	4
Maintenance Technician	ET2	AN/UCC-1C Maintenance School; Crypto Maintenance School	2-1/2

These added sources were needed to identify specifically the UCC-1C maintenance events reported in the computer program and to separate them from UCC-1 events. The data furnished in the MDCS program did not provide this separation; the Equipment Identification Code (EIC) generally identified the equipment only as the UCC-1 series and did not differentiate between the -1 and the -1C designs. A reproduction of the computer-program output used for the analysis is provided in Appendix E.

The MDCS program used in the analysis covered the 15-month period between 1 April 1966 and 30 June 1967 and contained reported events from 75 ships. With a few exceptions, i.e., where it was not possible to delineate the reported event specifically as either -1 or -1C equipment, all maintenance-action data reported were utilized in the analysis. The usable data consisted of 340 maintenance reports with "HOW MALFUNCTION" codes and the corresponding maintenance man-hours reported by the ships. The 340 reports were analyzed and reduced to represent 217 maintenance events. The completion of each general maintenance

action was considered an event. For example, an initial maintenance action that involved a delay in maintenance activity due to lack of parts, a requirement for outside assistance, or ship operations was combined with the completing action to represent a single event. In addition, maintenance actions that represented the general testing and adjusting of a set of converters over a continuous time span were combined to represent a single event. However, individual maintenance actions occurring as a result of discoveries made during the course of a general maintenance action were counted as separate events.

The results obtained from the analysis are shown in Tables 7 and 8. Table 7 summarizes the maintenance events and corresponding man-hours, including the events and man-hours that could be associated with the installation of the terminal equipments. Since installation activity does not represent malfunctioning of the equipment, nor does it provide an indication of the operational reliability of the equipment, these events and man-hours were subtracted and the results tabulated in Table 8. The similarity in the results obtained indicates that the maintainability of the two designs, from the standpoint of maintenance man-hours expended, is essentially the same.

TABLE 7

SUMMARY OF MDCS MAINTENANCE DATA

Equipment Identification	Total Number Reports	Total Number Events	Total Man-Hours Expended	Number of Ships*
AN/UCC-1	193	110	2012.0	35
AN/UCC-1C	147	108	736.5	46
*Nine ships were identified as having both equipments.				

TABLE 8

SUMMARY OF MDCS MAINTENANCE DATA EXCLUDING INSTALLATION ACTIVITY

Equipment Identification	Total Number Events	Total Man-Hours Expended	Average Man-Hours Per Event	Man-Hour Range	
				Maximum Per Event	Minimum Per Event
AN/UCC-1	106	546.6	5.2	116.8	0.1
AN/UCC-1C	105	545.0	5.2	34.0	0.2

Table 9 lists the malfunction codes reported and the number of times each was used for both designs. The table reflects the similarity in the number of events reported for each malfunction descriptor. The following malfunction descriptors were recorded on more than 60 percent of the events reported on each equipment:

Description		UCC-1C	UCC-1
No malfunction	(000)	22.7%	10.0%
Inoperative	(068)	9.3%	10.9%
Output Incorrect	(161)	12.0%	15.5%
No Output	(255)	17.6%	15.5%
Open	(450)	1.8%	10.9%

It was determined from "When Discovered" and "Action Taken" codes that the first three descriptors were used during installation activity and preventive maintenance as well as in describing corrective-maintenance actions. Unfortunately, the cause of corrective-maintenance actions could not be specifically identified because of the vague identification or nonidentification of the replaced parts. (In more than 55 percent of the reported events, replacement parts were used.) If this information had been reported in greater detail, the data could have been used with a review of the equipment schematics to identify the location and function of the source of trouble and, possibly, areas for engineering corrective actions.

The analysis of the MDCS shows no appreciable difference in the maintenance support required for the two terminal equipments. Also, in view of the length of the period (15 months) for which data were provided, the number of events reported, and the man-hours expended for a population of 75 ships, both equipments appear to be operationally satisfactory.

3.4 Cost Data

3.4.1 Development and Procurement Costs

The development and procurement costs for the UCC-1C and UCC-1 were obtained from the procurement contracts for each equipment. Since the cost and number of units bought varied considerably for each purchase, a common base had to be established to compare the relative costs of the UCC-1C and UCC-1 equipments. This base was established by calculating the cost of UCC-1C and UCC-1 converters and keyers on a per-cabinet basis. For the purpose of this analysis, a cabinet contains eight converters or eight keyers, one power-control attenuator, one test set, one technical manual, and associated hardware such as cabling, etc.

TABLE 9

HOW-MALFUNCTIONED REPORTS

Code	How-Malfunctioned Code Discription	Number of Events Reported AN/UCC-1	AN/UCC-1C
000	No Malfunction	11	24
004	Low GM or Emission	1	0
008	Noisy	0	1
021	Overloaded	0	2
054	Faulty Part	1	0
068	Inoperative	12	10
070	Broken	1	1
080	Burned Out	2	9
093	Missing Part	1	0
099	Other	0	7
117	Deteriorated	1	0
127	Adjustment Improper	5	4
160	Contact Connection Defective	0	1
161	Output Incorrect	17	13
196	Shorted	4	1
233	Erratic	1	0
242	Failed to Operate	6	2
255	No Output	17	19
276	Weak	0	1
346	Misaligned	7	3
360	Intermittent	1	0
428	Incorrect Reading	1	0
450	Open	12	2
458	Out of Balance	2	1
462	Output Too Low	0	1
472	Fuse Blown	1	0
700	Weak Electrically	3	0
750	Missing	1	1
819	Contact Not Operating Properly	1	0
884	Broken	0	1
900	Burned	1	4
	Total	110	108

The cost of a fully equipped cabinet of UCC-1C converters and keyers was compared with the cost of a similar cabinet of UCC-1 converters and keyers.

Tables 10 through 13 give the procurement cost data for the UCC-1C and UCC-1 equipments. The number of cabinets of converters bought is shown, along with the cost per cabinet and the average cost per cabinet for each purchase.

3.4.2 Installation Costs

Table 14 lists the labor and material costs associated with the installation of UCC-1C and UCC-1 equipments. The installation costs of UCC-1C and UCC-1 equipments are identical. Appendix G details the installation cost data assembled from shipyard records, supplied through the office of the Chief Planner and Estimator of the Long Beach Naval Shipyard.

TABLE 10

PROCUREMENT COSTS OF AN/UCC-1C CONVERTERS (IN DOLLARS)

Purchase Number	Number of Full Cabinets Bought	Cost Per Cabinet	Total Cost*	Average Cost Per Cabinet
1	702	1,952	1,370,304	
	17.5	1,824	31,920	
	18	1,802	32,442	
	12.5	1,867	23,335	
	44	1,781	78,364	
	10	1,867	18,668	
	2.5	1,867	4,667	
	20	4,203	84,060	
	6	4,075	24,447	2,004
2	3	1,821	5,464	
	7.5	1,887	14,154	
	16	1,801	28,812	
	3	1,821	5,464	1,827
3	48	2,378	114,132	
	28	2,859	80,052	
	13	2,224	28,912	
	10.5	2,357	24,752	
	4	1,318	5,272	2,446
4	12	2,555	30,666	
	16	2,233	35,720	
	10	2,233	22,330	
	6	2,650	15,900	
	3	2,240	6,720	
	1.5	2,368	3,552	2,369
5	0.5	5,858	2,929	5,858
6	1.5	5,858	8,787	5,858
7	2.5	5,858	14,645	
	2	4,321	8,642	
	2.5	5,010	12,525	
	6	5,379	32,274	5,237

*Development cost amortized over the production delivery schedule.

TABLE 11

PROCUREMENT COSTS OF AN/UCC-1 CONVERTERS (IN DOLLARS)

Purchase Number	Number of Full Cabinets Bought	Cost Per Cabinet	Total Cost*	Average Cost of Cabinet Per Purchase
1	4	7,557	30,228	7,557
2	2	5,464	10,928	
	5	5,557	27,784	5,530
3	24	5,040	120,960	
	8	4,924	39,392	5,000
4	44	3,265	143,660	
	16	3,190	51,036	3,245
5	20	3,956	79,105	
	16	3,509	56,140	
	52	3,190	165,867	3,420

*Development cost included in first purchase.

TABLE 12

PROCUREMENT COSTS OF AN/UCC-1C KEYERS (IN DOLLARS)

Purchase Number	Number of Full Cabinets Bought	Cost Per Cabinet	Total Cost	Average Cost of Cabinet Per Purchase
1	25	1,918	47,950	
	1	2,410	2,410	
	12	1,790	21,480	1,890

TABLE 13

PROCUREMENT COSTS OF AN/UCC-1 KEYERS (IN DOLLARS)

Purchase Number	Number of Full Cabinets Bought	Cost Per Cabinet	Total Cost	Average Cost of Cabinet Per Purchase
1	12	3,299	39,588	
	4	3,299	13,194	3,300
2	22	2,439	53,658	
	8	2,289	18,308	2,400

TABLE 14

SUMMARY OF INSTALLATION COSTS FOR AN/UCC-1C AND AN/UCC-1 TERMINAL EQUIPMENT

1. Labor Costs (Civilian Personnel)		
Shop-test terminal equipment and prepare for installation	24 man-hours	
Fabricate and install foundation aboard ship		
or		
Fabricate mounting kits and install in 19" cabinet	38 man-hours	
Shipboard installation of terminal equipment		
Install cable, connect a cold-wire check and final-test, check-out installation (includes quality-assurance services)	81 man-hours	
Total Labor Costs @ 8.50 hour	143 man-hours	$1,216
2. Material Costs		
Material used for equipment preparation and bonding (plugs - miscellaneous electrical material - bond mat).		$ 116
Material used for equipment installation (cable - mounting hardware - insulation - rubber matting)		$ 100
Material for foundations or mounting kit		$ 30
Total material		$ 246

4. ANALYSIS OF TERMINAL-EQUIPMENT PROBLEMS

Six problems associated with the performance and usage of both terminal equipments were identified and analyzed.

4.1 Proper Method of Utilization

For the UCC-1 or UCC-1C receiving system, most U. S. Naval ships are provided four converters per channel and two receivers to operate in a frequency-diversity/space-diversity mode or a frequency-diversity/r-f-diversity mode. In these modes maximum reception performance is obtained through redundancy when the equipments are adjusted and connected properly (see Figure 1).

4.2 System Operation With One Receiver

Aboard the USS Topeka and USS Cavalier, quite often a single receiver was used with the UCC-1C or UCC-1 system. Two receivers were available, but only one was patched to the system, and the second receiver was placed on standby. Whenever the reception on the first receiver became poor, the standby receiver was patched to the system. The operators then adjusted the first receiver or changed the frequency until good reception was obtained and placed the first receiver on standby. This method was used more aboard the USS Cavalier than aboard the USS Topeka.

Many of the management and technical shipboard communication personnel did not understand the reason for using two receivers in the system. They also stated that experience had shown them that the results obtained with one receiver were as good as those obtained with two receivers. Their opinion is justified only if the diversity balance of the equipment is not adjusted properly.

4.3 Improper Diversity Balance

The diversity balance of every channel of telegraph terminal equipment aboard the USS Topeka and the USS Cavalier was improperly adjusted. With the improper adjustment, the advantage of using the frequency-diversity/space-diversity or frequency-diversity/r-f-diversity is lost. In a four-converter system, when the diversity is not balanced -- that is, automatic gain-control voltage of one of the converters is set higher than the other three converters -- regardless of which converter receives the strongest input signal, the converter with the highest AGC setting will produce the output signal to key the telegraph d-c loop. The other three converters and one of the receivers in the system are ineffective. The system will operate as effectively with only one converter and one receiver.

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4.4 Test and Checkout Procedures

ARINC Research engineers discussed the test and checkout procedures for setting the diversity balance on UCC-1C equipment with the U. S. Naval Shipyard technicians, the MOTU (Mobile Technical Unit) personnel, and the technicians aboard the USS Topeka and USS Cavalier.

There were different opinions as to how the UCC-1C and its peripheral equipment should be set up to check and adjust the diversity balance according to the paragraph 2 4a(4)(b) of Technical Manual NAVSHIP 0967-046-9010, for AN/UCC-1C(V) Telegraph Terminal.

The four different procedures used by different Navy personnel to conduct the test and set the diversity balance are presented in Table 15.

According to the AN/UCC-1C(V) Technical Manual, Procedure 4 is the only correct method for conducting the test and setting the diversity balance. The improper methods described in the first three procedures for testing can be attributed to (1) a lack of understanding of the function of the telegraph terminal equipment, (2) to the fact that the Technical Manual does not present the test procedures in terms fully understandable by the technicians, and (3) the fact that the manual is written with the assumption that when conducting a test, the technician will read parts of the manual other than the one that describes the test.

4.5 Test-Equipment Problem

The test set is not a completely self-contained unit for checking the receive-only system. To perform the diversity-balance test on the converters of UCC-1C equipment, keyers are required along with the test set to generate a test signal to the receive system.

The test also requires disconnecting keyers and converters from the system and reconnecting them to each other back-to-back. After the test is completed, the keyers and converters must be disconnected and reconnected to return the system to operation.

Keyers are not normally available aboard the ships that have receive capabilities only. These ships must depend on external signal sources to obtain the test signal.

4.6 Lack of Visual Malfunction Indication

There is no convenient indication of improperly operating or malfunctioning keyers and converters. If one of the keyers on a two keyer transmit system is not operating, or up to three converters on a four-converter receive system are not operating, the radio operator is unaware of it unless he tests each module. Such tests are not periodically required; therefore, the condition will remain undetected unless the equipment fails completely.

An investigation should be conducted to determine the feasibility of incorporating a visual indicator to show that the modules are operating.

TABLE 15
VARIATIONS IN UCC-1C CHECKOUT PROCEDURES

Procedure 1:

(1) Entire system (Receiver, Crypto, UCC-1C equipment, and the Teletype) remains in service during the diversity-balance check.

(2) Use test-set TS-2232 UCC-1C(V); plug in test-set connector/adaptor to any one of the UCC-1C converters.

(3) Connect oscilloscope leads to the common and the AGC (Automatic Gain Control) pins of each converter being checked, and monitor the AGC output.

(4) The following procedure, described in paragraph 2-4d(4) (b)6 of the AN/UCC-1C(V) Technical Manual, is then performed (the procedure is reproduced below exactly as it appears in the TM):

"For four-channel diversity operation, perform the diversity balance as follows:
a Monitor the AGC test point of the Converter noted as having the second highest output.

Note

If the separation of signal levels was not sufficient to permit identification of the Converter having the second highest output, turn the DIV BAL control on the Converter with the highest output slowly counterclockwise until the signal levels separate sufficiently to permit identification of the second highest output.

b Turn the DIV Bal control on the Converter with highest output slowly counterclockwise until the AGC voltage observed on the oscilloscope reaches maximum amplitude.

Note

Do not advance the control past the maximum amplitude point.

c Connect the oscilloscope to monitor the AGC test point of the Converter noted as having the third highest output.

d Turn the DIV BAL controls on the Converters with the highest output and second highest output slowly counterclockwise. Advance each control slowly until the output no longer increases when either control is turned.

Note

Do not advance either of the controls past the maximum amplitude point.

e Connect the oscilloscope to monitor the AGC test point of the Converter noted as having the lowest output.

f Turn the DIV BAL controls on the three Converters with higher output slowly counterclockwise until the AGC output being monitored no longer increases.

Note

Do not advance any of the DIV BAL controls past the maximum amplitude point.

g Compare the AGC amplitude of all Converters in the diversity combination. If they are not equal, repeat steps b through f and readjust slightly as required. When this step has been completed, all Converters in the diversity combination have the same gain."

Procedure 2:

(1) Entire system (Receiver, Crypto, AN/UCC-1C and the teletype) remains in service (same as Item 1 of Procedure 1).

(2) Do not use test set.

(3) Connect oscilloscope leads to the common and the AGC pins of the converter being checked.

(4) Same as Item 4 of Procedure 1.

Procedure 3:

(1) Entire system may remain in service. However, better result is obtained if the receiver is taken out of the system.

(2) Use the test-set TS-2232-UCC-1C(V); plug in test set connector/adaptor to the converter. Set the tone setting on the test set to the tone frequency of the converter being checked.

(3) Connect oscilloscope leads to common and AGC output pins of the test set.

(4) Same as Item 4 of Procedure 1.

(Continued)

TABLE 15 (Continued)

Procedure 4:

Method A: When keyers are available for testing (i.e., keyers are in the system).

(1) Disconnect telegraph-terminals associated equipment from the UCC-1C System.

(2) Connect keyers and converters back-to-back.

(3) Plug in test set connector/adaptor to the keyer that corresponds to the converters being checked.

(4) Generate dot cycle with the test set.

(5) Connect oscilloscope to AGC and common pins of the converter being checked.

(6) The procedure described in paragraph 2-4d(4) (b)6 of the AN/UCC-1C(V) Technical Manual is then performed.

Method B: When keyers are not available for testing

(1) Entire UCC-1C system remains in service.

(2) Contact a ship or communication station and request transmission of dot cycle test (per Technical Manual).

(3) Connect oscilloscope to AGC and common pins of the converter being checked. (It is not necessary for the ship personnel performing the adjustments on the converter to use the test set when the dot cycle test is used.)

(4) Same as Item 4 of Procedure 1.

5. COMPARATIVE COST AND EFFECTIVENESS ANALYSIS

5.1 Effectiveness Analysis

As described in Section 3.1.2, a single malfunction on each of the UCC-1C and the UCC-1 terminal equipments was observed during the surveillance period aboard the USS Topeka.

If it is assumed* that the distributions of times to failure of the terminal equipments are exponential, the following values are obtained from the observed maintenance-action data:

Value	AN/UCC-1C Terminal Equipment	AN/UCC-1 Terminal Equipment
Number of Observed Malfunctions	1	1
Total Active Repair Time (Hours)	0.75	2.25
Total Equipment Energization Time	2800 hrs.	2800 hrs.
MTBF Based on Energization Time	2800 hrs.	2800 hrs.
Total Equipment Utilization Time (hours)	2800	848
MTBF (Mean Time Between Failures) based on utilization time (hours)	2800**	848**
Intrinsic Availability	1	1

$$\text{Intrinsic Availability}(A_j) = \frac{\text{Total Energized Time}}{\text{Total Energized Time} + \text{Total Active Repair Time}}$$

AN/UCC-1C

$$A_j = \frac{2800}{2800 + 0.75} \cong 1$$

AN/UCC-1

$$A_j = \frac{2800}{2800 + 2.25} \cong 1$$

*This assumption is based on the results of many studies that validate an exponential time to failure distribution for complex electronic equipments.

**Because of the single failure on each equipment the MTBF based on the utilization time is misleading. The different MTBF numbers are obtained because of the difference in the number of hours of utilization of the equipments during the surveillance period. With the available data it cannot be shown that there is a significant difference in MTBF between the two equipments when based on equal utilization times.

5.2 Cost Analysis

Figure 5 is a plot of the average cost per cabinet of converters as a function of the number of cabinets bought. This plot reveals that the cost of UCC-1C converters becomes fairly constant when 50 or more cabinets of them are bought and increases rapidly when less than 50 are purchased.

The curve representing the UCC-1 converter costs follows a trend similar to that of the UCC-1C. It appears that the cost levels out when approximately 60 or more are bought. The costs increases rapidly when fewer than 60 cabinets are bought.

Figure 5 shows that UCC-1 converters cost more than UCC-1C converters. For example, there is approximately a $1,000 difference in the price of a cabinet of UCC-1C and UCC-1 converters when about 80 cabinets are bought. This cost difference is even more significant when it is considered that development costs were all lumped in the first purchase of UCC-1 equipment and were distributed in the purchases of UCC-1C equipment.

Tables 12 and 13 tabulate procurement costs for UCC-1C and UCC-1 keyers, respectively. These data were not plotted, since there were too few points to establish a meaningful trend. It can be seen from Tables 12 and 13 that the cost per cabinet of UCC-1C keyers is less than that of UCC-1 keyers.

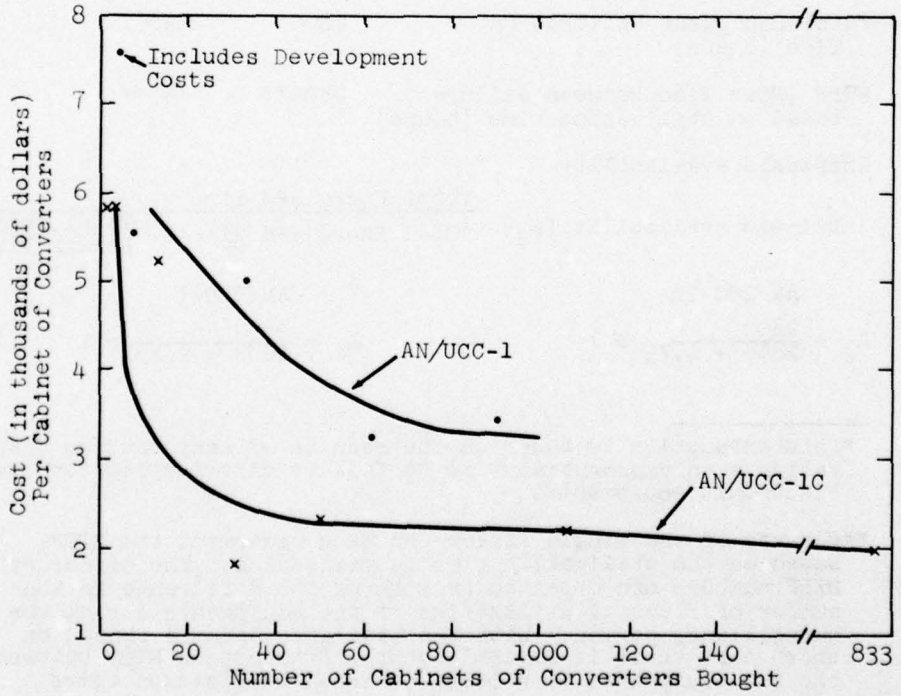

FIGURE 5

PROCUREMENT COST OF AN/UCC-1C AND AN/UCC-1 CONVERTERS VS NUMBER OF CABINETS BOUGHT

6. COMMUNICATION-NETWORK SYSTEM-RELIABILITY ANALYSIS

During the surveillance, only one malfunction was observed on each of the AN/UCC-1C and UCC-1 terminal equipments. The observed data were insufficient to determine whether there was a substantial difference in the effectiveness of the two equipments.

