NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

PRELIMINARY EDITION

REPORT NO. RN-DR-0019

REON/SACRAMENTO MANAGEMENT PLAN

APRIL 1964

MASTER

FILE COPY

NRO

Technical Document Center

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

**TECHNICAL DOCUMENT CENTER
Nuclear Rocket Operations**

DOC. NO.

N-1375

AGCS 0120-48

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

TABLE OF CONTENTS

I. INTRODUCTION

- A. GENERAL
- B. THE NERVA ENGINE
- C. TEST OF THE NERVA ENGINE
- D. GOVERNMENT MANAGEMENT OF THE NERVA PROGRAM
- E. THE CONTRACTOR ORGANIZATION
- F. SPECIAL ORGANIZATIONAL REQUIREMENTS

II. MANPOWER

- A. PROCEDURE FOR HANDLING PERSONNEL TRANSACTIONS

III. ORGANIZATION

- A. GENERAL
- B. PRINCIPAL FUNCTIONS
- C. TASK ORGANIZATION
- D. DEPARTMENTAL NUMBERING SYSTEM

IV. FACILITIES

- A. GENERAL
- B. OFFICE SPACE
- C. SPECIAL ROOMS
- D. SPECIAL AREAS

V. FISCAL

VI. SECURITY REQUIREMENTS

- A. GENERAL
- B. PROCEDURE FOR SHIPMENT OF CLASSIFIED DOCUMENTS HELD BY INDIVIDUALS
- C. PROCEDURE FOR SHIPMENT OF CLASSIFIED DOCUMENTS HELD BY REON
TECHNICAL INFORMATION CENTER
- D. REON CONTROL STATION
- E. COMPANY-CONTROLLED ACCESS AREA
- F. OPEN-SHELF STORAGE (CLASSIFIED DOCUMENTS)
- G. DESTRUCTION OF MATERIAL

Table of Contents (Cont'd)

- H. DOCUMENT ACCOUNTABILITY**
- I. VISIT CLEARANCE**
- J. COURIER AUTHORIZATION**
- K. EMPLOYEE CLEARANCES**
- L. TRANSFER OF SECURITY CLEARANCES**
- M. APPOINTMENT OF SECURITY REPRESENTATIVES**
- N. CLASSIFICATION OF GROUP ASSIGNMENT OFFICERS**
- O. RELATIONSHIP TO CORPORATE TECHNICAL INFORMATION CENTER (CTIC)**
- VII. COMMUNICATIONS**

LIST OF TABLES

- I. Manpower Summary Unconfirmed by Budget
- II. REON and NTO Direct and Indirect Manpower Ratios
- III. Facilities Capital Expenditure Estimate
- IV. Sacramento Space Requirements for Office and Special Rooms
- V. REON Classified Information Log - June 1963
- VI. Departmental Security Representatives
- VII. Classification and Group Assignment Officers

LIST OF FIGURES

- Fig. 1 Nerva Flight Test Engine Mockup
- Fig. 2 Hot Bleed Cycle Flow Schematic
- Fig. 3 Rift Stage
- Fig. 4 E-MAD Building
- Fig. 5 Engine Transport - Installation System
- Fig. 6 Test Cell A
- Fig. 7 Engine Test Stand No. 1
- Fig. 8 Nuclear Rocket Program Organization
- Fig. 9 REON Organization
- Fig. 10 NERVA Manpower vs Time
- Fig. 11 Formal Offer Memo
- Fig. 12 Program Manager Organization
- Fig. 13 NTO Organization
- Fig. 14 Administration Manager Organization

LIST OF APPENDICES

- A. Special Room Layouts
- B. Controls Laboratory Equipment
- C. Procedure for moving Documents and Files to Sacramento or NRDS
- D. Security Control Procedures - REON Restricted Area
- E. Access to REON Area
- F. Boxing and Transfer of Classified Documents to Sacramento and NRDS
- G. CTIC Memo
- H. SPI C-08-18-0

I. INTRODUCTION

A. GENERAL

With the imminent relocation of the REON organization to the Sacramento Plant, there is a need for a definitive document describing the resulting organization, its function, its interfaces with other Sacramento functions, its product, its customer, and other general planning data for the information and guidance of all concerned. It is the purpose of this report to fulfill this need. General background material is provided followed by detailed descriptions of manpower requirements, organization, contract task and sub-task management, facility fiscal requirements and fiscal considerations, security, safety and etc.

B. THE NERVA ENGINE

It is probably most logical to begin the background discussion with a definition of the product, namely, nuclear rocket engines.

To place this discussion in its chronological context, some history in this vital new field must be reviewed. The first recorded mention of American nuclear rocket propulsion was made in 1944, when some Los Alamos Scientific Laboratory (LASL) personnel speculated about a broadrange of potential applications of nuclear energy to propulsion. In 1946, a report was published concerning the application of a heat exchanger reactor to rocket propulsion. At that time, there was considerable scientific interest in the possibility of combining the tremendous potential of nuclear energy with the then-newly-exploited propulsion system concept of rocketry. Analysis and conceptual design studies were conducted by several organizations. No specific hardware developments were ordered, and the application of nuclear energy to propulsion was confined to the NEPA (Nuclear Energy for the Propulsion of Aircraft) project, the forerunner of the ANP (Aircraft Nuclear Propulsion) program. In the early 1950's interest was again evidenced in the nuclear rocket concept. This interest developed in several locations almost simultaneously, with enthusiasm kindled at Aerojet-General Corporation and elsewhere by the late Dr. Theodore Von Karman, Aerojet's founder and Chairman of its Technical Advisory Board. Largely because of this renewed impetus, the Atomic Energy Commission (AEC) directed LASL and the University of California Radiation Laboratory (UCRL - Livermore, California) to study the problem of applying nuclear power to rocket propulsion. At that time, the UCRL group followed an approach which centered around the use of solid graphite reactors, with hydrogen as a propellant, while the LASL program included consideration of ammonia or methane as propellants. In 1955, the United States Air Force became vitally interested in the propulsion potential offered by nuclear rocketry. The joint Atomic Energy Commission-United States Air Force ROVER program was formally initiated, with the AEC having its traditional cognizance over reactor development and testing and the Air Force having responsibility for non-nuclear engine component and subsystem development and launch vehicle applications. In 1957, a specific ROVER reactor development approach was selected, marking the beginning of the Kiwi reactor development program.

The AEC decided to proceed with the fabrication and testing of research reactors using uranium-loaded, graphite fuel elements to heat hydrogen to a temperature useful for rocket propulsion. The development responsibility was assigned to IASL, and the UCRL group was directed to devote their propulsion reactor efforts to the ramjet application. In 1958, responsibility for developing the non-nuclear engine and vehicles was transferred to the newly-formed National Aeronautics and Space Administration (NASA). In 1960, the joint AEC-NASA Space Nuclear Propulsion Office (SNPO) was organized, with its manager, Mr. Harold B. Pinger, reporting to both AEC and NASA for the national nuclear rocket program.

In the fall of 1960, the Kiwi program results were so encouraging and the forecasts were so positive and confident that SNPO believed that an industrial engine contractor should be selected to direct and control, under SNPO guidance, the development of a flight reactor (based on the IASL-Kiwi technology and configuration) and the non-nuclear engine components and subsystems, and to integrate these into a useful and reliable flight propulsion system. Competitive proposals were prepared and evaluated in the spring of 1961. In July 1961, the NERVA (Nuclear Engine for Rocket Vehicle Application) contract was awarded to the Aerojet-General Corporation. At the same time, the Government selected the Westinghouse Astronuclear Laboratory as a principal subcontractor for developing the flight reactor and certain other nuclear aspects of the engine development program. Also in 1961, the Nuclear Vehicle Projects Office (NVPO) was organized within NASA at the Marshall Space Flight Center in Huntsville, Alabama, to provide technical direction for the development of the RIFT (Reactor-In-Flight-Test) stage, which would serve as the flight test vehicle for the nuclear engine. The Lockheed Missiles and Space Company was the successful bidder for this program, and the RIFT contract was signed in May 1962.

The NERVA engine development is based on the solid core, heat exchanger reactor concept, selected by IASL for the Kiwi reactor development program. While other reactor concepts have been suggested and analyzed, the AEC believed that the first propulsion system development should be based on the significant body of thought and technical data available regarding this concept. Although there are some obvious limitations to the solid-core concept, its selection was judged the most logical approach to the early demonstration of the feasibility of nuclear rocket propulsion. The propellant or working fluid chosen to extract the energy from the reactor exerts a significant influence upon reactor and engine design. Because rocket specific impulse is a direct function of the root of gas temperature divided by molecular weight, other things being equal, high gas temperature and low molecular weight are desirable. Hydrogen was the logical propellant selection.

As a result of the renewed interest in nuclear rocket propulsion in the early 1950's, the AEC selected a specific reactor development approach in 1957 and ordered IASL to proceed with the fabrication and testing of research reactors. Before this, IASL had investigated graphite materials because these materials were very high temperature structural materials for reactor fuel elements. With the responsibility for the reactor assigned to it, IASL selected a development approach for early demonstration of feasibility.

The LASL approach was also strongly influenced by the difficulty of simulating some of the reactor environmental conditions without actually operating a reactor at a high power level. Hence, in the Kiwi development program, there was considerable component testing followed quite early by tests of complete reactors.

Two series of Kiwi tests were scheduled at the beginning of the development, in accordance with the guideline for establishing overall feasibility as soon as practicable. The first series, the Kiwi-A series, was conducted using gaseous hydrogen and was planned principally as a fuel element development test. The Kiwi-A configurations had somewhat of a "battleship" nature and incorporated many features for facilitating and expediting the test program, but these features would subsequently have to be modified or eliminated before a flight configuration could be established. Further, the decision to proceed with the Kiwi-A series using gaseous hydrogen postponed the necessity of developing and procuring liquid hydrogen pumping equipment. The first Kiwi (Kiwi-A) reactor test was conducted at Jackass Flats, Nevada, in July 1959, and was operated at rated power and temperature for several minutes. The Kiwi-A¹ was tested in July 1960. The Kiwi-A¹ had the same general external configuration as the Kiwi-A but had a revised core design. The third test in the Kiwi-A series (Kiwi-A3) was conducted during October 1960, with the core instrumented to provide data to verify some discrepancies observed between predicted and actual operation during the Kiwi-A¹ test. These three tests completed the Kiwi-A program.

The overall Kiwi-A results were very encouraging. Some problems were discovered in the experiments but many of these were well understood and had been predicted in advance. Personnel at LASL believed that the remaining problems could be solved satisfactorily in the subsequent Kiwi-B liquid hydrogen series. Largely because of the successful Kiwi-A series and the enthusiastic forecasts made for the Kiwi-B series, the Government believed that it was timely to select an industrial engine contractor to be responsible for the development of the nuclear rocket engine system. At this time, the Kiwi-B series of reactors was being designed, and parallel approaches were being used in some areas to solve some of the problems. For example, more than one type of core support was planned for this series of reactors. The Kiwi-B tests were scheduled to begin in the autumn of 1961, and to extend through the following year. This Kiwi-B program actually got under way late in 1961 and eventually required more time than had been scheduled. Some of the initial delay was caused by problems associated with the conversion of the test cell to handle liquid hydrogen. The first Kiwi-B test was conducted in December 1961, and gaseous hydrogen was employed as the propellant to provide a check-out of the new Kiwi-B basic design. In September 1962, the second Kiwi-B reactor test was conducted, and in November 1962, the third. During these tests, the reactor core and its support failed.

The tests could hardly be considered to be successful or to serve as a basis for committing a complete engine development effort. The mechanism of failure was not understood, and after the third Kiwi reactor test, there were several, apparently equally valid, postulations of the reason for failure.

It was decided that, before the next power test, extensive reactor component development testing and complete reactor core cold flow and vibration testing would be completed. The first of the cold flow experiments was conducted in May 1963. As a result of this test, the mechanism of core failure was at least testatively identified as being associated with vibrational dynamics. Hence, it was possible to incorporate certain design changes into the reactor configuration to ensure that subsequent power tests would be successful. More cold flow tests and an extensive series of vibration tests have now been completed. As a result of the reactor tests to date, much has been learned, and problems identified as serious development obstacles at the outset of the program have been solved satisfactorily. The physical properties of graphite are reasonably well understood and have been verified by testing. Methods have evolved for satisfactorily fabricating the graphite fuel elements, and techniques have been developed for their operation in a hydrogen environment. The problems of control during start-up and operation have apparently been solved. In fact, during the last Kiwi power test, when there were extreme variations in reactivity and other parameters, the controls performed satisfactorily under much more severe conditions than would ever be expected in the engine during development test or flight. The structural integrity of the reactor core is the principal remaining reactor development objective to be achieved.

As indicated, the results of the Kiwi-A series of reactor tests were so encouraging and the forecasts for the Kiwi-B series of tests were so enthusiastic that the contract for the engine development was awarded to Aerojet-General Corporation in July 1961. Westinghouse Astronuclear Laboratory was selected as principal subcontractor with responsibility for developing the flight reactor based on the IASL/Kiwi technology and configuration.

Many guidelines were established at the outset of the program, and three of these are worth mentioning to provide a better understanding of some of the developments and events that have occurred since the initiation of this program.

The flight reactor design was to be based on IASL/Kiwi technology and configuration, and the industrial team was to make only those changes in the mechanical design that were necessary to ensure that the reactor could perform in the space environment.

The second significant ground rule concerned the development of the non-nuclear engine components and subsystems and required that no large scale Procurement or development of these components or subsystems be effected until a reactor configuration was tested successfully and approved for incorporation in the engine. The development that was permitted had to be related to components with long lead times or that have critical or unknown characteristics from the standpoint of engine or reactor operation or testing. An example of this approach is the development of the turbopump for use in the engine propellant feed system, which is proceeding, while less attention is being devoted to such items as the thrust structures, the gimbal, and roll control. Because of the continuing reactor mechanical design problem, this ground rule remains in force.

The third significant ground rule concerned the overall goals and objectives of the NERVA development. The ultimate goal of this program is the demonstration that a nuclear rocket propulsion system will perform safely and reliably in the space environment. While directed studies of the application of NERVA class engines to specific missions of interest are being conducted, this initial NERVA program goal remains as stated.

In mid-December 1963, NERVA program redirections were announced. The RIFT (Reactor-In-Flight-Test) Program, to demonstrate that a nuclear rocket will, in fact, perform safely and reliably in the space environment, was cancelled. All NERVA engine work devoted to flight systems was deferred and the stated objectives of the NERVA program were restricted to include ground testing and static test demonstration only. According to the official NASA news release published on 24 December 1963:

". . . AEC/NASA will concentrate on ground reactor and experimental engine research and development and tests with particular emphasis on analyzing and understanding power levels, temperatures, operating life and the problems of frequent and reliable restarts. Work toward the development of the flight system is deferred until the technology learned from the Kiwi and NERVA project has been satisfactorily established."

". . . The major effort will be on reactor engineering and on other essential subsystems necessary to the creation and operation of an experimental nuclear propulsion engine. Those elements essential to the ground test program will be included. This revised project will require a lower level of funding but contemplates undertaking an eventual flight system development."

