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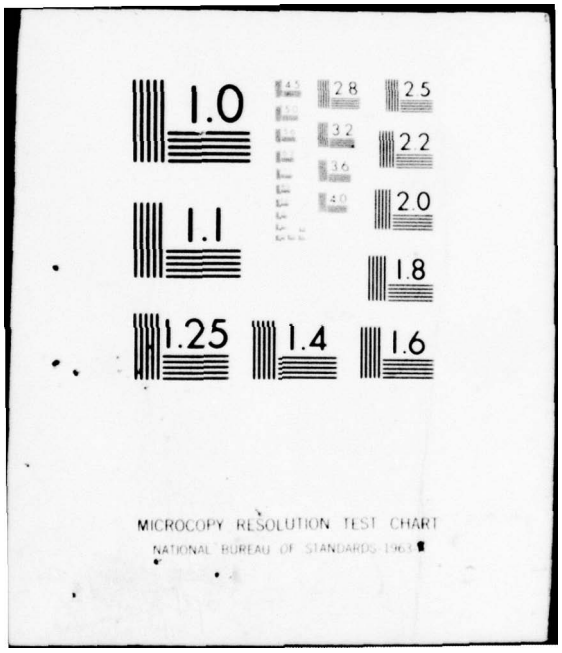
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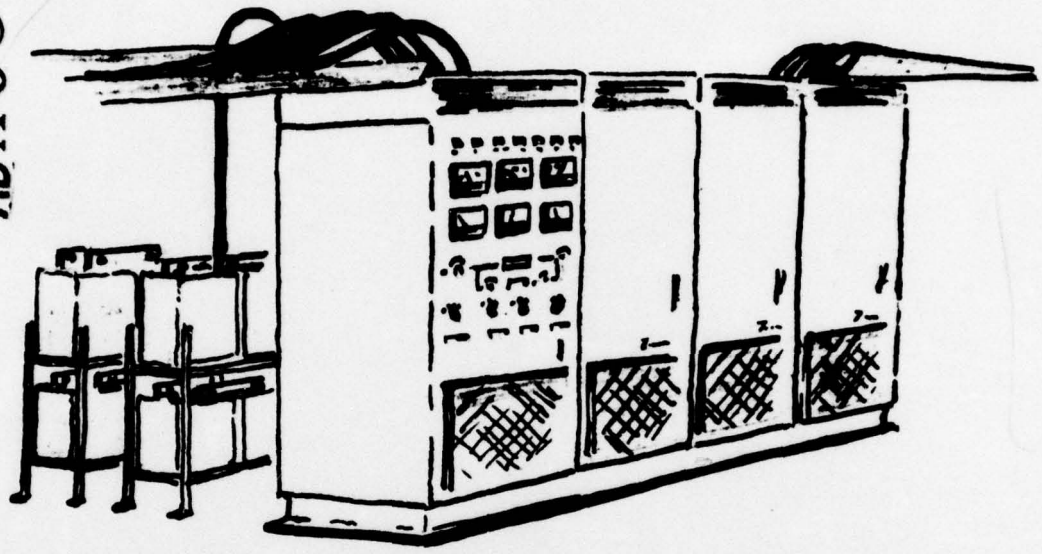


Integrated Logistic Support Plan for Uninterruptible Power Systems

Department of The Navy
Naval Facilities Engineering Command

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)

Chesapeake Division, Naval Facilities Engineering Command

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

3. REPORT TITLE

(6) INTEGRATED LOGISTIC SUPPORT PLAN FOR UNINTERRUPTIBLE POWER SYSTEMS

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5. AUTHOR(S) (First name, middle initial, last name)

(10) John Dixon, Jr.

6. REPORT DATE

(11) July 1976

(12) 26p.

7a. TOTAL NO. OF PAGES

25

7b. NO. OF REFS

NONE

8a. CONTRACT OR GRANT NO.

b. PROJECT NO.

c.

d.