To make a more meaningful comparison of the operational performance of the UCC-1C and UCC-1 and to evaluate the effect of interfacing equipments on the system, communication-network system outages were analyzed.

System outages and their causes as reported by the shipboard personnel or observed by ARINC Research engineers are listed in Table 16.

6.1 Reliability of Communication Network System

Operational data for the systems do not indicate that the reliability of the UCC-1C system is significantly different from that of the UCC-1 system.

The mean time between system outages (MTBSO) for total utilization time of the network system containing the UCC-1C equipment is approximately two and one-half times greater than that of the network system containing the UCC-1 equipment; but this is a biased value. The total utilization time of the system containing the UCC-1C equipment was 2,368 hours, with 697 hours at sea and 1,671 hours in port. The total utilization time of the system containing the UCC-1 equipment was 848 hours, with 843 hours at sea and 5 hours in port. Since the rate of network system outages at sea is far greater than in port, the comparison of 1,671 in-port hours of the system utilizing the UCC-1C equipment with 5 in-port hours of the system utilizing the UCC-1 equipment will produce an unrealistic, or biased result.

Using the hours at sea as a basis of computing MTBSO provides a better comparison of the reliability of the network system containing the UCC-1C equipment with that of the system containing the UCC-1 equipment. The following MTBSO values are obtained:

	UCC-1 Network USS Topeka	UCC-1C Network USS Topeka	UCC-1C Network USS Cavalier	UCC-1C Network Combined USS Topeka and USS Cavalier
Mean Time Between System Outages	17.5 hours	16 hours	29.8 hours	20 hours

Communication-network system operational data and reliability computations are summarized in Table 17.

TABLE 16

REPORTED CAUSES OF SYSTEM OUTAGES*

Equipment	Anamoly Reported	Corrective Action Taken	Number of Outages
Receive Network System Utilizing UCC-1 Aboard USS Topeka			
Receiver R-1051	Frequency drift		10
	Poor propagation	Receiver adjusted	5
	Poor frequency reception		3
	Component failure	Receiver replaced	1
Receiver AN/SRR-19	Poor propagation condition	Receiver adjusted	1
Crypto KW-26	Crypto out of synchronization due to:	Crypto resynchronized and adjusted	
	Vibration by gun firing		6
	Power interruption		7
	Cause unknown		5
Receiver R-1051 and Crypto KW-26	Poor signal from receiver through crypto. Crypto out of synchronization	Receiver and crypto adjusted	5
Unknown	None	None	4
Receive Network System Utilizing AN/UCC-1C Aboard USS Topeka			
Receiver R-1051	Frequency drift		
	Frequency drift/poor propagation condition combination	Receiver adjusted	3
	Receiver tuned improperly		2
	Poor reception		1
Receiver AN/SRR-19	Frequency drift		1
	Poor propagation condition	Receiver adjusted	1
	Component failure	Receiver replaced	1
Crypto KG-14	Crypto out of synchronization due to:	Crypto resynchronized and adjusted	
	Power interruption		7
	Vibration by gun fire		1
	Cause unknown		10
Receiver R-1051 and Crypto KW-26	Poor signal from receiver through crypto. Crypto out of synchronization	Receiver and crypto both adjusted	5
Unknown	None	None	8

*Does not include terminal equipment malfunctions.

TABLE 16 (Continued)

Equipment	Anamoly Reported	Corrective Action Taken	Number of Outages
Transmit Network System Utilizing AN/UCC-1 Aboard USS Topeka			
Transmitter AN/WRT-2	Unable to transmit messages due to component failure	Transmitter replaced	2
	Unable to transmit messages due to lack of power to transmitter	Power restored	1
Teletypewriter (Send)	Unable to send messages due to bad connection in teletype circuit	Connection repaired	1
Receive Network System Utilizing AN/UCC-1C Aboard USS Cavalier			
Receiver R-1051	Receiver out of adjustment	Receiver adjusted	1
	Receiver not tuned properly		1
	Frequency drift		1
Receiver AN/SRR-19	Lost broadcast on set frequency (Transmitting station discontinued broadcasting)	Receiver re-set to different broadcast frequency	2
Crypto KWR-37	Crypto out of synchronization due to:	Crypto resynchronized and adjusted	
	Bad keying from transmitting station		1
	Cause unknown		3
Receiver R-1051 and Crypto KWR-37	Poor signal from receiver through crypto. Crypto out of synchronization	Receiver and crypto both adjusted	1
Unknown	None	None	8

TABLE 17

COMMUNICATION-NETWORK SYSTEM OPERATIONAL DATA AND RELIABILITY COMPUTATIONS

Parameter	Receive Network System Utilizing UCC-1 Aboard USS Topeka	Receive Network System Utilizing UCC-1C Aboard USS Topeka	Receive Network System Utilizing UCC-1C Aboard USS Cavalier
Hours Equipment Available	2800	2800	1870
Hours Equipment Energized	2800	2800	1100
Hours Equipment Utilized	848	2368	720
Percent Utilization	30%	85%	40%
Hours Equipment Utilized at Sea	843	697	485
Hours Equipment Utilized at Port	5	1670	235
Total System Outages	48	47	18
System Outages at Sea	48	43	16
System Outages in Port	0	4	2
Mean Time Between System Outages During Total Utilization (Hours)	17.5	50	40
Mean Time Between System Outages at Sea (Hours)	17.5	15.95	29.83
Mean Time Between System Outages in Port (Hours)	-	417	117

Statistical tests of significance for the differences in the MTBSO of the UCC-1 system aboard the USS Topeka, the UCC-1C system aboard the USS Topeka, and the UCC-1C aboard the USS Cavalier were performed with the F-distribution. The purpose of these tests was to determine whether the MTBSO of the UCC-1C system aboard the USS Topeka was significantly different from the UCC-1 system aboard the USS Topeka and to show quantitatively the effect of ship operations and duty at sea on the system's reliability.

The test of significance with the F-distribution is based on fundamental statistical concepts established for data that are known, or assumed, to have an

exponential distribution.* Sample means computed from exponentially distributed data are distributed as chi-square (χ^2) with $2r + 2$ degrees of freedom, where r is the number of observations (in this case the number of system outages). Also, the ratio of two χ^2 variates is distributed as an F-distribution. By use of these basic statistical principles, tests were made for significant differences in MTBSO between systems aboard the USS Topeka and systems aboard the Cavalier.

The following calculations were made:

θ_1 = MTBSO of UCC-1 System aboard USS Topeka = 17.54 hours

θ_2 = MTBSO of UCC-1C System aboard USS Topeka = 15.95 hours

θ_3 = MTBSO of UCC-1C System aboard USS Cavalier = 29.83 hours

r_1 = Number of outages of UCC-1 system aboard USS Topeka during utilization at sea = 48

r_2 = Number of outages of UCC-1C system aboard USS Topeka during utilization at sea = 43

r_3 = Number of outages of UCC-1C system aboard USS Cavalier during utilization at sea = 16

The null hypothesis that $\theta_1 = \theta_2$ was tested against the alternate hypothesis that $\theta_1 \neq \theta_2$ at the 10-percent (α) level of significance as follows:

$$\frac{\theta_1}{\theta_2} \leq F(2r_1 + 2)\ (2r_2 + 2)\ (\alpha)$$

where

$$\frac{\theta_1}{\theta_2} = \frac{17.54}{15.95} = 1.1$$

and

$$F(2r_1 + 2)(2r_2 + 2)\ (\alpha) = F(98)\ (88)\ (0.10) = 1.3$$

Since 1.1 is less than 1.3, the null hypothesis of MTBSO equality between the UCC-1C and UCC-1 aboard the USS Topeka cannot be rejected.

The same statistical test was performed for the UCC-1C system outages aboard the USS Topeka and the USS Cavalier. In this test the null hypothesis is $\theta_3 = \theta_2$ and the alternate hypothesis is $\theta_3 \neq \theta_2$.

*Tests conducted to verify the hypothesis that the system outage data have an exponential distribution indicated that at the 20-percent level of significance the hypothesis cannot be rejected. For the computer printouts of the tests, see Appendix F.

The test was made again at the 10-percent (α) level of significance; it resulted in the following:

$$\frac{\theta_3}{\theta_2} \leq {}^{F}(2r_3 + 2)\ (2r_2 + 2)\ (\alpha)$$

where

$$\frac{\theta_3}{\theta_2} = \frac{29.83}{15.95} = 1.86$$

$${}^{F}(2r_3 + 2)\ (2r_2 + 2)\ (\alpha) = {}^{R}(34)\ (88)\ (0.10) = 1.5$$

Since 1.86 is greater than 1.5, the null hypothesis is rejected.

This indicates that the MTBSO of the UCC-1C system aboard the USS Cavalier was not equal to the one aboard the USS Topeka (it was higher in this case).

From the analysis the following deductions can be drawn:

- The UCC-1C and UCC-1 system networks aboard the USS Topeka have the same MTBSO.
- The type of ship, the under-way activities aboard the ship, and the amount of communication traffic handled by the ship affect the reliability of the communication network system.

When the ships are under way, communication activities are at maximum, and this affects the operation of the UCC-1C and UCC-1 systems. The environmental conditions -- shock, vibrations, temperature variations, movement of ship, gun fire, power interruptions -- during ship maneuvers also affect the operation of these systems.

Figure 6 presents the nonparametric-reliability-function curves for the UCC-1C network systems and the UCC-1 network system obtained from the system-outage data.

The reliability value is plotted against the hours of system operation at sea. The graph shows the probability of no outage, i.e., the probability that the message printout on the teletype will be satisfactory for a given number of hours following a previous unsatisfactory printout. The method used to derive the nonparametric reliability function is presented in the ARINC Research Reliability Engineering Text*.

*Techniques Used in Computing Reliability Function", Reliability Engineering, pp. 143-149, ARINC Research Corporation, Prentice-Hall, Inc., 1965.

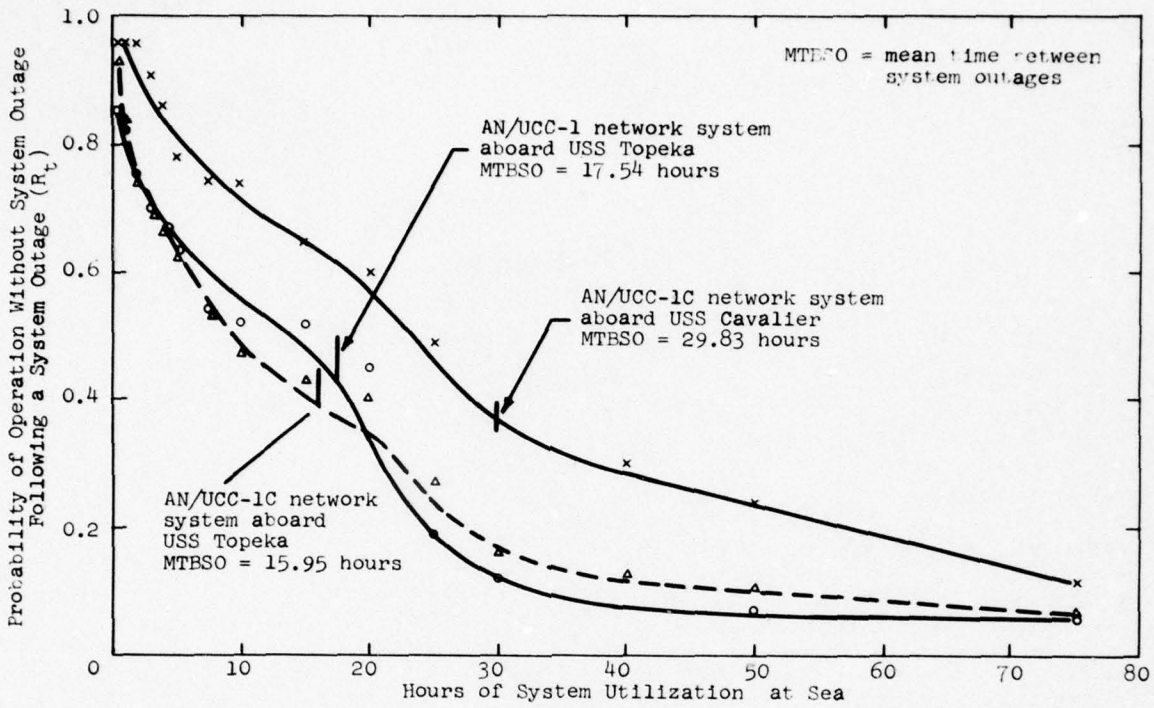

FIGURE 6

NONPARAMETRIC RELIABILITY FUNCTIONS

6.2 Analysis of System Outages

On both the UCC-1C and the UCC-1 systems, 30 percent of outages were reportedly attributed to the cryptographic equipment. Approximately 45 percent of the outages involved the receiver.

If the diversity balance on the terminal equipment were adjusted properly and the proper method of hookup (i.e., frequency-diversity/space-diversity or frequency-diversity/r-f diversity) were utilized, system outages attributable to the receiver could be reduced.

The following system outages resulting from receiver anomolies could be eliminated if the terminal equipment were correctly adjusted and balanced and a correct system configuration used:

Receiver-Caused System Outages	Number of Observed Occurrences	Situation Causing Outages
Frequency drift, poor propagation conditions, poor reception	41	Improper configuration
Crypto out of synchronization due to poor signal reception	11	Improper diversity balance

7. CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations resulting from the comparison of the UCC-1C and the UCC-1 are presented below.

7.1 Microelectronic Application

7.1.1 Conclusion

There was insufficient data and sample size to determine any quantifiable difference in the effectiveness between the observed UCC-1 and UCC-1C terminal equipments. Since neither equipment was properly used during the surveillance program, any inherent improvement in communication performance due to UCC-1C design may have been masked.

The analysis of the cost data shows that the UCC-1C provides a reduction of approximately 30 percent below the cost of the UCC-1 in converter equipment purchases in lots of 80 to 100 cabinets. A general cost reduction was observed in all UCC-1C equipment purchases.

Other military equipments have experienced operational problems with microelectronic designs (e.g., TACAN). In view of the apparent success of the application of microelectronics in the communication terminal equipment, it might be concluded that the manufacturer of this equipment has employed special design, procurement, and production procedures to ensure successful performance.

7.1.2 Recommendation

A continuation of the study should be made with the equipment in proper configuration and properly adjusted to evaluate performance advantages that can be attributed to the microelectronic design.

Microelectronic applications should be continued in future developments and modifications of the communication telegraph terminal equipment. It is recommended that a comparative review of manufacturer procedures or techniques be conducted to establish guidelines for future procurements.

7.2 Technical Manual Instructions on the Method of Operation and Testing of Terminal Equipments

7.2.1 Conclusions

Terminal equipments were not being utilized properly, because of poor understanding of the operation, advantages, and need for proper adjustment of multichannel telegraph-terminal equipments. In addition, the method of conducting tests was not fully understood by the technicians. Also, the manual assumes technicians will read parts of the manual other than the one that describes the test being conducted.

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7.2.2 Recommendations

An application manual, directed to supervisory personnel and describing the advantages and proper method of operation, should be prepared.

Test and adjustment procedures should be clarified in the technical manual for telegraph terminal equipments.

Each test procedure described in the technical manual should reference the test book or other appropriate instructions, if they have been previously discussed, or redescribe them. In general, the technical manual should be reviewed and revised so that each set of instructions is an entity and does not assume that the technician has read previous or following sections.

7.3 Terminal Equipment Problems

7.3.1 Conclusions

No convenient indicator is provided on the terminal modules for monitoring the mode of operation or determining the existence of a malfunction in the equipment.

Periodic testing of the terminal equipments to determine performance status is not currently required.

7.3.2 Recommendations

The feasibility of incorporating a visual indication of operation mode and malfunction should be studied. An indicator should be considered for future procurements as well as for modification to existing equipments.

PMR cards for periodic testing and balancing should be initiated. This maintenance could be performed quarterly.

7.4 Test Equipment

7.4.1 Conclusion

The test equipment provided for test and checkout of terminal equipments is incomplete. Currently, keyer modules must be available for performance of the test.

7.4.2 Recommendation

A completely self-contained unit should be obtained so that the recieve-only system can be tested without separate keyer modules. It is understood that the Naval Electronic Systems Command is currently investigating this problem.

7.5 Reliability of the System

7.5.1 Conclusions

The reliability of the communication network system utilizing UCC-1C or UCC-1 terminal equipments depends on the reliability of the interfacing equipments. More unsatisfactory outputs on teletype were attributed to the interfacing equipment than to the terminal equipment.

7.5.2 Recommendation

A detailed study should be conducted to evaluate and define communication problems caused by receivers and cryptograph and transmitting equipments. The evaluation should quantitatively measure the effects of these equipments on system reliability and maintainability and should result in specific recommendations for corrective actions. This study could be conducted in conjunction with the microelectronic operational performance evaluation.

7.6 MDCS Data

7.6.1 Conclusion

Although a procedure exists for reporting maintenance events through the MDCS, several additional sources of information (see Section 3.3) are required to analyze the maintenance data. Better utilization of MDCS data can be achieved from more efficient reporting.

7.6.2 Recommendation

Better instructions should be provided to the Fleet personnel for completing the MDCS forms, particularly with regard to accurate identification of the specific part name and part number of the malfunctioning parts.