Thus the formal development program is now defined to consist of a number of reactor tests to be followed by static test of ground test engine configurations.

The first six months of the NERVA program, Phase I, lasted from July 1961 through January 1962. This initial effort was devoted largely to two principal activities. The first major effort concerned the preliminary design of the NERVA flight test engine. The second effort concerned the complete engine development program plan. During this period, some non-nuclear engine components were built and tested, and certain other activities were conducted, but the preliminary design and the program plan were the chief results. During Phase I, a full-scale mockup of the NERVA flight test engine was constructed. A photograph of this mockup is shown in Figure 1. The flight test engine is approximately 22-1/2 feet long from the engine-vehicle interface to the exit plane of the exhaust nozzle. It is approximately 56 inches in diameter at the pressure vessel, and the maximum envelope is approximately 8 feet across the pressurization spheres. The NERVA engine consists of several major subsystems: the propellant feed system (including the turbo-pump and required valves and lines); the nuclear subsystem (including the reactor, the reflector, and the shield); the thrust chamber assembly (including

thrust structures, pressure vessel, gimbal for thrust vector control, and the main engine exhaust nozzle); the engine control system; and the pneumatic system.

The NERVA engine operates on the so-called hot bleed cycle principle, which derives its name from the position along the propellant feed system flow path, and hence temperature, at which hydrogen is extracted to provide the turbopump working fluid. A flow schematic is shown in Figure 2, Liquid hydrogen propellant from the vehicle tank enters the engine through the main tank shutoff valve, flows through the pump, is ducted to the cooling passages of the main thrust nozzle where it regeneratively cools the nozzle, passes up inside the pressure vessel through the reflector and shield, passes through the reactor core where it is heated to a very high temperature, and is finally discharged through the main exhaust nozzle producing the engine thrust. The hot bleed cycle extracts a small percentage of the propellant flow at the reactor exit. This bleed flow is cooled by some relatively cool hydrogen from the reactor core inlet plenum. This bleed flow then enters the turbine as working fluid and the turbine exhaust is discharged overboard through suitable nozzles to provide residual thrust recovery and vehicle roll control.

Although the potential of nuclear rocket propulsion in terms of vehicle performance is certainly vast, these gains are not achieved without certain complications that have not been previously encountered in rocket development and operation. One of the most significant of these unique environments is radiation, which creates a long list of effects and influences ranging from the behavior of materials in the combined radiation-cryogenic environment to the requirements for the remote engine assembly and disassembly techniques and the general hazards problem. Also, the residual radiation existing after engine shutdown creates the many problems associated with the cooldown requirement. The long durations of operation which can be expected with this new propulsion system place new and unusual requirements on rocket rotating machinery as well as the lifetime of the reactor core in its unique environment.

At the outset, the NERVA program was defined to demonstrate the feasibility of using nuclear rockets. The demonstration program will involve several ballistic flights from Cape Canaveral, boosted by the SATURN V launch vehicle. As envisaged in the RIFT program, this vehicle will be 33 feet in diameter and will weight much more than 100,000 pounds when fully loaded. Sizes can be appreciated by noting that the diminutive engine, as it appears in Figure 3, is over two stores high.

The usefulness of NERVA is not planned to end with the ballistic feasibility demonstration. An underlying philosophy in the development of RIFT and NERVA is that they ultimately be capable of performing useful operational missions in space. Accordingly, numerous application studies are being made of the NERVA engine. These studies cover lunar operations of several forms and heliocentric transfer orbits for "deep space probes," manned exploration, and parabolic and hyperbolic solar system escape trajectories.

C. TEST OF THE NERVA ENGINE

The choice of an appropriate test site for the reactors of the Kiwi program was a significant consideration because of the dangers of a possible excursion within the reactor and because the facility should be kept reasonably simple by releasing the exhaust plume into the open atmosphere. The AEC and LASL have used two principal test sites for many years - one in the Pacific, and the second at Jackass Flats, Nevada, approximately 90 miles north and west of Las Vegas. Early estimates that the release of the exhaust plume in the Nevada sky was permissible were confirmed by testing. Testing of the Kiwi reactors has been particularly successful as regards the release of radioactivity at the test site. Largely for this reason, the same site was chosen for the engine test.

The unique radiation environments present some new complications in conducting the development test program. The reactor and the non-nuclear engine subsystems will be assembled into the complete test engine in the Engine Maintenance, Assembly, and Disassembly building (E-MAD) at NRDS. A cutaway view of this building is shown in Figure 4. When assembled, the engine is placed on the engine installation vehicle for transportation and installation into the test stand, which is located approximately two miles from the E-MAD building. This transport-installation system is shown in Figure 5. The Engine Installation Vehicle (EIV) is essentially a railway flat car with appropriate superstructure to support and transport the engine. The shielded control car houses two men who will have control over the entire engine transport and test stand installation sequence. Motive power is provided by the prime mover, also shown in the figure. Following the engine tests, the engine is remotely disengaged from the test stand, attached to the EIV, and returned to the E-MAD building, where it is remotely disassembled for post-mortem inspection. The engine is disassembled into its major subsystems in the main bay of the E-MAD building, and small satellite cells located around the periphery of the main bay are used for the disassembly and post-mortem inspection of individual subsystems and components. The overhead positioning system, the wall-mounted handling system, the typical floor-mounted fixtures are shown in the cutaway view of the E-MAD building. Ground was broken for this facility at NRDS in August 1962. About 2-1/2 years will be required to complete the construction and activation of the facility.

Test Cells A and C were also built at NRDS to meet the requirements of the Kiwi reactor test program. These two test cells are similar, and one is shown in Figure 6. Test Cell A will also be used to accommodate the development test of the NERVA flight reactor. The Reactor Maintenance Assembly, and disassembly building (R-MAD) was also built for the Kiwi program and will be used by NERVA during the flight reactor test series.

Ground was broken for the first nuclear rocket engine test stand (ETS-1) in June 1961, one month before the award of the NERVA contract. Design work had preceded the construction by approximately ten months to a year. An artist's concept of the completed facility is shown in Figure 7. The hydrogen storage facilities, the hydrogen run tank and its shielding, the rail-mounted side shields, and the engine exhaust duct are also shown in the figure. The facility is approximately 140 feet high from the deck surface to the top of the run tank superstructure, and the vault containing the exhaust duct is approximately 55 feet deep. The test stand civil works are largely completed. However, the facility instrumentation, control, and nuclear rocket exhaust system must be installed and checked before the facility can be completely activated for the first engine development test.

D. GOVERNMENT MANAGEMENT OF THE NERVA PROGRAM

Having defined the NERVA engine, its history, status, and capabilities, it is next significant to examine the organization responsible for the national nuclear rocket effort. As indicated previously, the Space Nuclear Propulsion Office (SNPO) was created in 1960 under the provision of an Interagency Memorandum of Understanding between the Atomic Energy Commission and the National Aeronautics and Space Administration.

The manager of SNPO, Mr. Harold B. Finger, reports to both the AEC and NASA for the national nuclear rocket effort. Within the AEC, the channel is through the Director, Division of Reactor Development, and within NASA, it is through the Director, Office of Advanced Research and Technology. The Space Nuclear Propulsion Office Headquarters in Washington (SNPO-W) has three field extensions: The Cleveland extension (SNPO-C), located at the Lewis Research Center of NASA, is responsible for the technical direction of the engine development program; the Albuquerque extension (SNPO-A) provides certain liaison functions with LASL; and the Nevada extension (SNPO-N) provides cognizance of the development test activities at the Nuclear Rocket Development Station. As shown, Mr. Finger also has additional responsibilities within NASA as Director of Nuclear Systems in the Office of Advanced Research and Technology. In this capacity, he provided program direction to the Nuclear Vehicle Projects Office at the Marshall Space Flight Center. Mr. Robert W. Schroeder is Chief of SNPO-C and Mr. Bob P. Helgeson is Chief of SNPO-N. The government organization is shown in Figure 8.

The NERVA program is a new experience for Aerojet in that it deals with a relatively new government organization which has inherited policies, procedures, and attitudes from its parents while at the same time attempting to develop a character of its own. There is an extensive detailed monitoring function being performed by SNPO personnel, perhaps more day-to-day probing than Aerojet has ever experienced on any development program.

There is probably an additional point to be made when describing the customer. With very few exceptions, the SNPO personnel have a research laboratory or academic background and there is an important difference in approach to a major development program between the SNPO and the Aerojet personnel. The basic differences between the contractor and government personnel is concerned largely with the technological approach to be employed in achieving system development objectives. There is one body of thought which recommends a path of extensive analyses, deliberate laboratory research, exhaustive component research and development and ultimately culminating in subsystems and total system integration and test. The majority of the government personnel engaged in the NERVA technical direction and monitoring activities belong to this school. The other principal approach to system development is the one that is typically employed by industry and has been utilized in every previous major development program, so far as we know. Industry in general, in the conduct of development efforts, has followed a course which consists of an initial analysis of the development objectives to be achieved within a given time period together with a postulation of the most probable route leading to the stated objectives. In certain cases, subordinate and sometimes parallel backup efforts are included. Industry, in general, tends to build experimental hardware as soon as possible, to test this hardware for adequacy, to utilize the test results in systems analyses to predict the results of design modifications, to build new hardware, to test etc. Thus a program is characterized by the iterative sequence of design, build, test, redesign, build, test, until the development objectives have been achieved. REON supports this empirical approach. The government personnel directing and monitoring our program are specifically research-oriented and expect to see a great deal more analytical work before design, hardware fabrication and test are initiated. On the other hand, the contractor personnel are anxious to proceed with experimental verifications of concepts and therefore initiate design, fabrication and test at an earlier point in time than would our government counterparts. This is not to mean that these differences in approach are detrimental to the best interests of a development program. In fact, the blend of the two may well yield a rational middle course representing the most effective method of accomplishing objectives. Neither of the two approaches is bad, merely different, but it is significant to point out that they do create "people problems," in our relationship with our customer.

E. THE CONTRACTOR ORGANIZATION

When the NERVA prime contract was awarded to Aerojet-General in July of 1961, the Corporation established a special program management office at its Azusa, California, plant to exercise overall control and direction of the complete development effort. This organization is named REON (for Rocket Engine Operations - Nuclear) and includes personnel qualified by experience in the technical, administrative, and managerial skills required for this complex effort. The Westinghouse Astronuclear Laboratory is the principal

subcontractor and is responsible for developing the flight reactor and associated nuclear aspects of the program. This organization is located in Pittsburgh, Pennsylvania. Aerojet's Liquid Rocket Plant at Sacramento, California, is responsible for developing most of the non-nuclear engine components and subsystems. Also, AMF Atomics, a division of the American Machine and Foundry Company, is responsible for designing, developing, fabricating, and installing the unique, remotely-controlled equipment for assembling, disassembling, and transporting the engine during its development tests in Nevada. The fourth principal participant is the Bendix Corporation which is responsible for developing certain radiation-resistant control system components.

When REON is functioning at Aerojet's Sacramento Plant, it will be one of three major operations headquartered at the Sacramento facility; Liquid Rocket Operations (LRO), Solid Rocket Operations (SRO), and REON (Rocket Engine Operations - Nuclear). Combining and integrating the functions previously performed by REON in Azusa with the development operations being conducted in Sacramento should provide for a more centralized and efficient way of fulfilling Aerojet's prime contractor responsibilities with regard to the NERVA development program. The REON Organization Chart is designed primarily to meet the specific requirements of Contract SNP-1. It has the approval of both Corporate Management and the Customer. The basic organization and key personnel are shown under "Organization", Section III below. REON, as an overall operation, is projectized since it is basically a one project organization, and is likely to remain so for some time. Within the basic organization, the activities are functional as indicated on the charts.

As indicated previously, Aerojet-General Corporation is prime contractor for the NERVA engine development. Westinghouse Astronuclear Laboratory is the principal subcontractor for the reactor development.

Basically, Aerojet's responsibility is outlined as follows:

1. Responsibility for overall program planning, engine design, program integration and program control.
2. Responsibility for reactor-to-engine interface, both mechanical and functional and for interface control drawings and gauges.
3. Responsibility for overall engine control system and control sensors or instrumentation as applied to non-nuclear hardware.
4. Responsibility for overall program safety, both nuclear and industrial. In the latter case, the audit function is exercised.
5. Responsibility for program quality assurance plan and of overall engine and reactor components and exercise particularly the audit function on the reactor components.

6. Responsibility for overall activities at NRDS and with particular emphasis on planning, scheduling, safety and quality assurance. Specifically, Aerojet is responsible for engine testing and the activities on engine test stands and E-MAD (Engine-Maintenance, Assembly, and Dis-assembly Building).

7. Responsibility for review and approval of Westinghouse procurement packages.

8. Responsibility for review and approval of all NRDS test plans and activities.

Customer technical direction is vested in SNPO-Cleveland and is often very detailed. To understand Aerojet's role better, it is desirable to review the Westinghouse independent responsibility as viewed by the Customer.

1. Responsibility for reactor mechanical and nuclear design.

2. Responsibility for reactor (inner loop) control system, sensors and instrumentation.

3. Responsibility for Westinghouse vendor performance and quality assurance.

4. Responsibility for preparation of reactor test plans and specifications.

5. Responsibility for reactor testing at NRDS within the safety, quality assurance and approval limits as vested in Aerojet.

Within the above broad constraints, Aerojet provides the necessary technical, fiscal, and programmatic direction to Westinghouse with the organization outlined. Communication at the working level is carried out at the working level and is encouraged to ensure timely transmission of data. Technical data is transmitted by the Program Manager's office. Official program direction, technical or otherwise is transmitted by the Subcontracts Office which administers the subcontract with Westinghouse. A large subcontract for remote handling equipment is also administered by Subcontracts. This contract is with the Atomic Division of American Machine and Foundry Company.

2. SPECIAL ORGANIZATIONAL REQUIREMENTS

1. The NERVA program has three unusual characteristics which make it desirable to operate as closely as possible as an integrated group. The first of these is the AEC "Restricted Data" requirement which necessitates all engineering and office personnel to be cleared final Secret or equivalent based on Q clearances and requires special handling and confined areas for documentation. Recent difficulties with Security Officers should provide ample evidence of these problems.

2. The second unique characteristic is the special requirement on hardware resulting from the need to operate reliably in a radiation environment. It is essential that personnel be knowledgeable of these problems and capable of designing equipment to withstand the combined radiation and more complex environments of temperature, thermal shock, vibration shock, etc. Rotation with or part time assignments to inexperienced people would drastically increase costs, jeopardize schedules, and compromise designs. The following organizational reflections of the above merit special emphasis:

3. Projectizing of NERVA Test Activities

a. The projectization of the NERVA test activities is essential - using the following general ground rules:

(1) The management of facilities, including test stands and laboratories, where NERVA is the majority user, be immediately assigned to REON. Personnel associated with these facilities be transferred to REON.