9a. ORIGINATOR'S REPORT NUMBER(S)

NAVFAC FAC-2

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. DISTRIBUTION STATEMENT

Distribution of this document is unlimited

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY

Electronic Facilities Project Office
FPO-2

13. ABSTRACT

This report describes the complete integrated logistic support plan (ILSP) for Uninterruptible Power Supplies (UPS) at various Naval Shore installations that were procured by Chesapeake Division, Naval Facilities Engineering Command under contract N62477-76-C-0119. The plan provides information and guidance to equipment users, the contractor, the procuring activity, and all supporting activities. The report contains a detailed description of the plan, the activities, the events, the major milestones, the cognizant organizational responsibilities, and the key personnel concerned with providing the necessary resources to support the UPS installation throughout their life cycle.

DD FORM 1 NOV 68 1473 (PAGE 1)

S/N 0101-807-6801

391179

Unclassified

Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Logistics Power Supplies						

NAVFAC FAC-2
July 1976

INTEGRATED LOGISTIC SUPPORT PLAN

FOR UPS

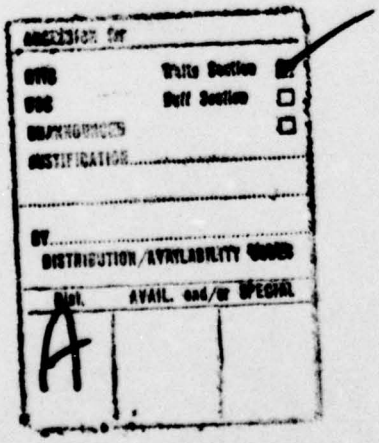
PROCURED BY

CHESAPEAKE DIVISION, NAVAL FACILITIES ENGINEERING COMMAND

UNDER CONTRACT N62477-76-C-0119

COMMUNICATIONS/ELECTRONICS FACILITIES PROJECT OFFICE

FPO-2



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I. INTRODUCTION

1.1 Purpose

The purpose of this document is to describe a complete integrated logistic support plan (ILSP) for the Uninterruptible Power Supplies (UPS) for Navy Shore Installations. This plan provides information and guidance to equipment users, the contractor, the procuring activity and all supporting activities.

1.2 Background

Technology

Prior to the mid 1960's, UPS systems consisted of a motor-generator set with a large flywheel. In the event of prime power loss, the generator maintained critical load power for a short period of time which was dependent on flywheel size and various other mechanical factors. As a result of the rapid development of semi-conductor technology, solid state UPS systems were introduced and gained wide acceptance in the mid 1960's. Earlier problems with poor reliability and efficiency were effectively resolved during four "generations" of development resulting in a fourth generation system which is 85% efficient and highly reliable.

ILS

The Navy currently has various systems in the field which are fulfilling the requirements for uninterruptible power supplies. However, most previous UPS contracts have been for individual installations and therefore relied on contractor support. Only one previous UPS contract has had any support planning associated with it, and because the support system has only recently taken effect, the results of this planning have not been fully realized. As a result, the ILS planning for this contract has not benefited from "lessons learned" on previous contracts nor from statistics gathered from currently operating systems.

1.3 Prccurement

Chesapeake Division, Naval Facilities Engineering Command (Code FPO-2) has been tasked to procure required UPS for major claimants of the Navy. This Multi-Year UPS program described in this ILSP is an equipment acquisition and management effort to provide needed uninterruptible power supplies to selected shore facilities:

1st Year

DCA, Stuttgart, Germany
NAVCAMS WESTPAC Guam MI
NAVCAMS EASTPAC Honolulu Hi
NSGD, Kami Seya, Japan
NAVCOMMU, Thurso, Scotland
LANTFLTWPNTRNGFAC Roosevelt Rds Pr
NAVCAMS MED Naples, It
NAVCOMMSTA, Stockton, CA

2nd Year

NAVCOMMU, London
NTCC, North Island, CA
NTCC, Puget Sound, WA
NTCC, Camp Lejeune, NC
NAVCOMMSTA, Iceland
NAVCAMS WESTPAC Guam MI
NAVCOMMSTA, Rota, Spain
NAVCOMMSTA, Yokosuka, Japan

3rd Year

NAVCOMMSTA, Diego Garcia
NTCC Breezy Point, Norfolk
NAVCAMS EASTPAC Honolulu, Hi
NAVCOMMSTA, Philippines
NAVCOMMU, Washington, DC
NAVCOMMSTA, Greece
NAVCOMMSTA, Adak

Options (anytime within 3 years after contract award)

NAVCOMMSTA, Iceland
NAVCOMMSTA, Diego Garcia
NAVCOMMSTA, Guantanamo Bay, Cuba
NAVCOMMSTA, Harold E. Holt, Australia
CINCPACFLT, Hi

