Institute of Nuclear Materials Management, 10 Annual Meeting, 1969

PREFACE

This report contains the Proceedings of the Tenth Annual Meeting of the Institute of Nuclear Materials Management.

The three-day meeting, sponsored by INMM, consisted of formal papers and discussions in the general and specific areas of management and safeguards of nuclear materials.

The Dinner Speaker was Mr. James T. Ramey, Commissioner, United States Atomic Energy Commission.

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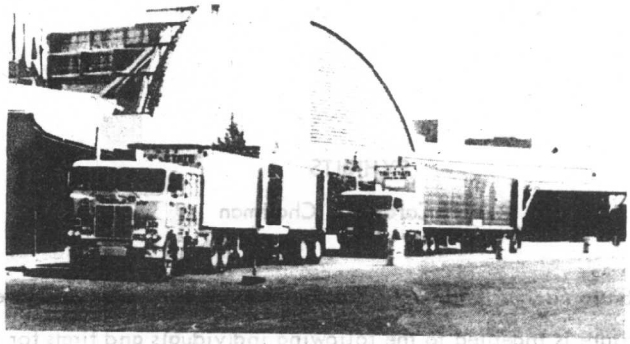
EXHIBITS

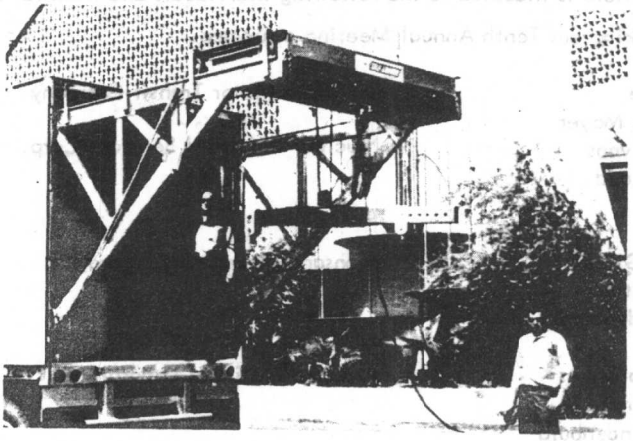
R. G. Cardwell, Chairman

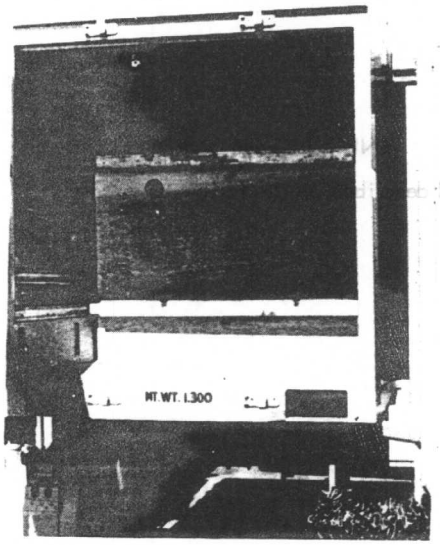
A general invitation to nuclear and nuclear-associated industry produced five excellent exhibits. The Institute is indebted to the following individuals and firms for their cooperation in making our Tenth Annual Meeting a success.

Jim Lee Charles Mayer Gene Evans Gene Loud	Tri-State Motor Transit Company and Nuclear Industrial Services Corp.
Keith Gilbert Jim Nutter Bill Rodenburg	Monsanto Research Corporation
John Farmakes Ron Perry Ron Brandenburg	Argonne National Laboratory
Bob Keepin Joerg Menzel Bob Hendron Ron Auguston Rod Walton	Los Alamos Scientific Laboratory
J. P. Jewett	SNPO-Nevada, NRDS

Exhibits are individually pictured and described on the following pages.







TOP - Tri-State special nuclear carriers on display at the convention center.

CENTER - Operators demonstrate the carrier's self-loading equipment.

BOTTOM - Dromedary unit for transporting classified and strategic materials.

NUCLEAR MATERIALS TRANSPORTATION

Tri-State Motor Transit Company

Tri-State started business in the early 1930's hauling, primarily, explosives for the old lead and zinc mines in the Oklahoma-Missouri-Kansas area. While the mines are almost gone now, they have left in their wake a colorful page in American history; and Tri-State has grown to where today its operations extend to every state in the union, except Hiwaii and Alaska, and to most of Canada.