(2) Management of design, supervision of construction, modification and activation of facilities and equipment for NERVA use be assigned to REON. All personnel associated with this effort be transferred to REON.

(3) In all areas where NERVA testing is accomplished, REON be assigned management responsibilities for safety.

4. Test Stands

That Test Stands C-6, H-4, H-4A, H-5 and H-6, where NERVA is a majority user, should be assigned to REON for management control. Test personnel, both salary and hourly, should be transferred to the REON Test Services Department. To provide a more cohesive operating group, propellant logistics and loading required for the "H" area should report to this REON Department. Area safety, including the Cryogenic Lab, should be assigned to REON to qualify under AEC regulations and to provide a complete project service.

5. Instrumentation Calibration and Valve Maintenance Center

The existing Instrumentation Calibration and Valve Maintenance Area in Test Zone "H" should be under the cognizance of the NERVA Program. The interchange between this lab and the Data Reduction Center will be significant. The lab should include transducer calibration and instrumentation service capabilities, as the present LRP Lab provides only a limited facility for NTO use.

6. Cryogenic Laboratory

The Cryogenic Laboratory was originally scheduled for majority NERVA use. The NERVA requirement for such a laboratory was the basic justification used in obtaining Government funds for its construction. NERVA is now the majority user, consequently, the management of this laboratory should be assigned to REON. Personnel, salary and hourly, should be transferred to the REON Laboratories Department.

7. Instrumentation and Control Personnel

The present Instrumentation and Controls Lab at Sacramento is used approximately 25% by NERVA and the Transducer Lab utilization by NERVA is 15%. In these two instances, we believe the personnel who are involved in NERVA work should be assigned to the REON Laboratories Department.

8. NERVA Facilities

The creation and activation of the NERVA facilities at Sacramento have been seriously delayed because of the difficult interface between project designers, facilities designers, construction contractors, test services and our customer. It will be advantageous to combine personnel concerned with NERVA facilities requirements throughout the program, both at Sacramento and NTO, into a single project organization. This type of organization will help to produce a consistent NERVA Test Program. It is recommended that all management control and associated personnel concerned with Tasks 5 and 6 be transferred to the REON Facilities and STE Department.

9. Manufacturing Control

NERVA, at this time, is hardware "poor" and long lead times are a continuing problem; we have test stands being activated and commitments made for "off-site" radiation tests on components, as well as commitments to the NRX reactor development program that must be met if we are to enjoy good customer relations. To this end it is necessary to extend the projectization of the NERVA program into the Manufacturing Control area; accurate, precise, and detailed data must be available in this operation to allow continuing assessment and reporting to REON Management and to the customer on this critical operation.

The evaluation of the data will allow REON Management to exercise its judgment on the merits of backup hardware or backup or alternate source and make other critical decisions concerning scheduling, assembly testing and tooling.

10. NERVA Assembly Department

This department will be responsible for assembly operations and will exercise direct supervision of all personnel. It will maintain a bonded area for spare parts and assembly storage. Hardware stores and tool crib functions are additional responsibilities. The NERVA assembly area will include TPA and valve assembly; CFDTs, NRX, and engine assembly; nozzle test assembly; support equipment assembly; radiation effects test pallet assembly; and a hot shop area for radioactive parts.

It is anticipated that parts from outside production or from the Sacramento manufacturing shops will flow into the assembly area for final assembly, acceptance test, and shipment.

The "Hot Shop" is a necessary and peculiar NERVA requirement. Its function is to provide facilities as necessary to repair and modify contaminated engine parts and to prepare activated samples for material analysis.

11. Product Assurance

The quality and reliability of the NERVA engine is of prime importance. The difficulty and complexity of the development job and the history of technical difficulties to date does not permit a margin of deviation from specifications which might even remotely result in a test failure which could jeopardize the entire program. The customer has reflected the importance placed on quality and reliability by insisting on assignment of clearly established responsibility for establishing the Product Assurance Plan, for auditing performance and for initiating corrective action in case of non-conformance to a staff whose sole function these are. Because of these considerations, the degree to which it is feasible to utilize personnel not under direct REON control for certain aspects of the product assurance function and the ways in which they are utilized must be determined by the REON project assurance manager in coordination with the Sacramento Works Manager.

As in the safety area the degree of specialized knowledge and ability required of the REON product assurance staff to understand and cope with the problems arising out of the development program precludes more than an administrative cognizance by personnel of the Sacramento plant staff.

12. Safety

Because the NERVA program has at its heart a nuclear reactor which produces phenomena which are hazardous in the extreme and which are best understood by nuclear specialists; with respect to safety, it is strictly governed by Atomic Energy Commission regulations and requirements. These reflect the unique complex and interactive conditions involved in a nuclear environment as well as the highly specialized technical problems of

radiation, use, assembly and disassembly and storage of radioactive equipment materials and wastes. The program also poses problems concerning other exotic and hazardous materials and physical extremes of temperature and working conditions which require continuous and specialized knowledge and experience. To meet the close, detailed supervision of the customer and the AEC and to give the safety aspects of the program the attention they deserve and to reflect the extreme sensitivity of safety in the eyes of the public, a Nuclear Safety Division has been made a major component of the REON organization.

This organization must be able to discharge its responsibilities in accordance with AEC requirements and its professional knowledge and experience. It cannot discharge this responsibility if through organizational standard practice, it is subordinated to organizations with merely industrial safety competence.

13. Subcontracts Administration

The particular substantial subcontract activity including the management of the Westinghouse subcontract which represents nearly 50% of the NERVA program expenditures, requires direct and continuous contact with the other members of the REON team. The relationship of subcontracts to the overall effort, the sensitivity of our subcontracts, the special knowledge required, relationships with our customer and our technical staff, all demand that they be administered under common direction and that this effort continue in its present pattern. Therefore, REON will maintain the administration of its principal subcontracts and consultants under its direct jurisdiction. In addition, there are certain, out of the usual, aspects of procurement and material which similar considerations dictate be handled by REON subcontracts personnel. These will be worked out after the move.

14. REON Technical Information Center

This facility is an important means of providing state-of-the-art information to the technical staff of cultivating and exploiting sources of information, of facilitating flow of information within the staff, of providing rapid response to requirements for information and of assuring that security requirements are met concerning accountability, storage, markings, reproduction, destruction and need-to-know for the thousands of classified documents which the program utilizes and generates. It will integrate a central project file operation with the outside specialized documents and other publications applicable to NERVA.

This facility is an integral part of performance of our technical job and must be performed by personnel knowledgeable as to our subject matter and directly responsive to NERVA Program needs and priorities.

15. Data Control

The NERVA security requirements, while no more severe in theory than any other classified project, are in practice unusually severe because of the high frequency of Restricted Data documents and drawings. REON is required by contract not only to generate drawings, but also to file and index drawings of all subcontractors, plus a large reference file of drawings of the Los Alamos Scientific Laboratory, many of which are Confidential Restricted-Data, - which require careful handling because of security clearance and need-to-know considerations. This large volume of C-RD must be protected by restricting the area in which the material is generated, processed and stored and access granted to personnel of other organization.

Integration of drafting and data control functions is desirable because they are so closely related in operation. Drawings are microfilmed on completion or receipt from subcontractors, a Recordak viewer (AGC owned) is available for quick reference, and a rented Xerox printer furnishes standard size prints for more extended use. This integrated function has provided excellent and rapid service to the project for about one year, and its continuance will facilitate the handling, storage and reproduction of drawings. A blueprint machine has been requisitioned to permit check prints to be made available immediately, to permit rapid distribution of prints of incoming vellums so that there can be maximum speed in responding to program requirements, and for office-type reproduction of materials too large for office copiers.

The complexity and security classification of the engineering data utilized by and produced by this program and the rapid service needed and the importance of this function are reflected in the direct contractual support for this activity. Its operation as an integral part of REON is essential.

16. Reproduction Area

The process of preparation of millions of pages of technical and administration material requires both quick response, immediately available facility and the publications capabilities associated with "Technical Publications". Preparation of REON materials is frequently a reiterative process of review and coordination which requires running of several ditto versions prior to publications. In addition, virtually all correspondence and management publications are duplicated on ditto for provision of information to those concerned. Tight controls are maintained to avoid improper duplication of classified information. This service is in full operation at least 9 hours per day.

II. MANPOWER

REON will have 670 people at Sacramento. This number includes management, engineering and related personnel as summarized in Table I. Further, 101 additional test personnel will be directly employed by REON. The ratio of REON direct to indirect personnel at Von Karman Center and NRDS from December 1962 through March 1964 can be determined from Figure 10. The 670 manpower estimate is based on a ratio of 35%.

Approximately 250 people have made affirmative commitments to move from Azusa to Sacramento. An additional 10 have not as yet made decisions and a further 84 occupy positions which will not be moved to Sacramento until September or later. To date 187 employees are now in Department 8200 which is serving as a holding department for REON personnel at Sacramento. A minimum of 208 positions remain to be filled during the move period. These positions break down as follows: Five executives and managers (salary), 94 professional and technical (salary), 24 administrative (salary), 15 technical (hourly), and 70 clerical (hourly).

Although there are no commitments to move hourly clerical personnel, approximately 20 cleared, skilled and experienced people in this category have expressed a desire to follow their jobs to Sacramento at their own expense.

A major problem in the timely filling of vacancies will be the requirement of final military security clearances or interim clearances based on Q clearances, before access can be granted to "Restricted Data" under the Atomic Energy Act of 1954. Experience at Von Karman Center and reported Sacramento experience indicate that completion of new clearances requires more than three months. Reaffirmation of clearance upon change of employers takes from 10 days to 3 months. The clearance requirement makes it virtually impossible to utilize persons with less than final military clearances at more than a small fraction of the capabilities. The larger the number of uncleared persons, the more difficult it is to utilize them because the available unclassified work or work of lower classification can be spread only so far.

With the loss of 136 of the technical and management personnel and 70 of the clerical personnel, REON will have a problem of maintaining continuity with respect to program background, relationships, and the mechanics of getting things done. It is therefore essential that experienced personnel of all types be retained on the program even at the expense of some other considerations. Among other actions, REON will, therefore, transfer to Sacramento such hourly employees whom we feel merit retention and whose transfer will be conducive to continuity and productive effort; such transfers to be at the expense of the employee.

A. PROCEDURE FOR HANDLING PERSONNEL TRANSACTIONS

To control effectively the handling of all personnel transactions pertaining to the move of REON Operations to Sacramento and Las Vegas, a central control point has been established in the Administrative Services Division in the office of W. G. Clayton. All transactions will be coordinated with the

Sacramento and Von Karman Center Industrial Relations Divisions in order to provide (1) maximum utilization of all available Aerojet personnel, (2) continuity of operation, and (3) overall program economy. The following procedure has been established and will be followed insofar as practicable.

1. When the number of direct-charge personnel has been established for each department, as required by PD-1005, and the authorized number of indirect personnel has been added, a complete departmental position-control chart will be prepared on which each position will carry a control number. As soon as these departmental manpower ceilings are established, a formal offer memo (see Figure 11) will be submitted to each invited employee.

2. After the offer memos have been signed and returned, a list of all "unassigned" personnel will be prepared and distributed, showing the "earliest release date" and the "latest release date" for each employee - the latter being the employee's layoff date. These dates will be established by the cognizant department managers.

3. For each vacancy that appears on the position-control chart, an employee requisition will be prepared by W. G. Clayton at the request of the department manager. The requisition will indicate the proper job classification and detailed description of the duties and qualifications of the candidate. Approvals of employee requisitions at Azusa will consist of the Division Manager and G. L. Ryland or R. H. Hardin. For all Sacramento openings, a copy of this requisition will be forwarded to Mr. George Harris, Department 8200 at Sacramento, for proper processing through the Sacramento Industrial Relations Division. Sacramento Industrial Relations will indicate within a week whether or not they have suitable candidates for each requisition. If they do not, candidates at Azusa will be interviewed for the job.

4. If suitable candidates are available at Sacramento, Sacramento Industrial Relations will notify George Harris of Department 8200 and he will coordinate the mailing of resumes and the arrangements for interviews. If a Sacramento candidate is acceptable, the Department Manager will so advise George Harris. The losing department will initiate the Change of Status and the employee will be transferred into Department 8200 and J. J. Peterson will sign as the receiving department head.

5. If a suitable candidate is not available at either Sacramento or Azusa, then Sacramento Industrial Relations will take appropriate recruiting action to fill the vacancy, especially in the areas where nuclear experience is mandatory.

6. Employee requisitions for openings within the NTO Division will be processed first through the Von Karman Center Industrial Relations Division and then (if no suitable candidates are available from Promotion and Transfer lists) through the Sacramento Industrial Relations Division for appropriate recruitments.

7. No employee requisitions will be required on 1 June 1964 to transfer any employee from Department 8200 or from REON-Azusa into the 7000

series of departments. These will be handled by W. G. Clayton on a "mass-transfer" basis. All employee requisitions still open at that time will be changed to reflect the appropriate 7000 series department number.

8. After the manpower ceilings have been established for each department, and the position-control chart has been approved by the cognizant Division Managers, the signature of G. L. Ryland or R. H. Hardin will suffice for approval, after Division Manager signature, of all employee requisitions and all REON personnel transactions which do not require salary committee action or approval, and that are compatible with current ceilings and merit increase budget limitations.

III. ORGANIZATION

A. GENERAL

Figure 9 is the present REON Organization Chart which supersedes the chart attached to the original REON reorganization memo. Figures 10, 11, and 12 are departmental breakdowns of the three senior divisions; namely, Program Manager, NERVA Test Operations, and Administration. The organizational level of each box is furnished in Section D.

B. PRINCIPAL FUNCTIONS

1. Program Manager

The Program Manager, under the policies and direction established by the Program Director and within the guidelines mutually agreed upon with the customer, is responsible for creating the basic program plan and, subsequent to its negotiation between the customer and REON management, the execution of the basic program plan as embodied in the authorizing Work Order, issued by REON Contract Administration.

The NERVA Program Manager's organization as presented in the organizational format elsewhere, utilizes the talents of those personnel formerly located with the NERVA program at the Sacramento Plant as well as the REON personnel from Von Karman Center. The major interface between the Program Manager's office and the Works Manager's Operations will be the Engineering Support Division. Program requirements necessitate extending the "projectization" of the NERVA program into the Manufacturing Control area, and the Laboratory and Test areas. The unique requirements in these areas dictate the necessity of REON jurisdiction over those portions where control is essential to customer satisfaction.

2. Nuclear Safety Division

The Manager of the Nuclear Safety Division is responsible for all safety aspects of the NERVA engine program at all participating facilities. This responsibility encompasses nuclear and radiation safety, overall system safety, and industrial safety. He will establish the rules, guidelines, and overall safety policies for all participating organizations to ensure the meeting of all contractual safety requirements, especially in the area of hazards unique to a nuclear development program including radiation, and the storage, handling and disposal of radioactive materials. He has the responsibility for the surveillance and auditing of safety activities at each plant and facility and for initiating remedial action when anomalies are disclosed. His office will be the interface between REON and the Works Manager's Office in all matters pertaining to safety.