This procurement will establish a standard family of UPS units to be procured over a three year period. The objective of this procurement is to provide reliable uninterruptible power systems in standard configurations which meet or exceed the performance required to support critical telecommunications equipment with minimum cost to the Government. This objective will be achieved through the use of a multi-year procurement contract which will:

a. Standardize all modules procured over a three year period.

b. Reduce costs by distributing non-recurring costs such as provisioning documentation and performance testing over a greater number of modules.

c. Provide increased reliability through interchangeability of parts.

d. Increase competition by minimizing the competitive disadvantage of smaller firms.

The specifications used in this procurement are a refinement of design and performance requirements which allow the maximum use of commercially available UPS modules, thus increasing competition while reducing cost.

1.4 Procurement History

No previous multi-year contracts for the procurement of UPS systems have been issued by this activity. Previous procurement contracts were awarded as the result of IFB or negotiation and have, in general, produced units which meet or exceed Government standards.

1.5 Scope

This Integrated Logistic Support Plan contains a detailed description of the plan, the activities, the events, the major milestones, the cognizant organizational responsibilities, and the key personnel concerned with providing the necessary resources to support UPS installations throughout their life-cycle.

This plan has been prepared in accordance with NAVMATINST 4000.20B. It has been structured to allow revised pages to be conveniently added or removed as additional information is received or program changes are effected.

Questions, comments and recommendations concerning this ILSP should be directed to:

Commanding Officer
Chesapeake Division
Naval Facilities Engineering Command
Bldg. 57, Washington Navy Yard
Washington, D. C. 20374
Attn: Code FPO-23

Telephone contacts are:

Autovon 288-4146/4147
Commercial (202) 433-4146/4147

II. SYSTEM DESCRIPTION

2.1 General: An uninterruptible power supply (UPS) consists of rectifier/charger, batteries, inverter, synchronizing equipment, protective devices, static switches, local and remote alarm and status panels and accessories to provide regulated uninterruptible electric power to the critical technical bus. The UPS includes all mechanical and electrical devices that will automatically effect continuity of electric power within specified tolerances without interruption upon failure or deterioration of the primary power. Continuity of electric power to the load will be maintained for an emergency period with the inverters supplied by the batteries, up to the specified maximum time, until restoration of the primary power or until AC input is provided from an alternate power source.

2.2 Configurations: A power module consists of rectifier/charger and inverter units with their associated controls, synchronizing equipment, protective devices and auxiliary equipment required to operate individually or in parallel with one or more identical modules.

Redundant UPS: The redundant UPS consists of two or more power modules connected in parallel. The UPS is capable of delivering rated load to the critical technical bus upon failure of any one power module of the UPS system. Each power module shares the rated load with one or more similar power modules.

Non-Redundant UPS: The non-redundant UPS consists of one power module and a static bypass switch. Upon failure of the power module, the UPS automatically bypasses to the utility or generator source without an interruption to the load.

III. MANAGEMENT

3.1 Program Management

Program management is under the direction of the Chesapeake Division, Naval Facilities Engineering Command, Communications/ Electronics Facilities Project Office, Code FPO-2.

3.2 Integrated Logistic Support (ILS) Management

Overall management responsibility and monitoring of the logistic effort is the responsibility of the Project Manager, Mr. Norman Baumgarten, FPO-21. In accordance with the requirements of NAVMATINST 4000.20B, the UPS ILS Manager is Mr. J. Dixon, FPO-23.

3.3 Logistic Support Responsibilities

The organizations and their responsibilities, along with key personnel, in the management of the UPS program are as follows:

a. Chesapeake Division, Naval Facilities Engineering Command (Code FPO-2) has been designated as Technical Manager for the UPS program. As the Technical Manager, it is responsible for the acquisition of the UPS equipment and associated software.

Responsibilities include:

(1) Acquisition of the UPS.

(2) Development and review of equipment specifications.

(3) Review and approve technical documents, schedules, and requirements.

(4) Review technical manuals, test plans and test results.

(5) Monitor, review and analyze those elements of logistic support which affect the equipment in terms of reliability, availability, and maintainability.

(6) Determine and develop modifications, alterations and/or field changes to eliminate design deficiencies.