Today, Tri-State specializes in the transportation of nuclear materials. This specialty includes

1. Trained personnel familiar with government regulations in the general handling of radiation survey instrumentation.
2. Specially designed trucking equipment to meet the unusual and unique requirements often associated with transporting nuclear materials.
3. Detailed and proven operating procedures providing maximum control and security of shipments in transit.
4. Special insurance protection through HELIA and NEPIA policies which reach out to include all those who have legal liability associated with a shipment.

Tri-State stands ready to meet the transportation requirements of the nuclear shipper and invites inquiries about its service. For information write to :

C.H. Mayer, Manager
Nuclear Service Division
Tri-State Motor Transit Co.
PO Box 113
Joplin, Missouri 64801

or

James W. Lee
Traffic Consultant
Tri-State Motor Transit Co.
PO Box 10236
Riviera Beach, Fla. 33404


Monsanto
MOUND LABORATORY
OPERATED BY
Monsanto Research Corporation
FOR THE
Atomic Energy Commission

PRECISION CALORIMETRY

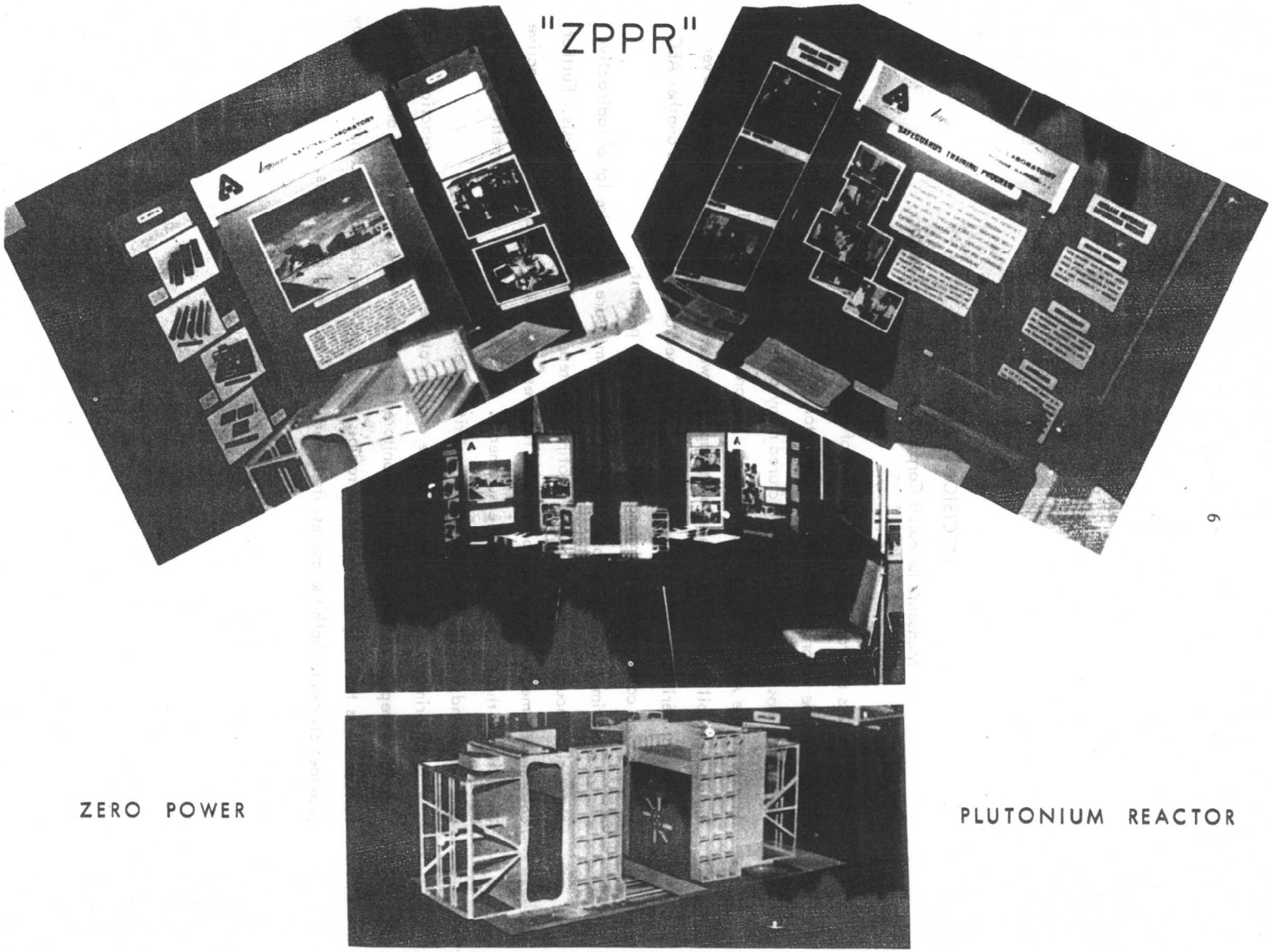
Monsanto Research Corporation - Mound Laboratory