3. NERVA Test Operations

The Manager, NERVA Test Operations, is responsible for all test and associated operations at the NRDS as specified by the Program Manager

and for Safety and Quality Assurance within the policies established by those respective activities and as approved by the Program Director. He has responsibility for conduct of all test operations pertaining to NRX (R-MAD and Test Cell "A"), ETS-1, and E-MAD, including facilities, equipment, plans, instrumentation and control, and data reporting. His office will provide the interface between NERVA Test Operations and the other divisions of REON.

4. Product Assurance Division

The Manager of Product Assurance is responsible for the establishment of a Product Assurance Plan for the NERVA program which meets all contractual requirements as established and approved by the customer. He has responsibility for approving the Product Assurance Program Plans for all participants, for auditing the performance of each plant against approved standards, and for initiating corrective action where needed. He is responsible for the interpretation of customer requirements and for obtaining customer approval of Product Assurance activities. Major participants include the Sacramento Plant, Von Karman Center, NERVA Test Operations at NRDS, Westinghouse Astronuclear Laboratory, Westinghouse Astrofuel Facility, and American Machine and Foundry.

5. Administration Division

The Manager, Administration, is responsible for Contracts, Subcontracts, Internal Program Administration, and Program Analysis. His office has the prime responsibility of the interfaces between REON and the customer, the major subcontractors, and the various service divisions of the Sacramento plant. His responsibilities under Program Analysis include independent evaluation of the overall performance of REON and our progress toward customer-established milestones. These responsibilities include overall fiscal control and consolidated technical and fiscal progress reporting. His function under Administrative Services will include the optimum utilization of Sacramento service groups in the interest of, and consistent with continuity of operation and overall program efficiency and economy, especially in the area of timely and effective staffing of the REON organization.

6. Staff Assignments

In addition to these five major divisions, the REON organization will maintain a small staff of highly qualified engineers or scientists for the purpose of handling special problems, investigations, and to act as assistants to the program for non-standard REON activities. The Advanced Concepts Division will carry out the IR&D programs of REON, conduct non-NERVA proposal activities, perform mission analysis studies, and conduct customer relation activities with potential users of nuclear rocket engines.

C. TASK ORGANIZATION

1. The NERVA Release Plan, as shown in PD-1004, indicates by work order release number, the cognizant (responsible) departments for all elements of work to be conducted in Contract Year 1964.

2. For summary purposes such as customer technical contacts, budget allocations, report and/or cost study input review, etc., the following individuals are assigned cognizance of the various subtasks of the contract:

<u>Subtask Number</u>	<u>Cognizant Activity Manager</u>	<u>Subtask Manager</u>
1.1 (less 1.1.8)	P. W. Rowe	R. V. Evleth
1.1.8	P. W. Rowe	C. K. Soppet
1.2	I. L. Odgers	H. H. Borneman
1.3	P. W. Rowe	C. K. Soppet
1.4	I. L. Odgers	J. J. Beereboom
1.5	I. L. Odgers	N. L. Irvine
1.8	B. Mandell	B. Mandell
1.9	I. L. Odgers	J. B. Williams
2.1	D. Holzman	M. J. Neder
2.2	D. Holzman	M. J. Neder
2.3	D. Holzman	M. J. Neder
2.4	I. L. Odgers	T. F. McGrath
2.5	J. B. Philipson	C. F. Leyse
2.6	D. L. Dewing	G. Birdsell
2.7	J. B. Philipson	D. S. Duncan
2.8	N. E. Erickson	A. Wilson
2.9	W. D. Stinnett	C. M. Rice
3.0	D. Holzman	J. L. Carton
3.1	P. W. Rowe	T. M. Prudden
3.2	N. E. Erickson	W. J. Kurtz
3.3	N. E. Erickson	D. L. Limbacher
3.5	N. E. Erickson	L. E. White
3.6	N. E. Erickson	W. J. Kurtz
3.8	N. E. Erickson	L. E. White
4.1	J. S. Robbins	J. J. Sogorka
4.2	L. R. Shirley	J. H. Diederich
4.3	R. B. Masterson	P. D. Kahn

Subtask Number	Coordinator Activity Manager	Subtask Manager
4.4	D. Halach	P. Shaffer
5.X	D. Halach	J. L. Carton
6.X	D. Halach	J. L. Carton
7.0	N. E. Erickson	N. E. Erickson
7.1	N. E. Erickson	N. E. Erickson
7.3	N. E. Erickson	N. E. Erickson
7.4	N. E. Erickson	W. G. Kurtz
7.5	N. E. Erickson	L. G. White

D. DEPARTMENTAL NUMBERING SYSTEM

The following department numbers are proposed in order to accommodate the existing BEON organization and task assignments as well as to provide for future growth. Because of the limitations imposed by the number series suggested by the Sacramento plant and the differences in size, scope and organizational structure of the divisions, true parallelism in number groups cannot be maintained.

DEPARTMENT NO. *	DIVISION/DEPARTMENT TITLE	ORGANIZATIONAL LEVEL
7000	BEON	Operations
7000	Technical Staff	Operations Staff
7040	Advanced Concepts	Operations Staff
7100	Administration	Senior Division
7120	Program Analysis	Division
7121	Documentation Services	Department
7124	Program Evaluation	Department
7127	Fiscal Control	Department
7130	Contracts	Division
7200	NERVA Test Operations	Senior Division
7205	Quality Control	Department
7210	Administration	Department
7220	Health & Safety	Department
7230	NERX Operations	Division
7231	R-MAD Operations	Department
7235	Test Cell "A" Ops.	Department
7240	ERS-1 Operations	Division
7260	E-MAD Operations	Division
7300	Nuclear Safety	Division
7310	Systems Safety Analysis	Department
7320	Nuclear & Radiation Safety	Department
7330	Industrial Safety	Department

* Tentative pending discussion with Sacramento officials.

<u>DEPARTMENT NO.</u>	<u>*</u>	<u>DIVISION/DEPARTMENT TITLE</u>	<u>ORGANIZATIONAL LEVEL</u>
7400		Product Assurance	Division
7420		Audit & Surveillance	Senior Department
7440		Product Assurance - Sacto	Senior Department
7500		Program Manager	Senior Division
7510		Staff Engineering	Division
7520		Thermodynamics	Senior Department
7530		Materials	Senior Department
7540		Structures	Senior Department
7550		Nuclear Analysis	Senior Department
7560		Program Controls	Division
7561		PERT	Department
7564		Budget	Department
7610		Component Development	Division
7620		Propellant Feed System	Senior Department
7621		Turbopump Assembly	Department
7630		Thrust Chamber Assembly	Senior Department
7631		Nozzles	Department
7632		Pressure Vessel & Assy.	Department
7640		Instrumentation & Controls	Senior Department
7641		Instrumentation	Department
7646		Control System Design	Department
7650		Radiation Effects	Senior Department
7660		Project Engineering	Division
7670		Integration - NRX	Senior Department
7671		Nuclear Subsystem Integration	Department
7676		NRX Projects	Department
7680		NERVA Exhaust System	Senior Department
7681		Hot Gas Supply System	Department
7682		NES Duct System	Department
7690		NERVA Engine System	Senior Department
7691		Experimental Engine	Department
7696		CFDTS	Department
7710		Engineering Support	Division
7720		Laboratory & Test Operations	Senior Department
7721		Test Planning	Department
7726		Test Services	Department
7730		Facility & STE	Senior Department
7740		Manufacturing Control	Senior Department
7741		Planning, Control & Liaison	Department
7746		Assembly Shop	Department
7750		NERVA Support Systems	Senior Department
7760		Engineering Services	Department
7770		Systems Analysis	Division
7771		Performance Analysis	Department
7774		Data Analysis	Department

* Tentative pending discussion with Sacramento officials.

IV. FACILITIES

A. GENERAL

The prime-contractor role of REON, coupled with unique security requirements necessitate careful consideration in regard to facilities. The move to Sacramento and the resultant integration of operations creates the following as facility requirements:

1. Creation of a basic REON work area suitable for the management, design and design integration of the engine development under the SNP-1 Contract.

2. Creation of specialized facilities which will contribute to analysis, design, fabrication and test efforts.

These generalized requirements are described in more detail in the following paragraphs, and an estimate of capital expenditure is furnished in Table III.

B. OFFICE SPACE

At Von Karman Center REON has approximately 42,000 square feet inclusive of a utility core and major corridors and the area has been occupied by a maximum of 470 people. This occupancy level has been too crowded to permit effective working conditions, good housekeeping, a business-like appearance, and compliance with reasonable safety requirements. Within the area are 8 hard and 50 easy wall offices occupying 7393 square feet.

The REON organization (exclusive of the Vice President and the Associate Director) requires 7 offices for the senior managers who report directly to the Vice President. 13 additional offices are required for managers of major functional segments. Also, there are office requirements for a Westinghouse representative, and an SNPO representative and his staff. In addition to the above, offices which provide opportunity to conduct business and work in relative privacy and quiet are needed for 45 additional personnel. These latter employees carry on important discussions and negotiations with the customer, subcontractors, and associate contractor personnel, as well as supervising substantial organizations. In status and tenure they are senior Aerojet and REON personnel.

Projected strength at Sacramento is approximately 670. Of these, approximately 33 require individual "banker's type" offices in addition to those indicated above. An additional 33 senior personnel should be housed, no more than 2 men to a 12 x 12 cubicle. There will be 120 secretarial personnel of whom 110 will be housed in the specialized areas outlined below. The aggregate requirements for the above, in square feet, is 45,224. General desk space is therefore required for 334 persons. A reasonable amount of such space per person is 75 square feet exclusive of aisles and corridors, etc., which brings the net requirement to 67,274 (refer to Table III).

A perimeter security wall is required to create a company-controlled access area. Such an area permits proper safeguarding of the large amount of material classified Confidential-Restricted Data and higher in REON possession. In the absence of such safeguards there would be a continuing hazard that persons not holding final government-granted security clearances would have access to Restricted Data. Such an area similar to that which REON currently has at Von Karman Center, also contributes to increased work output by reducing the need for opening and closing file cabinets during the day. At the entrances to such an area security gates would be manned by REON receptionists. The area for uncleared personnel must be outside the controlled access area, as should: a lobby, areas for unclassified discussions with vendors, an area for conduct of interviews of uncleared job candidates referred by Industrial Relations, and areas for displays of models and mockups and visitor coordination.

The following pages the names and titles of the personnel who will occupy REON offices in the following respective categories; senior management personnel, division management personnel, senior departmental management personnel and departmental management personnel.

OFFICE REQUIREMENTS - SENIOR MANAGEMENT PERSONNEL

J. J. Peterson	Tech. Staff	7000
W. C. Beckwith	Advanced Concepts	7040
G. L. Ryland	Mgr. Administration Sr. Div.	7100
J. B. Phillipson	Mgr. Nuc. Safety Div.	7300
D. L. Dewing	Mgr. Product Assurance Div.	7400
W. D. Stinnett	Program Manager Sr. Div.	7500
C. M. Rice	Associate Pro. Mgr. Sr. Div.	7500

OFFICES REQUIREMENT - DIVISION MANAGER LEVEL

I. Bornstein	Technical Staff	Ops Staff 7000
R. H. Hardin	Mgr. Admin. Services	Div. 7110
J. J. S. Daniel	Mgr. Program Analysis	Div. 7120
H. Pharr	Mgr. Contracts	Div. 7130
V. Miller	Mgr. Subcontracts	Div. 7160
N. Erickson	Mgr. NTO	Div. 7200
J. H. Beveridge	Mgr. Staff Engineering	Div. 7510
J. S. Robbins	Mgr. Program Controls	Div. 7560
I. L. Odgers	Mgr. Component Div.	Div. 7610
P. W. Rowe	Mgr. Project Engineering	Div. 7660
D. Holzman	Mgr. Engineering Support	Div. 7710
B. Mandell	Mgr. Systems Analysis	Div. 7770
W. A. Fiala		
WANL (Weiler)		

OFFICE REQUIREMENTS - SENIOR DEPARTMENT MANAGER LEVEL

D. L. Duncan	Mgr. Systems Safety Analysis	Sr. Dept. 7310
C. F. Leyse	Mgr. Nuclear Radiation & Safety	Sr. Dept. 7320
A. Haeseman	Mgr. Industrial Safety	Sr. Dept. 7330
	Mgr. Audit & Surveillance	Sr. Dept. 7420
G. Birdsell	Mgr. Product Assurance - Sacto	Sr. Dept. 7440
	Mgr. Thermodynamics	Sr. Dept. 7520
C. W. Funk	Mgr. Materials	Sr. Dept. 7530
G. Kaveny	Mgr. Structures	Sr. Dept. 7540
J. Vreeland	Mgr. Nuclear Analysis	Sr. Dept. 7550
H. H. Borneman	Mgr. Propellant Feed	Sr. Dept. 7620
J. J. Beereboom	Mgr. Thrust Chamber Assy	Sr. Dept. 7630
N. Irvine	Mgr. Instrumentation & Control	Sr. Dept. 7640
J. B. Williams	Mgr. Radiation Effects	Sr. Dept. 7650
C. K. Soppet	Mgr. Integration NEX	Sr. Dept. 7670
T. M. Prudden	Mgr. NERVA Exhaust System	Sr. Dept. 7680
R. Evleth	Mgr. NERVA Engine System	Sr. Dept. 7690
R. M. Beattie	Mgr. Laboratory & Test Oper'ns.	Sr. Dept. 7720
J. L. Carton	Mgr. Facility & STE	Sr. Dept. 7730
	Mgr. Manufacturing Control	Sr. Dept. 7740
M. Neder	Mgr. NERVA Support System	Sr. Dept. 7750
T. Walsh	Ass't.Mgr. NERVA Support System	Sr. Dept. 7750

