DATA ITEM
IDENTIFICATION NO.
L003-SS090205-F1

PRELIMINARY

NERVA

PREOPERATIONAL LOGISTICS SUPPORT PLAN

MADE

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DOC. NO. 11-1619
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Data Item Identification Number
L003-SS090205-F1

NUCLEAR ROCKET OPERATIONS

September 1968

CLASSIFICATION CATEGORY

UNCLASSIFIED

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CLASSIFYING OFFICER

Sept 24, 1968

DATE

AEROJET - GENERAL CORPORATION
A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

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1. SCOPE

1.1 Purpose

This plan establishes the policies, procedures, and responsibilities for providing integrated logistics support for the NERVA Propulsion and Test Systems Preoperational Program. It prescribes the maintenance management system, material provisioning methods, and material movement mode(s) necessary to provide minimum inventory during the various phases of the program.

1.2 Applicability

This document applies to all NERVA Propulsion and Test System Programs, which occur during the NERVA Ground and Flight test phases.

It applies to all Contractors to the extent delineated in this document.

Documentation required by this plan, or which is necessary for the Contractor to maintain adequate management control, may be prepared with Electrical Accounting Machines (EAM) or Electronic Data Processing Equipment (EDPE).

1.3 Explanation of Terms

See Appendix A for an explanation of terms used in this plan.

2. APPLICABLE DOCUMENTS

The procedures and requirements of the documents listed below are applicable to the NERVA Propulsion System Logistics Plan except as modified by this document.

2.1 Federal

Atomic Energy Commission Manual AEC Chapter 0529

2.2 Military

AFM 75-2 - Military Traffic Management Regulation

AF Form DD 250 - Material Inspection and Receiving Report

AFSCM/AFLCM 310-1 - Management of Contractor Data and Reports

AFSCM 375-1 - Configuration Management During Definition and Acquisition Phases

AFSCM 375-5 - Systems Engineering Management Procedures

MIL-P-116E - Methods of Preservation

MIL-STD-129D - Marking for Shipment and Storage

2.3 Contractor - Aerojet

RN-S-0465 - The NERVA Management Plan

RN-__-___ - The NERVA Maintainability Program Plan

RN-__-___ - The NERVA Site Activation Plan

RN-__-___ - The NERVA Technical Order Publication Plan

RN-__-___ - The NERVA Training Plan

RN-__-___ - NERVA Propulsion System Handbook

RN-__-___ - NERVA Propulsion System Aerospace Ground Equipment
Plan

AGC-90207 - NERVA Propulsion System

3. REQUIREMENTS

3.1 Logistics Responsibility

The logistics responsibilities defined herein are established to insure that the NERVA Propulsion System is maintained, supplied, and transported in consonance with the requirements of SNPO-NPRD-1, "NERVA Program Requirements Document," and NERVA Propulsion System Specification. The implementation of this plan requires the organizational acceptance of the following responsibilities:

3.1.1 Engine Prime Contractor - Aerojet-General Corporation (AGC)

Aerojet-General Corporation shall be responsible for the following functions:

a. Integration and implementation of the total NERVA Propulsion System Logistics Program, insuring the compatibility of all logistics elements, subcontractor and associate or host contractor interfaces.

b. Coordination with SNPO in the development of NERVA Propulsion System Program logistics requirements, logistics documents, and when appropriate, present additional requirements, and/or requirement changes to SNPO.

c. Convene and conduct meetings with subcontractors, associate or host contractors, and SNPO to accomplish effective system logistics support. All meetings held shall comply with AGC Document RN-S-0465, "NERVA Management Plan."

3.1.2 Nuclear Subsystem Subcontractor (Westinghouse Electric Inc.)

Westinghouse Electric Inc. shall be responsible for the following functions:

a. Providing logistics support for the NERVA Nuclear Subsystem in accordance with this plan.

b. Providing qualified representatives to participate in logistics support meetings scheduled and conducted by the Engine Prime Contractor, or SNPO.

c. Providing Nuclear Subsystems logistics documentation inputs to the Engine Prime Contractor.

d. Identifying additional or changed nuclear subsystem logistics requirements and presenting them to the Engine Contractor as specified in this document.

3.1.3 Airframe Contractor - Marshall Space Flight Center (MSFC)

Marshall Space Flight Center shall be responsible for the following functions:

a. Integration and implementation of the S-N Airframe logistics program.

b. Coordination with SNPO in the development of airframe logistics requirements, and when appropriate, present additional airframe logistics requirements and/or requirement changes to SNPO.

c. Providing qualified representatives to participate in logistics support meetings scheduled by SNPO.

3.1.4 Space Nuclear Program Office (SNPO)

Space Nuclear Program Office shall be responsible for the following functions:

a. Insuring that the S-N Logistics policy employs techniques for predicting and providing quantitative support consistent with basic S-N program requirements.

b. Insuring that each organization having a responsibility for any part of this plan will adhere to its implementation and fulfill its responsibilities.

c. Evaluate and approve contractor site activation requirements.

d. Insure that all approved preoperational support facilities at Nuclear Rocket Development Station (NRDS), Michoud Assembly Facility (MAF), Mississippi Test Facility (MTF), and Kennedy Space Center (KSC) are available in time to conduct the NERVA Propulsion System Test Program.