(7) Provide technical assistance to user Commands as required and upon request.

(8) Provide criteria for UPS installations.

b. Engineering Field Divisions (EFD's) are responsible for the installation of the UPS except at DCA, Europe. This includes power studies, the design of spaces to accommodate UPS and the submission of the facility design to CHESDIV FPO-2 for review and approval.

c. Naval Electronic Systems Command is responsible for the funding of several of the UPS installations for NAVTELCOM and NAVSECGRU.

d. Naval Telecommunications Command is responsible for the operation, maintenance, personnel and training to support the UPS after installation in facilities under their cognizance. They are also responsible for programming of funds for their installations.

e. Naval Security Group Command is responsible for the operation, maintenance, personnel and training to support the UPS after installation in facilities under their cognizance. They are also responsible for programming of the funds for their installation.

f. Defense Communications Agency is responsible for funding of the UPS installation at DCA, Stuttgart, Germany.

g. Naval Air Systems Command is responsible for funding the UPS instlalation at Atlantic Fleet Weapons Range.

h. Atlantic Fleet Weapons Range (LANTFLTWPNRAN) is responsible for the operation, maintenance, personnel and training to support the UPS after installation in facilities under their cognizance.

i. Navy Ships Parts Control Center (SPCC) is responsible for establishing the supply support system necessary to support the UPS installations throughout their life-cycle.

j. Army Corps of Engineers is responsible for the facility design and the installation of UPS at DCA, Europe. CHESDIV will review the facility design if so requested.

TABLE 3-1

PARTICIPATING ORGANIZATIONS AND KEY PERSONNEL

UPS PROJECT MANAGEMENT

ORGANIZATION AND FUNCTION	NAME	CODE	TELEPHONE
NAVFAC Project Manager	Mr. N. Baumgarten	FPO-21	AV 288-4146/7
NAVFAC ILS Manager	Mr. J. Dixon	FPO-23	AV 288-4146/7
NAVELEXSYSCOM	Mr. P. Toohey (FLTSATCOM) Mr. T. Sutton (TELCOM)	PME-106-123 ELEX/51042	Comm 692-7520 Comm 692-8362
NAVTELCOM	LCDR J. Dodson	CNTC/05B	Comm 282-0685
NAVSECGRU	CWO Hedgpeth		Comm 282-0724
SPCC	Ms Mary Talley	5412	AV 277-3909
EFD (CHESDIV)	Mr. R. A. Wildman	102	AV 288-3765
EFD (LANTDIV)	Mr. R. Crabtree	12	AV 690-7331
EFD (PACDIV)	Mr. W. Watson	12	AV 471-3213 Comm 471-3213
EFD (WESTDIV)	Mr. W. Reilly	112	AV 859-2631
NAVAIRSYSCOM	Mr. Johnson Mr. Elam	AIR-53524A	Comm 692-3994
DCA	Mr. N. Dill		Comm 437-2253
DCA	Mr. G. Porter	420	Comm 692-7060

3.4 Major Milestones

Major milestones for the UPS procurement are shown in Figure 3.1 below.