OFFICE REQUIREMENTS - DEPARTMENT MANAGER LEVEL

H. Johnson	Advanced Concepts	Op Staff 7040
D. Vanica	Advanced Concepts	Op Staff 7040
B. Houghton	Advanced Concepts	Op Staff 7040
Visitor Control	Advanced Concepts	Op Staff 7040
Six Sr. Engineers	Open Reqs	Op Staff 7040
Bob Swanson	Consultant to Sr. Dept. 7690 Evleth	
J. Carroll	Staff to B. Mandell	
W. G. Clayton	Mgr. Manpower & Office	Dept. 7110
	Mgr. Information & Security	Dept. 7110
R. Masterson	Mgr. Documentation	Dept. 7121
G. N. Eisenhart	Mgr. Program Evaluation	Dept. 7124
L. Shirley	Mgr. Fiscal Control	Dept. 7127
	Mgr. (Within Contracts Div.)	Dept. 7130
	Mgr. (Within Contracts Div.)	Dept. 7130
J. L. Dooling	(Mgr. within Subcontracts Div.)	Dept. 7160
R. C. Bawbell	(Mgr. within Subcontracts Div.)	Dept. 7160
S. F. Collins	(Mgr. within Subcontracts Div.)	Dept. 7160
R. T. Biko	Mgr. Inspection Control	Dept. 7430
	Mgr. Data & Reports	Dept. 7400
	Mgr. Product Assurance Engr.	Dept. 7400
	Mgr. Audit & Surveillance	Dept. 7440
	(Mgr. within Structures)	(Dept. 7540)
	(Mgr. within Structures)	(Dept. 7540)
	(Mgr. within Nuclear Analysis)	(Dept. 7550)
	(Mgr. within Nuclear Analysis)	(Dept. 7550)
	(Mgr. within Nuclear Analysis)	(Dept. 7550)
J. J. Sogorka	Mgr. Program Planning	Dept. 7560
	(Mgr. PERT)	Dept. 7561
V. J. McDevitt	Mgr. Budget	Dept. 7564
	(Mgr. Turbopump Assembly)	Dept. 7621
	(Mgr. Nozzles)	Dept. 7631
	(Mgr. Pressure Vessel & Assy.)	Dept. 7632
	(Mgr. Instrumentation)	Dept. 7641
	(Mgr. Controls System Design)	Dept. 7646
	(Mgr. within Instr. & Controls)	Dept. 7640
	(Mgr. Nuclear Subsystems)	Dept. 7671
	(Mgr. NRX Projects)	Dept. 7676
	Mgr. Hot Gas Supply System	Dept. 7681
	Mgr. NRS Duct System	Dept. 7682
	Mgr. Analysis & Integration	(Dept. 7680)
	(Mgr. CFDTS)	Dept. 7696
J. Beattie	Mgr. Lab. & Test Operations	Dept. 7720
	(Mgr. within Facility & STE)	(Dept. 7730)
	(Mgr. within Facility & STE)	(Dept. 7730)
	(Mgr. within Facility & STE)	(Dept. 7730)
	(Mgr. within Facility & STE)	(Dept. 7730)
	(Mgr. Manufacturing Control)	Dept. 7740

OFFICE REQUIREMENTS - DEPARTMENT MANAGER LEVEL - Continued

	(Mgr. Planning, Control & Liaison)	Dept. 7741
	(Mgr. Assembly Shop)	Dept. 7746
	(Mgr. within NERVA Support System)	Dept. 7751
	(Mgr. within NERVA Support System)	Dept. 7752
	(Mgr. Drafting & Checking - Sanchez)	Dept. 7761
	(Mgr. Central Data Control - Penning)	Dept. 7762
	(Mgr. Performance Analysis-Mandell Acting)	Dept. 7780
Gordon	Mgr. Data Analysis	Dept. 7790

C. SPECIAL ROOMS

Special rooms consist of Documentation, Drafting, Central Data Control, Uncleared Area, PERT Room, Technical Information Center, Conference Rooms (3), Lobbies and Access Gates (2), Mail-Stationery Supply and Office Copying Center, Crypto-TWX Room, Management Control Center, SNPO Customer Office, and General Storage Room.

1. Name of Facility:

Documentation Area

2. Nature of Facility:

Area must have floor-to-ceiling walls, 3-tumbler combination lock and card-key door, security "Closed Area". One hard office required in area.

3. Required Space (Sq. Ft.):

1,600 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$6,500

6. Number of Personnel Assigned:

Ten to twelve employees

7. Cognizant Department:

Documentation Services, R. B. Masterson

8. Purpose:

See Item 9.

9. Contractual Requirement or Policy Development:

Experience has proved the need, over a three-year period, of a documentation service group between the generation of report material by engineering or other project personnel and the Technical Publications final operations. This service group expedites the submission of report material, collaborates with the authors as needed, edits the drafts, assembles illustrative material, and maintains schedules of anticipated work load. This latter function, work load forecast, is correlated with Technical Publications so that personnel of the latter will be available as required. This group also assists in preparation of presentation material - both by contribution to the end product and by handling and expediting of such material through Technical Publications and Illustrations groups.

The "Closed Area" requirements originated in the fact that so many classified activities would be in process at one time that it was highly impractical to put everything away at the end of one day and have to spread it all out again the next day in order to resume work on it. The "Closed Area" also strengthens the security position of the documentation activity because such activity is centered in one protected area and access is limited to cognizant personnel only.

Such an area is also invaluable for the personnel working overtime preparing material for publication. By securing the door to the room, the need for securing material in cabinets each time a trip has to be made to Technical Publications, the Photo Lab, or elsewhere is obviated.

This area also permits organized open-shelf storage of photo-litho negatives which are frequently needed in numerous reports. Such reuse avoids duplication of costs. Cabinet storage for this material is awkward because of carrying sizes and shapes of material.

For general information, the output of this group in Contract Year 1963 consisted of:

	<u>Average Pages Per Document</u>
12 monthly technical letter reports	220
12 monthly fiscal reports	45
6 special reports on reliability	200
29 volumes of program planning and replanning	750 - 800
3 volumes of final year-end reports	500
93 special topical reports	

The above represents an average of three reports per week, all of substantial size. There is no indication that the total reporting requirements will be any less this year and later, but will add the following requirement:

Quarterly Technical Reports (in place of monthly)	450
Monthly Milestone Reports	70
Monthly Reliability and Quality Control Reports	200

Continuation of this service under the same work setup is considered essential to proper performance of Contract Item 4.

10. Time Factors, Etc.:

Due to the fact that this room will be occupied by June 1964, accurate cost estimates, capital expenditure and requisition, etc. should be prepared without delay. Construction should begin immediately, to allow documentation personnel adequate office and working space by June.

11. Equipment Inventory on Hand:

General office equipment, i.e., desks, cabinets, etc., is available. Open shelving, 50 linear feet, will be needed.

1. Name of Facility:

Drafting and Data Control Closed Area

2. Nature of Facility:

Drafting Area - Closed Area with drafting boards plus 2 small "banker's" offices. Central Data Control Area - Closed Area with 6 small offices. (See Appendix A for additional data.)

3. Required Space (Sq. Ft.):

5,900

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$14,000

6. Number of Personnel Assigned:

- a. Drafting - Forty-six people are authorized for this function.
- b. Data Control - Twelve people are authorized for this function.

7. Cognizant Department:

Engineering Services, P. Shaffer

8. Purpose:

Provide closed working area for draftsmen that will enable them to handle at a minimum drawings, charts, etc., thus increasing effective time, security regulations and productivity. Data Control area's purpose is microfilming, engineering releases, effectivity control, vellum storage, microfilm developing and mounting and related blueprinting.

9. Contractual Requirement or Policy Development:

Since both of these functions are directly connected with contractual requirements, this discussion is limited to the desirability of a separate Closed Area.

The NERVA security requirements, while no more severe in theory than any other classified project, are in practice unusually severe because of the high frequency of Restricted Data documents and drawings. REON is required by contract not only to generate drawings, but also to file and index drawings of all subcontractors, plus a large reference file of drawings of the Los Alamos Scientific Laboratory, many of which are Confidential - Restricted Data, which require careful handling because of security clearance and need-to-know considerations. The easiest way to assure proper protection of this large volume of

C-RD material, both in work and in storage, is to restrict the area in which the material is generated, processed and stored. With a Closed Area, it will be possible to leave classified drawings in process on drawing boards overnight, thereby making substantial savings in setup time - up to 45 minutes per day per classified drawing on the board.

Integration of drafting and data control functions is desirable because they are so closely related in operation. Drawings are microfilmed on completion or receipt from subcontractors. A Recordak viewer (AGC owned) is available for quick reference, and a rented Xerox printer furnishes standard size prints for more extended use. This integrated function has provided excellent and rapid service to the project for about one year, and its continuance will facilitate the handling, storage and reproduction of drawings. A blueprint machine has been requisitioned to permit check prints to be made available immediately, to permit rapid distribution of prints of incoming vellums so that there can be maximum speed in responding to program requirements, and for office-type reproduction of materials too large for office copiers.

10. Time Factors, Etc.:

These two combined areas should be ready for occupancy no later than June 1.

11. Equipment Inventory on Hand:

See Appendix A.

1. Name of Facility:

Uncleared Personnel Area

2. Nature of Facility:

Open area immediately outside the REON area

3. Required Space (Sq. Ft.):

1,000 sq. ft.

4. Drawings, Etc.:

Not applicable. Any area directly outside the REON area will suffice.

5. Cost of Acquisition (Approx.):

Should it be necessary to wall off a proportion of a floor, otherwise a security area, for this purpose - \$2,000.

6. Number of Personnel Assigned:

Approximately 20 to 40 persons will occupy this area.

7. Cognizant Department:

Administrative Services, R. H. Hardin

8. Purpose:

See Item 9.

9. Contractual Requirement or Policy Development:

Every person granted access to Restricted Data under the Atomic Energy Act must have a final, Government-granted clearance. The processing and granting of such clearances or the reaffirmation of existing clearances takes substantial amounts of time, and because clearances cannot be initiated until a firm employment agreement is made, it is inevitable that a number of people will be "on board" in REON without having received clearances. They cannot be housed in the restricted REON work area, but must be placed in an open area set aside for this purpose. In order to have them at least partially contributing while their clearances are being processed, a work area adjacent to the REON enclosure is virtually a necessity. This area consists of no more than floor space and desks. The location, however, is critical in that reasonable proximity must exist between the uncleared people and their supervisors so that whatever work they can handle without secret clearance can be readily assigned and, on completion, delivered to supervision.

10. Time Factors, Etc.:

Availability of an uncleared area should be made no later than the date that a restricted area is established for REON.

11. Equipment Inventory on Hand:

Desks, chairs, etc. are now available. No additional equipment is foreseen.

1. Name of Facility:

PERT Closed Area

2. Nature of Facility:

Drafting boards butted as long work tables, magnetic boards on wall. Floor-to-ceiling walls, 3-tumbler combination lock, closed security area.

3. Required Space (Sq. Ft.):

800 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$8,500

6. Number of Personnel Assigned:

Eight employees are anticipated to work in this area.

7. Cognizant Department:

Program Controls, J. S. Robbins

8. Purpose:

To provide a centralized area to prepare all PERT functions and thus create the maximum effectiveness for which PERT was intended.

9. The PERT technique is a contractual callout. In REON, as elsewhere under comparable requirements, the best way of handling the PERT operation is to set aside a room adequate for the personnel assigned, with large wall space and drafting table capacity. The Closed Area requirement is desirable because it enables personnel to leave classified material on the boards or walls, thus saving the labor costs of securing various items during lunch time or at the end of the day. PERT charts, which are locked up, do not encourage essential interchange with working level engineering personnel. Charts on display contribute to an active process of updating which encourages management use of the PERT tool. The room size requested has been tried at the Von Karman Center and found conducive to effective operations.

10. Time Factors, Etc.:

This room will be occupied by June 1964. Construction should begin immediately, to allow personnel to have adequate working space by June 15.

11. Equipment Inventory on Hand:

- a. On Hand: Desks, magnetic boards, vellum cabinet
- b. Needed: If magnetic boards are removed from present REON Von Karman Center PERT Room and shipped to Sacramento, only equipment needed is "Spert" boards.

1. Name of Facility:

REON Technical Information Center (RTIC) with open shelf C-RD storage

2. Nature of Facility:

Consists of a vault (floor-to-ceiling walls, 3-tumbler combination lock door, closed security area), open space behind service counter, and one office.

3. Required Space (Sq. Ft.):

2,000 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$6,500

6. Number of Personnel Assigned:

Approximately twelve people will be in this facility.

7. Cognizant Department

Administrative Services, R. H. Hardin

8. Purpose:

Used as a center for working documents, classified and unclassified, used in NERVA Research and Development. Controls security, secures materials, catalogs, and indexes them, control of reproduction, etc.

9. Contractual Requirement or Policy Development:

This function is a natural outgrowth of various procedures connected with security, submission of reports to customer and others, and library and other information media.

The NERVA program requires a wide range of reports, documents, books and other materials to bring information on applicable technology and related program progress. These materials are for the most part classified, in constant use, and must be immediately available. Approximately 100 requests for information are handled each day. At Sacramento this activity will be further expanded to encompass REON central records. This function requires open-shelf, vault storage for classified documents; working area for cataloguing, indexing and making searches; facilities for wrapping; area for retrieval equipment; area for engineers to review documents (thereby avoiding large automatic distribution); and area for necessary security activities.

10. Time Factors, Etc.:

All construction and modifications are to be completed no later than 1 June 1964.

11. Equipment Inventory on Hand:

a. On Hand: Shelving, classified storage cabinets, desks, tables, small Verifax, vellum cabinets, tub files

b. Needed: Additional shelving, replacements for present unmovable counters, Jonkers aperture drilling equipment, keypunch-typewriter equipment

1. Name of Facility:

Conference Rooms (three)

2. Nature of Facility:

Conference Room 1 - Floor-to-ceiling walls. Room to contain a 9-foot-diameter table, 21 chairs, and projection equipment booth and screen
(Classified)

Conference Room 2 - Eight-foot-high walls to form a rectangular room that contains a 5-foot table and 20 upholstered chairs
(Unclassified)

Conference Room 3 - Floor-to-ceiling walls with accordion partition capable of dividing the room when required. Contains 5 tables (one 5', one 6', and three 8') and 30 chairs.
(Classified)

3. Required Space (Sq. Ft.):

Conference Room 1	-	360
"	"	2 - 320
"	"	3 - 800

Total 1480

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$5,000 (all three)

6. Number of Personnel Assigned:

Not applicable

7. Cognizant Department

Administrative Services, R. H. Hardin/Customer Relations

8. Purpose:

Conference Rooms within the REON area are desirable because of the classified material constantly being discussed at the majority of the meetings.

9. Contractual Requirement or Policy Development:

Existing conference rooms are in use 80% of the time. Control of Restricted Data material discussed makes provision of conference space within REON area essential. The rooms should be capable of being opened into one room for large meetings.

10. Time Factors, Etc.:

Conference Room should be available by 1 June 1964.

11. Equipment Inventory on Hand:

Some equipment for the conference rooms (See paragraph 2 above) is on hand. Five additional tables and 30 chairs are needed for Conference Rooms 2 and 3.

1. Name of Facility:

Lobbies and Access Control Gates (2)

2. Nature of Facility:

Gate 1 - Counter Perimeter, Security Desk and Gate

Gate 2 - Security Desk and Gate with small counter

3. Required Space (Sq. Ft.):

Gate 1 - 300 sq. ft.

Gate 2 - 65 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.)

\$2,000

6. Number of Personnel Assigned:

Two gate attendants (one for each gate)

7. Cognizant Department:

Administrative Services, R. H. Hardin

8. Purpose:

To control access to the REON area. Gate 1 will be constructed so as to provide a waiting area for escorts, new applicants, vendors, etc. Gate 2 will be for access only.

9. Contractual Requirement or Policy Development:

Because of the nature of the NERVA contract, most material within the REON area is of such classification that to obtain access, a final Government-granted clearance and a need-to-know must be established. Therefore, control gates are mandatory to assure that only those persons who are properly identified, escorted, etc. gain access to the REON area.

10. Time Factors, Etc.:

Control gates should be constructed simultaneously with construction of the entire REON area.