3.1.5 Plans for Site Activation

Aerojet-General Corporation shall provide SNPO with Propulsion System Site Activation Plans that contain the space, material and storage requirements needed to perform the SNPO-NPRD-1 directed preoperational activities scheduled for the Nuclear Rocket Development Station, Michoud Assembly Facility, the Mississippi Test Facility, and Kennedy Space Center. The plans shall be prepared in accordance with AFSCM/AFLCM 310-1, Data Item F-5-35.0-1.

SNPO shall insure that the requested support facilities are available and checked out thirty (30) days prior to the first need date.

3.1.5.1 NRDS Site Activation Plans

The preliminary site activation plan shall be completed and available for review at the Preliminary Design Review (PDR) of the NERVA engine. The final issue shall be published by the Critical Design Review of the NERVA engine.

3.1.5.2 MAF, MTF and KSC Site Activation Plans

Preliminary site activation plans for the above facilities shall be completed by initiation of NERVA Engine Qualification Program.

3.2 Maintenance Program

The maintenance program is intended to achieve system readiness and operational performance effectively and economically as described in AGC Document RN-_-____, "NERVA Maintainability Program Plan."

3.2.1 Maintenance Policies

This plan contains the criteria that will be used to establish a NERVA Propulsion System Maintenance Program. The effective implementation of this program requires that each contractor be responsible for the maintenance of his end items. Agreements between contractors for performance of maintenance actions will not relieve a contractor of his responsibility.

3.2.1.1 Maintenance Concept

The maintenance program shall be based on a concept of:

- a. Maintenance being accomplished by contractor personnel of skills compatible with those at the contractors plant utilized to perform the same function during in-plant development.
- b. Minimum maintenance at the launch site and test stands, consisting primarily of component replacement in accordance with approved procedures.

3.2.1.2 Maintenance and Repair Cycles

Propulsion System maintenance shall be performed in cycles that are either preventative, or corrective or that encompass servicing. The specific functions in each cycle shall be determined from a Propulsion System Maintenance Analysis performed in accordance with AFSCM 375-5. The cycles for maintenance are:

- a. Preventative maintenance shall be accomplished at scheduled intervals.
- b. Corrective maintenance shall be accomplished as its need is identified.

c. Servicing shall be accomplished at predetermined intervals that do not adversely affect program activities.

3.2.1.3 Repair, Modification and Overhaul

Repair, modification or overhaul requirements that Aerojet determines to be necessary shall be directed to SNPO and rework accomplished in accordance with AGC Document RN-S-____, "The NERVA Maintainability Program Plan."

3.2.1.4 Criteria for Acceptance of Repaired Items

Repaired components shall comply with the serviceability and functional criteria established for acceptance of newly fabricated hardware. The conditions and implementation of repaired components testing and its approval shall be as specified in the NERVA Maintainability Program Plan.

3.2.2 Maintenance Levels

NERVA Propulsion System maintenance shall be performed at the Organization, Field and Depot level with these levels defined as follows:

a. Organizational Level Maintenance - Organizational maintenance is that maintenance performed at the test stand(s) or launch pad. It will consist of the trouble-shooting, alignment, calibration, inspections, preventative maintenance checks, and removing and replacing components.

b. Field Level Maintenance - Field maintenance is that maintenance performed in the engine, stage, and/or launch assembly area. It will consist of component bench checks, functional acceptance checks, testing and periodic calibration, repair and replacing components.

c. Depot Level Maintenance - Depot maintenance is that level of maintenance beyond the responsibility and capability of the organization and field sites. It involves major overhaul and repair or complete rebuilding; thus, it shall normally be performed at the Contractors and/or Vendors Plants (e.g., AGC and WANL). However, this maintenance may sometimes be performed at the field level by depot mobile maintenance teams from the Contractor's Depot.

3.2.2.1 Aerojet-General Corporation, Sacramento

Aerojet, Sacramento, a Propulsion System Depot will have the capability to perform all levels of engine maintenance, i.e., modify, overhaul and repair the engine subassemblies and components and related AGE. Rework of NERVA Propulsion System components returned to Sacramento will be performed in accordance with the applicable NERVA Maintainability Program Plan procedures governing "returned product."

3.2.2.2 Westinghouse Electric Inc., Large, Pa.

Westinghouse, Large, a Nuclear Subsystem Depot, will have the capability to perform all levels of nuclear maintenance, i.e., modify, overhaul and repair the Nuclear Subsystem, components of this subsystem and related AGE. Rework of nuclear subsystem components returned to Large will be performed in accordance with NERVA Maintainability Program Plan procedures governing "returned products."

3.2.2.3 Nuclear Rocket Development Station, Nevada

NRDS will have the capability to perform the field and organizational maintenance to support the following activities during the NERVA Engine Development and Qualification Test Program phases:

a. Engine Assembly and Maintenance Building (Field)

The E-MAD Field Maintenance delineated in the NERVA Maintainability Program Plan will encompass the function necessary to accomplish the following activities:

System Subassemblies.