Process control and accountability of radioactive materials are primary functions of radionuclide calorimeters. Mound Laboratory, in its continuous calorimetry program since 1945, has designed and manufactured many of its calorimeters for specific assays throughout the Atomic Energy Commission. The practicality of calorimetry for maintaining accountability of nuclear materials shipped between plants was demonstrated. Over a one-year period, quantities of plutonium-238 shipped between Mound and another AEC site, assayed calorimetrically, disagreed by only 0.03 percent.

Calorimetric assay is nondestructive and can measure the entire lot of radioactive material without the sampling and aliquoting required for other types of analysis. Further, calorimetric measurements can be made in the presence of large amounts of nonradioactive impurities without impairing the measurements. Neither the exact stoichiometric formula of a compound, nor the nonradioactive impurities present must be known.

Calorimetry is also amenable to the analysis of chemical or nuclear reaction yields; individual steps of the process can be monitored to identify steps where yields are low. A further use is the assay of recoverable radioisotopic trash from the process lines. This assay provides checks on both the process itself and on the recovery procedures.

"ZPPR"



ZERO POWER PLUTONIUM REACTOR

ZERO POWER PLUTONIUM REACTOR
Argonne National Laboratory

Argonne National Laboratory's exhibit featured a scale model of its recently completed Zero Power Plutonium Reactor (ZPPR). The animated model, equipped with a push-button taped message repeater, was supplemented by displays describing fabrication and assay of ZPPR fuel and the Laboratory's safeguards training program.

ZPPR, the nation's largest plutonium-fueled critical facility, began operation on April 18, 1969, at the U. S. Atomic Energy Commission's National Reactor Testing Station in Idaho. It is operated by Argonne for the AEC's Division of Reactor Development and Technology. Initial criticality was achieved with 357.34 kilograms of fissile plutonium. Later cores in ZPPR may contain up to 3000 kg. of plutonium and have volumes as great as 6000 liters.

The reactor is a split-table type with a matrix measuring eight feet deep and ten feet wide by 10 feet high. A larger matrix can be installed later to simulate reactor cores up to 8 x 14 x 14 feet.