APPENDIX A

IDENTIFICATION OF MONITORED AN/UCC-1C AND AN/UCC-1 EQUIPMENTS

TABLE A-1

IDENTIFICATION OF THE AN/UCC MODULES AND ASSOCIATED COMMUNICATION EQUIPMENTS ABOARD THE USS TOPEKA

ARINC Research Code Number	Equipment Identification	Part Number	Serial Number	Assignments	
				Communication Channel	Frequency
AN/UCC-1C Modules					
CY-4	Cabinet	CY-4639/UCC-1C(V)			
CV-17			A-1505	1	1785
CV-18			A-1350	1	1785
CV-19			A-1463	1	425
CV-20			A-1468	1	425
CV-21	Converter	CV-1920(P) UCC-1C(V)	A-1392	2	1955
CV-22			A-1498	2	1955
CV-23			A-1384	2	595
CV-24			A-1546	2	595
CA-4	Control Attenuator	C-6554/UCC-1C(V)	A-114		
CY-5	Cabinet	CY-4639/UCC-1C(V)			
CV-25			A-1451	3	2125
CV-26			A-1470	3	2125
CV-27			A-209	3	765
CV-28			A-1318	3	765
CV-29	Converter	CV-1920(P) UCC-1C(V)	A-1433	4	2295
CV-30			A-1420	4	2295
CV-31			A-1483	4	935
CV-32			A-1547	4	935
CA-5	Control Attenuator	C06554/UCC-1C(V)	A-118	4	
CY-6	Cabinet	CY-4639/UCC-1C(V)			
CV-33			A-1544	5	2465
CV-34			A-1432	5	2465
CV-35			A-1270	5	1105
CV-36			A-1444	5	1105
CV-37	Converter	CV-1920(P) UCC-1C(V)	A-1558	6	2635
CV-38			A-1306	6	2635
CV-39			A-1466	6	1275
CV-40			A-1590	6	1275
CA-6	Control Attenuator	C-6554/UCC-1C(V)	A-151		
CY-7	Cabinet	CY-4639-UCC-1C(V)			
CV-41			A-1521	7	2805
CV-42			A-1449	7	2805
CV-43			A-1512	7	1445
CV-44			A-1402	7	1445
CV-45	Converter	CV-1920(P) UCC-1C(V)	A-1472	8	2975
CV-46			A-1443	8	2975
CV-47			A-1453	8	1615
CV-48			A-1469	8	1615
CA-7	Control Attenuator	C-6554/UCC-1C(V)			
TS-1	Test Set	TS-2232 UCC-1C(V)			
AN/UCC-1 Associated Communication Equipment					
R-3	Receiver	R-1051/URR	B-1466		
R-4	Receiver	R-1051/URR	B-1488		
R-5	Receiver	AN/SRR-19A	28		
KR-9			153		
KR-10			154		
KR-11	Crypto	KG-14/TSEC	152		
KR-12			180		
KR-13			155		
KR-14			135		
KR-15	Crypto	KWR37	2883		

(continued)

TABLE A-1 (Continued)

AN/UCC-1 Modules

ARINC Research Code Number	Equipment Identification	Part Number	Serial Number	Assignments	
				Communication Channel	Frequency
CY-1	Cabinet	CY-3956/UCC-1(V)			
KY-1			154	1	1785
KY-2			85	1	425
KY-3			75	2	1955
KY-4			140	2	595
KY-5	Keyer	KY-490(P)-UCC-(V)	171	3	2125
KY-6			231	3	765
KY-7			204	4	2295
KY-8			112	4	935
CA-1	Control Attenuator	C-4702/UCC-1(V)	56		
CY-2	Cabinet	CY-3956/UCC-1(V)			
CV-1			173	1	1785
CV-2			306	1	1785
CV-3			472	1	425
CV-4			478	1	425
CV-5	Converter	CV-1522(P) UCC-1(V)	461	2	1955
CV-6			440	2	1955
CV-7			444	2	595
CV-8			479	2	595
CA-2	Control Attenuator	C-4702/UCC-1(V)			
CY-3	Cabinet	CY-3956/UCC-1(V)			
CV-9			230	3	2125
CV-10			219	3	2125
CV-11			388	3	765
CV-12			387	3	765
CV-13	Converter	CV-1522(P) UCC-1(V)	297	4	2295
CV-14			330	4	2295
CV-15			382	4	935
CV-16			448	4	935
CA-3	Control Attenuator	C-4702/UCC-1(V)			
TS-2	Test Set	1920A/UCC-1C(V)			
AN/UCC-1C Associated Communication Equipment					
R-1	Receiver	R-1051/URR	B-1500		
R-2	Receiver	R-1051/URR	B-1447		
KR-1		KW-26(R)	1848		
KR-2		KW-26(S)	1716		
KR-3		KW-26(R)	23347		
KR-4	Crypto	KW-26(S)	23389		
KR-5		KW-26(R)	23337		
KR-6		KW-26(S)	23388		
TR-1			111		
TR-2			221		
TR-3			268		
TR-4			222		
TR-5	Transmitter	AN/WRT-2	200		
TR-6			235		
TR-7			237		
TR-8			236		

TABLE A-2

IDENTIFICATION OF THE AN/UCC-1C MODULES AND ASSOCIATED COMMUNICATION EQUIPMENTS ABOARD THE USS CAVALIER

ARINC Research Code Number	Equipment Identification	Part Number (Honeywell Inc.)	Serial Number	Assignments	
				Communication Channel	Frequency
AN/UCC-1C Modules					
CY-1A	Cabinet	CY4639-UCC-1 UCC-1C(V)			
CV-1A			A-674	1	1785
CV-2A					
CV-2A			A-320	1	1785
CV-3A			A-489	1	425
CV-4A			A-1023	1	425
CV-5A	Converter	CV-1920P UCC-1C(V)	A-666	2	1955
CV-6A			A-992	2	1955
CV-7A			A-667	2	595
CV-8A			A-398	2	595
CA-1A	Control Attenuator	C-6554/UCC-1C(V)	A-170		
CY-2A	Cabinet	CY-4639/UCC-1C(V)			
CV-9A			A-711	3	2125
CV-10A			A-1006	3	2125
CV-11A			A-462	3	765
CV-12A			A-999	3	765
CV-13A	Converter	CV-1920(P) UCC-1C(V)	A-557	4	2295
CV-14A			A-352	4	2295
CV-15A			A-469	4	935
CV-16A			A-558	4	935
CA-2A	Control Attenuator	C-6554/UCC-1C(V)	A-199		
CY-3A	Cabinet	CY-4630-UCC-1C(V)			
CV-17A			A-4001	5	2805
CV-18A			A-3946	5	2805
CV-19A			A-4029	5	1445
CV-20A			A-4222	5	1445
CV-21A	Converter	CV-1920(P) UCC-1C(V)	A-7705	6	2975
CV-22A			A-6599	6	2975
CV-23A			A-4408	6	1615
CV-24A			A-8988	6	1615
CA-3A	Control Attenuator	C-6554/UCC-1C(V)	A-415		
TS-1A	Test Set	TS-2232/UCC-1C(V)			
AN/UCC-1C Associated Communication Equipment					
R-1A	Receiver	R-1051/URR	E-776		
R-3A	Receiver	R-1051/URR	B-832		
R-7A	Receiver	AN/SSR-19A	A-25		
KR-1A	Crypto	TSEC/KG-14	408		
KR-2A	Crypto	TSEC/KG-14	1149		
KR-3A	Crypto	TSEC/KW-37	334		
KR-4A	Crypto	TSEC/KW-37	337		

APPENDIX B

SUMMARY OF EVENTS OCCURRING
DURING SURVEILLANCE PERIOD

TABLE B-1

SUMMARY OF EVENTS DURING SURVEILLANCE PERIOD ABOARD USS TOPEKA

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
Crypto KW-26 (AN/UCC-1)	4/25/2243	1	1	1	1
Crypto KW-26 (AN/UCC-1)	4/26/1415	1	1	1	1
Trans-mitter WRT-2 (AN/UCC-1)	4/27/67	WRT-2 will not lock on frequency setting	Unable to Transmit Messages	Transmitter Taken Off Line	
Receiver R1051/ URR(AN/UCC-1)	4/27/1930	Frequency Drifting	Messages Garbled	Adjusted and Aligned	
Crypto KW-26 (AN/UCC-1)	4/27/2132	Crypto Out of Synchronization		Adjusted	2
Crypto KW-26 (AN/UCC-1)	4/27/2145	Crypto Out of Synchronization		Adjusted	2
Crypto KW-26 (AN/UCC-1)	4/27/2155	Crypto Out of Synchronization		Adjusted	2
Crypto KW-26 (AN/UCC-1)	4/27/2210	Crypto Out of Synchronization		Adjusted	
Crypto KW-26 (AN/UCC-1)	4/27/2220	Crypto Out of Synchronization		Secured Equipment Until Cease Fire	
Crypto KG-14 (AN/UCC-1C)	4/28/2015	Crypto Out of Synchronization	Messages Garbled	Adjusted	
R1051 Receiver (AN/UCC-1C)	4/28/2138	Poor Frequency Propagation	Garbled Messages	Adjustments	3
Crypto KG-14 (AN/UCC-1C)	4/30/0200	Crypto Out of Synchronization	Messages Garbles	Adjusted	

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
R1051 Receiver (AN/UCC-1C)	5/1/1525	Poor Frequency Propagation	Garbled Messages	None	4
R1051 Receiver (AN/UCC-1/1C)	5/1/1700	Poor Frequency Propagation	Garbled Messages	None	5
AN/UCC-1C System	5/2/0530	Unknown	Messages Garbles	None	6
AN/UCC-1C System	5/2/0640	Unknown	Messages Garbled	None	7
Crypto KW-26 (AN/UCC-1)	5/2/1815	Crypto Out of Synchronization	Messages Garbled	Adjustment	8
Crypto KG-14 (AN/UCC-1C)	5/3/1430	Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051/ URR(AN/UCC-1)	5/3/1550	Frequency Drift	Messages Garbled	Tuning & Adjustment	9
Receiver R1051/ URR(AN/UCC-1)	5/4/1630	Poor Frequency Propagation	Messages Garbled	Tuning & Adjustment	
Receiver R1051/ URR(AN/UCC-1)	5/11/1745	Frequency Drift	Messages Garbled	Tuning & Adjustment	
Teletype (AN/UCC-1)	5/5/1530	Bad Connection on Teletype	Unable To Send Messages Via UCC-1 System	Repair Connection on Teletype	
R1051/ Receiver (AN/UCC-1)	5/5/1930	Frequency Drift	Messages Garbled	Tuning & Adjustment	
R1051/ Receiver	5/5/2155	RF Gain	Messages Garbled	Adjustment	
AN/UCC-1C System	5/9/1510	Unknown	Unable to Receive Messages	None	10
AN/UCC-1C System	5/10/2010	Unknown	Messages Garbled	None	11

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
R1051/ Receiver (AN/UCC-1)	5/10/2020	Poor Frequency Propagation and Drift in Frequency	Messages Garbled	Adjustment	12
Crypto KG-14 (AN/UCC-1C)	5/11/2305	Switch on Crypto on Wrong Position	Messages Garbled	Receiver R1051 Tuned. Crypto Switch Placed on Correct Position	
Receiver R1051/URR (AN/UCC-1)	5/15/2015	Frequency Drift	Messages Garbled	Adjustment	
Crypto KG-14 (AN/UCC-1C)	5/16/1450	Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051.KG-14 Crypto (AN/UCC-1C)	5/16/1600	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051/KG-14 Crypto (AN/UCC-1C)	5/16/2100	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1)	5/16/2135	Defective Frequency Shift Band on Receiver	Unable to Receive Messages	Receiver Removed From UCC-1 System	13
Receiver R1051/KW-26 Crypto (AN/UCC-1)	5/17/1430	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	
AN/UCC-1C System	5/17/2040	Poor Frequency Propagation	Messages Garbled	None	14
Crypto KG-14 (AN/UCC-1C	5/17/2220	Crypto Out of Synchronization	Messages	Adjustment	
Crypto KG-14 (AN/UCC-1C)	5/18/1330	Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1C)	5/18/1420	Frequency Drift	Messages Garbled	Adjustment To Receiver	

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
Crypto KG-14,KW-26 (AN/UCC-1C)	5/18/1622	Crypto Out of Synchronization	Messages Garbled	Adjustment	15
R1051 (AN/UCC-1C)	5/18/1640	Frequency Drift	Messages Garbled	Adjustment To Receiver	
Crypto KG-14,KW-26 (AN/UCC-1C)	5/18/1652	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
Crypto KG-14,KW-26 (AN/UCC-1C)	5/18/1735	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
Receiver R1051/KG-14 (AN/UCC-1C)	5/19/1430	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	
Crypto/ KG-14,KW-26 (AN/UCC-1/1C)	5/19/1530	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
WRT2 Transmitter (AN/UCC-1)	5/19/1635	Power to Transmitter Off	Unable to Transmit Messages	Power Restored	
Crypto/ KG-14,KW-26 (AN/UCC-1/1C)	5/19/2045	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
Receiver R1051 (AN/UCC-1)	5/22/1715	Frequency Drift	Messages Garbled	Adjustment	
Receiver R1051/KG14 Crypto (AN/UCC-1C)	5/22/1740	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	
AN/UCC-1C System	5/22/1800	Unknown	Unable to Receive Messages	None	16
Receiver R1051/ KG-14 Crypto (AN/UCC-1C)	5/22/2150	Frequency Drift/ Crypto Out of Synchronization	Messages Garbled	Adjustment	17

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
AN/UCC-1C System	5/23/1900	Unknown	Unable to Receive Messages	None	16
Receiver R1051 (AN/UCC-1C)	5/23/1930	Frequency Drift Bad Propagation Condition	Messages Garbled	Adjustment	17
Crypto KW-26 (AN/UCC-1)	5/24/1620	Crypto Out of Synchronization	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1)	5/24/2315	Frequency Drift	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1C)	5/25/1505	Frequency Drift Bad Propagation Condition	Messages Garbled	Adjustment	17
Crypto/ KG-14,KW-26 (AN/UCC-1/1C)	5/25/1825	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
Receiver R1051 (AN/UCC-1C)	5/31/2245	Frequency Drift	Messages Garbled	Adjustment	
AN/UCC-1C System	6/1/0110	Unknown	Messages Garbled	Receiver Replaced Frequency Changed	
Receiver R1051/ (AN/UCC-1)	6/1/1435	Frequency	Messages Garbled	Adjustment	18
AN/UCC-1C Converter CV-1920(P) UCC-1C(V)	7/6/1830	Distortion at Loop Current Output	Messages Garbled	Adjustment	19
Crypto/ KG-14,KW-26 (AN/UCC-1/1C)	7/7/2200	Crypto Out of Synchronization	Messages	Adjustment	20
Receiver AN/SRR-19A (AN/UCC-1C)	7/7/2340	Poor Frequency Propagation Condition	Messages Garbled	Receiver Replaced, Frequency Setting Changed	21

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
Receiver R-1051 (AN/UCC-1C)	7/9/1555	Frequency Drift	Messages Garbled	Adjustment	
Crypto KG-14 (AN/UCC-1C)	7/9/2240	Crypto Out of Synchronization	Messages Garbled	Adjustment	
AN/SRR-19A (AN/UCC-1C)	7/9/0100	Failure of Receiver	Messages Garbled	Receiver Replaced	22
AN/SRR-19A (AN/UCC-1C)	7/11/1530	Frequency Drift	Messages Garbled	Adjustment	
WRT Transmitter (AN/UCC-1)	7/11/1530	Failure of Transmitter	Unable to Transmit Messages	Transmitter Replaced	
Receiver R1051 (AN/UCC-1C)	7/12/1610	Unknown	Garbled Messages	Receiver Removed From System	23
Receiver R1051 (AN/UCC-1)	7/13/1725	Frequency Drift	Garbled Messages	Adjustment	
Receiver AN/SRR-19A (AN/UCC-1)	7/2/1510	Poor Frequency Propagation Condition	Garbled Messages	Receiver Replaced	22
AN/UCC-1	8/2/1710	Unknown	Garbled Messages	None	
Receiver R1051 (AN/UCC-1C)	8/2/1710	Frequency Drift	Garbled Messages	Adjustment	
CV-1522(P)/ UCC-1 Converter	8/3/0225	Excessive Distortion at Loop Current Output	Messages Garbled	Adjustment*	32
Crypto/ KG-14 KW-26 (AN/UCC-1/1C)	8/3/0310	Crypto Out of Synchronization	Unable to Receive Messages	Adjustment	15
R1051 Receiver (AN/UCC-1C)	8/3/1850	Frequency Drift/Poor Frequency Reception	Unable to Receive Messages	Adjustment	24

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
AN/UCC-1C/1 Systems	8/4/0215	Poor Frequency Reception	Unable to Receive Messages	None	25
Crypto KW-26/R1051 Receiver (AN/UCC-1C)	8/4/1350	Poor Frequency Reception	Crypto Gives Alarm Unable to Receive Messages	Adjustment	
AN/UCC-1	8/14/1520	Unknown	Unable to Receive Messages	None	26
Receiver R1051 (AN/UCC-1)	8/5/1535	Frequency Drift	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1)	8/6/1350	Frequency Drift	Messages Garbled	Adjustment	
Receiver R1051/KW-26 Crypto (AN/UCC-1C)	8/7/0830	Problem of Keying at the Transmit Station	Unable to Receive Messages Crypto. Gives Alarm	Adjustment	27
AN/UCC-1	8/7/1240	Unknown	Unable to Receive Messages	None	
Receiver R1051 (AN/UCC-1)	8/8/1815	Poor Frequency Reception	Messages Garbled	None	28
Receiver R1051 (AN/UCC-1)	8/9/1145	Poor Frequency Reception	Messages Garbled	Adjustment	
Crypto KW-26/ R1051 Receiver (AN/UCC-1)	8/9/1145	At Transmit Station	Unable to Receive Messages Crypto Gives Alarm	Adjustment	29
Receiver R1051 (AN/UCC-1)	8/9/1145	Poor Frequency Reception	Messages Garbled	Adjustment	

TABLE B-1 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
Receiver R1051 (AN/UCC-1C)	8/10/1430	Frequency Drift	Messages Garbled	Adjustment	
Receiver R1051 (AN/UCC-1C)	8/10/1715	Receiver Out of Tune	Messages Garbled/ Messages Received on Wrong Channels	Adjustment/ Communi-cation Transfer From UCC-1C to UCC-1	30
Crypto KW-26 R1051 Receiver (AN/UCC-1)	8/11/1140	Bad Keying From Transmit Station	Unable to Receive Messages Crypto Gives Alarm	Adjustment	31

REMARKS:

[1]Information on crypto malfunctions could not be obtained because of security reasons.

[2]Guns firing.

[3]Not due to receiver; poor propagation conditions.

[4]Messages garbled due to poor propagation for 35 min. No corrective action taken.

[5]Messages garbled due to poor propagation. No corrective action taken.

[6]Messages garbled for 15 minutes.

[7]Messages garbled for 10 minutes.

[8]Poor propagation and frequency drift causing crypto to go out of synchronization.

[9]Frequency and receiver changed.

[10]Not due to any equipment aboard ship. Problem was at the transmitting station.

[11]Problem at the transmitting station.

[12]Not due to receiver; poor propagation conditions.

[13]Defective receiver was removed from the system. System was operational with only one receiver. Defective receiver was repaired upon arrival at port by shipyard personnel.

[14]Not due to receiver; poor propagation conditions.

TABLE B-1 (continued)

[15]Crypto out of synchronization because of power interruption.

[16]Transmitting station off the air.

[17]Bad frequency propagation conditions.

[18]Poor frequency propagation at high-frequency setting; high-frequency receiver replaced by low-key receiver.

[19]Incident Report No. 1.

[20]Crypto out of synchronization because of gun fire.

[21]Poor frequency propagation condition at low-frequency setting; low-frequency setting; low-frequency receiver was replaced by high-frequency receiver.

[22]Receiver unable to tune properly.

[23]System was operating with two receivers (frequency/space diversity). Removal of one receiver corrected the malfunction.

[24]Poor frequency reception; ship approximately 1000 miles from transmitting station.

[25]Communication with San Diego via UCC-1C discontinued; ship approximately 1200 miles from transmitting station.

[26]Loss of communication.

[27]Receiver adjusted but did not clear the problem. Problem at transmit station.

[28]Poor frequency reception because of a tropical thunder storm.

[29]Keying problem at transmitting station.

[30]Receiver out of tune by exactly two channels. Messages were sent by transmitting station on channels 3 & 4, ship was receiving on channels 5 & 6.

[31]Receiver adjusted but did not clear the problem.

[32]See incident report No. 2.

TABLE B-2

SUMMARY OF EVENTS OCCURRING DURING SURVEILLANCE PERIOD ABOARD USS CAVALIER

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
Receiver R1051 (AN/UCC-1C)	6/27/1615	Receivers Out of Adjustment		Adjusted Receivers	1
Crypto KWR-37 (AN/UCC-1C)	6/27/2125	Crypto Out of Synchronization	Messages Garbled	Adjusted Crypto & R-1A, R-3A, & R-7A	
Receiver R1051 KWR-37 Crypto (AN/UCC-1C)	7/9/2110	Receiver Out Crypto Out of Synchronization		Repaired by ET's	
Receiver AN/SRR-19 (AN/UCC-1C)	7/24/0210	Lost Broadcast on Receiver	Messages Garbled	Returned to Different Frequency	
Crypto KWR-37 (AN/UCC-1C)	7/24/0210	Crypto Out of Synchronization		Recycled Crypto	
Crypto KWR-37 (AN/UCC-1C)		Out of Synchronization		Adjusted Crypto	
Crypto KWR-37 (AN/UCC-1C)	7/27/0013	Out of Synchronization		Recycled Crypto	
AN/UCC-1C System	8/15/0300	Undetermined	Messages Garbled	---	2
Receiver AN/SRR-19 (AN-UCC-1C)	8/16/1730	Transmission Off the Air	Messages Garbled/ Unable to Receive Messages	Change Frequency Reception (Receiver Adjustment)	3
AN/UCC-1C System	8/17/0500	Unknown	Unable to Receive Messages	--	4
R-1051 Receiver (AN/UCC-1C)	8/17/1900	Unexperienced Personnel Tuning The Receiver	Unable to Receive Messages	Adjustment to Receiver	

TABLE B-2 (continued)

Equipment Identification	Date/Time of Incident	Cause of Incident	Type of Incident	Corrective Action Taken	Remarks
R1051 Receiver (AN/UCC-1C)	9/1/2030	Frequency Drift	Unable to Receive Messages	Adjustment to Receiver	
AN/UCC-1C System	9/2/0130	Unknown	Unable to Receive Messages	None	
AN/UCC-1C System	9/6/1100	Unknown	Messages Garbled	None	
AN/UCC-1C System	9/6/1630	Unknown	Unable to Receive Messages	None	
AN/UCC-1C System	9/6/1927	Unknown	Unable to Receive Messages	None	
Crypto KWR-37 (AN/UCC-1C)	9/7/1850	Crypto Out of Synchronization	Messages Garbled	Adjustment	5
AN/UCC-1C System	9/8/0130	Unknown	Unable to Receive Messages	None	3

REMARKS:

[1]Crypto gave alarm.

[2]Different frequencies were selected to correct the problem. Broadcast was regained at same frequency setting at which incident occurred.

[3]Transmitting station off the air at set frequency.

[4]Problem at transmitting station.

[5]Crypto out of synchronization because of bad keying from transmitting station.

APPENDIX C

SURVEILLANCE PROCEDURES

APPENDIX C

SURVEILLANCE PROCEDURES

1. Observer Objectives

The objectives of the ARINC Research Observer are as follows:

A. Conduct shipboard surveillance by maintaining appropriate records for establishing the reliability, maintainability and cost effectiveness of the AN/UCC-1C and of conventional telegraph terminals.

B. Collect all AN/UCC-1/A, B or C parts replaced during the shipboard surveillance period.

C. Collect information on the effect that other equipments have on the operation of the AN/UCC-1A, B or C and, if time permits, additional information on reliability and maintainability data of equipments that interface with the telegraph terminal.

D. Collect information on environmental and operational conditions that may affect equipment reliability and maintainability.

In performing the above, the emphasis will be on observing the AN/UCC terminal equipments. Data collection on interfacing equipments will be of secondary importance or as time permits.