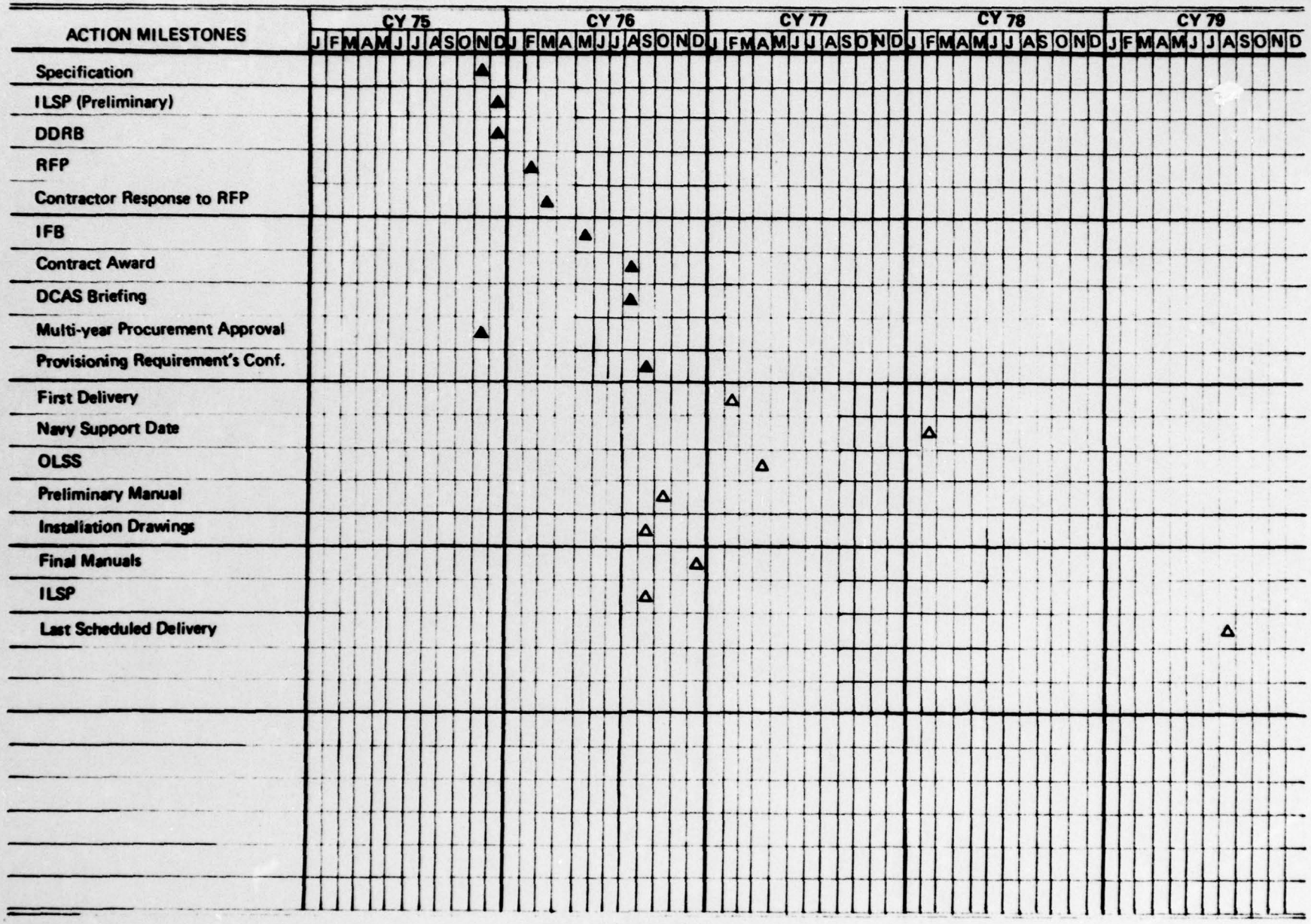

Figure 3-1 Major Milestones.

IV. MAINTENANCE

4.1 Maintenance Concept

The maintenance concept for the UPS is to minimize (a) equipment downtime, (b) skill level requirements, (c) test equipment requirements, (d) active repair time and (e) maintenance personnel requirements. The maintenance concept provides for the replacement of plug-in assemblies at the organizational level. Repair of the plug-in assemblies will be accomplished at the depot level if such repair is deemed cost-effective.

4.1.1.1 Maintenance Levels

a. Organizational Level: The majority of maintenance actions required to restore defective UPS to service are to be performed at this level. The process includes trouble-shooting, repair and tests and measurements required to ensure that performance standards are met and to ensure proper operation of the UPS installation. Preventive maintenance will also be performed at this level. This may include changing filters, reading meters and indicators, and checking cable connections, batteries and hydrogen gas detectors.

b. Depot Level: All repairable assemblies that are considered beyond the capability and facilities available to the organizational level and deemed as non-throwaway will be repaired by the Depot at the designated overhaul point.

c. Technical Assistance: For maintenance requirements deemed beyond the capability of the organizational level, a representative will be fielded to provide required assistance upon request to FPO-2.

4.2 Maintenance and Material and Management (3-M) System

The 3-M system as described in OPNAVINST 4790.4 will be used to control and schedule planned maintenance and to report maintenance and failure data. These two functions are defined as Planned Maintenance System (PMS) and Maintenance Data Collection System (MDCS) respectively.

4.2.1 Planned Maintenance System

The Planned Maintenance System provides maintenance managers with detailed procedural instructions to be followed in performing routine maintenance and periodic system/equipment operational checks. This system also provides the means for scheduling these routine maintenance actions.