- (1) Receiving and inspection of NERVA Propulsion

- (2) Subassembly Preassembly Checkout

- (3) Engine Post-Assembly Checkout

- (4) Propulsion System Instrumentation Calibration

- (5) Periodic Inspection

- (6) Corrective Maintenance (as defined in the NERVA Maintainability Plan).

- (7) Post-Test Examinations

b. Engine Test Stand (Organizational)

The ETS organizational maintenance will support the following activities:

- (1) Engine Pre-Installation Checkout

- (2) Engine Post-Installation Checkout

- (3) Engine Servicing

- (4) Engine Post-Firing Test

- (5) Corrective Maintenance (remove and replace components)

3.2.2.4 Michoud Assembly Facility, Louisiana

MAF will have the capability to perform the Field Maintenance necessary to accomplish the following activities:

- subassemblies.
- a. Receiving and inspection of stage nuclear systems and
 - b. Subassembly preassembly checkout.
 - c. Engine post-assembly checkout.
 - d. Airframe post-assembly checkout.
 - e. Airframe post-assembly checkout.
 - e. S-N pre-mating checkout.
 - f. S-N post-mating checkout.
 - g. S-N preparation for shipment.
 - h. S-N post-acceptance test inspection.
 - i. Corrective maintenance (as defined in NERVA Maintainability Plan).

3.2.2.5 Mississippi Test Facility

MFT will have the capability to perform the organizational maintenance necessary to accomplish the following activities:

- a. S-N pre-installation checkout.
- b. S-N post-installation checkout.
- c. S-N servicing.
- d. S-N acceptance test.

- e. S-N post acceptance test checkout.
- f. S-N preparation for shipment.
- g. Corrective maintenance (remove and replace components).

3.2.2.6 Kennedy Space Center, Florida

KSC will have the capability to perform the field and organizational maintenance to support the following activities:

a. Vertical Assembly Building (Field)

The VAB field maintenance will support the following activities:

- (1) S-N receiving and inspection.
- (2) S-N pre-mating checkout.
- (3) S-N post-mating checkout.
- (4) Launch Vehicle post-assembly checkout.
- (5) LV preparation for transfer (to launch pad).
- (6) Corrective maintenance (as defined in the NERVA

Maintainability Plan).

b. Launch Pad (Organizational)

PAD organizational maintenance at KSC will support the following activities:

- (1) LV pad arrival inspection.
- (2) S-N pre-launch checkout.
- (3) S-N pre-launch servicing.
- (4) LV pre-launch checkout.
- (5) Corrective maintenance (as defined in the NERVA Maintainability Plan).

3.2.3 Precision Measurement Equipment Laboratory

The Propulsion System and its subsystems will require calibration at NRDS, MAF, MTF, and KSC. Aerojet personnel shall remove the NERVA Propulsion System item requiring calibration and deliver it to the applicable facility host organization standards laboratory, where it will be calibrated in compliance with previously provided AGC specifications.

3.2.4 Maintenance Procedures

Aerojet-General Corporation will provide procedures covering all phases of NERVA Propulsion System test and maintenance activities at NRDS, MAF, MTF, and KSC. The procedures shall be developed in accordance with AGC Document RN-_____, "NERVA Technical Order Publication Plan." (AFSCM/AFLCM 310-1, Data Item H-1-14.0-1.)

3.2.5 Real Property Installed Equipment (RPIE) and Government Furnished Equipment (GFE)

All RPIE utilized during the NERVA Propulsion and Test Systems Preoperational Program at NRDS, MAF, MTF and KSC shall be maintained by the Facility's Host Organization. Aerojet shall utilize all facility Host RPIE control documents and procedures that do not adversely impact on the NERVA Propulsion System Program. All GFE utilized in direct support of Contract End Items shall be maintained by the Contractor and all other GFE shall be maintained by the Facility Host Organization.

3.3 Supply Program

The NERVA Propulsion System Supply Program will insure maximum effectiveness and economics in providing support for preoperational test activities.

3.3.1 NRDS Spares Program

The procedures and concepts delineated herein are designed to provide NERVA Propulsion System supplies compatible with existing methods. Thus, the Propulsion System spares shall be provided as follows:

3.3.1.1 NRDS Spares Determination

NRDS spares shall be determined by compliance with the following requirements:

a. The selection of items and determination of quantities selected by Aerojet shall be based on providing adequate support at minimum cost with a minimum inventory level for each NERVA test conducted at NRDS.

b. When selecting spare parts, consideration shall be given to predicted failure and consumption data, condemnation rates, ease of replacement, program readiness needs, facility maintenance capability and turnaround time.

c. The items and quantities selected for each NERVA test conducted at NRDS will be an estimate of the spare parts required within the spares logistics supply system for minimum support of each test as established by program schedules.

3.3.1.2 NRDS Spare Parts Acquisition

NRDS spares shall be acquired by compliance with the following requirements:

a. A spare parts list covering all items and quantities selected by Aerojet in support of a test shall be submitted to SNPO indicating therein those firm estimated costs which are available. The spare parts list shall provide

the basis upon which the contractor shall be funded for spare parts under this phase of the contract.

b. When the items, prices and quantities contained in the spare parts list and any revisions are acceptable to SNPO, SNPO will establish this list by an amendment to the contract.

c. Where possible, orders for approved spare parts will be concurrent with placement of purchase orders for each item of test hardware.

d. Whenever an approved Engineering Design Change affects spare parts on order the contractor will amend the spare parts on order in the same ratio as the change affected the end article on the contractor without further approval of SNPO and will revise the Spare Parts List by revision.