2. Functional Procedures

In the performance of his duties the observer must rely upon cooperation of shipboard personnel. The equipment being evaluated will be operational 24 hours a day, 7 days per week. Since it will be impractical for the observer to be present this entire time, he must rely on information provided by shipboard personnel on maintenance actions taken in his absence.

In order to accomplish his objectives the observer will correlate data gathered from ships' personnel with his own observed data and transfer this data to the following reports:

1) Initial Report

2) Daily Log

3) Weekly Activities Report

4) Incident Report

5) Work Sheet

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A description of each of these reports follows:

A. Initial Report

Prior to beginning the evaluation the observer will assign assembly code numbers to all AN/UCC and interfacing equipments, and terminal subassembly code numbers to all AN/UCC-1/A, B or C components. A description of these codes follows:

(1) Assembly Code Number -- Alfa-numeric code assigned by the observer to identify the particular major assembly unit of the major equipment such as AN/UCC-1C, radio transmitter, etc. This code will differentiate between similar major equipments other than teletypewriters.

(2) Terminal Subassembly Code Number -- Alfa-numeric code assigned by the observer to the components of the AN/UCC-1/A, B, or c equipments. This code will differentiate between different subassemblies (alfa- see table 1) of the UCC-1/A, B or C equipments and between similar subassemblies (numeric- see Figure 1). It is imperative that each subassembly maintain the same alfa-numeric number for the duration of the evaluation.

The observer will attach embossed tags containing these code numbers to all AN/UCC and interfacing equipments. A list will be made of the assigned assembly and terminal subassembly code numbers and the information will be tabulated in the following manner and forwarded to ARINC Research, Annapolis, during the first week of the evaluation.

SY/SUBASSY DE NO.	NAME OF EQUIPMENT	PART NO. (FSN, EIC, OR MANUFACTURER PART NO.)	SERIAL NO.	NAME OF MANUFACTURER (1)	* LOCATION IN SHIP	** D/T EVAL. BEGAN

(1) Note: The manufacturer of the AN/UCC equipments are as follows:

Major Equipment	Manufacturer
AN/UCC-1	Stelma
AN/UCC-1A	American Science
AN/UCC-1B	Metro-Tel
AN/UCC-1C	M-H

* Physical location in Ship -- Draw up on a work sheet a sketch of various compartments (not necessarily to scale), indicating the relationships of major equipments and specifying their code numbers.

** Date/Time each unit evaluation began (starting point assigned by the observer)

B. DAILY LOG

In order to observe the daily events and conditions that affect the operation of the AN/UCC and related equipments a daily log will be maintained. Entries will be made on a daily basis and will record the time of events and occurrences such as the following:

1) The location of the ship (in port or at sea)

2) Activities of the ship (participating in maneuvers, gunnery practice, refueling, etc.)

3) Environmental conditions (weather conditions and effects on transmitter and receivers, conditions of the sea)

4) Maintenance actions performed on related equipments but not effecting the operation of the AN/UCC equipments

5) Installation of additional equipments and/or removal of equipments from evaluation

6) Change of personnel

7) All other observed happenings that the observer feels may be of importance

Copies of the daily log will be forwarded to ARINC Research, Annapolis, on a weekly basis.

C. WEEKLY ACTIVITIES REPORT:

The observer will submit a weekly activities report summarizing significant events and conditions that occurred during the period of the week preceding the date of report. The report will contain a summary of the daily log entries and an analysis of the effects of events that were not apparent when the daily entries were made. The report will also give the status of incomplete incident reports.

D. INCIDENT REPORT

The incident report will be used for the systematic tabulation of information on maintenance actions performed on the AN/UCC and interfacing equipments. AN/UCC/A, B or C equipments will take precedence, and an incident report is to be submitted on each AN/UCC evaluation unit for each maintenance action initiated during the period of the evaluation. A maintenance action will constitute those actions necessary for retaining AN/UCC-1/A, B or C equipments in or restoring them to a normal operational condition. (Performing its intended function). Work performed on interfacing equipments for malfunctions which affect the performance of the AN/UCC equipments are included in these actions.

The reports should be forwarded to ARINC Research, Annapolis, as soon as they are completed or within one week of the occurence whether complete or not.

E. WORK SHEET

Work sheets will be used by the observer to record general information, draw sketches and diagrams and to continue comments from the incident reports.

GENERAL INFORMATION

The following outline will be used as a guideline or base to work from while compiling information during evaluation of the AN/UCC-1 equipments. It is imperative that all subjects listed be considered for comment. However, the outline is not intended to be restrictive in any way and by no means should comments be limited only to items listed below.

1. Specific Equipment Information
   a. Physical location (diagrams, sketches)(Initial Report)
   b. Correlate equipment serial numbers with assigned evaluation numbers (Initial Report)
   c. Operating hours prior to evaluation (AN/UCC units)
   d. Daily equipment operating schedule
   e. Associated government furnished equipment (GFE) (radio transmitters and receivers, patch panels, crypto equipment, etc., -- diagrams and sketches) (Initial report)
   f. Adequacy of GFE
   g. Percentage of maintenance performed at equipment, in repair shop, by shore activities (estimate)
   h. Power supply - Initial report
   i. Equipment history and major modifications
2. Equipment Installation and Installation Design (AN/UCC)
   a. Is equipment design adequate? (Can equipment perform intended function?)
   b. Wiring and cabling
   c. Unsafe conditions
   d. Installation problems
   e. Suggested improvements for future installations or retrofitting existing installation
3. Equipment Design
   a. Iatches and fasteners (require only a few turns for release; require special tools; or are captive)
   b. Access (internal and external access adequate for both visual and manipulative tasks)

c. Packaging (mechanical disassembly required for internal access to components and parts)

d. Units -- parts, (plug-in nature; mechanically held; soldered)

e. Visual displays (visual information on equipment operation is sufficiently given within one display area; two display areas; more than two areas must be consulted to obtain sufficient information about equipment operation)

f. Fault and operation indicators (information provided clearly for rapid action; not clearly presented; repairs operator interpretation)

g. Test points (availability, identification)

h. Labeling (parts labeled with full identifying information, labeling clearly visible)

i. Adjustments (adjustment or realignment necessary to place equipment back in operation)

j. Testing (defective part or component can be determined without removal from ckt, requires removal)

4. Equipment Environmental Conditions

a. Temperature

b. Ventilation

c. Space (accessibility for operation and maintenance)

d. Lighting

e. Cooling system

f. Unusual conditions (high seas, firing, rocket launching, etc.)

5. Test and Repair Shop Facilities

a. Physical location with respect to operating equipment area and stock or supply room.(Initial report)

b. Working space

c. Adequate benches and stools

d. Lighting

e. Ventilation

f. Sufficient power sources

g. Hazardous working conditions

6. Test Equipment and Tools

a. External test equipment (identification and number of pieces of external test equipment required)

b. Availability (insufficient, or substitute equipment used)

c. Operating condition (operating and in calibration)

d. Preparation (time required to set-up)

e. Capabilities (gives all information needed to perform proper maintenance)

f. Test equipment manuals available

g. Handling (weight)

h. Presentations (easily read)

i. Tools (necessary tools immediately available, in good condition, substitute tools used, insufficient)

j. Special pieces of test equipment and tools needed

7. Technical Data (Manuals, Instructions, Plans, Schematics)

a. Availability (necessary manuals and instructions immediately available)

b. Clarity (facts and procedures presented in clear and concise manner)

c. Accuracy (up-to-date, errors, omissions)

d. Completeness (required signal characteristics and/or tolerances for all test points are stated)

e. Schematics and circuit diagrams (availability, clarity, accuracy, completeness)

8. Supply

a. Accessability (spare parts immediately available--5 minutes, some time expended in obtaining -- 30 minutes, excessive delay, not available)

b. Auxilliary materials (cleaning fluids, solder, wire, etc., immediately on hand)

c. Parts identification (obtained quickly through use of parts lists, cross references, etc., some delay, considerable delay)

d. Supply forms (time required in completing)

e. Comparison of shipboard stores inventory to APL

9. Preventive Maintenance

a. Planned policy and schedule (Submit samples of PMR cards)

b. Observed procedures

c. Observed times PM performed

d. Length of time required to perform PM

10. Organizational Procedures

a. Operations

b. Maintenance

c. Extra duties

d. Liberty and leave policies

e. Turnover rate

11. Manning

a. Number of personnel available for duty

b. Number of personnel assigned

c. Work schedules

d. Rating

e. Adequacy

f. Personnal histories of maintenance personnel (training, experience, knowledge, rating)

12. Training

a. OJT

b. Classroom

13. Forms Completed by Personnel

a. Daily Log

b. Maintenance worksheets (MDCS or other)

c. Supply

14. Problem Areas

a. Difficult maintenance tasks

b. High failure rate items

c. Critical adjustments required frequently

d. Unusual circumstances

e. Working conditions

f. Attitudes of technicians

g. Suggestions

DEFINITION OF TERMS CONTAINED IN ARINC RESEARCH
INCIDENT REPORT ON THE AN/UCC-1/AN/UCC-1C EVALUATION PROGRAM

PAGE 1 OF ____ -- Insert total number of pages being submitted with this particular report form, and number each of the attached pages.

REPORT NO. -- Chronological numbering of reports beginning with #1. Under certain conditions the completion of the maintenance action may be delayed. The maximum length of time a report should be held in abeyance pending additional information is one week. If, after this time, all of the required information is not available the observer should perform the following: 1) bring the report up to date, 2) note in what respect the report is incomplete and 3) note that a follow-up report will be submitted.

If a report is forwarded by the observer to ARINC Research, Annapolis, before all entries are completed, additional report form(s) should be forwarded when the remaining information becomes available. The follow-up report forms will contain supplemental information and need repeat only pertinent information (such as contained in the form heading and blocks one and two) and changes in information contained in the original report. Follow-up reports should be labeled with the original number followed by the subletters "A", "B", etc. depending on the number of additional reports required.

Example -- A keyer fails and is immediately replaced in the cabinet by a spare keyer of the same frequency. The malfunctioned keyer is placed on the bench, but is not immediately repaired. After one week (or sooner if it is obvious to the observer that no further action will be taken in the immediate future) the observer forwards the first report and explanation to ARINC Research, Annapolis.

During the second week the keyer is analyzed and a defective resistor is to be replaced. However, the defective resistor is not available in the ships stockroom and a supply delay is experienced. The observer forwards a second report describing in detail the action taken during the second week. The report is labeled with

the original number followed by the subscript "A". (i.e. -- #1A). During the third week the resistor is obtained and maintenance is completed. The observer submits a third report containing the final information. This report is labeled with the original number followed by the subscript "B". (i.e. -- #1B)

REPORT DATE -- Date the report is forwarded to ARINC Research, Annapolis, regardless of whether or not it is complete.

1. EQUIPMENT IDENTIFICATION -- Parts A, B and C of this section identify the equipment type and the major assembly and subassembly of the failed equipment receiving the attention of the report.

A. MAJOR ASSY -- The model or identification number of the major equipment receiving the attention of the maintenance action and/or containing the failed component. Example -- UCC-1, UCC-1A, UCC-1B, UCC-1C, and model numbers for radio transmitters and receivers, transmit and receive radio antennas, wiring and cabling, multiplexer-demultiplexer for UCC-1C equipment, patch panels, DC loop power supply, cryptographic equipment or teletypewriter equipment;

B. ASSY CODE NO.--Alpha-numeric code assigned by the observer to identify the particular major assembly unit of the assembly identified in A above. This code will differentiate between similar major equipments other than teletypewriters (see Figure 1). The observer will forward an initial report identifying the name, manufacturer, part number and serial number of each piece of equipment and its associated assembly code number.

C. TERM SUBASSY CODE --Alpha-numeric code assigned by the observer to the components of the UCC-1/A, B or C equipments. This code will differentiate between different sub-assemblies (alfa- see table 1) of the UCC-1/A, B or C equipments and between similar sub-assemblies (numeric- see Figure 1). The observer will forward an initial report associating the serial number of individual cabinet, keyer, converter, attenuator, multiplexer-demultiplexer and test set with its assigned alfa-numeric subassembly code number. It is imperative that each subassembly maintain the same alfa-numeric number for the duration of the evaluation.

TABLE 1

The Alpha code for UCC-1/A, B or C subassemblies should be as follows:

Code	
CY	Elect equip cabinet
KY	Freq shift keyer
KY(F)	Keyer chassis assy, front
KY(R)	Keyer chassis assy, rear
CV	Freq shift converter
CV(F)	Converter chassis assy, front
CV(R)	Converter chassis assy, rear
C	Control attenuator
C(F)	Control-attenuator chassis, front
C(R)	Control-attenuator chassis, rear
TS	Test set
TD	Multiplexer-demultiplexer

NOTE: If units and assemblies in addition to those listed above are included in the evaluation, the observer will identify them with his own coding and include this coding in his initial report (see item 18) or in an addendum to the initial report when necessary.

2. TYPE OF REPORT -- Circle one to indicate whether corrective maintenance (CM), preventive maintenance (PM) or other maintenance was performed. Other maintenance is interpreted as maintenance on equipments such as air conditioners which may effect the communication systems operations.

3. PARTS REPLACED/REPAIRED -- List all components and/or parts replaced or repaired (except teletypewriters).

A. REF DESIG -- Should be taken from the technical manual
B. NAME -- of the equipment being repaired whenever possible. The reference designator and name of all parts repaired and/or replaced should be listed. If a malfunctioned part is replaced with a part of different design or value, this should be noted in block #7, "MAINT ACTION".

S/A CODE -- (UCC-1/A, B or C equipments only) If a complete subassembly such as a keyer or converter is replaced or repaired give the subassembly alfa-numeric code.

RPLMT/RPR -- Check the appropriate column to indicate whether the part or subassembly was a replacement or was repaired. If a malfunctioned part is replaced with a part of different design or value this should be noted in block #7, "MAINT ACTION".

PRI/SEC -- Check the appropriate column to indicate whether the failed part was the primary cause of failure or a secondary failure resulting from a previously failed part or condition. An explanation should be included in block #6, "DISCRIPTION OF MALFUNCTION."

ANALYSIS -- Check "Yes" or "NO" to indicate whether or not the part is being forwarded to ARINC Research, Annapolis, for further analysis. All parts on UCC-1 A, B or C equipments that are removed should be forwarded for failure analysis.

UNIT COST -- Give the unit cost of each part and/or subassembly listed. This cost will be obtainable from the ships technical supply section.

4. SYMPTOMS: FIRST NOTED - MON ___ DAY ___ TIME ___ -- Insert the month, day and time (Greenwich mean time) the symptoms were first noticed and describe the anomalous operation of the equipment that led to the discovery of the malfunctioned part. (Example -- low meter reading, high meter reading, noise, vibrations, overheating, intermittent operation, inoperative, teletypewriter message garbling, etc.)

5. NOTED CONDITIONS: (RELATED ACTIVITIES) -- Indicate conditions or related activities at or near the time of failure that could have effected equipment operation. Examples of some conditions to be noted are:

A. Auxillary equipment failures
   1) Air conditioning system
   2) Power supply
B. Humidity
C. Excessive heat or cold
D. General maintenance
   1) Cleaning
   2) Scrubbing decks
   3) Welding
   4) Painting
   5) Polishing
   6) Chipping paint from decks (including adjacent and overhead compartments)
E. Heavy seas or storm conditions
F. Geographical location
G. Ship activities
   1) Gunnery practice
   2) Missile launching
   3) Violent maneuvers
   4) Entering or leaving a communications area
   5) Preparation for inspection
H. Equipment relocation
I. Operator or maintenance technician availability

Even though the observer may not consider the above conditions to be of importance, this information will be invaluable during the final analysis in determining statistically whether or not a relationship between the failure modes and the observed conditions did exist.

6. DESCRIP OF MALF -- Give a complete and detailed description of the malfunction. State the cause of the malfunction and its effect on other components and equipments. Use the work sheet to draw diagrams and schematics. Identify by name and/or reference and mechanical condition of all failed parts. Circle either "YES" or "NO" to indicate whether or not a diagram or schematic is attached.

7. MAINT ACTION TAKEN -- In addition to an explanation of all parts repaired and/or replaced, give a detailed explanation of all other corrective and preventive maintenance actions. List all adjustments such as bias control, level control, trigger control and diversity balance control adjustments. Identify by reference designator and name each part or module replacement when the replacement is different from the original part identified in block 3.

8. MAINT TIMES -- Times required for all actions necessary for retaining an item in or restoring it to a specified condition. Since all maintenance times will not be continuous, but will be interrupted occasionally by coffee breaks, lunches, etc., several columns are included to record the date/time the maintenance action started and stopped and to record the reason for the interruption.

The date/time will be a six digit number. The first two digits will indicate the date, while the last four digits will indicate the "ZULU" time. (Example -- March 24, 2 P.M. Z will be indicated as 241400Z) The reason for interruption should be explained as briefly as possible. The observer can develop his own coding if the situation so warrants. Examples -- CB - Coffee Break, SD - Ships duties, IB - incidental break, OD- off duty for the day, MB- meal break.

A. FAULT LOCATION -- That element of Maintenance Time during which testing and analysis is performed on an item to isolate a failure.

B. ACTIVE REPAIR -- Active repair time includes fault correction time which is defined as that element of Maintenance Time during which a failure is corrected by (1) repairing in place (2) removing, repairing, and replacing; or (3) removing and replacing with a like serviceable item. In addition to fault correction, active repair time includes the time required to gain access to, disassemble, clean, lubricate, assemble, check-out, and adjust and calibrate the failed equipment.

Note: In the case of an item being removed and replaced with a like serviceable item, even though the item is replaced by an item with a different terminal subassembly code number, both the removal and replacement times will be included in the active repair time. In addition, the active repair time will include the time required to repair or replace the individual components of the removed item.

C. SUPPLY DELAY -- That element of Delay Time during which a needed item is being obtained from other than the designated organizational stockrooms.

Note: The administrative delay time is not tabulated on this report form but will be calculated at a later date by ARINC Research, Annapolis, using the formula.
Adm Delay Time = Total down time - (fault location time + active repair time + supply delay time)

9. A. TECH RATING -- Give the technical rating of each technician that works on the equipment during the maintenance action:

B. EMT -- Estimated maintenance time (in percentage)

Estimated percentage of the total maintenance time (clock hours) that each technician contributed to completing the maintenance action. Example -- Total maintenance time (clock time) - 100 mins. Tech A (RM3) worked on the repair the full 100 mins. Techn B (RM1) assisted A for 20 mins. and Tech C (chief Petty Officer) assisted for 10 mins. EMT's will be tabulated as follows:

Tech	EMT
RM3	100%
RM1	20%
Chief	10%

10. TEST EQUIP USED -- List all test equipment utilized during maintenance action.

11. TECH MANUALS USED -- Circle either "YES" or "NO" to indicate whether or not technical manuals were referred to during the maintenance action.

12. DEGRADATION TIME -- The date/time that the UCC-1/A, B or C equipment is degraded because of a malfunction. This time begins when the symptom is first noted and ends when the malfunction is corrected and the failed item is back in operation or when the failed item is replaced by a like serviceable item.