11. Equipment Inventory on Hand:

All equipment to furnish these gates is available and on hand.

1. Name of Facility:

Mail, Stationery Supply Distribution Office, and Office Copying Center

2. Nature of Facility:

Reproduction equipment and complete mail accumulation and distribution facility, storage and distribution of standard supplies secured from plant stationery stores.

Two connected rooms with 8-foot high walls

3. Required Space (Sq. Ft.):

350 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$2,000

6. Number of Personnel Assigned:

Five

7. Cognizant Department:

Administrative Services, R. H. Hardin

8. Purpose:

This facility supplies all REON personnel with necessary stationery supplies without delay usually incurred when ordering from Von Karman Center Stationery Stores. The center provides fast and efficient delivery of all internal correspondence, incoming U.S. mail and incoming TWX's. The reproduction facility saves time and money for all personnel in that material is reproduced in a local, convenient facility.

9. Contractual Requirement or Policy Development:

The size of the REON project organization and the fairly heavy volume of incoming and outgoing mail and internal memos make it desirable to have a mail facility integral with the project. Similarly, the usage of more common items of stationery makes it economically desirable to stock such items in a convenient location. The same condition prevails in the matter of reproduction facilities. Both mail distribution and reproduction are closely tied in with correspondence control to assure timely action and response. As practiced for the past three years, the consolidation of the above three service functions into one area, staffed by one small group, has made it possible to maintain

adequate service in each area without unnecessary cost since the personnel assigned to these functions perform them as required on an interchangeable basis. Thus, when the mail is "received," it is promptly sorted into the appropriate pigeon-holes, and the sorter is free to service the supplies or office copiers. Since the latter are normally in use on a full-shift basis, the net effect is that the mail and stores function is a low-cost item. If these services were not thus functionally and physically combined, the service would have to be performed at a probably higher cost.

The combination of these functions makes possible the maintenance of high-caliber service in these and other functions at a low cost because alternative work loads are always available should work on one function become slack.

10. Time Factors, Etc.:

The reproduction center should be functioning at Sacramento as soon as possible. June 15 the transfer of personnel should be completed and the center must have facilities, supplies and equipment ready to resume service.

11. Equipment Inventory on Hand:

Stationery shelving, ditto, Verifax, and Thermofax machines are REON's property. The Xerox machine is rented as an overhead item. Xerox machine will be ordered.

1. Name of Facility:

Crypto MX Room

2. Nature of Facility:

Floor-to-ceiling, soundproof room, with copper or lead shielding

3. Required Space (Sq. Ft.):

120 sq. ft. (10 x 12)

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$2,500

6. Number of Personnel Assigned:

One person will be assigned to this area.

7. Cognizant Department:

Administrative Services, R. H. Hardin

8. Purpose:

To transmit classified material from REON to the customer in a minimum amount of time.

9. Contractual Requirement or Policy Development:

This requirement is a natural outgrowth of various procedures connected with security and the timely submission and handling of classified data and reports.

10. Time Factors, Etc.:

Construction should begin whenever possible; or upon notification by REON.

11. Equipment Inventory on Hand:

All equipment required for this facility is available except crypto terminal equipment (scrambling device and teletype machine) for which a Capital Requisition is being prepared.

1. Name of Facility:

Management Control Center

2. Nature of Facility:

Special chart board display cabinets, special charts and conference tables, projection equipment and workroom for up-to-date maintenance of charts. Floor-to-ceiling walls, security door. This area will be a closed security area.

3. Required Space (Sq. Ft.):

1,750 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$15,300

6. Number of Personnel Assigned:

There will be two people located in the Management Control Center and space for a work area for up-to-date maintenance of charts.

7. Cognizant Department:

Progress Evaluation

8. Purpose:

For use by REON managers to meet for discussions and planning of various tasks on the NERVA program. This room will house charts, graphs, programs, interfacing details and other material for management use on a permanent display basis. Continuous management exposure is a basic part of its use. Closeness, convenience, and adequacy are mandatory.

9. Contractual Requirement or Policy Development:

Currently development of management control rooms is being actively pursued at Corporate, Plant and major project levels in Aerojet. REON management has been directly involved in such planning, and with Admiral Raborn visited the Navy Special Projects Management Center and Lockheed, Sunnyvale, to get direct orientation on the use of such facilities on the Polaris program. Since that time, REON management has reflected the high priority given to this activity and has directed that immediate steps be taken to provide a suitable control room. A control room is now in existence in REON, housed in temporary quarters in a conference room. Although the construction of a suitable control room has not yet been accomplished because of the REON move, it has high priority.

Mr. J. J. S. Daniel, formerly of Admiral Raborn's staff, has been transferred to REON to assume responsibility for the Program Analysis activity of which management control is a part.

It is essential that the REON Management Center be in the vicinity of the Program Manager and his principal staff members. The center's accessibility should encourage top management to use and visit the room daily and thereby bring continuously to top management's attention trends and problem areas which require management's attention and action.

10. Time Factors, Etc.:

This facility should be ready for occupancy immediately after the REON move. Construction of the REON area in Sacramento should include this facility. The activity will be set up in interim quarters pending completion of construction.

11. Equipment Inventory on Hand:

See Appendix A.

1. Name of Facility:

SNPO Customer Office

2. Nature of Facility:

Three offices, floor-to-ceiling, plus a conference room

(See Appendix A.)

3. Required Space (Sq. Ft.):

563 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$5,000

6. Number of Personnel Assigned:

Six customer personnel will occupy this office by June 1964. There is a possibility of expansion of one or two people beyond the six that are forecast in June.

7. Cognizant Department:

Not applicable

8. Purpose:

To provide the customer resident with suitable office space.

9. Contractual Requirement or Policy Development:

It has been Aerojet's custom to provide the various customer resident offices in the past and REON is adopting this policy.

10. Time Factors, Etc.:

Because of the fact that this room will be occupied by June 1964, accurate cost estimates, capital expenditure and requisition, etc. should be prepared without delay. Construction should begin immediately, to allow SNPO-C Resident adequate office space by June.

11. Equipment Inventory on Hand:

All necessary equipment adequately to furnish these offices will be purchased and supplied by June 1964. A detailed list will be provided at a later time.

1. Name of Facility:

General Storage Room

2. Nature of Facility:

One room connecting to mail area; walls, 8-foot high

3. Required Space (Sq. Ft.):

400 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$500

6. Number of Personnel Assigned:

Not applicable

7. Cognizant Department:

Administrative Services, R. H. Hardin

8. Purpose:

To provide means of (1) storing bulky departmental material out of departmental areas, (2) storing REON property not immediately needed prior to use or turn in, and (3) storing REON property used only intermittently (such as chart carriers, stepladders, easels, etc.).

9. Contractual Requirement or Policy Development:

Storage area will assist in keeping the REON area neat, in accordance with Aerojet's good housekeeping policy. If necessary, an area adjacent to the Reproduction Center could be utilized for this facility, but storage should be by the Reproduction Center so that the material stored could be arranged neatly and access could be controlled.

10. Time Factors, Etc.:

This storage area should be provided at Sacramento as soon as possible. The transfer of personnel should be completed by June 15 and the area must be available for storage purposes.

11. Equipment Inventory on Hand:

Equipment required will be shelving and bins. Specifications will be provided.

D. SPECIAL AREAS

Special areas in the Sacramento Plant fabrication and test facilities include the following:

Classified Hardware Vault

XE Mockup Work Area

Assembly Area

Restricted H Area

Hardware Storage - Test Stand Area

Data Reduction Center in C&H Area

Analog Computer - Instrumentation and Controls Laboratory

Note: Capital expenditure estimates are included in Section V - Fiscal, Table III.

1. Name of Facility:
Classified Hardware Vault
2. Nature of Facility:
A closed area with double doors which is accessible to fork lifts
3. Required Space (Sq. Ft.):
300 sq. ft.
4. Drawings, Etc.:
Layout of the vault is not critical.
5. Cost of Acquisition (Approx.):
\$1,000
6. Number of Personnel Assigned:
None; for storage only. Personnel will not be assigned to area.
7. Cognizant Department:
Administrative Services, R. H. Hardin
8. Purpose:
Provide closed security area for storage of classified, accountable material.
9. Contractual Requirement or Policy Development:
Classified, accountable material must be stored so that casual, visual observation may not be permitted. The walls must be floor-to-ceiling and the door must be locked with a 3-tumbler combination lock.
10. Time Factors, Etc.:
A classified hardware vault should be available by 15 May 1964.
11. Equipment Inventory on Hand:
No equipment is on hand. A limited amount of shelving will be required.

1. Name of Facility:

XE Mockup Work Area

2. Nature of Facility:

One mockup work area for XE Mockup, nominally 25 ft x 30 ft, with 5-ton overhead cranes having hook height of 30 ft.

3. Required Space (Sq. Ft.):

750 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

Space only (See Item 9.)

6. Number of Personnel Assigned:

Not applicable at present

7. Cognizant Department:

Project Engineering, P. Rowe

8. Purpose:

See Item 9.

9. Contractual Requirement or Policy Development:

This is listed for planning purposes only, since the customer has not accepted our proposals to furnish the mockup; however, since we have recently proposed it and expect an answer shortly, our planning should include space allocation reasonably concurrent with the rent of the assembly work.

10. Time Factors, Etc.:

Not applicable at this time

11. Equipment Inventory on Hand:

All equipment will have to be supplied. A detailed list will be furnished when acceptance by the customer is evident.

1. Name of Facility:

Assembly Area (secured area)

2. Nature of Facility:

The assembly area will have a bonded area for spare parts and assembly storage, hardware stores, a tool crib, pump assembly stations, engine assembly stands, nozzle assembly stations, support equipment assembly area, and a hot shop for radioactive parts.

3. Required Space (Sq. Ft.):

4,000 sq. ft.

4. Drawings, Etc.:

Not applicable - to be furnished at a later time

5. Cost of Acquisition (Approx.):

Not available at this time

6. Number of Personnel Assigned:

Not applicable

7. Cognizant Department:

Project Engineering, P. Rowe

8. Purpose:

To provide for the anticipated parts from outside production or from the Sacramento Plant manufacturing shops which will flow into the assembly area for final assembly, acceptance test and shipment.

The "Hot Shop" is a necessary and peculiar NERVA requirement. Its function is to provide facilities as necessary to repair and modify contaminated engine parts and to prepare activated samples for material analysis.

9. Contractual Requirement or Policy Development:

The Assembly Area is under direct supervision of the NERVA Assembly Department and will maintain a bonded area for spare parts and assembly storage. Hardware stores and tool crib functions are additional responsibilities.

10. Time Factors, Etc.:

Completion of this facility will be required by 15 December 1964. During Contract Year 1965, this assembly area is required for performing above-mentioned duties.

11. Equipment Inventory on Hand:

Not applicable at present

A detailed list of equipment needed or available will be furnished at a later date.

1. Name of Facility:
Area "H" Restricted Area (Fencing)
2. Nature of Facility:
A six-foot-high fence 1,200 feet long around Test Stand "H"
3. Required Space (Sq. Ft.):
Not applicable
4. Drawings, Etc.:
Not applicable
5. Cost of Acquisition (Approx.):
\$3,000
6. Number of Personnel Assigned:
Not applicable
7. Cognizant Department:
Not applicable
8. Purpose:
To prohibit visual or physical access into the Test Stand "H" area
9. Contractual Requirement or Policy Development:
Classified nature of the hardware being tested necessitates such a fence around the test area.
10. Time Factors, Etc.:
Construction of this fence should begin as soon as possible. All necessary administrative duties will be initiated immediately.
11. Equipment Inventory on Hand:
Not applicable

1. Name of Facility:

Hardware Storage: Test Stand Area

2. Nature of Facility:

Two storage areas will be required which can be secured.

3. Required Space (Sq. Ft.):

1,600 sq. ft. (two 800 sq. ft. areas)

4. Drawings, Etc.:

Layout of the two areas is not critical.

5. Cost of Acquisition (Approx.):

\$5,000

6. Number of Personnel Assigned:

No personnel will be assigned to these areas.

7. Cognizant Department:

Engineering Support, D. Holzman

8. Purpose:

Storage of hardware adjacent to test stands

9. Contractual Requirement or Policy Development:

Space is required to store hardware before, during and after tests are run. Classified hardware must not be left where casual, visual observation is possible.

10. Time Factors, Etc.:

These areas should be available no later than 1 July 1964.

11. Equipment Inventory on Hand:

This is a new requirement; therefore, some shelving will be required plus a suitable enclosure.

1. Name of Facility:

Data Reduction Center for C&H Area and NFO Input

ADDITIONAL REQUIRED INFORMATION TO BE SUPPLIED

1. Name of Facility:

Analog Computer Facility, Instrumentation and Controls Laboratory

2. Nature of Facility:

Facility to be six rooms, totaling 8,000 sq. ft., for the following:

Transducer Laboratory
Actuator Test Facility
Computer Laboratory
Computer Maintenance
Electronics Laboratory
Remote Control Mockups and Administrative and Supervision Area

3. Required Space (Sq. Ft.):

8,000 sq. ft.

4. Drawings, Etc.:

See Appendix A.

5. Cost of Acquisition (Approx.):

\$100,000

6. Number of Personnel Assigned:

There will be twenty people on hand in the immediate area of the laboratory.

7. Cognizant Department:

Instrumentation and Controls, N. L. Irvine, Manager

8. Purpose:

The controls problem on the NERVA engine is the creation of a system of sensors and information processing which will be able to take information arising from operating phenomena, analyze it, and apply it to activation or adjustment of controls (pumps, valves, and nuclear controls) toward desired engine performance. The situation differs from normal rocket engines in the sheer complexity of phenomena; cryogenic to extremely high temperatures, use of liquid hydrogen which poses problems of pumps, seals, corrosion and high volatility; a highly radioactive environment which produces radiation damage and heating, and much longer run duration which makes necessary and permits use of a comprehensive, sophisticated, and carefully balanced feedback system for control.

The development of the system requires the development of sensors which are capable of measuring the extreme values to be used for control purposes, the calibration of the sensors and other components so that their behavior in this complex and exotic environment can be reliably known in advance, and the assembly and testing of all components together so that their operation as a system is predictable, their interactions known, and needed modifications and development can take place. In this effort, the analog computer is utilized to simulate a missing piece or system of the engine so that the system can operate as a unit during the component development effort.

9. Contractual Requirement or Policy Development:

These laboratories are necessary to perform the contractual commitments for the development, assembly, checkout and fabrication of transducers (particularly control transducers) under sub-subtask 2.4.6, and to perform control system evaluation by the tie-in of control system amplifiers and actuators with the analog computer simulation of the engine and test stand simulation. This work is done under sub-subtasks 1.5.1, 1.5.2, and 1.5.3. Additional needs are stated under sub-subtask 2.2.8 of the Work Statement: "Upgrade the design criteria for the test simulator; upgrade the test stand control system functional requirements and design criteria."

10. Time Factors, Etc.:

The Controls Laboratory Facilities should be made available as soon as possible but not later than 30 September 1964. While the specific requirements for the engine control system have been deleted by the customer for the remainder of this contract year, they will be reinstated for CY 1965 and CY 1966. CY 1965 begins October 1.