3.3.2 NERVA Propulsion System Spares Program

3.3.2.1 Supply Policies

The NERVA Propulsion System Spares Program shall be based on the following:

a. A Spare Parts Provisioning Guidance Conference shall be held between SNPO and AGC. The purpose of this conference will be to:

(1) Select 310 data items which Aerojet-General Corporation shall use for documenting spare parts to be provisioned beyond NRDS.

(2) Establish ground rules for:

(a) Period of time to be covered by each provisioning action.

(b) Method of computing quantities.

(c) Pricing method.

b. Aerojet-General Corporation shall identify and provision the spare parts for the NERVA Propulsion System making maximum use of standard government items. Any standard government item identified shall be provided from government sources as GFP, where feasible.

c. Spares and spare parts for real property installed equipment are to be the responsibility of the Host Facility Manager.

d. The spares for GFE used in direct support of a Contract End Item will be furnished by the Contractor. All other spares will be furnished by the Facility's Host Organization.

e. The NERVA Propulsion System Supply Program shall be managed by the Support Systems Section of the Systems Department, Nuclear Rocket Operations, Aerojet-General Corporation.

3.3.3 Material Management

3.3.3.1 Inventory Control

a. Under the provisions of this plan, logistics inventory management shall be established which shall exercise management control of all NERVA Propulsion System stock locations under the cognizance of AGC. In all matters pertaining to inventory management, AGC's local offsite account administrators will be under the surveillance of the local SNPO Plant Representative.

b. A Government Furnished Property (GFP) bonded area will be established and maintained at AGC-Sacramento, WANL-Large, NRDS, MAF, MIF, and KSC, for the purpose of storage, issuance and shipment of NERVA Propulsion System Spare Parts and spare parts received from Government supply sources in support of the various programs.

3.3.3.2

Stock Balance

AGC shall control and direct the stock balance and consumption reporting as follows:

a. Supply system stock levels will be determined on the basis of overall needs of the various locations with maximum consideration given to failure and consumption data, and will be independent of the facility/site location of the stock.

b. Site stock levels shall be programmed to vary with anticipated utilization.

c. Maximum utilization shall be made of existing assets. Where practical, equipment and parts to fill specific requirements will be reclaimed from completed laboratory, static, field and flight testing. Such equipment and parts will be repaired, overhauled and/or modified to suitable condition for use in support of program activities.

d. Establish and maintain similar bonded areas at each test site for the purpose of storing, issuing, and shipping Aerojet, associate contractor, and GFP spare parts required to support operations at each location.

e. Establish and maintain accountable records at each location in accordance with AGC Document RN-__-____, "NERVA Configuration Management Plan."

f. Coordinate movement of serviceable and repairable spare parts between source and offsite locations and between locations as required to support the various programs. Movement of associate contractor items will be in accordance with the expressed needs of the associate contractor.

g. The use history of Aerojet provisioned spare parts will be accumulated and reported by program to SNPO through the SNPO Plant Representative every one-hundred and eighty (180) days. Use data will be collected at the point of issuance and at that time will be identified to the particular using location.

3.3.3.3 Surplus Property Disposition

Surplus and obsolete spare parts which cannot be economically reworked to meet existing requirements and those items which cannot be economically returned to a serviceable condition shall be disposed of in accordance with existing Host Facility procedures.

a. Surplus and obsolete parts which may be economically reworked to meeting existing requirements in other programs will be transferred in an "as-is" condition.

b. Aerojet will conduct spare parts requirements reviews as follows:

(1) Hi-Value spare parts every one-hundred and eighty (180) days.

(2) Low-Dollar spare parts every one-hundred and eighty (180) days.

c. Aerojet shall provide the results of the review to SNPO within thirty (30) days following the completion of each review. The purpose of the above review is to compare inventory levels at on-site and off-site locations with current requirements and to determine the need for such action as follows:

(1) Reallocation

(2) Disposal of inventory surplus and obsolete spare parts.

(3) Cancellation of outstanding orders.

(4) Adjustment of stock levels.

(5) Modification of surplus to new configurations.

3.3.4 Engineering and Technical Services

Aerojet shall provide two phases of Engineering and Technical Services for the NERVA Program. Phase I shall include the necessary engineering and technical services in support of NERVA Test Program at NRDS. Phase II shall provide two categories of engineering and technical services in support of the NERVA Program after testing at NRDS is complete. These categories are; (1) Contractor Plant Services (CPS), and (2) Contractor Field Service (CFS).

3.3.4.1 NRDS Services

NRDS services are those services performed by Aerojet at NRDS which are directly related to the development and improvement of the technical skills of personnel utilized in assembling, transporting, testing, disassembling, and examining the NERVA test item.

3.3.4.1.1 Contractor training consists of the materials and services provided by Aerojet in support of NERVA Propulsion System Test Program at NRDS.