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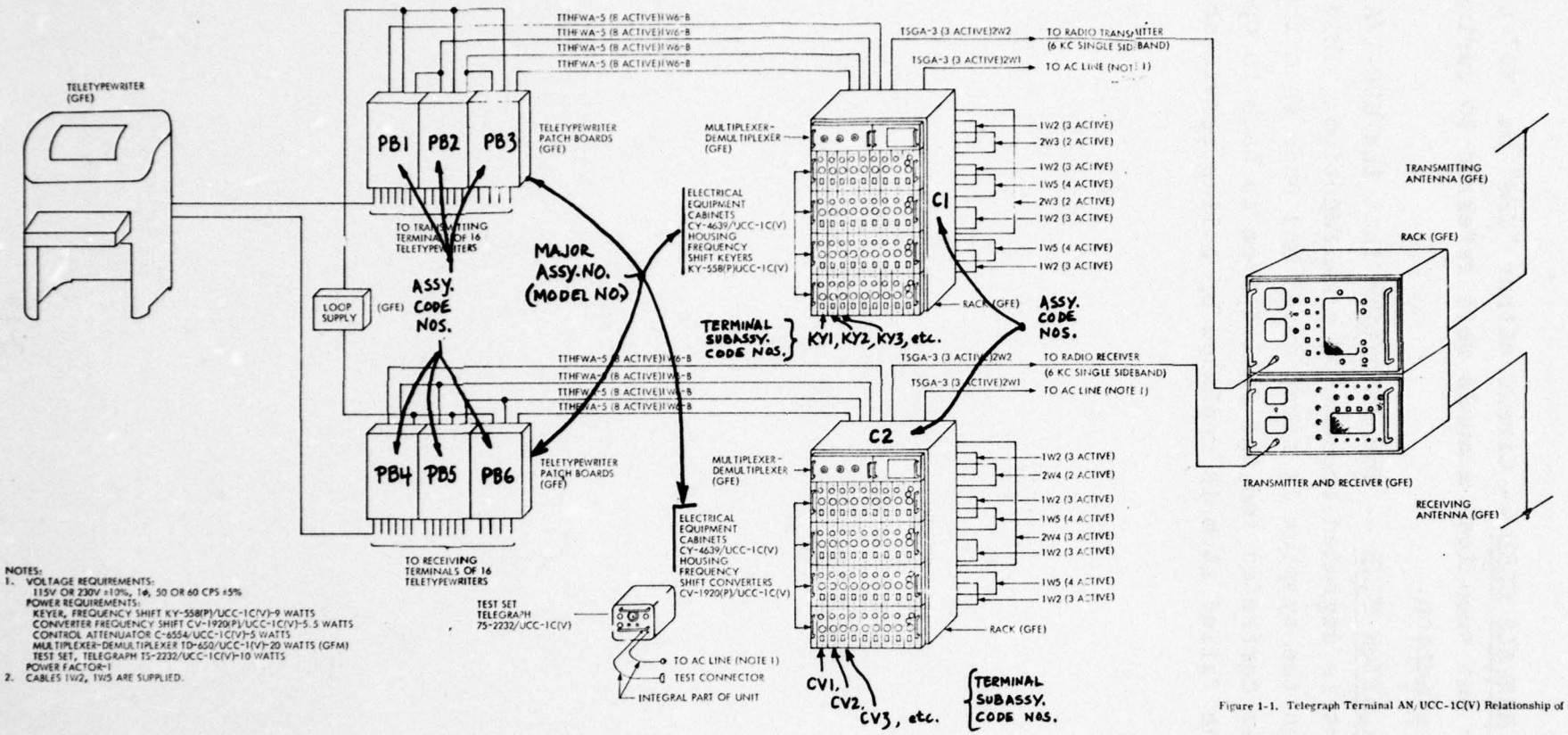

NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1φ, 50 OR 60 CPS ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558(P)/UCC-1C(V)-9 WATTS
   CONVERTER FREQUENCY SHIFT CV-1920(P)/UCC-1C(V)-5.5 WATTS
   CONTROL ATTENUATOR C-6554/UCC-1C(V)-5 WATTS
   MULTIPLEXER-DEMULTIPLEXER TD-650/UCC-1(V)-20 WATTS (GFM)
   TEST SET, TELEGRAPH TS-2232/UCC-1C(V)-10 WATTS
   POWER FACTOR=1
2. CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 1-1. Telegraph Terminal AN/UCC-1C(V) Relationship of Units

APPENDIX D

INCIDENT REPORTS

Page 1 of 1

AN/UCC-1C EVALUATION PROGRAM
INCIDENT REPORT - W.O. 553-01

Report No. 1
Report Date: July 24, 1967

1. Equipment Identification:
   A. Major Assy. AN/UCC-1C(V)
   B. Assy. Code No. CV-1920(P)UCC-1C (V)
   C. Term Subassy. Code CV-17

2. Type of Report: (CM) PM Other

3. Parts Replaced/Repaired

A. Ref. Desig.	B. Name	S/A Code	RPL	RPR	PRI	SEC	Analysis Yes	Analysis No	Unit Cost

4. Symptoms: First noted --Mon 7 Day 6 Time 1830Z
Printing of messages was garbled on Channel #1
AN/UCC-1C System

5. Noted Conditions: (Related Activities)

6. Descrip. of Malf: (Cause and Effect - Elect & Mech Cond of Parts - Names & Nos. of other Effected Assy's)
Sketch: Yes (No)
Converter CV-17 loop current output has a distortion between 25% to 45%

7. Maint Action Taken: (Exaplanation of Repairs/Replmts)
1. "Delay" setting adjusted to center
2. Bias setting adjusted until the distortion was minimum and channel # 1 was being printed satisfactorily

8. Maint Times	D/T Start	D/T Stop	Reason	D/T Start	D/T Stop	Reason	D/T Start	D/T Stop	Reason
A. Fault Location:	6/1830	6/1855							
B. Active Repair:	6/1855	6/1915							
C. Supply Delay:	----								

9. A. Tech Rating	B. EMT	10. Test Equip Used	11. Tech Manuals Used:	12. Degradation Time:
ETR 2	45 min.	Telegraph Distortion Analyzer Model TDA - 2NB (Stelma Inc.)	(Yes) No	Assembly: Start Date/Time ____ Stop Date/Time ____
				SubAssembly: Start ____ Stop ____

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Page 1 of 1

AN/UCC-1C EVALUATION PROGRAM
INCIDENT REPORT - W.O. 553-01

Report No. 2
Report Date: Aug. 7, 1967

1. Equipment Identification:
   A. Major Assy. AN/UCC-1(V)
   B. Assy. Code No. CV-1522(P)/UCC-1(V)
   C. Term Subassy. Code CV-09

2. Type of Report: CM PM Other

3. Parts Replaced/Repaired

A. Ref. Desig.	B. Name	S/A Code	RPL	RPR	PRI	SEC	Analysis Yes	Analysis No	Unit Cost

4. Symptoms: First noted --Mon 8 Day 3 Time 0225
Channel #3 Printing of messages garbled.

5. Noted Conditions: (Related Activities)

6. Descrip. of Malf: (Cause and Effect - Elect & Mech Cond of Parts - Names & Nos. of other Effected Assy's)
Sketch: Yes (No)
Converter CV-9 loop current output has a distortion of 45%

7. Maint Action Taken: (Exaplanation of Repairs/Replmts)
1. Delay setting adjusted to center
2. Bias setting adjusted until the distortion was minimum

8. Maint Times	D/T Start	D/T Stop	Reason	D/T Start	D/T Stop	Reason	D/T Start	D/T Stop	Reason
A. Fault Location:	03/0245	03/0415	Off Duty						
	03/1500	03/1530							
B. Active Repair:	03/1530	03/1545							
C. Supply Delay:									

9. A. Tech Rating	B. EMT	10. Test Equip Used	11. Tech Manuals Used:	12. Degradation Time:	Date/Time	Date/Time
ETR 2	2 hrs. 15 min.	Telegraph distortion - Analyzer Model TDA-2NB (Stelma Inc.)	Yes (No)	Assembly: Start		Stop
				SubAssembly: Start		Stop

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AD-A054 693 ARINC RESEARCH CORP ANNAPOLIS MD F/G 17/2
COST-EFFECTIVENESS COMPARISON OF SHIPBOARD TELEGRAPH TERMINAL E--ETC(U)
NOV 67 M Y RAWASIA, E B BELL, C W DUKE N00024-67-C-1182
UNCLASSIFIED 553-01-1-849 NL

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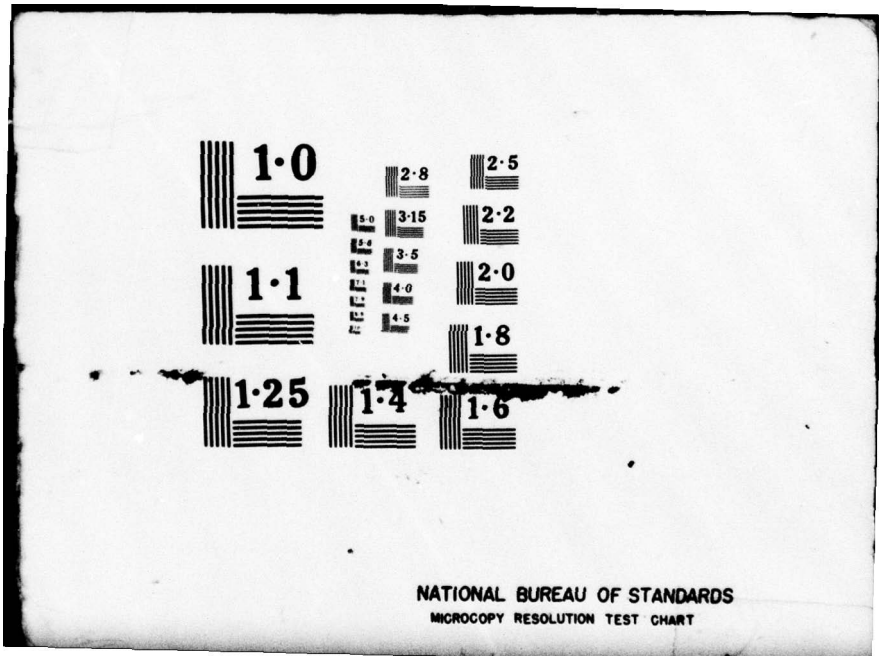
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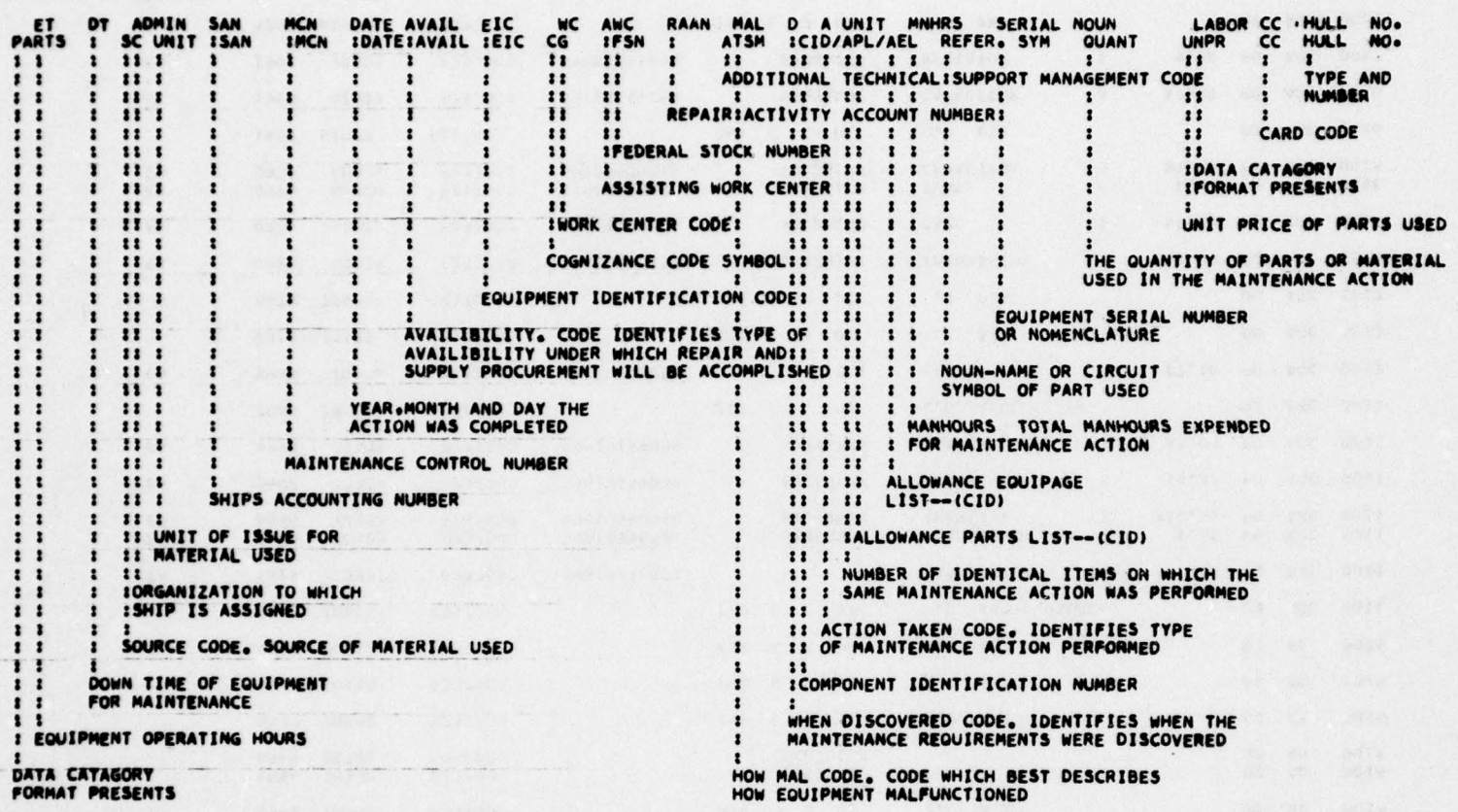
1·4
1·6
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

APPENDIX E

MDCS COMPUTER OUTPUT

MDCS 11 FORMAT

MDCS GENERAL DATA RETRIEVAL



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UCC-1 & UCC-1C TERMINAL EQUIPMENT
MALFUNCTION AND PARTS PROCUREMENT DATA

MDCS11-4-06304 — MDCS GENERAL DATA RETRIEVAL —
PERIOD COVERED 01 APR 66 THRU 30 JUN 67 — DATE PREPARED 20 SEPT 67

ET PARTS	DT SC	ADMIN UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	EIC AVAIL EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL NOUN SYM	QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
				8544	70302	F237000				000	D	J	01	1.0	A22			D1	AD	0018
				8545	70302	F237000				000	D	J	01	1.0	A 22			D1	AD	0018
				8544	70302	F237000							FCCC1 1					D2	AD	0018
				8545	70302	F237000							FCUCC1 2					D2	AD	0018
				4379	70508	F237000				196	C	D	01	4.0	A27			BO	AE	0025
				4427	70510	F237000				196	G	D	01	4.0	A27			BO	AE	0025
				4518	70612	F237000				458	K	E	01	3.0	827			BO	AE	0025
				6348	70116	F237000				750	G	C	01	.2	A3076 ANUCC-1			BO	AGC	0011
		EA		5814	70221	F237000		59618786521							TRANSISTOR	11	$.35	FO	AGC	0011
		EA		5994	70308	F237000		59618786521					61399554		TRANSISTOR	5	$.35	FO	AGC	0011
		EA		6035	70308	F237000		59610540046					61399554		TRANSIST	2	$18.50	FO	AGC	0011
		EA		5402	70323	F237000		59619149034					62264007		TRANSISTOR	3	$5.00	FO	AGC	0011
		EA		5993	70404	F237000		59619149034					61399554		TRANSISTOR	1	$5.00	FO	AGC	0011
				7089	70508	F237012				242	C	C	01	1.0	ANUCCIC A4			BO	AGC	0011
		EA		7099	70508	F237012		58059216019					66264001		CIRCU	3	$7.20	FO	AGC	0011
				2818	70130	F237000				900	C	J	01	.1	A18			DO	AGC	0012
				5828	70422	F237000				068	E	H	01	.1	D24			DO	AGC	0012
		EA		0914	60819	F237012		59618536093					58123197		TRANSISTOR	12	$9.20	FO	AGC	0016
		EA		0924	60822	F237000		59109950218					58123197		CAP	1	$4.00	FO	AGC	0016
		EA		0924	60826	F237010		59609683858					58123197		TUBE	8	$.15	FO	AGC	0016
		EA		0924	60826	F237000		59109950218					58123197		CAPACITOR	5	$4.00	FO	AGC	0016
				1409	61025	F237000				068	C	C	01	10.0	833			DO	AGC	0016
		EA		1409	61025	F237000		59108194768					58123197		CAPACITOR	6	$5.90	FO	AGC	0016
		EA		1992	70601	F2A3000		59052791894					62764785		RESISTOR	1	$.00	FO	AGC	0017
				5291	61018	F237011				242	C	J	01	1.5	280			DO	AGMR	0001
		EA		5438	61026	F23							62764992		014	1	$.00	KO	AGMR	0001

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ET PARTS	DT ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SYM	SERIAL NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA		5439	61026	F23							62764992	Q14		1	$.00	KO	AGMR	0001
		EA		5440	61026	F23							62764992	C20		1	$.00	KO	AGMR	0001
		EA		5440	61026	F23							62764992	Q14		1	$.00	KO	AGMR	0001
		EA		5441	61026	F23							62764992	Q14		1	$.00	KO	AGMR	0001
				5800	61128	F237011				450	G	C	01	.5	497			BO	AGMR	0001
				5808	61128	F237011				450	G	C	01	.5	508			BO	AGMR	0001
				5809	61128	F237011				450	G	C	01	.5	463			BO	AGMR	0001
				5811	61128	F237011				450	G	C	01	.5	424			BO	AGMR	0001
				5812	61128	F237011				450	G	C	01	.5	667			BO	AGMR	0001
				5813	61128	F237011				450	G	C	01	.5	519			BO	AGMR	0001
				5814	61128	F237011				450	G	C	01	.5	425			BO	AGMR	0001
		EA		5800	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5808	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5809	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5811	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5812	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5813	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
		EA		5814	61128	F23Q14	CONVERTER						62764786			1	$11.60	KO	AGMR	0001
				5856	61130	F237012				450	C	C	01	.5	466			BO	AGMR	0001
				5857	61130	F237012				450	C	C	01	.5	527			BO	AGMR	0001
				5858	61130	F237012				450	C	C	01	.5	499			BO	AGMR	0001
		EA		5858	61130	F23Q14	TRANSISTOR						62764786			1	$5.20	KO	AGMR	0001
		EA		5856	61130	F23Q14	TRANSISTOR						62764786			1	$5.20	KO	AGMR	0001
		EA		5857	61130	F23Q14	TRANSISTOR						62764786			1	$5.20	KO	AGMR	0001
				6647	70224	F237012				450	C	C	01	.2	482			BO	AGMR	0001
				6765	70307	F237012				450	D	C	01	.1	482			BO	AGMR	0001
				6766	70307	F237012				450	D	C	01	.1	456			BO	AGMR	0001
				6766	70307	F237012	59608536093						62764787	ST-201		1	$5.20	FO	AGMR	0001
		EA		6766	70316	F237012	59608536093						62764787	XSISTOR		1	$5.20	FO	AGMR	0001
		EA		6768	70316	F237012	59608536093						62764785	ST201		1	$9.20	FO	AGMR	0001
		EA		6528	70321	F237010	59202849493						62764992	FUSE		450	$.05	FO	AGMR	0001
		EA		7097	70417	F237012	59109950218						62764782	CAPACITOR		2	$4.00	FO	AGMR	0001
		EA		7098	70417	F237012	59052793514						62764782	RESISTOR		2	$.10	FO	AGMR	0001
		EA		6918	70501	F237012	59618536093						62764996	A14		1	$9.20	FO	AGMR	0001
		EA		6768	70501	F237012	59618536093						62764785	ST201		1	$9.20	FO	AGMR	0001
		EA		5291	70502	F237011	58056822954						71966089	TUNEDCKT		1	$75.00	FO	AGMR	0001

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL NO. HULL NO.
					7404	70515	F237012				450	C	C	01	.1	262			B0	AGMR 0001
		EA			7404	70515	F237012		59608536093					62764991	0-14ST-201		1	$5.20	F0	AGMR 0001
					7853	70610	F237014				040	C	C	01	.5	A9			B0	AGMR 0001
					7852	70610	F237014				450	C	C	02	.3	A9			B0	AGMR 0001
					7851	70610	F237014				450	C	C	02	.3	A9			B0	AGMR 0001
					7873	70613	F237012				196	G	C	01	.5	378			B0	AGMR 0001
					7910	70616	F237014				450	C	C	02	.3	A6			B0	AGMR 0001
					7974	70622	F237012				450	G	C	04	.5	425			B0	AGMR 0001
					2069	70524	F237000				000	D	H	01	.2	A135			D1	AGTR 0001
					2069	70524	F237000							AN/UCC-1C V 3					D2	AGTR 0001
					0180	61013	F237012				255	C	C	01	5.0	181			B0	AGTR 0003
					0534	70509	F237000				233	C	K	05	.3	SYSTEMN			D0	AKA 0104
					4256	70523	F237000				000	D	E	01	.5	A115			B0	AD 0026
					0115	70302	F237012				000	D	J	01	.5	B450			D0	AD 0105
					0207	70403	E F237015			08809	161	C	T	00		A86 UCCI			B0	AD 0105
		EA			0115	70404	F237012		59356655717					62981956	PLUG		1	$1.80	F0	AD 0105
		EA			0115	70419	F237013		59359955782					58123151	CONNECTOR		1	$8.60	F0	AD 0105
					0650	70503	F237012				068	C	J	01	2.0	B448			D0	AD 0105
					0115	70616	F237012				000	D	P	01	1.0	B450			D0	AD 0105
					8089	70407	F237000				000	D	G	01	1.0	A26			B1	APA 0037
					8089	70407	F237000							TS-2232-1					B2	APA 0037
					8090	70407	F237000				000	D	J	01	.1	A26			D1	APA 0037
					8090	70407	F237000							UCC-1C-2					D2	APA 0037
					7459	70602	F237000				000	D	G	01	3.0	A26			B1	APA 0037
					7459	70602	F237000							FC3-UCC-1C					B2	APA 0037