4.2.2 Maintenance Data Collection System

The Maintenance Data Collection System provides a means by which maintenance personnel report corrective maintenance actions. Coded data elements are used to record this information for standardization and data processing purposes. The data, once entered into the data banks, are available to anyone who needs them. It provides a means of information feedback from the field which enables concerned organizations to institute changes in the design or supply system which will improve the reliability, maintainability, safety and operational readiness of the equipment.

4.3 Reliability and Maintainability

The UPS is designed for a minimum acceptable mean-time-between-failures (MTBF) of 100,000 hours of redundant UPS and 20,000 hours for non-redundant UPS. The equipment mean-time-to-repair (MTTR) at the organizational level is 40 minutes. These numbers will be based on MIL-HDBK 217B data at 50° C.

4.4 Preventive Maintenance

Preventive maintenance will be performed in accordance with the instructions in the technical manual to be supplied by the manufacturer and the PMS cards developed for the 3-M system.

4.5 Corrective Maintenance

Corrective maintenance will be accomplished at only two maintenance levels: organizational (at the shore installation) and depot (Contractor's facilities).

4.6 Safety

No unusual safety precautions are necessary in operating and maintaining the UPS installations. Standard electrical safety practices should be followed and warning labels should be heeded.

V. SUPPLY SUPPORT

5.1 Supply Support Concept

The objective for supply support is to provide timely and economical life-cycle support. It is intended to use established Navy supply channels.

Supply support is summarized as follows:

a. Contractor will deliver an initial set of spares for each UPS installation. This will provide support for one year. A one-year warranty is provided by the contractor. Since problems that arise during the first year after installation may involve warranty considerations, the problem should immediately be reported to CHESDIV.

b. Formal provisioning of the equipment for long term support will be performed by the Navy Supply System. Navy supply support will take effect one year after first delivery. Navy Ships Parts Control Center will handle provisioning.

c. MILSTRIP/MILSTRAP procedures will be followed for support of equipment.

5.2 Supply Support Levels

Supply support levels will correspond to the maintenance levels described in Section IV.

a. Organizational Level:

Supply support for organizational level maintenance will be consistent with the maintenance concept previously defined, i.e. plug-in type replacement of defective items. Replacement modules will be stocked on-site as determined by failure rate date. Some piece parts such as lamps, fuses, etc. may be stocked on-site.

b. Depot Level:

The contractor has the responsibility to supply the parts needed for repair and replacement of plug-in modules on an as required basis for the duration of the contract.

5.3 Spare Parts

Spare parts, as recommended by the contractor to maintain and support the UPS equipment for one year, will be provided with the equipment. A listing of these parts giving manufacturer's part number, quantity and unit price will be provided by the contractor. As a minimum, the following spare parts will be provided:

ITEM	QUANTITY SYSTEM POWER MODULES		
	1	2	
Switchgear power fuses (if used)	3	4	each type
Pilot lamp	3	4	"
Power semiconductors	2	4	"
A.C. and D.C. power capacitors	10%	10%	2 ea. min.
Control and drive transformers	1	1	each type
Printed circuit card	1	1	"
Replaceable blower components (belts, blades, motors, pulleys, ...)	1	2	"
Reusable air filter	50%	50%	of total used
Replaceable circuit breaker trip element	1	1	each type
Power semiconductor fuse	20	20	"
Control circuit fuse	10	10	"
Low voltage power supply	1	1	"
Voltage regulator supply	1	1	"

Table 5-1
Recommended Spare Parts List

This list can be modified if manufacturer's data indicates need for deviation.

5.4 Parts List

A priced parts list of all major assemblies, replaceable parts and special tools required for long-range (past one year) maintenance and support of the UPS equipment will be provided by the contractor. The list shall have two sections: (1) list of assemblies and parts in disassembly or top-down breakdown sequence and (2) a parts index providing a cross-reference from the manufacturer's part number to the item number on the parts list. From this information, a selection of usage and depth of long-range support items will be made by SPCC and a repair parts order will be negotiated. Subsequently, an allowance parts list (APL) will be issued by SPCC.

5.5 Requisitioning Procedures

The user should not requisition initial allowances as these are provided as interim repair parts packages with each equipment installation.