The following training tasks cover the training of personnel required to support the NERVA engine and associated test program, associated facilities and AGE at NRDS. This training will be performed by the Support Systems Section of the Systems Department. Instructors and engineers will conduct the training courses in classrooms and laboratories at NRDS.

a. Contractor Training

Aerojet shall develop a training and certification program to insure that personnel can perform their tasks with proficiency to encompass the following:

b. Training and Certification Plan

Aerojet shall develop an internal training and certification plan. The plan shall be a working document maintained current through program duration to reflect system changes, current training program schedules, and methods utilized.

c. Program Scope

The training program shall be oriented to provide operator, test and maintenance personnel with principles of operation safety, handling, assembly, and maintenance of the NERVA Propulsion System. Special training courses will also be provided for program planners and "need to know" personnel. Training of SNPO personnel shall be provided as necessary.

d. Training Methods

Training methods shall include formal classroom training, job-experience-training, and on-the-job-training. Aerojet will utilize the functional and maintenance analysis documentation, procedures, and test procedures to prepare required course material including a lesson plan, student study guide, examinations, and necessary visual aids. A NERVA Propulsion Handbook will be prepared and utilized as a text for the training courses.

e. Plan Coordination

Aerojet will coordinate training requirements, course content, and schedules with SNPO and associate contractors.

f. Administration

Aerojet will maintain student training records.

g. Follow-On Proficiency Training

Follow-on proficiency training to maintain certification status will be provided by Aerojet, as required.

h. Training Location and Facilities

Formal classroom training shall be conducted at NRDS.

i. Certification

Aerojet will provide Certification of Contractor personnel which encompasses system knowledge, training courses for development of individual skills, and demonstration of individual capabilities in their assigned area of responsibility.

3.3.4.2 Contractor Plant Services

CPS are those services performed by Aerojet at its Sacramento Plant which are directly related to the development and improvement of the technical skills of the NERVA Propulsion Systems Personnel Subsystem.

3.3.4.2.1 Contractor training consists of the materials and services normally provided by Aerojet in support of NERVA Propulsion Systems and includes the following tasks as specifically applied to the NERVA Propulsion System:

Cross-Contractor Training Orientation

Launch Crew Certification

The above training tasks cover the training of personnel required to support the NERVA engine and its associated facilities and AGE in the field. This training will be performed by the Support Systems Section of the Systems Department. Instructors and engineers will conduct the training courses in classrooms and laboratories at Sacramento.

a. Contractor Training

Aerojet shall develop a training and certification program to insure that Aerojet personnel can perform their tasks with proficiency to encompass the following:

b. Training and Certification Plan

Aerojet shall develop an internal training and certification plan. The plan shall be a working document maintained current through program duration to reflect system changes, current training program schedules, and methods utilized.

c. Program Scope

The training program shall be oriented to provide operator, test and maintenance personnel with principles of operation safety, handling, assembly, and maintenance of the NERVA Propulsion System. Special training courses will also be provided for program planners and "need to know" personnel. Training of SNPO personnel shall be provided as necessary. Training will be provided in the following areas:

(1) Principles of Nuclear Propulsion and S-N Familiarization

Instruction in this area will provide a comprehensive overview of the NERVA/S-N system, the launch vehicle, and program facilities. Principles essential to understanding and operation of Nuclear Rocket Propulsion and Control Systems will be provided. Coverage of the Aerospace Ground Equipment and subsystem operations and interrelationships will also be presented.

(2) S-N Airframe, Assembly, Mating and Alignment

Instruction in this area will provide detailed information on the S-N construction features, assembly, handling, and mating of S-N segments. Special emphasis will be placed on the detailed alignment and attachment requirements of the S-N with the launch vehicle, for KSC launch site. Instruction will also cover the ground handling equipment necessary to accomplish these tasks.

(3) S-N Transportation, Servicing, Storage and Handling

Instruction in this area will provide a working knowledge of the vehicle handling and servicing techniques and procedures peculiar to the activities at the Contractor's facilities, at NRDS, MAF, MTF and KSC. The methods, techniques, and inspection requirements will be presented. AGE required for the handling, servicing, transportation and storage will be covered in sufficient detail to insure accomplishment of these tasks. Pertinent safety precautions and hazard identifications will be presented in applicable instructional segments of these courses.

(4) S-N Propulsion and Thrust Vector Control

Instruction in this area will provide the detailed description of Propulsion System composition, capabilities, and limitations. Discussions on construction features, operational features, electrical sequencing, instrumentation, assembly, handling, and safety precautions provide a working knowledge of the complete system and its associated ground equipment. Instruction in the areas of S-N Propulsion and Thrust Vector Control (TVC) includes; (1) construction of the EPIC, (b) location of components, (c) operation of valves/orifices, (d) pneumatic system pressurization and leak detection, (e) tank pressures, (f) LH servicing and PPSOV operation, (g) vents, (h) connections, and (i) ground system interfaces. Scheduled and unscheduled maintenance requirements for the TVC system will be discussed.