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE		EIC AVAIL EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					0448	60823		F237012				127	C	E	01	1.0	A6276			BO	APA	0045
					8530	70126		F237000				255	C	F	01	50.0	C 173			BO	APA	0045
			EA		0768	60991		F237011		59359216015					58123197			2	$1.30	FO	AR	0008
			EA		0768	60991		F237010		59359216022					58123197			2	$1.30	FO	AR	0008
					3812	60611		F237010				255	C	D	01	1.0	MUXER UCC-1C			BO	CA	0073
					9208	60701		F237012				255	C	C	01	2.0	CV1522P UCC1V			BO	CA	0073
					5328	61201	E	F237000			04618	080	C	C	01	21.0	TS 2232 UCC 1			CO	CA	0073
					5328	61201	E	F237000			04618	080	C	C	01	21.0	TS 2232 UCC1			CO	CA	0073
					7612	70106		F2A3000				161	C	D	01	.5	MUXUCC-1C			BO	CA	0073
					8598	70501		F2A2000				346	C	E	01	2.0	UCC-1A/B			BO	CA	0073
					8666	70504		F2A3000				161	C	D	01	1.0	UCC1CVMUX			BO	CA	0073
					9138	70624		F237012				161	C	D	01	2.0	CV-1522P			BO	CA	0073
					9160	70627		F237012				819	C	D	01	2.0	CV-1522P			BO	CA	0073
					1764	60516		F237012				233	C	C	01	24.0	D15			BO	CA	0148
					2777	60608		F237013				196	C	C	01	1.0	C6			BO	CA	0148
			EA		2777	60608		F237013		59608531065					58123197		CR20	1	$5.40	FO	CA	0148
			EA		4261	60622	1	F237013		59608531065					62764781		1A2A1CR20Z	2	$5.40	FO	CA	0148
			EA		0759	60719	1	F237012		59619683858					62764781		A1CR7DIODE	2	$.70	FO	CA	0148
			EA		0873	60801	1	F237015		59359645468					89162001		2P1	8	$2.00	FO	CA	0148
			EA		0874	60801	1	F237015		59358146598					89162001		2P4	4	$3.30	FO	CA	0148
			EA		0875	60801	1	F237015		59358791813					89162001		2P5	4	$4.30	FO	CA	0148
					1346	70117		F237000				450	C	J	01	10.0	C8			DO	CA	0148
			EA		1372	70125	1	F237012		59608536093					62764782		1A2A1Q14	2	$11.60	FO	CA	0148
			EA		1373	70125	1	F237012		59608786521					62764782		1A2A1Q9	6	$.41	FO	CA	0148
					7341	70328		F237012				161	C	C	01	.5	C21			BO	CA	0148
					7342	70328		F237012				161	C	C	01	1.0	701			BO	CA	0148
			EA		7342	70328	1	F237012		59618786521					62704789		1A2A1Q11	3	$.41	FO	CA	0148

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			7341	70403	1	F237012		59618536093					62704994	1A2A1Q14		1	$9.20	FO	CA	0148
		EA			1346	70505	1	F237012		59156909399					62764789	1A1FL1		1	$50.00	FO	CA	0148
					1346	70509		F237000				450	C	C	01	2.0	C8			DO	CA	0148
					0035	70525		F237012				255	C	C	01	1.0	C8			BO	CA	0148
					0036	70525		F237012				255	C	C	01	2.0	177			BO	CA	0148
		EA			1471	61102	1	F237012		59051711999					62764781	R-0048		4	$.50	FO	CAG	0001
					1464	61122		F237000				450	G	C	01	1.0	76			BO	CAG	0001
		EA			1464	61123	1	F237000		59608536093					58123197	Q-14		2	$9.20	FO	CAG	0001
		EA			3242	61207	1	F237012		59351924789					62765101	A1J1		1	$.43	FO	CAG	0001
					3793	61210		F237011				346	A	E	01	1.0	141			BO	CAG	0001
					3790	61210		F237011				346	A	E	01	1.0	123			BO	CAG	0001
					3791	61210		F237011				346	A	E	01	1.0	198			BO	CAG	0001
					3792	61210		F237011				346	A	E	01	1.0	208			BO	CAG	0001
					3786	61210		F237011				346	A	E	01	1.0	166			BO	CAG	0001
					3787	61210		F237011				346	A	E	01	1.0	121			BO	CAG	0001
					3788	61210		F237011				346	A	E	01	1.0	56			BO	CAG	0001
					3789	61210		F237011				346	A	E	01	1.0	124			BO	CAG	0001
		EA			6188	70118	1	F237012		59202849493					62765101	1-F-1		10	$.40	FO	CAG	0001
					7629	70203		F237012				255	C	D	01	3.0	166			BO	CAG	0001
		EA			8518	70206	1	F237012		59109950218					62765102	1A1C21		1	$4.00	FO	CAG	0001
		EA			6973	70225	1	F237012		59202849493						FUSEF-001		10	$.40	FO	CAG	0001
					8861	70304		F237012				127	C	D	01	.4	208			BO	CAG	0001
					8862	70304		F237012				127	C	D	01	.4	337			BO	CAG	0001
					8860	70304		F237012				127	C	D	01	.4	363			BO	CAG	0001
					8867	70304		F237011				127	C	D	01	.4	166			BO	CAG	0001
					8871	70304		F237011				127	C	D	01	.4	123			BO	CAG	0001
					8870	70304		F237011				127	C	D	01	.4	124			BO	CAG	0001
					8872	70304		F237000				127	C	D	01	.4	121			BO	CAG	0001
					8858	70304		F237012				127	C	D	01	.4	370			BO	CAG	0001
					8864	70304		F237012				127	C	D	01	.4	291			BO	CAG	0001
					8865	70304		F237012				127	C	D	01	.4	231			BO	CAG	0001
					8868	70304		F237011				127	C	D	01	.4	198			BO	CAG	0001
					8863	70304		F237012				127	C	D	01	.4	258			BO	CAG	0001

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ET PARTS	DT	ADMIN SC	UNIT	SAN	MCN MCN	DATE AVAIL DATE	AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SYM	SERIAL NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					8859	70304		F237012				127	C	D	01	.4	250			BD	CAG	0001
					8866	70304		F237011				127	C	D	01	.4	141			BD	CAG	0001
					8869	70304		F237011				127	C	D	01	.4	208			BD	CAG	0001
					8873	70304		F237011				127	C	D	01	.4	56			BD	CAG	0001
		EA			8518	70306	1	F237012		59108501502					62765102		1A1C22	1	$1.10	FD	CAG	0001
		EA			8518	70306	1	F237012		59608531065					62765102		A1CR20	1	$1.10	FD	CAG	0001
		EA			7242	70307	1	F237012		59352593608							1A2J-1	1	$5.40	FD	CAG	0001
		EA			8518	70307	1	F237012		59618531065					62765102		1A1CR20	1	$1.10	FD	CAG	0001
		EA			8518	70307	1	F237012		59608786521					62765107		2N404A	1	$.31	FD	CAG	0001
		EA			7242	70308	1	F237012		59350793487							1XA-1	1	$3.00	FD	CAG	0001
		EA			9128	70308	1	F237012		59608786521					62765108		1A1Q7/2N40	2	$.31	FD	CAG	0001
		EA			8518	70312	1	F237012		59608453954					62765108		1A1Q11/2N3	1	$3.90	FD	CAG	0001
					9414	70313		F237012				127	C	E	01	.3	C285CV1522			BD	CAG	0001
					9415	70313		F237012				127	C	E	01	.5	C208CV1522			BD	CAG	0001
					9416	70313		F237012				127	C	E	01	.5	C370CV1522P			BD	CAG	0001
					9417	70313		F237012				127	C	E	01	.3	C291CV1522 P			BD	CAG	0001
					9419	70313		F237012				127	C	E	01	.3	C337CV1522 P			BD	CAG	0001
					9420	70313		F237012				242	C	C	01	.7	C250CV-1522 P			BD	CAG	0001
					9412	70313		F237012				127	C	E	01	.3	C304CV1522			BD	CAG	0001
					9411	70313		F237012				127	C	E	01	.3	C324CV1522			BD	CAG	0001
					9413	70313		F237012				127	C	E	01	.3	C393CV1522			BD	CAG	0001
					9418	70313		F237012				127	C	E	01	.3	C258CV1522 P			BD	CAG	0001
					8518	70313		F237012				242	C	C	01	40.0	C363CV1522			BD	CAG	0001
					9128	70313		F237012				242	C	C	01	6.0	C231CV1522			BD	CAG	0001
					9407	70313		F237012				127	C	E	01	.3	C443			BD	CAG	0001
					9408	70313		F237012				127	C	E	01	.3	C246			BD	CAG	0001
					9409	70313		F237012				127	C	E	01	.3	C475			BD	CAG	0001
					9410	70313		F237012				127	C	E	01	.3	C361			BD	CAG	0001
		EA			9420	70313		F237012		59202849493					62765108		1A2F1FUSE	1	$.10	FD	CAG	0001
		EA			3242	70322	1	F237012		59352593608					62765108		1-J-1	1	$5.40	FD	CAG	0001
		EA			9168	70412	1	F237000		59156909400					62765110		1A2FL-1	1	$2[illegible].00	FD	CAG	0001
		EA			8518	70603	1	F237012		59608360382					62765102		A1CR21	1	$3.30	FD	CAG	0001
		EA			6684	60521		F237010		59356655717							CONNECTOR	2	$3.00	FD	CAG	0002
		EA			5725	60527		F237012		59350606774					58123197		1A2TP3	5	$.25	FD	CAG	0002
					6725	60623		F237000				000	D	J	01	2.0	A144D17			DD	CAG	0002

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					2161	60415	F237012				068	C	F	01	1.0	CV1522P/UCC-1			BO	CC	0001
					2358	60509	F237012				000	D	E	01	1.0	CV1522P	A10		BO	CC	0001
					2359	60509	F237012				000	D	E	01	3.5	CV1522P	D23		BO	CC	0001
			EA		0854	61122 1	F237010		59605834410					62764781		TRANSISTOR	2	$1.80	FO	CC	0001
			EA		0854	61212 1	F237010		59618536093					62764781		TRANSISTOR	6	$9.20	FO	CC	0001
			EA		0854	61227 1	F237010		59617525229					62764781		TRANSISTOR	10	$.32	FO	CC	0001
			EA		0854	61227 1	F237010		59618453954					62764781		TRANSISTOR	6	$2.70	FO	CC	0001
			EA		0854	61229 1	F237010		59617525229					62764781		TRANSISTOR	9	$.32	FO	CC	0001
			EA		0854	61230 1	F237010		59619683858					62764781		CR13DIODE	10	$.13	FO	CC	0001
			EA		0854	61231 1	F237010		59605776084					62981956		CR1DIODE	4	$1.00	FO	CC	0001
			EA		0854	70103 1	F237010		59618531065					62981956		CR3DIODE	3	$1.10	FO	CC	0001
			EA		6623	70110 1	F237010		59052793500					62764781		R23RESISTO	4	$.10	FO	CC	0001
			EA		6623	70110 1	F237010		59108195745					62764781		C21CAPACIT	4	$.38	FO	CC	0001
			EA		6623	70114 1	F237010		59617525229					62764781		2N404TRANS	4	$.32	FO	CC	0001
			EA		0854	70114 1	F237010		59106443595					62981956		C-21CAPACI	3	$.36	FO	CC	0001
			EA		6623	70114 1	F237010		59618360382					62764781		1N3022BDIO	5	$1.20	FO	CC	0001
			EA		6623	70117 1	F237010		59610692110							Q1TRANSIST	8	$1.20	FO	CC	0001
			EA		6623	70117 1	F237010		59600692110					62764781		1A2A1QTRAN	3	$2.60	FO	CC	0001
			EA		6623	70117 1	F237010		59058826380					62764781		1A2A1R41RF	1	$5.70	FO	CC	0001
			EA		6623	70117 1	F237010		59108353912					62764781		1A2A1C-15C	2	$.32	FO	CC	0001
			EA		6623	70124 1	F237010		59202849493							FUSE1A1A2F	29	$.07	FO	CC	0001
			EA		0854	70126 1	F237010		59618360382					62764781		CR21DIODE	6	$1.20	FO	CC	0001
			EA		6891	70130 1	F237010		59202804045							FUSEHOLDER	10	$.05	FO	CC	0001
			EA		6891	70206 1	F237010		59202215673							FUSEHOLDER	10	$.18	FO	CC	0001
			EA		6623	70213 1	F237010		59109950218							1A2A1C-21C	6	$2.70	FO	CC	0001
			EA		6623	70213 1	F237010		59057028070							1A2A1R-31R	6	$6.50	FO	CC	0001
			EA		6623	70217 1	F237010		59619683858							1A2A1CR7DI	12	$.10	FO	CC	0001
			EA		6623	70217 1	F237010		59502258123							TA2A1T3TRA	5	$9.50	FO	CC	0001
			EA		6623	70217 1	F237010		59507194325							1A2A1L1IND	6	$8.00	FO	CC	0001

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
			EA		6623	70217	1	F237010		59108927871						1A2A1C7CAP		8	$.21	FO	CC	0001
			EA		6623	70217	1	F237010		59507994163						1A2A1T-1TR		4	$6.90	FO	CC	0001
			EA		6623	70220	1	F237010		59502258123						1AA1T3TRAN		3	$9.50	FO	CC	0001
			EA		6891	70318	1	F237010		59156822947				71966091		FILTER		2	$161.00	FO	CC	0001
					6953	70327		F237011				242	A	C	01	8.0	306			BO	CC	0001
					6952	70327		F237012				242	A	C	01	8.0	528			BO	CC	0001
					6909	70327		F237000				700	C	C	01	9.9	A-10			BO	CC	0001
					6891	70327		F237000				700	C	C	01	9.0	A-10			BO	CC	0001
					6879	70327		F237000				700	C	C	01	6.0	P-23			BO	CC	0001
			EA		6909	70328	1	F237010		59106882822				71966091		C-13		4	$.38	FO	CC	0001
			EA		6909	70328	1	F237010		59202849493				71966091		FUSE1/8AMP		20	$.07	FO	CC	0001
			EA		6891	70417	1	F237010		59156822946				71966091		FILTER		2	$48.00	FO	CC	0001
			EA		6952	70420	1	F237010		59506822861				62764991		DISCRIMNAT		1	$147.00	FO	CC	0001
			EA		6953	70420	1	F237010		59351924789				71966091		JACKV-1		4	$.31	FO	CC	0001
			EA		6891	70420	1	F237010		59107173635				62764991		CAPACTOR		3	$1.00	FO	CC	0001
			EA		6879	70420	1	F237010		59351924789				62764991		JACK		4	$.31	FO	CC	0001
			EA		6991	70421	1	F237010		59156822969				62764991		FILTER		2	$72.00	FO	CC	0001
			EA		6891	70421	1	F237010		59156909405				62764991		FILTERFLY		1	$209.00	FO	CC	0001
			EA		6952	70423	1	F237010		59352593608				62764991		JACKV-1		1	$5.40	FO	CC	0001
			EA		6953	70423	1	F237010		59508800427				71966091		CHOK		2	$.81	FO	CC	0001
			EA		6891	70423	1	F237010		59108805433				62764991		CAPACTOR		4	$.36	FO	CC	0001
			EA		6909	70423	1	F237010		59109950218				71966091		C-13		3	$1.60	FO	CC	0001
			EA		6909	70423	1	F237010		59107818983				71966091		C-8		4	$.73	FO	CC	0001
			EA		6879	70423	1	F237010		59109950218				62764991		CAPACTOR		6	$1.60	FO	CC	0001
			EA		6891	70423	1	F237010		59108927871				62764991		CAPACTOR		3	$.73	FO	CC	0001
			EA		6879	70423	1	F237010		59108927600				62764991		CAPACTOR		5	$1.20	FO	CC	0001
			EA		6953	70429	1	F237010		59502258123				71966091		TRANSFORME		2	$9.50	FO	CC	0001
			EA		6909	70504	2	F237010		58206822870				71966091		KEYER1A1A1		1	$360.00	FO	CC	0001
					6623	70508		F237010				161	C	C	01	6.0	475			BO	CC	0001
			EA		6953	70510	1	F237010		59618786521				71966091		TRANSISTOR		10	$.35	FO	CC	0001
					5038	60403		F237000				346	C	H	01	.2	D26			DO	CC	0002
					5040	60403		F237000				346	C	H	01	.2	A3			DO	CC	0002
					5041	60403		F237000				346	C	H	01	.2	A4			DO	CC	0002
					5039	60403		F237000				346	C	H	01	.2	A2			DO	CC	0002

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					5321	60425		F237012				161	C	C	01	1.0	167				BD	CC	0002
					5322	60425		F237012				161	C	C	01	1.0	232				BD	CC	0002
					5342	60502		F237012				161	C	J	01	1.5	102				DD	CC	0002
		EA			5321	60504		F237012		59608552537					58123197	Q14ST205		5	$1.50	FD	CC	0002
		EA			5321	60504		F237012		59608536093					58123197	Q12ST201		5	$11.60	FD	CC	0002
					5342	60607		F237012				161	C	C	01	1.5	102				DD	CC	0002
		EA			5342	60609	1	F237012		59506822980					58123197	STELLMA C5		1	$75.00	FD	CC	0002
		EA			5698	60721	1	F237011		59051923971					58123197	3301/2W		2	$.03	FD	CC	0002
		EA			5698	60721	1	F237011		59109950218					58123197	60MFDCAP		1	$4.00	FD	CC	0002
		EA			0098	60728	1	F237011		59109950218					58123197	C2C360FDCA		2	$4.00	FD	CC	0002
					0059	60802		F237011				428	C	C	01	2.5	A3CHANNEL		4		BD	CC	0002
					5038	60802		F237000				346	C	C	01	43.0	D26				DD	CC	0002
					5039	60802		F237000				346	C	D	01	43.5	A2				DD	CC	0002
					5040	60802		F237000				346	C	D	01	15.5	A3				DD	CC	0002
					5041	60802		F237000				346	C	D	01	14.0	A4				DD	CC	0002
		EA			0156	60809	1	F237000		59618536093					58123197	ST201		4	$9.20	FD	CC	0002
					0469	60910		F237011				068	A	C	01	1.5	AN/UCC-1V				BD	CC	0002
		EA			0156	60919	1	F237000		59208453954					58123197	2N329A		3	$.09	FD	CC	0002
					0722	60928		F237011				068	C	C	01	3.0	D26				BD	CC	0002
		EA			0722	60928	1	F237011		59109950218					58123197	C13		2	$4.00	FD	CC	0002
		EA			0722	60928	1	F237011		59052792626					58123197	680 1W		5	$.10	FD	CC	0002
					0757	60930		F237011				068	A	C	01	4.0	D26				BD	CC	0002
		EA			0757	61003	1	F237011		59051956761					58123197	R81-R83		5	$.04	FD	CC	0002
		EA			0757	61003	1	F237011		59052499468					58123197	R183		5	$.07	FD	CC	0002
		EA			0757	61003	1	F237011		59052992000					58123197	R1		5	$.60	FD	CC	0002
		EA			0156	61006	1	F237000		59618431009					58123197	2N404A		4	$.46	FD	CC	0002
		EA			1050	61107	1	F237011		59606829178					58123197	2N404		2	$.50	FD	CC	0002
					5078	70105		F237012				255	A	C	01	2.0	210				BD	CC	0002

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MMHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			5078	70111 1	F237011		59156822862					71966086		FILTERASSY	1	$75.00	FO	CC	0002
		EA			5078	70111 1	F237012		59156822969					62764781		FILTERCON	1	$50.00	FO	CC	0002
		EA			0757	70131 1	F237011		59618431009					58123197		Q13-Q18	15	$1.10	FO	CC	0002
		EA			0722	70313 1	F237011		59107835268					58123197		22UFDCAP	2	$3.30	FO	CC	0002
					6184	70328	F237012				255	C	C	01	3.0	1272			BO	CC	0002
		EA			6199	70403 1	F237012		59618786524					58123197		2N404 Q2	4	$.31	FO	CC	0002
					1018	60720	F237012				255	C	C	01	3.0	AN/UCC-1V D13			BO	CG	0010
		EA			1018	60720 1	F237012		59618536093					N/A		1A1Q14ST20	4	$9.20	FO	CG	0010
					6201	60913	F237011				161	C	E	03	6.0	AN/UCC-1V D13			BO	CG	0010
					6202	60913	F237012				161	C	E	06	8.0	AN/UCC-1V D13			BO	CG	0010
		EA			0302	60922 1	F237012		59608536093					58123153		Q14/ST201A	1	$9.20	FO	CG	0010
		EA			6225	60610	F237000		59052792633					58123153		R28 82	1	$.10	FO	CG	0011
		EA			6225	60611	F237000		59605776085					58123153		CR5DIODE	1	$.45	FO	CG	0011
					3182	61027	F237000				080	C	C	08	2.0	699			BO	CG	0011
					3418	61030	F237000				346	C	D	08	3.0	EAN-UEC-1C699			BO	CG	0011
					3538	61103	F237000				000	D	E	01	.5	AN/UCC-1C 45			BO	CG	0011
					3539	61103	F237000				000	D	E	01	.5	AN/UCC-1C 45			BO	CG	0011
					3515	61107	F237000				346	C	D	01	.9	AN/UCC-1 C 16			BO	CG	0011
					3514	61107	F237000				346	C	D	01	.9	AN/UCC-1 C 16			BO	CG	0011
					3671	61111	F237010				161	C	D	01	.4	AN/UCC-1V 16			BO	CG	0011
					4016	70123	F237000				255	C	C	01	1.0	AN/UCCU 16			BO	CG	0011
		EA			4576	70316	F237000		59608536093					62764781		TRANSISTOR	1	$9.20	FO	CG	0011
					4720	70321	F237000				000	D	E	01	1.0	85 UCC1			BO	CG	0011
		EA			4880	70417	F237011		59608536093					58123158		Q14	4	$9.20	FO	CG	0011
					4880	70420	F237012				255	C	C	01	6.0	AN URC16			BO	CG	0011
					8062	70520	F237000				161	C	D	01	20.0	ANUCC1V012			BO	CG	0011