Currently, the requirements stated under Subtasks 2.2 and 3.2 are reinstated immediately and the work will be conducted at the Azusa facilities.

11. Equipment Inventory on Hand:

- a. Equipment on hand: Appendix B
- b. Equipment needed: Appendix C

TABLE III
CAPITAL EXPENDITURE ESTIMATE

<u>Special Area</u>	<u>Sq. Ft.</u>	<u>Est. Cost</u> <u>-\$-</u>	<u>When Needed</u>
Documentation Area ✓	1,600	6,500	June 1
Drafting and Data Control Closed Area ✓	5,900	14,000	June 1
Uncleared Personnel Area ✓	1,000	2,000	June 1
PERT Closed Area ✓	800	8,500	June 1
RECON Technical Information Center ✓	2,000	6,500	June 1
Conference Rooms, ROM ✓	1,480	5,000	June 1
Lobbies and Access Control Gates (2) ✓	365	2,000	June 1
Mail, Stationery Supply Distribution Office, and Office Copying Center ✓	350	2,000	June 1
Crypto TWX Room ✓	120	2,500	Sept. 1
Management Control Center ✓	1,750	15,300	June 1
SNPO Customer Office ✓	563	5,000	June 1
General Storage Room (Office) ✓	400	500	ASAP
Classified Hardware Vault	300	1,000	May 15
XE Mockup Work Area	750	(Space only at present)	Sept. 15
Assembly Area	4,000	(Space only)	Dec. 15
Area "H" Restricted Area (Fencing)	N/A	3,000	ASAP
Hardware Storage: Test Stand Area	1,600	5,000	July 1
Data Reduction Center for C&I Areas and NTO Input	-----To be supplied-----		
Analog Computer Facility, Instrumentation and Controls Laboratory	8,000	100,000	Oct. 1
Storage for FX Mockup		(Space only)	Sept. 1

TABLE III - CONTD

<u>Special Area</u>	<u>Sq. Ft.</u>	<u>Est. Cost</u> <u>-\$-</u>	<u>When Needed</u>
Hot Shop	Est. not yet available		AGC FY 1965
Capital Equipment	N/A	39,500	As required
Miscellaneous		10,000	June 1

TABLE IV

SACRAMENTO SPACE REQUIREMENTSFOR OFFICES AND SPECIAL ROOMS (NET)

	<u>Net Space</u> <u>(Sq. Ft.)</u>	<u>Number of</u> <u>REON Personnel</u>
1. SNPO	563	--
2. WANL	190	--
3. Picatinny	65	--
4. Documentation Services	1,600	12
5. PERT	800	8
6. Access Control	545	3
7. Management Control Center	800	2
8. Crypto TWX Room	120	1
9. Contracts	1,500	15
10. Analog Computer Facility, Instrumentation and Controls Laboratory	8,000*	20
11. Subcontracts	2,000	20
12. Data Control Closed Area	1,400	12
13. REON Technical Information Center	2,000	12
14. Mail, Stationery Supply Distribution Office, and Office Copying Center	350	5
15. Drafting	4,500	46
16. Three Conference Rooms	1,480	--
17. Offices	19,160	180
18. Other Direct and Indirect	<u>21,645</u>	<u>333</u>
	66,718	671
	- <u>8,000*</u>	
	<u>58,718</u>	

Note: Does not include aisles, lobbies, passageways, restrooms, etc.

V. FISCAL

REON prepared a forecast for the Aerojet-General Corporation 1964 fiscal year. However, because of imminent cutbacks in the program and because of the possible move to Sacramento the forecast was not submitted to the Corporate Capital Expenditure Committee. On its own initiative the committee established an authorization of \$20,000 for interim expenditures for items of office equipment costing under \$1,000. Of this authorization, approximately \$8,000 has been obligated.

The total forecast was for \$93,000. In addition, it had been agreed that the Von Karman Center would make a special submission of approximately \$100,000 for an addition to existing buildings to house the controls laboratory, the latter facility to include most of the items to be included in the Instrumentation and Controls Laboratory at Sacramento. This special submission was also superseded by the decision to move REON.

As the result of the foregoing, the capital budget which will be submitted in the immediate future will cover expenditures for the full fiscal year and include anticipated costs arising out of moves of REON personnel to Sacramento and Las Vegas, as well as the Instrumentation and Controls Laboratory and normal operating needs.

OVERHEAD BUDGET:

A special study of the problem of transition in the overhead budget and accounting area is currently underway and will be completed so that REON input to the Sacramento plant may be provided for the May 15 due date.

VI. SECURITY REQUIREMENTS

A. GENERAL

A major security requirement for REON arises from the fact that a large proportion of the material generated and handled on the program is classified; that much of this material, because of its relationship to nuclear energy, is Restricted Data under the Atomic Energy Act of 1954; and that access to such material can be given only to those with a need-to-know and a final government granted clearance. Additional complications arise because portions of the information in REON custody were received or developed under AEC "Q" classification and there continue to be "Q" vendors and "Q" associate organizations in the program. There is "Q" information which would be vital in consideration of advanced nuclear rocket systems, and certain "Q" information is needed on at least one NERVA task.

Of particular security significance is the quantity of classified material published by REON. Table IV, REON Classified Information Log, lists the classified material published during June 1963.

Each publication job requires classification decisions, page by page; control of transmittal of classified information; authorizations for reproduction; creation of photos, offset and multilith masters, litho-negatives, etc.; establishment of distribution lists, need-to-know decisions, and effort for distribution, proper storage and safeguarding, and ultimate destruction. All of these require instructions, training, supervision, and controls.

REON's immediate problem is the transfer of active classified material from its custody in the Von Karman Center to its custody in the Sacramento center. This transfer is taking place concurrent with the transfer of restricted data document accountability from the former REON Transfer and Accountability Station to the Von Karman Center Master Document Control Center. Thus, a massive records, consolidation research, and records-posting and revision job is taking place while documents are being prepared for shipment.

To make the transfer, detailed steps are required which are outlined in the paragraphs following. In summary, these require:

1. Preparation of complete log sheets to cover each classified document contained in a package shipped.
2. Establishment of REON control station responsibility at Sacramento for receipt and reissue of material shipped.
3. Establishment of qualified secure holding place at Sacramento for individual and REON Technical Information Center holdings of classified materials, to permit shipments of documents which will not be required during the movement period.
4. Resumption of RTIC service at Sacramento.

5. Establishment of a Q interest and a Q facility and transfer of Q documents in REON custody thereto.

6. In addition for operation at Sacramento the following are essential:

a. Establishment of a company-controlled access area for REON proper.

b. Establishment of specialized closed areas as follows:

(1) Documentation Room

(2) PERT Room

(3) REON Technical Information Center

(4) Management Control Center

(5) Classified Hardware Storage

c. Establishment of company controlled access area.

(1) Areas C and H

(2) NERVA Assembly Area

(3) Instrumentation and Controls Laboratory

d. Preparation of area access instructions (Appendices C, D and E).

e. Designation of classification and group assignment officials (see attached).

f. Designation of those authorized to approve classified reproduction.

g. Designation of Security Representatives.

B. PROCEDURE FOR SHIPMENT OF CLASSIFIED DOCUMENTS HELD BY INDIVIDUALS

A procedure has been prepared and distributed which outlines the steps to be taken for inventory, boxing and transfer of classified documents to Sacramento and NRDS (Appendix F).

Boxed documents are forwarded as soon as a shipment has been accumulated.

**C. PROCEDURE FOR SHIPMENT OF CLASSIFIED DOCUMENTS HELD BY REON
TECHNICAL INFORMATION CENTER**

1. Classified documents in RTIC will be prepared for shipment as follows:

a. Prepare inventory sheet in triplicate, listing documents in each box. Prepare mailing label in duplicate. Place two copies of inventory and mailing labels in box with documents. File one copy of inventory.

b. Documents boxed for shipment will be checked by MDCC at Von Karman Center against the inventory, the box sealed and wrapped and forwarded to Sacramento, MDCC, attention RTIC as indicated on mailing label.

D. REON CONTROL STATION

In the past, five Control Stations have been established at Sacramento to process classified documents for REON personnel. These Control Station functions have been assigned to secretaries. In the immediate future a REON Control Station will be established and the previous stations will be eliminated, except where geographic location makes additional stations necessary.

Sacramento is not now a Q-cleared facility. The first step in obtaining a Q clearance is to establish an interest or need-to-know for access to specific categories. Next would be establishment of a Q area for Q file storage and an area for reading. Then would come the request for Facility Clearance. Also required would be the following:

1. Approval of specific file cabinets.
2. Obtaining Q clearance for each person having access to the secret material. An L clearance is sufficient for confidential material.
3. Establishment of the method of destruction of Q material.
4. Establishment of an approved mail channel, including a Q mailing address, and appointment of specific persons to pick up the mail.

E. COMPANY CONTROLLED ACCESS AREA

A large portion of material generated and handled by REON personnel is classified. Most of this classified material, because of its relationship to nuclear energy, is Restricted Data under the Atomic Energy Act of 1954.

Closed and Company Controlled Access Areas are necessary to enable REON personnel to work efficiently with classified information without risk of unauthorized persons having access and to enable REON to establish and maintain proper control over need-to-know.

Appendices C, D, and E are security procedures prepared for operation of the REON Security Area at Von Karman Center.

A company-controlled access area should be established for REON proper in Sacramento no later than 15 May 1964. Additional areas should be established as these are physically constructed.

F. OPEN SHELF STORAGE (Classified Documents)

An estimated 25,000 classified documents are presently on file in RTIC. Approximately 650 incoming documents are received per month, 85 document numbers are assigned by RTIC per month for generated documents with multiple copies of each. These documents would require approximately 70 four-drawer files for storage.

In addition, REON reports are received from Technical Publications and others for distribution by RTIC. Until the distribution has been completed, temporary storage of these documents is required. In the absence of a vault-type facility this would require from 20 to 30 four-drawer files be retained continuously for such temporary storage with attendant inefficient use of space and time. Opening and closing 70 file cabinets and combination locks would require an estimated 70 minutes per day, on an average of one per minute per cabinet. Additional space would be required for the file cabinets to be used for temporary storage of documents. Floor loading would be a problem with 70 to 100 file cabinets concentrated in a small area. REON already has shelving for a vault-type operation and therefore, little additional cost for shelving is required.

Because of the volume of documents involved, the increased efficiency of operations, it is necessary that a Vault and Open-Shelf Storage be provided to store classified documents in RTIC. The Vault would be designated a closed area.

NOTE: Paragraph 2.13.3.6 of the Aerojet-General Corporate Security Manual states that a closed area may be used as an alternate method of storage.

At the present time, there is no space assigned in Sacramento to receive and store bulk material from RTIC.

G. DESTRUCTION OF MATERIAL

Presently, classified material to be destroyed is collected and Certificates of Destruction are prepared by RTIC personnel. Periodically, these documents are forwarded to MDCC for destruction. Certificates of Destruction are retained by RTIC for future use. A similar system will be used in Sacramento.

At present, when Q material is to be destroyed, Certificates of Destruction are prepared by two Q-cleared persons in RTIC. One person burns the documents and the other is a witness. Certificates of Destruction are retained by RTIC for future reference. A similar arrangement will be established in Sacramento.

H. DOCUMENT ACCOUNTABILITY

Secret and SRD Documents are being assigned AZ accountability numbers and when received at Sacramento, will be assigned SA numbers. Numbers assigned to Confidential and CRD documents will not be changed at the present time.

I. VISIT CLEARANCES

Because of the geographical dispersion of the NERVA Program, a great deal of travel is necessary. To permit required access to classified information, visit clearances must be processed. During the REON move it is not practicable to suspend travel while security clearances are being transferred from Von Karman Center to Sacramento. It will, therefore, be necessary for special provisions to be made for advance processing of visit clearances out of Sacramento before the actual move has occurred.

J. COURIER AUTHORIZATIONS

REON has frequent need for courier authorizations. Although this is avoided whenever possible, tight deadlines often necessitate that material must be hand carried to meetings in Cleveland, Pittsburgh, Washington, etc. Almost daily it is necessary to hand carry material to Post Offices and airports to assure receipt on time. Facilities for after-hours approval of courier authorizations to meet the above requirements are essential.

K. EMPLOYEE CLEARANCES

Before any employee can have access to Restricted Data he must have a final military clearance. For new employees, processing a clearance takes an average of three months. Reaffirmations of clearance take from 10 days to two months.

Uncleared persons cannot be admitted to the Closed Areas (without escorts) and this delay in clearance is expensive in time and money. Uncleared persons are able to work in the area set up for uncleared personnel; however, they are able to perform only a fraction of the work they will do later when cleared. The move to Sacramento will cause a major problem in the beginning until all new hires or transfers have been cleared. The clerical personnel will be mostly affected.

L. TRANSFER OF SECURITY CLEARANCES

During the period that REON personnel are maintaining offices in both the Von Karman Center and Sacramento, security clearances will be required in both plants. A listing of all persons so involved will be forwarded to Sacramento to establish the clearance there. On 1 June 1964, all clearances for REON-VKC personnel will be transferred to Sacramento along with the transfer of the major number of persons, excepting REON personnel remaining

at Von Karman Center after 1 June 1964. Security Clearances for these persons will be transferred at the time of transfer to Sacramento.

M. APPOINTMENT OF SECURITY REPRESENTATIVES

The RECON Security Coordinator is the Manager, Administrative Services, Mr. R. H. Hardin. To assist him, Department Security Representatives are required. Table IV is a list of security representatives currently appointed. As security representatives are transferred to Sacramento they will be indoctrinated by representatives of the Plant Security Manager, Sacramento Plant.

N. CLASSIFICATION AND GROUP ASSIGNMENT OFFICERS

Classification and Group assignment officers currently assigned are included in Table V.

O. RELATIONSHIP TO CORPORATE TECHNICAL INFORMATION CENTER (CTIC)

Four copies of each technical report or analysis is now forwarded to CTIC where an abstract is prepared and the documents are retained. All classified material is marked "Limited Distribution" and access is permitted only when a need-to-know has been established (Appendix G).

SPI C-08-18-0 (Appendix II) states that an abstract and one copy of each technical report or analysis shall be forwarded to CTIC. At the present time, CTIC is preparing abstracts and four copies of the documents are forwarded to CTIC.

It is expected that in the future, each author will prepare abstracts in accordance with the SPI.

VII. COMMUNICATIONS

REON has many and varied requirements for communications between the customer, subcontractors, and other Aerojet activities. This is mainly caused by the unusual conditions of operation within REON.