(5) S-N Measurement Equipment Operation and Maintenance

This area of instruction will provide technical training for Aerojet personnel to operate and perform scheduled and unscheduled maintenance. Data recording set modifications, as required, will be covered in this course. Operation of required test equipment necessary for testing/checking the functional status of the category of equipment will be covered.

d. Training Methods

Training methods shall include formal classroom training, job-experience-training, and on-the-job-training. Aerojet will utilize the functional and maintenance analysis documentation, procedures, and test procedures to prepare required course material including a lesson plan, student study guide, examinations, and necessary visual aids. A NERVA Propulsion Handbook will be prepared and utilized as a text for the training courses.

e. Plan Coordination

Aerojet will coordinate training requirements, course content, and schedules with SNPO and associate contractors.

f. Administration

Aerojet will maintain student training records.

g. Follow-On Proficiency Training

Follow-on proficiency training to maintain certification status of launch crews will be provided by Aerojet, as required.

h. Cross Training of Contractor Personnel

Cross training of other contractor personnel in areas of systems interface shall be accomplished.

i. Training Locations and Facilities

Formal classroom training shall be conducted at the Contractor's Plant, MAF and Cape Kennedy. Contractor training at MAF and Cape Kennedy shall utilize Government-furnished classrooms, desks, projectors, screens, and chalk boards.

j. Certification

Aerojet will provide Certification of Contractor personnel which encompasses system knowledge, training courses for development of individual skills, and demonstration of individual capabilities in their assigned area of responsibility. The minimum requirements for certification of Contractor personnel are defined herein.

3.3.4.3 Contractor Field Services

a. The Contractor's Field Services personnel requirements will be identified in the NERVA Propulsion System Aerospace Ground Equipment Plan (AGEP). An analysis of the operations documented in the Propulsion Systems Functional Flow Diagrams and the maintenance activities delineated in the NERVA Maintainability Plan will be made in accordance with AFSCM 375-5 to ascertain the applicable personnel requirements.

b. The type of Contractor Field Services (CFS) personnel shall be recommended by Air Force Speciality Code (AFSC) and quantity per location. The information presented will include task performed by each person, and include task work specification and relationship to major systems equipment items, and a phasing scheme showing the number of persons required by code, by location versus real time.

c. It shall also include the type of field services representatives (FSRS) required to provide on-site liaison and advisory services.

d. The CFS program shall be managed by the Support Systems Section of the Systems Department.

3.3.5 Aerospace Ground Equipment (AGE)

The AGE necessary to support the NERVA Propulsion System's shall be described in RN-_-____, "NERVA Propulsion System Aerospace Ground Equipment Plan." The AGE required shall be recommended in a format submitted by the Contractor and approved by SNPO.

3.4 Transportation Program

3.4.1 Responsibilities

3.4.1.1 SNPO

SNPO will be responsible for:

a. Designation of a Procuring Activity Transportation Officer (PATO) to provide NERVA program direction relating to transportation, the preparation and transmittal of Government Bills of Lading, and assistance when required in material movement.

b. SNPO, in coordination with Aerojet, will schedule the use of Government furnished transportation and material handling equipment and the turnaround of that equipment.

c. Provide prime movers, transporter/trailer convoy vehicles, and security at NRDS, KSC, MAF and MTF for vehicle and equipment transport.

d. Assistance when required in obtaining authorization of the movement of oversize/overweight loads.

3.4.1.2 Aerojet-General Corporation

Aerojet responsibility will be to:

a. Define and identify the NERVA Propulsion System requirement for Government furnished transportation equipment to the SNPO Transportation Officer. Insure that transportation equipment, shipping containers, and packaging methods are available or shall be developed to provide safe and serviceable delivery of material.

b. Coordinate with the SNPO Traffic Officer in establishing need dates and times for Government-furnished transportation equipment with expected shipping dates and departure time of shipments from the Contractor facility.

c. Arrange and provide transportation of Aerojet furnished equipment, spares, repairables, and test support equipment to comply with instruction provided by SNPO.

d. Provide the equipment and manpower to package, pack, transport, load, secure, and ship the contract end items at Aerojet and WANL facilities.

e. Arrange for instrumenting and technical monitoring of each shipment during in-transit.

f. Transmit to SNPO any instrumentation and environmental data accumulated during transportation and handling within five days after completion of the shipment.

g. Request specialized Government-furnished equipment, if required, and provide manpower to unload the shipment at NRDS, MAF, MTF, and KSC.

h. Notify SNPO when the Government-furnished transportation equipment at the sites are ready for return shipment, i.e., shipping containers, to the AGC, Sacramento facilities.

i. Provide manpower and equipment required to prepare and load the transportation equipment for turnaround.

3.4.2 Traffic Management

Aerojet shall provide a Traffic Management function to implement this plan in consonance with NERVA program requirements. Traffic management will provide the following:

a. Assurance that transportation capabilities are available to provide movement of all program equipment including development of movement plans, as required, to provide efficient handling and transportation for normal shipments, as well as those items, which because of size, shape and/or weight require specialized handling.

b. Coordinate with the appointed SNPO Traffic Officer those areas that require a combined effort to insure schedule compliance in accordance with governing publications.

c. Obtain routing authorizations as required from Military Transportation Management Terminal Service (MTMTS) in accordance with AFM 75-2. Coordinate with the MTMTS those movements that require assistance in securing state and local routing clearances.

d. Administer the use and prepositioning of GBL's as directed by SNPO in accordance with AFM 75-2.

e. Control of premium transportation will be exercised and surveyed throughout the program. Shipments will be transported by the most economical modes of transportation commensurate with the requirement.

f. Commercial bills of lading will be used on all items transported between supplier and manufacturer facilities; between the Contractors plants, and between the Contractor and subcontractor's plants, except when such items are being transferred on DD-250 documentation.