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL	EIC EIC	WC CG	ANC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			7325	60607	1	F237011		59507805568					71966081		T1OUTPUTXF	1	$35.00	FO	CG	0012
					5630	61121		F237000				255	C	J	01	9.5	4296			DO	CGN	0009
					5630	61212		F237000				255	C	C	01	4.5	4296			DO	CGN	0009
		EA			2523	60817		F237012		59507246731					58120154		1A2T1	6	$15.00	FO	CLG	0003
					8356	70209		F2A1000				000	D	J	01	5.0	AU09			DO	CLG	0003
					8356	70522		F237000				000	D	M	01	2.0	A109			DO	CLG	0003
					9742	60708		F237000				000	D	J	01	.5	A212			DO	CLG	0004
		EA			9742	60808	1	F237010		59358271545					61399554		PLUG	4	$6.00	FO	CLG	0004
		EA			9742	60810	1	F237010		59358168643					61399554		PLUG	4	$5.70	FO	CLG	0004
					1495	60907		F237000				000	D	E	01	1.0	A212			BO	CLG	0004
		EA			5371	61227	1	F237011		58059216019					62264007		IC-1MICROC	1	$7.20	FO	CLG	0004
					5371	70127		F237000				068	A	C	01	4.0	738			BO	CLG	0004
		EA			3200	60501		F237010		59358151541					62982108		PLUGELECT	2	$2.70	FO	CLG	0005
					3352	60516		F237012				255	C	J	01	3.0	625			DO	CLG	0005
		EA			3684	60620		F237000		59358168643					62981956		PLUG	4	$5.70	FO	CLG	0005
		EA			2729	61075		F237011		9623805343200416					71966095		FILTER	1	$248.75	PO	CLG	0005
					3022	61031		F237010				255	C	C	02	3.0	A71			BO	CLG	0005
		EA			3022	61101		F237010		59156822966					62264000		FILTER	1	$50.00	FO	CLG	0005
		EA			3022	61101		F237010		59156909398					62264000		FILTER	1	$128.00	FO	CLG	0005
					3161	61119		F237000				000	D	J	01	.1	AN/UCC-1CV			D1	CLG	0005
					3160	61119		F237000				000	D	J	01	.1	AN/UCC-1CV			D1	CLG	0005
					3160	61119		F237000							FIELDCHANGE01					D2	CLG	0005
					3161	61119		F237000							FIELDCHANGE02					D2	CLG	0005
					2792	70117		F237011				004	C	C	01	1.0	94			DO	CLG	0005
		EA			3352	70514		F237012		59156909398					62764788		FILTER	1	$128.00	FO	CLG	0005

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			5435	60406	F237011		59108826695					71966095		22UF35VDC	1	$1.20	FO	CLG	0006
		EA			5435	60406	F237011		59108927871					71966095		15UF20VDC	2	$.68	FO	CLG	0006
					7698	60505	F237000				Q01	D	A	01	.2	AN/UCC1V			BO	CLG	0006
					7699	60505	F237000				Q01	D	A	01	.2	AN/UCC1V			BO	CLG	0006
		EA			8331	70104	F237000		58206822870							KEYERSUBAY	1	$250.00	FO	CLG	0006
					8331	70111	F237011				000	D	B	01	.1	AN/UCC1VKEYER			BO	CLG	0006
		EA			7822	70202	F237011		58059216019							A1A11C1	6	$7.20	FO	CLG	0006
					6940	70224	F237011				276	C	C	01	1.5	ANUCC-1C			BO	CLG	0006
		EA			6940	70224	F2A3000		59052791979					71966107		R33	2	$.12	FO	CLG	0006
		EA			6942	70224	F2A3000		59052549201					71966087		1A1A1R20	2	$.04	FO	CLG	0006
		EA			9553	70224	F2A3000		58059216019							A1A11C1	10	$7.20	FO	CLG	0006
		EA			6955	70301	F237012		58056822972					62764995		1A2A1	1	$250.00	FO	CLG	0006
		EA			0503	70303	F2A3000		59359216015					62764994		CONNSECT	1	$1.30	FO	CLG	0006
					0506	70304	F2A3000				008	C	K	01	.5	ANUCC1C			DO	CLG	0006
		EA			0555	70309	F2A3000		59052791979					71966098		R33	1	$.12	FO	CLG	0006
					9553	70403	F2A3000				255	A	C	05	20.0	AN/UCC-1CSNED			BO	CLG	0006
		EA			1645	70403	F2A3000		59358168643					58123153		CONNECTR	1	$5.70	FO	CLG	0006
					6942	70405	F2A3000				900	C	C	01	.2	AN/UCC-1CKEYE			BO	CLG	0006
					6955	70405	F237012				161	C	C	01	1.0	AN/UCC-1			BO	CLG	0006
					0503	70405	F2A3000				000	D	P	01	.5	AN/UCC-1CKEYE			BO	CLG	0006
					0753	70405	F237012				161	C	J	01	.4	AN/UCC-1CCONV			DO	CLG	0006
					0728	70405	F237011				161	C	J	01	2.0	AN/UCC-1CKEYE			DO	CLG	0006
					3365	70417	F2A3000				161	C	C	01	9.0	AN/UCC-1CKEYF			BO	CLG	0006
					0506	70418	F2A3000				008	C	C	01	.2	AN URC1C			DO	CLG	0006
		EA			0753	70608	F2A3000		58059257259					58123153		1A2A1CONVC	1	$50.00	FO	CLG	0006
		EA			0728	70615	F2A3000		58059257257					58123153		CARD	1	$184.00	FO	CLG	0006
		EA			4314	70322	H F237000		58153700827					2839405			1	$.00	FO	CLG	0007

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					0036	60809	F237012				090	C	J	03	1.2	1543			DO	CLG	0008
			EA		0041	61013	F237012		015341A2A1Q6					62264008	TRASISTOR		5	$4.60	PO	CLG	0008
					0036	61015	F237012				080	C	C	03	50.0	1543	ANUCC1		DO	CLG	0008
					8227	70321	F237012				450	C	D	01	1.2	263			BO	CLG	0008
					8006	70621	F2A3000				000	D	E	32	7.0	UCCICCONVERT			BO	CLG	0008
					4192	70206	F237012				255	C	C	01	2.5	B245			BO	CVA	0019
					4201	70207	F237011				161	C	C	01	2.0	C5			BO	CVA	0019
					4210	60805	F237011				450	C	J	01	5.0	A425			DO	CVA	0034
					7086	70403	F237015				000	D	E	01	.5	C54			BO	CVA	0034
					1209	60425	F237011				068	A	J	01	1.0	D47			DO	CVA	0042
					2657	60706	F237010				360	C	C	01	10.0	02			BO	CVA	0042
			EA		2657	60706	F237010		59357553804						1J8		1	$7.36	F1	CVA	0042
			AY		2657	60706	F237010		58206822870						1A1A1		1	$360.00	F1	CVA	0042
					2932	60820	F237012				068	C	C	01	1.0	D3			BO	CVA	0042
					1209	60820	F237011				068	A	C	01	.5	D3			DO	CVA	0042
			EA		1209	60820	F237011		59507246731					UCC1	1AT1		1	$15.00	FO	CVA	0042
			EA		2932	60820	F237012		59610692110						TRANSISTOR		1	$.31	F1	CVA	0042
			EA		2932	60820	F237012		59618343194						TRANSISTOR		1	$1.20	F1	CVA	0042
					2943	60824	F237012				068	C	C	01	2.0	D3			BO	CVA	0042
			EA		2943	60824	F237012		59610692110					CU1522PUCC1	TRANSISTOR		1	$1.20	FO	CVA	0042
					6863	60902	F237012				068	C	J	01	3.0	C58			DO	CVA	0042
					7197	61104	F237012				068	C	C	01	2.0	C47			BO	CVA	0042
			EA		7197	61104	F237012		59618166237					CV1522PUCC1	A1Q2		1	$1.50	FO	CVA	0042
			EA		7197	61104	F237012		59610692110					CV1522PUCC1	A1Q1		1	$1.20	FO	CVA	0042
					7210	61107	F237012				068	C	C	01	2.0	D3			BO	CVA	0042

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA		7210	61107	F237012		59618536093			CV1522P			1AQ14			1	$9.20	FO	CVA	0042
				0188	70526	F237011			450	C	D	01		1.5	D2				BO	CVA	0042
				6863	70529	F237012			068	C	C	01		6.0	C58				DO	CVA	0042
		EA		6863	70529	F237012		59618166237						1A2AQ2			1	$1.50	F1	CVA	0042
				8005	70503	F237000			750	E	J	02			UCC 1				DO	CVA	0059
				2614	60425	F237011			462	C	D	01		.2	B75				BO	CVA	0060
				2615	60425	F237011			462	C	D	01		.2	B65				BO	CVA	0060
				2618	60425	F237011			462	C	D	01		.2	B26				BO	CVA	0060
				2616	60425	F237011			462	C	D	01		.2	B69				BO	CVA	0060
				1465	60815	F237010			099	C	D	01		30.0	C4				BO	CVA	0060
				7194	61010	F237000			068	C	D	01		18.0	C4				BO	CVA	0060
				2394	70106	F237010			255	E	C	01		2.0	B11				BO	CVA	0060
		EA		2394	70106	F237010		59205772264			62764781			HOLDER			4	$1.20	FO	CVA	0060
				2646	70410	F237000			255	C	J	01		4.0	B20				DO	CVA	0060
				5583	70424	F237012			000	D	E	01		1.5	358				BO	CVA	0060
				5695	70426	F237012			000	D	E	01		10.0	358				BO	CVA	0060
				0127	70510	F237011			068	C	D	01		1.0	C4				BO	CVA	0060
				0413	70612	F237000			099	K	K	01		1.0	A458				DO	CVA	0060
				0412	70612	F237000			099	K	K	01		1.0	A400				DO	CVA	0060
				0414	70612	F237000			099	K	K	01		1.0	A122				DO	CVA	0060
				0415	70612	F237000			099	K	K	01		1.0	A126				D1	CVA	0060
				0415	70612	F237000					ANUCC1CV 2								D2	CVA	0060
				7290	70628	F237000			255	C	J	01		1.5	A2014				DO	CVA	0060
				2867	60801	F237010			472	C	C	01		2.0	AN1UCC611V1				BO	CVA	0062
		EA		2867	60801	F23F1											1	$.10	KO	CVA	0062
		EA		7901	60911	F237000		59059511424						1A1A1R7			1	$.50	FO	CVA	0062

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					0296	61112	F237000				054	C	J	01	3.0	42			DO	CVA	0062
					0278	60602	F237012				127	A	E	01	1.0	A96			BO	CVA	0064
					0279	60602	F237012				127	A	E	01	.5	A98			BO	CVA	0064
					0277	60602	F237012				127	A	E	01	.5	A97			BO	CVA	0064
					0984	60614	F237012				255	A	J	01	.5	462			DO	CVA	0064
					1360	60614	F237012				255	A	J	01	.5	449			DO	CVA	0064
					1359	60614	F237012				255	A	J	01	.5	350			DO	CVA	0064
		EA			1360	60626	F237012		59608536093								1	$9.20	FO	CVA	0064
					0274	60704	F237012				255	A	J	01	.5	A430			DO	CVA	0064
		EA			0273	60704	F237012		59608453954								1	$3.90	FO	CVA	0064
		EA			0749	60708	F237012		59608453954								1	$3.90	FO	CVA	0064
		EA			0749	60708	F237012		59051963583								5	$.60	FO	CVA	0064
		EA			0984	60814	F237012		59608536093								1	$9.20	FO	CVA	0064
					0373	60919	F237012				255	A	C	01	.2	A413			DO	CVA	0064
					0274	60919	F237012				255	A	C	01	.2	A430			DO	CVA	0064
					9280	60923	F237000				255	C	C	01	1.0	A410			BO	CVA	0064
					0749	61029	F237012				255	H	C	01	.2	A421			DO	CVA	0064
					0984	61107	F237012				255	A	C	02	2.0	462			DO	CVA	0064
					1360	61107	F237012				255	A	C	01	1.0	449			DO	CVA	0064
					7789	70403	F237012				196	D	C	02	.5	A434			BO	CVA	0064
		EA			7789	70403	F237012		59618536093								2	$9.20	FO	CVA	0064
					7797	70404	F237012				242	C	C	01	3.0	A430			BO	CVA	0064
		EA			7797	70404	F237012		59058826380								1	$5.70	FO	CVA	0064
					8593	70407	F237012				255	C	J	01	2.0	449			DO	CVA	0064
		EA			8593	70407	F237012		59618536093								1	$1.90	FO	CVA	0064
					8597	70410	F237012				255	C	C	01	.5	A429			BO	CVA	0064
		EA			8597	70410	F237012		59050685919								1	$2.00	FO	CVA	0064

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					8593	70511	F237012				255	C	C	01	.5	449			DO	CVA	0064
		FT			2906	70518	F237012		61451841253								800	$.15	FO	CVA	0064
		FT			2906	70518	F237012		61451841253								800	$.15	FO	CVA	0064
					3932	70523	F237012				068	C	J	01	2.0	A419			DO	CVA	0064
		EA			3932	70523	F237012		59051908889								1	$.04	FO	CVA	0064
					7611	70527	F237012				255	C	C	01	.2	A412			BO	CVA	0064
		EA			7611	70527	F237012		59051908889								1	$.04	FO	CVA	0064
					7670	70601	F237012				255	C	C	01	2.0	A430			BO	CVA	0064
					7665	70601	F237012				255	C	C	01	1.0	A425			BO	CVA	0064
		EA			7665	70601	F237012		59618536093								1	$1.90	FO	CVA	0064
					7677	70602	F237012				161	C	J	01	.5	A425			DO	CVA	0064
					7824	70617	F237012				160	G	C	01	3.5	A422			BO	CVA	0064
					1384	70119	F237012				068	C	J	01	.5	A197			DO	CVA	0066
					5938	70627	F237000				099	C	E	01	.2	D-9			BO	CVS	0011
					1017	70327	F237000				161	C	C	01	1.0	842			BO	CVS	0012
					7009	70503	F237000				068	C	C	01	2.5	936			BO	CVS	0012
		EA			7009	70503	F237000		59306822970								1	$2.50	FO	CVS	0012
					7258	70516	F237000				000	D	E	04	1.0	737			BO	CVS	0012
					7258	70516	F237000				000	D	E	04	1.0	737			BO	CVS	0012
					7344	70519	F237000				127	C	E	04	1.0	732			BO	CVS	0012
					7344	70519	F237000				127	C	E	04	1.0	732			BO	CVS	0012
		EA			7812	70616	F237000		59507194325								1	$8.00	FO	CVS	0012
		EA			7812	70616	F237000		59507194325								1	$8.00	FO	CVS	0012
		EA			7812	70616	F237000		59619683858								10	$.13	FO	CVS	0012
		EA			7812	70616	F237000		59619683858								10	$.13	FO	CVS	0012
		EA			7812	70617	F237000		59618786521								10	$.31	FO	CVS	0012
		EA			7812	70617	F237000		59618453954								2	$3.90	FO	CVS	0012
		EA			7812	70617	F237000		59618953954								2	$3.90	FO	CVS	0012

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			7834	70617	F237000		59107173635								1	$10.50	FO	CVS	0012
		EA			7834	70618	F237000		59610876047								1	$.25	FO	CVS	0012
					7834	70619	F237000				161	C	C	01	26.0	D31			BO	CVS	0012
					7834	70619	F237000				161	C	C	01	26.0	D31			BO	CVS	0012
					7856	70619	F237000				161	C	C	01	.5	D31			BO	CVS	0012
		EA			7834	70619	F237000		59108927871								2	$.68	FO	CVS	0012
		EA			7834	70619	F237000		59610876047								4	$.25	FO	CVS	0012
					7812	70621	F237000				161	C	C	01	30.0	D31			BO	CVS	0012
					7950	70625	F237000				161	C	C	01	6.0	731			BO	CVS	0012
		EA			8753	60929	F237000		59608084741						A1CR4		1	$1.60	FO	CVS	0015
					5973	70328	F237000				346	C	E	01	6.5	D17UCC1V			BO	CVS	0020
					5974	70328	F237012				255	C	C	02	1.5	D19UCC1V			BO	CVS	0020
					2124	70225	F2A3000				161	C	K	01	20.0	ANUCC-1C			DO	DD	0449
					2124	70310	F237012		04637		161	C	T	01					CO	DD	0449
					2124	70318	F237012				161	C	M	01	2.5	AN/UCC-1C			DO	DD	0449
					3486	70323	F237012				068	C	C	01	22.0	UCC1C			BO	DD	0449
					3487	70404	F237012				000	D	B	01	1.7	ANUCC-1C			BO	DD	0449
		EA			6595	70314	F237010		59359216015						58123153	PLUG	1	$1.30	FO	DD	0681
		EA			6595	70402	F237010		59359216022						58123153	PLUG	2	$1.30	FO	DD	0681
					2962	70512	F237013				070	G	C	01	.1	500			BO	DD	0682
		EA			2962	70525	F237013		59205772264						61399554	1A3A1XF1	20	$1.10	FO	DD	0682
					6423	61209	F237000				000	D	K	01	.2	AN-UCC-1			D1	DD	0701
					6423	61209	F237000								SADD6961238				D2	DD	0701
		EA			6073	70317	F237010		59159200494						62981956	FILTER	1	$21.90	FO	DD	0717
					3770	70119	F2A3000				000	D	K	01	.5	A34			D1	DD	0718
					3769	70119	F2A3000				000	D	K	01	.5	A34			D1	DD	0718
					3770	70119	F2A3000								FC 2				D2	DD	0718

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL EIC	EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D CID	A APL	UNIT AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					3769	70119	F2A3000						FC 1							D2	DD	0718
					2003	61018	F237000					068	H	K	01	45.0	91351			D0	DD	0719
					2003	61211	F237000					068	H	M	01	222.5	91351			D0	DD	0719
					5482	61101	F237010					000	D	E	01	3.0	A123			B0	DD	0728
					0153	70220	F237000					450	A	D	01	.5				B0	DD	0728
					3272	70606	F237000					346	C	E	01	36.5	A123			B0	DD	0728
		EA			3272	70609	F237000	59356655717					58123151			1AX1		1	$4.60	F0	DD	0728
		EA			4764	60912	F237013	59205832158					58123151			FUSEHOLDER		1	$.79	F0	DD	0729
					4764	61031	F237013					070	A	C	01	.2	A76			B0	DD	0729
					3653	61015	F237000					255	C	D	01	.3	62264009			B0	DD	0730
					3723	61026	F237000					884	C	F	01	.8	A2/UCC CV	A13		B0	DD	0730
					3733	61030	F237000					021	C	F	01	.6	AN UCC IC			B0	DD	0730
					3733	61031	F237000					021	C	F	01	.6	AN/UCC 1C	VA1		B0	DD	0730
		EA			3841	61116	F237012	59617526081					62264015			Q-6		3	$.63	F0	DD	0730
		EA			4064	61222	F237000	59607526081					62264015			Q-1		10	$.89	F0	DD	0730
		EA			3878	70103	F237000	59617526081					62264008			Q-6		12	$.89	F0	DD	0730
					4403	70224	F237000			08810		000	D	7	00					B0	DD	0730
					4403	70224	F237000			08810		000	D	7	00					B0	DD	0730
					4403	70321	F237000			08810		242	A	7	00					B0	DD	0730
		EA			0652	61222	F237000	59352837190					62264015			1J1		1	$.45	F0	DD	0744
					4707	70610	F237000					068	C	C	01	.5	AN/VCC			D0	DD	0744
					6584	70423	F2A3000					080	C	C	01	2.5	A6843			B0	DD	0745
					6629	70512	F237000					080	C	C	02	1.0	A6843	A6963		B0	DD	0745
					9484	61220	F237000					080	C	C	06	6.0	A91			B0	DD	0746
		EA			1215	70124	F237000	59608536093					62264000			RESISTOR		12	$9.20	F0	DD	0746

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					2757	70309	F237000				458	G	D	01	2.0	A91			BO	DD	0746
					2756	70309	F237000				255	C	C	03	1.0	A91			BO	DD	0746
					0650	70108	F237012				346	C	C	01	.3	ANUCC1V			BO	DD	0752
		EA			0650	70108	F237012		59051711999					58120102		RESISTOR	8	$.04	FO	DD	0752
					0703	70118	F237012				161	C	K	01	4.0	ANUCC1			DO	DD	0752
		EA			0754	70201	F237000		59617291059							TRANSISTOR	2	$.83	FO	DD	0752
		EA			0703	70221	F237012		59608786521							2N404	2	$.35	FO	DD	0752
					0703	70223	F237012				161	C	C	01	998.0	ANUCC1			BO	DD	0752
					0703	70223	F237012				161	C	C	01	8.0	ANUCC1			DO	DD	0752
					2919	60405	F237000				255	C	D	01	1.0	A109			BO	DD	0758
					4408	61121	F237000				021	C	J	01	4.0	A52			DO	DD	0758
		EA			4408	70320 1	F237000		58059216020					58120230		2A1IC1	8	$9.00	FO	DD	0758
		EA			4408	70324 1	F237000		58059216019					58120230		1A2A1IC1	4	$7.20	FO	DD	0758
		EA			4408	70405 1	F237000		59619149034					58120230		1A2A1Q6	3	$5.00	FO	DD	0758
					4408	70503	F237000				021	C	C	01	2.5	A52			DO	DD	0758
		EA			7934	61031	F237000		59619149034					62264000		262417	10	$5.00	FO	DD	0759
					3739	70119	F237000				000	D	J	01	1.0	A487			DO	DD	0763
					3739	70127	F237000				000	D	M	01	1.5	A487			DO	DD	0763
		FT			3739	70210 1	F237000		61455537823					58123197		COAX	500	$.23	FO	DD	0763
		EA			3739	70218 1	F237000		59358146598							CONNECTOR	3	$3.30	FO	DD	0763
		EA			3739	70301 1	F237000		59358168643							CONNECTOR	2	$5.70	FO	DD	0763
		EA			3739	70301 1	F237000		59358151541							CONNECTOR	2	$2.70	FO	DD	0763
		EA			3739	70317 1	F237000		59358510221					58123197		CONNECTOR	2	$3.00	FO	DD	0763
		EA			3739	70410 1	F237000		61459132063					58123197		CABLE	100	$.25	FO	DD	0763
		EA			3739	70411 1	F237000		59358168643					58123197		CONNECTOR	3	$5.70	FO	DD	0763