All requisitions for items to support UPS equipment will be prepared by the user activities in accordance with Military Standard Requisition and Issue Procedures (MILSTRIP).

VI. PERSONNEL AND TRAINING

6.1 Manning Concept

The UPS is designed for continuous operation and will operate unattended which eliminates the need for operating personnel. Maintenance personnel, therefore, are free to perform other duties, except when it is necessary to perform preventive or corrective maintenance on the equipment.

The personnel levels recommended to perform maintenance on the UPS are:

a. For those public works departments manned by civilian journeymen, a billet should be established under the Civil Service series WG-2614 Electronics Mechanic. A grade level of WG-11 is recommended.

b. For those public works departments manned by military personnel, an existing billet should be recoded for a Construction Electrician NEC CE-5601, Construction Equipment Electronic Control Repairman.

Since UPS maintenance will only be on an as needed basis, personnel in the described billets will be trained and available to also maintain electronic controls and equipment in heating, air-conditioning, alarm and communication applications in addition to power systems.

6.2 Training Requirements

Maintenance personnel will attend a maintenance course on the equipment and/or be provided on-the-job training (OJT) by the manufacturer representatives in all aspects of operation and preventive and corrective maintenance. This formal five (5) day training course will be provided by the contractor upon installation of the UPS equipment at each site.

6.3 Training Course

All maintenance personnel who are to fill these UPS-associated billets should be provided with training at the Army UPS Course - "Overseas ASC UPS By-Pass System Repair Course", No. 622-F17, prior to the UPS installation.

Subjects covered in the course include:

Introduction to the UPS By-Pass System
- Rotary UPS System
- Safety Precautions and First Aid
- Polyphase Theory
- UPS By-Pass Logic Fundamentals
- Integrated Circuit Operational Amplifiers
- UPS By-Pass System
- Turn-On, Transfer, Turn-Off Procedures
- Circuit Breaker Cubicles
- Load Bank

Battery Charger
- Block Diagram of the Battery Charger
- Schematic & Logic Analysis of Battery Charger
- Battery Charger Maintenance Routines

Inverter
- Block Diagram of the Inverter
- Schematic & Logic Analysis of the Inverter
- Inverter Maintenance Procedures

This 6 week, 1 day course is offered at Ft. Gordon, Georgia. Initial school quotas for Navy have been granted for FY-77. Military personnel will receive training enroute to the billet under PCS orders from BUPERS. Requests for school quotas for civilian journeymen filling this type of billet must be made in writing and addressed to:

Chief of Naval Technical Training
Naval Air Station Memphis 75
Millington, TN 38054

Attn: Code N2222

There is no charge for the course; however, travel and per diem expenses will be borne by the requesting activity.

A prerequisite for the Army UPS course is a thorough knowledge of electronics. Personnel who do not qualify in this aspect must attend the Navy Basic Electricity and Electronics Program (BEEP), Course No. NAVPERS-94558-OA. This is a multi-media, individualized, self-programmed instruction course offered by Naval Training Centers at San Diego, Great Lakes, Memphis and Orlando. The course is offered continuously and typically takes five (5) weeks to complete, although the time is totally dependent upon the particular student's progress.

Subjects covered include:

Basic Electricity and Electronic Theory

Transistors	Multi-vibrators
Solid State	Ware Shaping Circuits
Power Supplies	Special Devices
Amplifiers	Voltage Multi-pliers
Trouble Shooting	SCR Power Supplies
Vacuum Tubes	Regulators
Oscillators	IC Chips

6.4 Video Tapes

As an aid to training, CHESDIV will coordinate the creation of a video tape library which will provide a review of and quick reference to various aspects of UPS maintenance.

This system will be available at each location and will be indexed to provide easy access to pertinent information. It is expected to reduce the training time significantly. Due to the novelty of the system, it is anticipated that the personnel response will be good, and the system will provide the flexibility necessary to train personnel with various skill levels and learning rates.

The video tape approach will utilize an already existing capability in NAVELEX to produce the tapes as well as currently available equipment for playback at the various UPS installations.

VII. SUPPORT AND TEST EQUIPMENT

7.1 Support Equipment Concept

Special test equipment, required to support UPS, will be avoided if possible. Any special test equipment required will be identified by the manufacturer.