3.4.3 Methods of Shipment

3.4.3.1 Engine and Engine Subassemblies

Aerojet-General will utilize commercial motor carrier as the primary means of transporting NERVA engine subassemblies from Sacramento to its use sites. Return of engine subassemblies shipments from use sites to Sacramento, that may be required will utilize commercial motor carrier as the primary transportation means. Secondary transportation means for engine shipments will be via military airlift. Nuclear subsystem special railway transport will be the only means of Nuclear subsystem transport.

3.4.3.2 Aerospace Ground Equipment

Motor carrier will be the primary means of movement of AGE to NRDS, MAF and KSC. Military airlift through the facilities of contract airlift support will be utilized as the secondary means of movement of AGE to the use sites. Return movements of AGE that are required from use sites will utilize commercial motor carrier as the primary transportation means.

3.4.3.3 Spares

Spares will be shipped to the use sites primarily by commercial motor carrier. Commercial air or the most expeditious means available will be utilized for movement of spares required to return equipment to serviceable status that is delaying critical test programs or launch preparations.

3.4.4 Transportation Procedural Data

3.4.4.1 Technical Requirements

Packaging Technical Requirements Data File shall be maintained by Aerojet. Standard packaging information will be maintained to include; (1) specialized container design, handling devices, fixtures, etc., and (2) supplementary data to depict the detailed blocking, bracing, and cushioning requirements. Spares special study item preservation and packaging requirements will be available for SNPO review in a Contractor-developed format. Submittal and approval of preservation, packaging, and packing shall be accomplished in accordance with AFSCM 375-1 and the stipulated data requirements established in 375-1, Exhibits I, II, IV, V and VI.

3.4.4.2 Preservation and Packaging

Packaging requirements will be identical as to the minimum that will insure serviceability of material during shipment, handling, and limited storage periods. Preservation will be the minimum required for adequate protection against corrosion and deterioration under conditions of normal handling, shipment and anticipated storage. USAF Series 71 regulations will be used to the maximum extent possible.

Preservation and packaging shall meet the requirements of SNPO-NPRD-1 and AGC 90205, NERVA Propulsion System.

a. Pressure Vessel and Reactor Assembly (PVARA)

The PVARA is considered a "Radioactive Material" and must be transported in accordance with existing AEC and ICC regulations.

AEC Manual, Chapter 0529 (Preservation, Packaging, Packing and Container Marking for Space Systems) will be complied with as pertains to preservation, packaging, packing and container marking of equipment and spare parts for shipment or storage and as specified in contractual documents.

b. Aerospace Ground Equipment

The majority of AGE used at NRDS, MAF and KSC will be scheduled for delivery to enable immediate usage without requiring storage. The AGE will be preserved, packaged, and packed to comply with AGC Document RN-__-__, "NERVA AGE Plan."

c. Spare and Repairables

Spares for NRDS, MAF and KSC will be cleaned, preserved, packaged, and packed only to the extent necessary for delivery and inside storage not to exceed three years. Methods of preservation and packaging will conform to the requirements of Specification MIL-P-116E.

Packages that may require overpacking for acceptance by the carrier will be packed in exterior-type shipping containers, which meet the requirements of ICC rules, the Consolidated Freight Classification rules, and the Truckers Association rules. The shipping containers will be for inside, covered storage.

Vendor items requiring return for repair or refurbishment will be transported in the vendor's initial packaging if available. Otherwise, they will be packaged in accordance with the best commercial practice for the mode of transportation to be used.

Container marking will be in accordance with MIL-STD-129. In addition to the MIL-STD-129 markings, all exterior packages will be marked as "NERVA Propulsion System Spares."

Containers for items designated as critical parts will be marked, "NERVA CRITICAL PART" in red letters and "FRAGILE" in accordance with MIL-STD-129.

NERVA
PREOPERATIONAL SUPPORT
LOGISTICS PLAN

Appendix A
EXPLANATION OF TERMS

Acceptance	An official act by the Government to accept transfer of accountability, title and delivery of a Contract End Item.
Accountable Records	The transcribed material used to maintain an accurate audit of property.
Aerospace Ground Equipment	All equipment required on the ground to make a system, command and control system support system, advanced objective, subsystem or end item of equipment operational in its intended environment. This includes all equipment required to install, launch, arrest, guide, control, direct, inspect, test, adjust, calibrate, appraise, gage, measure, assemble, disassemble, handle, transport, safeguard, store, actuate, service, repair, overhaul, maintain, or operate the system, subsystem, end item or component. AGE is functionally subclassified as Operating Ground Equipment (OGE) and Maintenance Ground Equipment (MGE).
Airframe	The framework and envelope of a spaceship including the structural components and tankage.
Cancellation Addendum	An appendix to a government contract which defines the conditions, terms and methodology of resolving and cancelling the contract.
Contractor	An individual, partnership, company, corporation or associate having a contract with the procuring activity for the design, design and manufacture, or manufacture of article(s) under the terms of a contract.
Contractor Furnished Equipment (CFE)	The items of equipment furnished by a prime contractor utilizing contract funds.
Cross-Contractor	The service performed by one space systems contractor for any or all other contractors on the same system.