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE	AVAIL EIC	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					7512	70512		F237000				127	D	E	01	8.0	A-21			B0	DD	0776
					7512	70512		F237000				127	D	E	01	8.0	A-21			B0	DD	0776
		FT			0300	70624		F237010		61455426910					58123153		ACPOWCABLE	50	$.16	F0	DD	0784
					0208	60907	E	F237015			04643	117	A	0	00	21.0	TELETYPETEST			B0	DD	0785
					0208	60908	E	F237015			04643	117	A	D	01	6.0	TELETYPETEST			C0	DD	0785
					2565	70326		F237010				255	C	C	01	.5				B0	DD	0787
					2898	70414		F237012				900	C	J	03	4.0	NONE			D0	DD	0787
					2969	70417		F237000				161	C	C	01	.1				B0	DD	0787
		EA			2614	70424		F237015		59205772264					92232000		SF1	6	$1.10	F0	DD	0787
					2042	70428		F237000				099	C	D	16	1.5	AN/UCC-1C			B0	DD	0787
					2898	70510		F237012				900	C	C	03	.5	NONE			D0	DD	0787
		EA			2618	70511		F237010		59619149034					58123151		2N3439	4	$5.00	F0	DD	0787
		EA			2115	70516		F237000		59202849493					58123153		FUSE	5	$.05	F0	DD	0787
					2283	70606		F237000				161	C	C	01	1.5	A-193			B0	DD	0787
		EA			7129	70520		F237000		59352577208					62795101		CONN	1	$5.40	F0	DD	0790
		EA			7129	70520		F237000		59356655717					62795101		CONN	1	$4.60	F0	DD	0790
		EA			7129	70525		F237000		59351924789					62765101		JACK	1	$.43	F0	DD	0790
					6952	61117		F237012				127	C	H	01	12.0	A6533AN/UCC1			D0	DD	0795
		EA			2685	60412		F237000		59352592019					58123196		CONNECTOR	2	$.81	F0	DD	0825
		EA			1960	60425		F237000		59358151541					58123196		CONNECTOR	1	$2.70	F0	DD	0825
		EA			1960	60518		F237000		59358151541					58123196		CONNECTOR	3	$2.70	F0	DD	0825
					1960	60603		F237000				000	D	M	01	99.9	A59			D0	DD	0825
		EA			1960	60603		F237000		59357211081					58123196		CONNECTOR	2	$3.00	F0	DD	0825
		EA			1960	60603		F237000		59357553809					58123196		CONNECTOR	2	$3.60	F0	DD	0825
		EA			1960	60603		F237000		59358146598					58123196		CONNECTOR	1	$3.30	F0	DD	0825
		EA			1960	60603		F237000		59358817775					58123196		CONNECTOR	4	$2.40	F0	DD	0825

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			6621	60819	F237000		59205772264					62264003		FUSEHOLDER	1	$.94	FO	DD	0832
					6632	60911	F237015				080	C	J	01	.5	A1037			DO	DD	0832
					6621	60915	F237015				080	C	C	01	1.0	A1037			BO	DD	0832
					6657	61010	F237012				127	C	D	01	1.0	A84			BO	DD	0832
					6632	61010	F237015				080	C	C	01	1.0	A1037			DO	DD	0832
		EA			6621	70227	F237010		58059218371							1A3A2	1	$30.36	FO	DD	0832
		EA			4155	70417	F2A3141		59617526081					58123155		TRANSISTOR	5	$2.30	FO	DD	0845
		EA			4155	70506	F2A3141		59617526081					58123155		TRANSISTR	14	$2.30	FO	DD	0845
					0920	60827	F237000				900	C	C	01	5.0	A2973			BO	DD	0846
					0920	60827	F237000				900	J	C	01	5.0	A2973			DO	DD	0846
		EA			0920	60926	F237000		59052792633					58123153		R-28	3	$.13	FO	DD	0846
		EA			0920	61114	F237000		62401558014					58123153		LIGHTBULB	24	$.19	FO	DD	0846
					0920	61117	F237000				900	C	C	01	3.0	A2973			DO	DD	0846
					7223	60609	F237012				127	G	B	01	.5	A491			BO	DD	0876
		EA			7223	60901	F237013		01534262412					58123153		1A2A1IC4	2	$15.00	PO	DD	0876
					5995	61212	E F237000				255	C	K	01	.5	1AV			DO	DD	0940
					5995	61219	F237000				255	C	D	01	.5	1AV			DO	DD	0940
					3995	70126	F237000				000	D	J	01	.1	CONVERTER			D1	DD	0941
					3995	70126	F237000							SA931-178					D2	DD	0941
					3542	60616	F237000				080	C	C	02	.8	ANUCCICV			BO	DD	0948
		EA			7231	70519	F2A1000		59619149034					62264010		TRANSOR	3	$5.00	FO	DD	0948
		EA			1549	70313	F237012		59602620160					62737700		TUBE	2	$1.20	FO	DD	0951
		EA			1549	70313	F237012		59602757497					62737700		TUBE	2	$.65	FO	DD	0951
					1822	61019	F237000				000	D	J	02	.5	CY3956UCC1V			DO	DDR	0874

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ET PARTS	DT	ADMIN SC	UNIT	SAN	MCN	DATE AVAIL	AVAIL	EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					7112	70411		F2A2000				346	C	E	01	24.0	ANUCC1A			B0	DDR	0874
					0408	60730		F237012				161	C	C	01	4.5	A-14			B0	DE	1041
					6429	60811		F237010				000	D	B	01	.3	A13			B0	DE	1045
					4285	70104		F237000				000	D	B	01	.1	A17			B0	DEG	0001
					8507	60404		F237012				900	C	C	01	.5	ANUCC1V			B0	DLG	0009
					8570	60404		F237012				196	C	C	01	.5	ANUCC1V			B0	DLG	0009
		EA			8507	60409		F237012		59605776085							CR5	4	$.45	F0	DLG	0009
					5286	60612		F237000				099	C	K	02	.5	ANUCC1 SY			D0	DLG	0009
		EA			6118	70215		F237012		59052793516							RESISTOR	9	$.04	F0	DLG	0009
					6118	70319		F237000				099	G	C	02	30.0	A173 A174			B0	DLG	0009
					5286	70321		F237000				099	C	T	02		ANUCC1			D0	DLG	0009
		EA			6118	70403		F237012		59618536093					62264002		TRANSISTOR	6	$1.90	F0	DLG	0009
					6895	70105		F237000				093	K	C	01	.3	1209			B0	DLG	0012
		EA			6895	70109	1	F237000		59052792296					92600251		RESISTOR	7	$.13	F0	DLG	0012
					6934	70111		F237000				068	G	J	01	.5	1214			D0	DLG	0012
		EA			6934	70126	1	F237000		59052792296					92600251		RESISTOR	5	$.13	F0	DLG	0012
		EA			2962	70201	1	F237010		59358151541					58123150		CONNECTOR	6	$2.70	F0	DLG	0012
		EA			2962	70202	1	F237000		59350896309							CABLECLAMP	3	$1.00	F0	DLG	0012
		EA			2962	70207	1	F237010		59358168643							CONNECTOR	3	$5.70	F0	DLG	0012
		EA			2962	70209	1	F237013		59202966842							4AMPFUSES	20	$.21	F0	DLG	0012
		EA			2962	70209	1	F237013		59207224894							6AMPFUSES	10	$.15	F0	DLG	0012
		EA			2962	70209	1	F237013		59202850810							5AMP FUSES	25	$.17	F0	DLG	0012
					6934	70223		F237000				068	G	C	01	4.0	1214			D0	DLG	0012
					4187	60415		F237010				000	D	J	01	2.0	A249			D0	DLG	0024
					4187	60505		F237010				000	D	M	01	40.0	A249			D0	DLG	0024

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ET PARTS	DT	ADMIN SC	UNIT	SAN SAN	MCN MCN	DATE AVAIL DATE AVAIL	EIC EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
		EA			4187	60505	F237010		59358151541						J4		2	$2.30	F0	DLG	0024
		EA			4187	60505	F237010		59358146598						J1		1	$3.30	F0	DLG	0024
		EA			4187	60505	F237010		59357553804						J8		2	$3.60	F0	DLG	0024
		EA			4819	70317	F2A3000		59617526081					58123153	1A2A1Q6		6	$.89	F0	DLG	0024
					4819	70318	F2A3000				080	C	C	05	2.5	ULC NR1			B0	DLG	0024
					5394	70531	F2A3000				000	D	H	01	1.0	A-249			D1	DLG	0024
					5394	70531	F2A3000							FC-3					D2	DLG	0024
		EA			3428	60425	F237000		59351924758					58123196	PJ-C47B		10	$.61	F0	DLG	0026
					3428	60426	F237000				000	D	C	01	2.0	A2 AN-UCC-1			D0	DLG	0026
					0902	60925	A F237000				099	E	K	01	.5	A82			D0	DLG	0028
					0902	70315	F237000				099	E	C	01	20.0	A82			D0	DLG	0028
		EA			4091	70228	F237013		59352593608					62765101	JACK		1	$5.40	F0	LPD	0005
					4107	70304	F237012				458	C	E	03	9.0	ANUCC1V			B0	LPD	0005
		EA			4280	70419	F237013		59352593608					62765101	JACK		1	$5.40	F0	LPD	0005
		EA			4279	70419	F237013		59350793487					62765101	1XA1		1	$3.00	F0	LPD	0005
		EA			4280	70607	F237013		58158876504					61600033	INSULATOR		1	$1.92	F0	LPD	0005
					2009	70406	F237000				161	C	J	01	.5	A28			D0	LPD	0006
					2055	70428	F237000				099	K	P	01	.2	A28ANUCC1CV			B0	LPD	0006
		EA			2015	70518	F2A3000		59550603278					85912101	CRYSTAL		1	$17.00	F0	LPD	0006
					2216	70611	F237000				161	C	C	01	1.0	A28			B0	LPD	0006
					5512	70525	F237012				450	D	C	01	2.5	ANGCC1V1274			B0	LPH	0002
					5559	70608	F237012				127	G	C	01	11.5	ANUCC10001274			B0	LPH	0002
					5489	60920	F237000				000	D	M	01	36.0	A101			D0	LPH	0003
					5489	61106	F237000				000	D	M	01	90.0	A101			D0	LPH	0003
					8734	61204	F237015				000	D	H	01	.1	B244			D1	LPH	0003

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ET PARTS	DT	ADMIN SC	UNIT	SAN	MCN MCN	DATE AVAIL DATE	EIC AVAIL EIC	WC CG	AWC FSN	RAAN	MAL ATSM	D	A	UNIT CID/APL/AEL	MNHRS REFER.	SERIAL SYM	NOUN QUANT	LABOR UNPR	CC CC	HULL HULL	NO. NO.
					8735	61204	F237013				000	D	H	01	.1	B244			D1	LPH	0003
					8734	61204	F237015							FC000001					D2	LPH	0003
					8735	61204	F237013							FC000002					D2	LPH	0003
					8734	70214	F237015				000	D	G	01	.2	B244			D1	LPH	0003
					8735	70214	F237013				000	D	G	01	.5	B244			D1	LPH	0003
					8734	70214	F237015							FCUCC1C-1					D2	LPH	0003
					8735	70214	F237013							FCUCC1C-2					D2	LPH	0003
					0963	70614	F237012				346	C	K	01	5.0	A-39			D0	LPH	0003
					0963	70623	F237012				346	C	E	01	24.0	A-39			B0	LPH	0003
					0963	70623	F237012				346	C	E	01	4.0	A-39			D0	LPH	0003
					2456	70610	F237012				068	A	D	01	1.5	A63			B0	LPH	0010
					3421	70520	F237000				346	C	D	01	3.0	A119			D0	LSD	0017
					1462	70527	F237000				000	D	H	02	.2	AN UCC 1CV			D1	LSMR	0525
					1462	70527	F237000							FC AN/UCC-1CV-					D2	LSMR	0525

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APPENDIX F

COMPUTER PRINTOUT OF STATISTICAL TESTS

ANALYSIS OF RELIABILITY DATA

THE AN/UCC-1 NETWORK SYSTEM ABOARD THE USS TOPEKA

NON PARAMETRIC RELIABILITY FUNCTION

INTERVAL	NO. AT START	NO. FAIL	NO. TERM.	REL. AT END OF INT.
0.00 -- 0.50	60	9	0	0.852459
0.50 -- 1.00	51	2	1	0.819672
1.00 -- 2.00	48	4	0	0.752760
2.00 -- 3.00	44	3	1	0.702576
3.00 -- 4.00	40	2	0	0.668304
4.00 -- 5.00	38	2	2	0.634032
5.00 -- 7.50	34	5	2	0.543456
7.50 -- 10.00	27	1	2	0.524047
10.00 -- 15.00	24	0	3	0.524047
15.00 -- 20.00	21	3	0	0.452586
20.00 -- 25.00	18	11	0	0.190563
25.00 -- 30.00	7	3	0	0.119102
30.00 -- 40.00	4	1	0	0.095282
40.00 -- 50.00	3	1	0	0.071461
50.00 -- 75.00	2	0	1	0.071461
75.00 -- 200.00	1	1	0	0.035731

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TEST HYPOTHESIS-DATA EXPONENTIAL

MTBSO IS 17.54

TIME	EFFECTIVE SAMPLE SIZE	ALLOWED DEVIATION	NON-PAR. FCN.	THEOR. FCN.
0.50	60	0.1381	0.852459	0.971899
1.00	51	0.1498	0.819672	0.944587
2.00	48	0.1544	0.752760	0.892245
3.00	44	0.1613	0.702576	0.842804
4.00	40	0.1692	0.668304	0.796102
5.00	38	0.1736	0.634032	0.751988
7.50	34	0.1835	0.543456	0.652103
10.00	27	0.2059	0.524047	0.565486
15.00	24	0.2184	0.524047	0.425238
20.00	21	0.2335	0.452586	0.319774
25.00	18	0.2522	0.190563	0.240466
30.00	7	0.4044	0.119102	0.180828
40.00	4	0.5350	0.095282	0.102256
50.00	3	0.6178	0.071461	0.057824
75.00	2	0.7566	0.071461	0.013905
200.00	1	1.0700	0.035731	0.000011

CANNOT
REJECT HYPOTHESIS AT 20% SIGNIFICANCE

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ANALYSIS OF RELIABILITY DATA

THE AN/UCC-1C NETWORK SYSTEM ABOARD THE USS CAVALIER

NON PARAMETRIC RELIABILITY FUNCTION

INTERVAL	NO. AT START	NO. FAIL	NO. TERM.	REL. AT END OF INT.
0.00 -- 0.50	22	1	0	0.956522
0.50 -- 1.00	21	0	0	0.956522
1.00 -- 2.00	21	0	0	0.956522
2.00 -- 3.00	21	1	0	0.913043
3.00 -- 4.00	20	1	0	0.869565
4.00 -- 5.00	19	2	0	0.782609
5.00 -- 7.50	17	1	0	0.739130
7.50 -- 10.00	16	0	1	0.739130
10.00 -- 15.00	15	2	0	0.646739
15.00 -- 20.00	13	1	2	0.600543
20.00 -- 25.00	10	2	1	0.491353
25.00 -- 30.00	7	2	0	0.368515
30.00 -- 40.00	5	1	0	0.307096
40.00 -- 50.00	4	1	2	0.245677
50.00 -- 75.00	1	1	0	0.122839

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TEST HYPOTHESIS-DATA EXPONENTIAL

MTBSO IS 29.83

TIME	EFFECTIVE SAMPLE SIZE	ALLOWED DEVIATION	NON-PAR. FCN.	THEOR. FCN.
0.50	22	0.2281	0.956522	0.983377
1.00	21	0.2335	0.956522	0.967030
2.00	21	0.2335	0.956522	0.935148
3.00	21	0.2335	0.913043	0.904316
4.00	20	0.2393	0.869565	0.874501
5.00	19	0.2455	0.782609	0.845669
7.50	17	0.2595	0.739130	0.777680
10.00	16	0.2675	0.739130	0.715156
15.00	15	0.2763	0.646739	0.604785
20.00	13	0.2968	0.600543	0.511448
25.00	10	0.3384	0.491353	0.432516
30.00	7	0.4044	0.368515	0.365765
40.00	5	0.4785	0.307096	0.261579
50.00	4	0.5350	0.245677	0.187070
75.00	1	1.0700	0.122839	0.080911

CANNOT
REJECT HYPOTHESIS AT 20% SIGNIFICANCE

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ANALYSIS OF RELIABILITY DATA

THE AN/UCC-1C NETWORK SYSTEM ABOARD THE USS TOPEKA

NON PARAMETRIC RELIABILITY FUNCTION

INTERVAL	NO. AT START	NO. FAIL	NO. TERM.	REL. AT END OF INT.
0.00 -- 0.50	54	4	0	0.927273
0.50 -- 1.00	50	5	1	0.836364
1.00 -- 2.00	44	5	1	0.743435
2.00 -- 3.00	38	3	2	0.686248
3.00 -- 4.00	33	1	0	0.666064
4.00 -- 5.00	32	2	1	0.625697
5.00 -- 7.50	29	4	1	0.542271
7.50 -- 10.00	24	3	1	0.477198
10.00 -- 15.00	20	2	0	0.431751
15.00 -- 20.00	18	1	0	0.409027
20.00 -- 25.00	17	6	2	0.272685
25.00 -- 30.00	9	4	0	0.163611
30.00 -- 40.00	5	1	1	0.136342
40.00 -- 50.00	3	1	0	0.102257
50.00 -- 75.00	2	1	1	0.068171

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TEST HYPOTHESIS-DATA EXPONENTIAL

MTBSO IS 15.95

TIME	EFFECTIVE SAMPLE SIZE	ALLOWED DEVIATION	NON-PAR. FCN.	THEOR. FCN.
0.50	54	0.1456	0.927273	0.969134
1.00	50	0.1513	0.836364	0.939221
2.00	44	0.1613	0.743435	0.882135
3.00	38	0.1736	0.686248	0.828520
4.00	33	0.1863	0.666064	0.778163
5.00	32	0.1892	0.625697	0.730866
7.50	29	0.1987	0.542271	0.624823
10.00	24	0.2184	0.477198	0.534165
15.00	20	0.2393	0.431751	0.390403
20.00	18	0.2522	0.409027	0.285333
25.00	17	0.2595	0.272685	0.208540
30.00	9	0.3567	0.163611	0.152415
40.00	5	0.4785	0.136342	0.081415
50.00	3	0.6178	0.102257	0.043489
75.00	2	0.7566	0.068171	0.009069

CANNOT
REJECT HYPOTHESIS AT 20% SIGNIFICANCE

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APPENDIX G

INSTALLATION COST DATA

for PEACE OF MIND BUY SAVINGS BONDS

LONG BEACH NAVAL SHIPYARD
LONG BEACH 2, CALIFORNIA

IN REPLY REFER TO:

14 July 1967

ARINC Research Corporation
2551 Riva Road
Annapolis, Maryland 21401

ATTN: Mr. W. C. Duke

Gentlemen:

During a recent visit to this shipyard by Mr. Ralph All and Mr. Mohammed Yahya Rawasia, cost effectiveness evaluation of UCC-1(V) and UCC-1C(V) teletype terminal equipment was discussed with our Mr. William Schneider. The installation of UCC-1 aboard the USS CAVALIER was selected as a typical installation for costs as shown in enclosure (1).

In accordance with agreement with your Mr. All, data requested by your letter of June 8 was provided by Code 234 and is forwarded as enclosures (1) and (2). If Code 234 can be of any additional assistance do not hesitate to let them know.

E. L. Martin
E. L. MARTIN

Encl:
(1) Installation Costs
(2) Associated Drawings (2 copies)

1. Labor Costs

a. Civilian Personnel

Shop test AN/UCC-1 Equip & prepare for installation	24 M/H	
Fabricate & install fdn aboard ship	38 M/H	
or		
Fabricate mounting kits & install in 19" cabinet		
Shipboard installation of AN/UCC-1 Equip	81 M/H	
Install cable, connect, cold wire check and final tests, check-out of installation (includes Quality Assurance services)		
Total labor costs @ 8.50 hour	143 M/H	$ 1,216

b. Contractor engineer services — Not Used

c. MOTU Services — Not Used

Primary function of MOTU is to provide Technical Services to Forces Afloat when requested for ship not assigned availability at a Naval Shipyard

2. Material Costs

Material used for equipment preparation and bonding (plugs - misc elex mat - bond mat)	$ 116
Material used for equipment installation (cable - mtg hardware- insulation - rubber matting)	100
Material for foundations or mounting kit	30
Total material	$ 246

3. Transportation by commercial carriers from storage area to ship — None

4. Other costs (Ship structure mods) — None