The customer has an extremely large organization to supervise the NERVA Project. This large staff reviews, in minute detail, the operations of REON and subcontractors, which results in generation of many exacting requirements and in turn generation of frequent communications needs to and from REON. At the present time, REON does not, within itself, produce any hardware, but it does generate and receive large amounts of paperwork in its management of the NERVA Program. This paperwork includes Engineering Drawings, Specifications, Progress and Status Reports of all kinds. Many of the reports generated by REON include information received from subcontractors, such as Westinghouse, and operations in NTO. These reports cannot be finalized until the information is received, reviewed, and assembled into the final report or other action by REON. As a result, the last minute shipment of reports, etc., to the customer is the rule rather than the exception. Despite attempts to improve the situation, schedules established by the customer continue to be tight for both subcontractors and REON. A large proportion of REON people are affected by the requirements to forward such items within the deadlines set. Usually, the items are ready for mailing after regular working hours and require special security handling, and special handling to get them to the airport in time for scheduled flights.

Some relief may be received in this area if crypto facsimile transmission, for which our requirements have been sought by the Government, is installed between REON and other activities.

Mailroom service is used to bring mail into and out of the plant on a routine basis. REON requires high quality service in order to keep delays to a minimum in receiving and forwarding mail.

Telephone service is used extensively by REON personnel. Some 400 telephone instruments are presently in use in REON.

An average of 880 TWXs are received and sent each month by REON personnel. TWXs must be handled by all concerned as expeditiously as possible. Any delay in receipt could mean test delays, failure to meet deadlines or other serious consequences.

Communications are heaviest between REON and Cleveland and Pittsburg. Communications with Washington, D.C. are somewhat less. Mail is used whenever instantaneous receipt is not required. Telephone or TWX is used for instantaneous communication but at present do not permit discussion of classified information.

At the present time, Aerojet airplane flights are made to and from Las Vegas and Ontario on Mondays and Fridays each week. A similar service will be required between Sacramento and Las Vegas. During the time when testing will be heavy at NTO, it will probably be necessary to have one aircraft scheduled solely to transport REON and other NERVA Project personnel to and from Nevada and direct commercial routing will be needed as well.

TABLE I
(To be supplied)

TABLE V
(To be Supplied)

TABLE VI
(To Be Supplied)

TABLE VII
(To Be Supplied)

FIGURES 1 THROUGH 8 TO BE OFFSET

Figure 10

To be photo offset

Approved 10 April 1964

W.C. House
W. C. House

Vice President - REON

Approved

D.P. O'Flaherty
D. P. O'Flaherty

Manager, Corporate Salary Administration & Organization

FIGURES 12, 13 & 14 TO BE FURNISHED

APPENDICES A, B, G and H Will be offset

PROCEDURE FOR MOVING DOCUMENTS AND FILES TO SACRAMENTO OR NRDS

A. Sort all documents in your custody into four groups:

1. Documents which can be destroyed.
 - a. Arrange with RTIC for destruction of classified documents in accordance with AGC Security Procedures.
 - b. Discard unclassified documents. Forward unclassified reports to RTIC for possible addition to the RTIC Library.
2. Unclassified documents required.
 - a. Place documents in file cabinet.
 - b. When documents are ready for shipment to Sacramento or NRDS, notify RTIC for RTIC check of file.
3. Classified documents required for use until moved to Sacramento or NRDS.
 - a. Place documents in file for use and safeguarding until departure is about to be made. (At that time these will be processed as in 4 below.)
4. Classified documents not required until after Sacramento or NRDS move.
 - a. Confidential and Confidential Restricted Data documents.
 - (1) Prepare inventory, in quadruplicate, and box documents. (Inventory sheets available at RTIC.)
 - (2) Place inventory with each box. Each box will have inventory sheets only for documents contained therein.
 - (3) Prepare an appropriate mailing label, in duplicate, for each box to be shipped as follows:

AEROJET-GENERAL CORPORATION
MDCC

Sacramento, California

Attention: _____

AEROJET-GENERAL CORPORATION
or NERVA Test Operations

P.O. Box 297
Mercury, Nevada

Attention: _____

- (4) Documents boxed for shipment will be checked by MDCC at Von Karman Center against the inventory, the box sealed and wrapped and forwarded to Sacramento or NRDS, MDCC, Attention of person indicated on mailing label.

Procedure for Moving Documents
and Files to Sacramento or NRDS -2-

b. Secret and Secret Restricted Data Documents.

- (1) Determine when you will need documents in Sacramento or NRDS and advise RTIC.
- (2) Return documents to RTIC for processing shipment.

B. Library Material

1. Return all "Aerojet Library" reference books and reports on indefinite loan to the REON Unclassified Library.
2. Return all "Aerojet Library" material to the Von Karman Center Main Library if it was not indicated as indefinite loan.

C. Shipment of Files to Sacramento

1. RTIC will check all unclassified material in files, including desk file before shipment.
2. RTIC will affix a "This Cabinet to be Used for Unclassified Storage Only" sticker, initialed by the checker, on each file when ready for shipment.
3. All locks will be removed from files before removal from Building 160 and to vans. Locks will be returned to Lock & Key Control.
4. When files are ready for security inspection, RTIC will notify MDCC for inspection and sealing of files.

SECURITY CONTROL PROCEDURES

REON RESTRICTED AREA - BUILDING 160

1. Purpose:

- 1.1 To establish procedures for effecting security controls to safeguard classified information in the REON Restricted Area in Building 160.

2. Definitions:

- 2.1 Admittance Control Employee - a properly cleared project employee who has been instructed in all phases of admittance control procedures and is assigned the responsibility of effecting compliance.
- 2.2 Access List - A listing of the names of personnel having a pre-determined need-to-know who require access to the area infrequently.
- 2.3 Access Point - Any doorway or other opening which may be a means of gaining unauthorized access to area and/or information if not properly secured, or admittance controlled.
- 2.4 Authorized Personnel - Properly identified personnel whose assigned tasks cannot be effectively accomplished unless access to the area is granted.

Note: Individuals may be "authorized" even though access to classified information is not authorized, or required; providing they are continuously escorted by a responsible person, who assumes the responsibility of assuring there is no compromise of classified information."

- 2.5 Entry Register - a register maintained at each entry for the purpose of recording the name, time of entry and departure, person visited, and purpose of visit of persons entering who do not have "M" badges.
- 2.6 Frequent Admittance - The requirement for admittance to the area an average of three (3) days per week, for an indefinite period of time.
- 2.7 Need-to-Know - The requirement for access to REON classified information in the performance of assigned work. A minimum clearance of SECRET (an interim clearance is not valid) is a prerequisite for establishing a need-to-know.

- 2.8 Unauthorized Personnel - persons not properly identified, not escorted when one is required, or not requiring access to the area in the performance of their work.

3. Procedures:

3.1 Access Controls

- 3.1.1 North and South Stairway - a door with standard key operated locking hardware will be installed at these locations and shall be locked when the area is unoccupied. An electrically controlled half-door or turnstile will be installed for controlling access during working hours. These stations will be manned by Admittance Control Employees from 7:30 A.M. to 5:00 P.M. on normal working days, and during any overtime shifts which exceed 30 percent of the total working force of personnel assigned to the area. A lesser percentage will require that each individual assume complete responsibility for safeguarding information under his custody.

- 3.1.2 East Stairway Door - This door will be Conspicuously marked "Emergency Use Only" and shall be used only in an emergency. Door shall be mounted so that it opens outward from the REON area and shall have an emergency exit lock installed on the inner side, and equipped for key operation on the inner side only.

- 3.1.3 Northwest Hall Door - (Same as 3.1.2 above)

- 3.1.4 West Center Hall Door - Conspicuously marked "Emergency Use Only". Mounted so that it opens outward from the REON area and equipped with an emergency exit lock installed on the inner side, operable by key from both sides.

Note: for the purposes of personnel traffic controls this door will be considered an emergency exit only; however, its use for moving equipment and material between Building 160A and the freight elevator is authorized. Any person opening this door shall be responsible for maintaining access controls and for locking when purpose for opening has been accomplished.

- 3.1.5 Freight Elevator - Cage door on elevator will be equipped with a key padlock and shall be locked when elevator is not in use.

- 3.1.6 Control of Keys to Perimeter Doors -

- a. North and South Doors - a key for these doors will be retained at Gate #3 and may be issued to any Azusa Plant employee having the area designator "M" on his employee badge.
- b. Emergency Doors and Elevator Door - A key to these doors will be issued to the REON Stationery Stores office and Custodial Services office. Other issuance of keys to

these doors will require the prior approval of the Manager of Security.

3.2 Personnel Identification and Control

- 3.2.1 Project personnel and personnel of supporting activities of the Azusa plant who have an established need-to-know and require frequent admittance shall be issued employee badges displaying the Area access designator "M". The REON Security Coordinator shall submit requests for the issuance of these badges to the Plant Security Office and shall provide notification when a change of status occurs which eliminates a further need for access to the REON area.
- 3.2.2 Government and subcontractor personnel, whose clearances and need-to-know are verified, requiring access on a frequent basis for an indefinite period of time, shall be issued "Resident Representative" badges displaying the area access designator "M". The REON Security Coordinator shall submit requests and provide notification as in Paragraph 3.3.1.1.
- 3.2.3 A list of all other personnel, for whom a need-to-know has been established, shall be maintained at each entry control point. The Manager of Security's approval will be obtained prior to placing a name on this list. Prior to permitting entry to personnel in this category they shall sign the entry register and exchange their badge or pass for a "temporary M" badge, and shall exchange the "temporary M" badge for their regular badge or pass when departing.
- 3.2.4 Personnel whose names do not appear on the access list, but for whom a need-to-know is established at time of entry, shall sign the register and exchange badges as required in Paragraph 3.3.1.3.
- 3.2.5 Authorized personnel who do not have a need-to-know, i.e., personnel who do not have the required clearance and/or do not require access to classified information in the performance of their assigned work must sign the register and an escort shall be in attendance prior to permitting them to proceed into the area. Personnel in this category must wear an "escort required" card throughout the duration of their visit and must be continuously escorted while within the area. Entry of personnel in this category must be kept to an absolute minimum.

3.3 Duties of Admittance Control Employee

- 3.3.1 Employees assigned as admittance Control Employee shall be responsible for effecting compliance as follows:
- a. Shall assume duties at assigned station at the time designated for commencement of controls and shall remain

continuously in attendance until properly relieved or until time for discontinuance of maintaining access controls.

- b. Shall establish positive identity and assure that required identification is properly displayed prior to permitting entry into the area.
- c. Shall permit no unauthorized person to enter.
- d. Shall determine that an escort is in attendance when one is required.
- e. Shall supervise entries in the Entry Register assuring that all entries are complete, correct and legible.
- f. Shall maintain control of temporary "M" badges or "escort required" passes, recovering all such badges or passes issued as the person departs.
- g. Shall contact the RBOW Security Coordinator for guidance pertaining to any situation not covered by these procedures.

3.4 Documentation Area

3.4.1 Area shall be surrounded by floor to ceiling walls with no openings which might permit unauthorized visual or physical access.

3.4.2 Entry door to the area shall be equipped for card-key operation when occupied and shall be secured with a combination padlock when unoccupied.

3.5 T & A Station Shelf Storage Area

3.5.1 Area shall be surrounded by floor to ceiling walls with no openings which might permit unauthorized visual or physical access.

3.5.2 Entry door will be secured with a combination padlock when the T & A Station is not manned.

3.6 T & A Station Working Area

3.6.2 During hours of operation access to this area will be controlled by electrically controlled half-doors.

3.7 PERT Room

3.7.1 Area shall be surrounded by floor to ceiling walls with no openings which might permit unauthorized visual or physical access.

- 3.7.2 Entry door will be secured with a combination padlock when the room is unoccupied.

4. Security Coordinator Responsibilities

- 4.1 REON Security Coordinator shall be responsible for:
- a. Instructing of all REON personnel to the extent necessary to assure their being knowledgeable of these procedures and of their individual responsibilities in effecting compliance.
 - b. Providing copies of these procedures and current Access Lists to each Admittance Control Employee
 - c. Submitting request to the Plant Security Office for employee badges requiring area access designator and for informing this office when any badges requested are no longer required.
 - d. Obtaining the Manager of Security's approval prior to placing names on the Access List.
 - e. General supervision in all matters pertaining to security within the REON Division.

5. Deviations

- 5.1 No deviations to these procedures will be permitted without the prior approval of this office.
6. All previous procedures and instructions pertaining to the security controls of the REON Restricted Area are cancelled herewith.

C. A. Bowers
Manager of Security
Azusa Plant

MEMORANDUM

TO: All REON Gate Receptionists
FROM: REON Security Coordinator
SUBJECT: Access to REON Area

DATE: 26 February 1964
753:850:ECM:sw

The following procedures will be adhered to when processing personnel for admission into restricted areas at REON.

Non-Escort and Non-Registered

1. AGC Personnel, with large "M" in upper right-hand corner of regular AGC (VKC) badge.
2. NASA Resident Representatives, when Military badge has large "M" in upper right-hand corner.

Non-Escort - Must Register and Pick Up Access Badge

1. AGC Personnel, as appear on approved list.
2. SNPO Personnel, as appear on approved list.
3. Major Sub-Contractors, as appear on approved list.
4. Consultants, as appear on approved list

Security, Plant Protection and Fire Section Personnel

1. The names of personnel from these activities need not appear on the access list. Identity and level of clearance shall be confirmed when doubt exists.

Escort Required - Must Register and Pick Up Escort-Required Tag

1. All personnel, not on list, requiring access to the REON area. All personnel must be under escort at all times and not be in the area more than 15-20 minutes.

R. H. Hardin
REON Security Coordinator

MEMORANDUM

TO: REON Clerical Staff DATE: 14 February 1964
753:M848:ECM:sw

FROM: REON Internal Management

SUBJECT: REON Security Gate, Control of

COPIES TO: I. Also, R. H. Hardin, E. C. Mayr, File

Due to the change in clerical staff personnel, security gate attendants and their reliefs are now as follows:

Gate One (Main Lobby)

P. McKenzie, Attendant (8:30 - 5:00)

Reliefs

Early Shift	7:30 - 8:30	P. DiGennaro
Break, A.M.	10:00	L. Harding
Lunch	12:30	M. Seymour
Break, P.M.	2:30	L. Harding

Gate Two (Rear Lobby)

V. Scott, Attendant (7:30 - 4:00)

Reliefs

Break, A.M.	10:00	A. Cervanka
Lunch	12:00	L. Kline
Break, P.M.	2:30	A. Cervanka
Late Shift	4:00 - 5:00	J. Mason or R. Viverto

In the event person(s) are not available to relieve on a break or for lunch, they may contact either S. Wilmot/L. Kline (for breaks) or A. Cervanka/P. DiGennaro (for lunch) who are alternates.

This schedule will be strictly adhered to. Any problems concerning break and lunch reliefs SHOULD BE WORKED OUT BETWEEN THE ASSIGNED PERSONNEL AND ALTERNATES BEFORE BEING BROUGHT TO THE ATTENTION OF E. C. Mayr.

14 February 1964

This memorandum supersedes all previous memoranda concerning this subject.

Your cooperation in this matter is appreciated and will lead to a smoother security control of gates and personnel concerned.

R. H. Hardin, Manager
REON Internal Management

A handwritten signature in cursive script, appearing to read "R. H. Hardin", is written over the typed name and title.