Some General Purpose test equipment will be required to maintain the UPS. As a guide to planning, the following list is given:

Multimeter (VOM)
AC Voltmeter
DC Voltmeter
AC Ammeter
DC Ammeter
Wattmeter
Clamp-on Ammeter
Dual-beam oscilloscope
Current transformer
Temperature meter
Phase sequence indicator
DC power supply
Synchroscope
Digital voltmeter

The exact requirements will not be known until the manufacturer submits a list of general purpose test equipment.

7.2 Calibration

Calibrated support and test equipment is necessary to establish and maintain high quality operation. Test equipment when required will be kept in calibration. This requires repair by the maintenance personnel within their capabilities and where repair parts are available.

7.3 Tools

The following list of tools needed to maintain the UPS is given for planning purposes:

Torque wrench
SCR mounting force gauge
Printed circuit board extender
Soldering iron
Tool kit (standard hand tools)
Diagnostic extender
Open loop AC regulator
Pentrux "A" (8 fl. oz.)
Crowfoot attachments
4" LG extension

The actual tools needed will depend on the manufacturer and the list will be revised as information becomes available.

VIII. TECHNICAL DOCUMENTATION

8.1 General

Contractual provisions have been provided to assure timely development, acquisition, and distribution of the technical data to provide for operating, maintaining, training, supply support, and repair of the UPS. Documentation to be provided include drawings, operation and maintenance manuals, provisioning lists, and this ILSP.

Table 8-1 lists the logistic support documentation for the UPS.

TABLE 8-1

ITEM NO.	TITLE	AVAILABILITY DATE
1	Integrated Logistic Support Plan for UPS	August 1976
2	Technical Manual	150 DAC
3	Installation Drawings	90 DAC
4	Schedule of Prices	30 DAC
5	Test Program	90 Days before testing
6	Test Reports	7 Days after factory tests 21 Days after field tests
7	Certificate of Prior Submission	IAW Provisioning Requirements Statement
8	Provisioning Parts List	
9	Logistic Support Drawings	
10	Interim Repair Parts List	
11	Scheduling Letter of Provisioning	

IX. TRANSPORTATION, HANDLING AND STORAGE

9.1 General

To assure safe arrival of repairable assemblies that, after failure, must be shipped back to the repair facility, the proper packing is essential to adequately protect the unserviceable assemblies during their return to repair sites.

Material returned to the depot for repairs will, whenever possible, be shipped in the reuseable container in which the item was received. Use of the designated container is required, if available, since the interior cushioning and supporting gear is specifically designed to permit easy repositioning of the failed item. When such containers are not available, interior blocking, bracing and cushioning will be applied to prevent damaging movement of the contents during handling and shipping operations.

X. FACILITIES

10.1 Facilities Concept

The UPS will be installed as a complete system at various shore facilities. Each installation will include all items necessary to provide a complete UPS installation to meet the demands of the activities.

10.2 Depot Repair Facilities

Depot level repair requirements for the UPS system are anticipated to be low due to the high reliability of the system.

The manufacturer will provide the depot repair capability. All requests for repair that is beyond the capability of the using activity should be sent to Chesapeake Division, Naval Facilities Engineering Command (Code FPO-2) who will negotiate repair arrangements with the manufacturer.

10.3 Organizational Repair Facilities

Storage for spare parts, general purpose test equipment, special purpose test equipment, etc. will be provided by the using activity. A workbench will also be provided by the using activity.

Table 10-1 - Facility Matrix

Logistics Item	Responsibility/Location
Technical Data & Manual Storage	NAVTELCOM/ Washington, DC
Organizational Maintenance Activity	Using activity/Public Works Dept.
Interim Repair Parts Storage	Using activity
Repair Parts Storage-Navy Supported	SPCC/Mechanicsburg, PA
Training	Contractor/On site
Parts/Test Equipment Storage	Using activity
Depot Maintenance Activity	Manufacturer

XI. CONFIGURATION MANAGEMENT

11.1 General

After the UPS is installed in various locations, it will be necessary for any field changes or modifications to be fully documented in an effort to establish the impact on the supply system, necessary test equipment, etc. It therefore will be required that the activities prepare and submit to CHESDIV, proposed field changes as Engineering Change Proposal's (ECP's) on DD Form 1693 in accordance with MIL-STD-481.