Appendix A

DD-250	A Department of Defense (Material Inspection and Receiving Report) form used to reflect government receipt of property.
Depot	An establishment which supplies material and personnel for assembly and installation of a space system.
Disputes	Discussions of the validity of a contractor item and appeal procedures.
Expendability-Repair-Cost (ERC)	That percent of cost factor which the government decides it would rather replace a part than repair it if the repair cost exceeds the preset percentage.
Field	A functional maintenance area that can perform maintenance beyond the organizational or periodic maintenance levels.
Government Bills of Lading (GB/L)	A document with which a federal agency pays freight charges for shipment by common carrier and/or contract carrier.
Government Furnished Equipment (GFE)-	Items in the possession of, or acquired directly by the government, and delivered or made available to the contractor.
Government Furnished Aerospace Equipment (GFAE)	Equipment furnished to a contractor by a federal agency for use as a flight article and/or end a flight article.
Government Furnished Property (GFP)	Any asset of the U. S. Government usually used to denote CEI's which have previously been formally accepted by the Government, and to denote inventory items.
Host (Facility) Inventory	An itemized list of all or any property on hand.
Inventory Control	The methods and/or procedures used maintaining an account that shows the cost and quantity of property received, issued on order and on hand, and available for issue.

Logistics (Preoperational)	The segment of a system activity that provides for the maintenance, supply and transportation of the system and its support from initial component ground test through engine flight test at KSC, i.e., equipment facilities and personnel.
Maintainability	A characteristic of design and installation which is expressed as the probability that an item will be retained in or restored to a specified condition within a given period of time, when the maintenance is performed in accordance with prescribed procedures and resources.
Maintenance	All actions necessary for retaining an item in or restoring it to a specified condition.
Maintenance Concept	A guide on how to establish maintenance requirements.
Maintenance Levels	The amount or quantity of maintenance authorized or directed for a specific location.
Maintenance, Corrective	The actions performed, as a result of failure, to restore an item to a specified condition.
Maintenance Cycles	The regular intervals where maintenance is scheduled.
Maintenance, Preventative	The actions performed in an attempt to retain an item in a specified condition by providing systematic inspection, detection and prevention of incipient failure.
Material	All the things required for the equipment, maintenance, operation, and support of the test program activities.
Mating	The act of attaching interfacing subassemblies to each other.
Modification	The physical alteration of a piece of equipment so as to change its capabilities and characteristics.

Appendix A

Nuclear Subsystem	That portion of the NEERVA engine which is capable of emitting radiation by going critical.
Obsolete	No longer satisfactory for the purpose for which it was obtained due to improvements or revised requirements.
Off-Site	A contractor facility on a government facility.
On-Site	Contractor's Main Plant.
Overhaul	The rebuilding, or extensive repair and reconditioning of an item.
Packaging	The wrapping and cushioning of individual items, is not concerned with containers.
Packing	The process of putting items in a shipping container includes bracing, weatherproofing, etc.
PAD	Place of Airborne Debarkation for a launch vehicle, e.g., PAD 19 or 20 at Cape Kennedy.
Personnel Subsystem	The people necessary to the operation, service and maintenance of a system.
Priced Spare Parts List	The initial list of spares recommended (to the customer) for system support (by the contractor).
Priced Spare Parts Exhibit	Customer approved list of spares that is added to the contract.
Real Property Installed Equipment (RPIE)	Government owned or leased equipment that is physically attached to, integrated into or built in or on other government owned property and normally procured through the Military Construction Program.

Appendix A

Reallocation	To assign to another location, and/or a different quantity. A change in a previous supply allocation.
Remove/Replace	To remove an item and install a like item.
Repair	The restoration to an operable condition.
Spare	An extra piece of equipment, component, accessory or the like that is held in reserve for use when needed.
Servicing	The replenishment of consumables needed to keep an item in operating condition, but not including any other preventive maintenance or any corrective maintenance.
Site	The specific location of a system or aggregate thereof when said location is federally owned or leased.
Site Activation	To establish an operating capability at a site.
Stage Nuclear Propulsion System	That system of the Nuclear Stage which converts energy into thrust including all of its support subsystems, i.e., AGE, Facilities, Personnel, and Procedures.
Stock Balance	A stock supply of items in quantities deemed sufficient to meet requirements for a specific period.
Stock Level	The quantity of supplies authorized to be held in anticipation of future demands.
Surplus Property Disposition	The transferral of property considered not usable in the NERVA Propulsion and Test System program.
Traffic Management	The process of planning, organizing, coordinating, controlling and directing the movement of systems artifacts from one point to another.

Appendix A

Transportability

The capability of material to be moved by towing, by self-propulsion, or by carrier, via railways, highways, waterways, pipelines, ocean and airways.