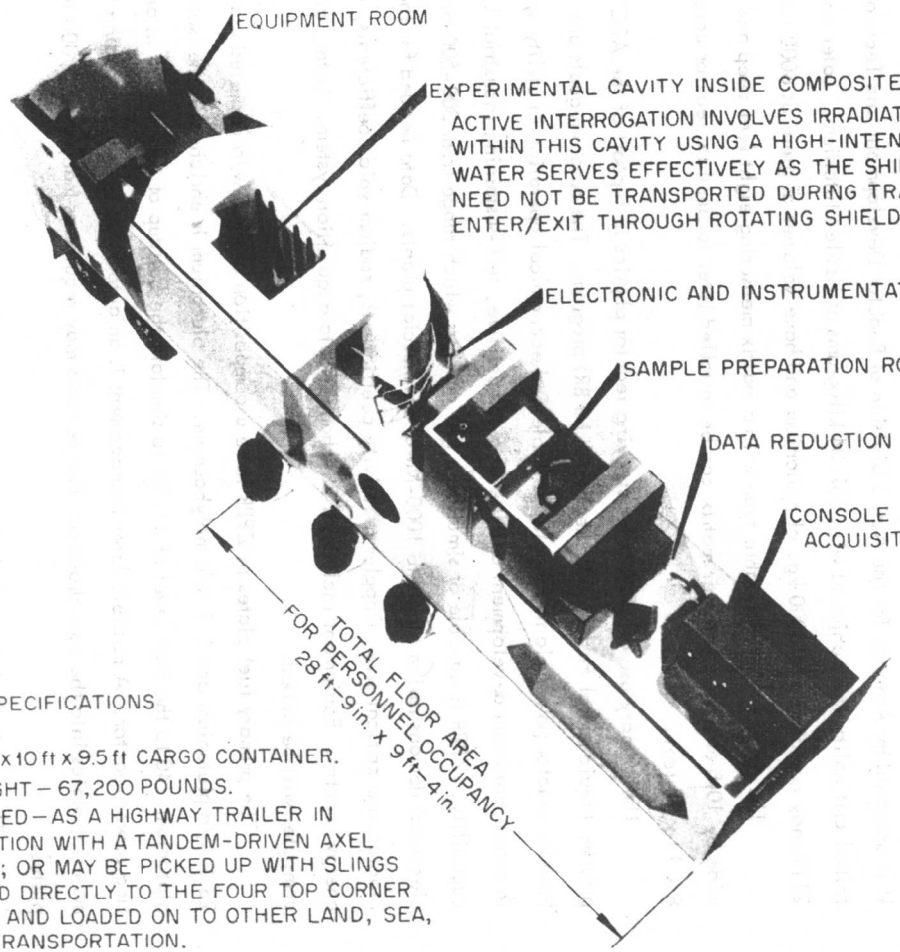
The primary use of ZPPR is for studying reactor physics in support of the AEC's high-priority Liquid Metal Fast Breeder Reactor (LMFBR) program. The program goals are to develop breeder reactor power plants for safe, reliable and economical operation in utility systems and to assure maximum development and use of a competitive, self-sustaining industrial LMFBR capability. ZPPR is capable of simulating fast reactors which range from 300-500 megawatt electrical demonstration plants to 1000-Mwe commercial plants. Data needed for these large reactors are critical size, Doppler reactivity coefficients, sodium void coefficients, and neutron energy spectra. Equipment includes a 28-channel data acquisition system. Later, an on-line computer will be added.

The primary fuel plates in ZPPR have a composition of 69.3 w/o depleted uranium, 28.2 w/o plutonium and 2.5 w/o molybdenum. The plutonium is enriched in the isotope plutonium-240 to the high level of 11.5% to simulate the buildup of this isotope in an operating power reactor. A possible later improvement is an automated system for loading fuel and material plates into the core drawers. Future cores may require as many as 200,000 individual plates.

The reactor cell is encircled by concrete and earth. Containment is achieved by a unique 16-foot thick sand-and-gravel roof supported by a network of cables and several layers of wire mesh. High-efficiency particulate filters serve as a backup system. During operation the reactor cell is isolated by blast and seal doors.

Data from operation of ZPPR are expected to be of great value to designers and operators of large commercial liquid-metal fast breeder reactors.

Model of Mobile Safeguards Assay Laboratory



GENERAL SPECIFICATIONS

HOUSING—
IN A 50 ft x 10 ft x 9.5 ft CARGO CONTAINER.

GROSS WEIGHT – 67,200 POUNDS.

TRANSPORTED—AS A HIGHWAY TRAILER IN CONJUNCTION WITH A TANDEM-DRIVEN AXEL TRACTOR; OR MAY BE PICKED UP WITH SLINGS ATTACHED DIRECTLY TO THE FOUR TOP CORNER FITTINGS AND LOADED ON TO OTHER LAND, SEA, OR AIR TRANSPORTATION.

MOBILE SAFEGUARDS ASSAY LABORATORY
University of California - Los Alamos Scientific Laboratory

The techniques for direct on-line nondestructive assay of fissionable materials being developed at Los Alamos are directly applicable not only to safeguards but to nuclear materials management and accountability problems throughout the nuclear industry.

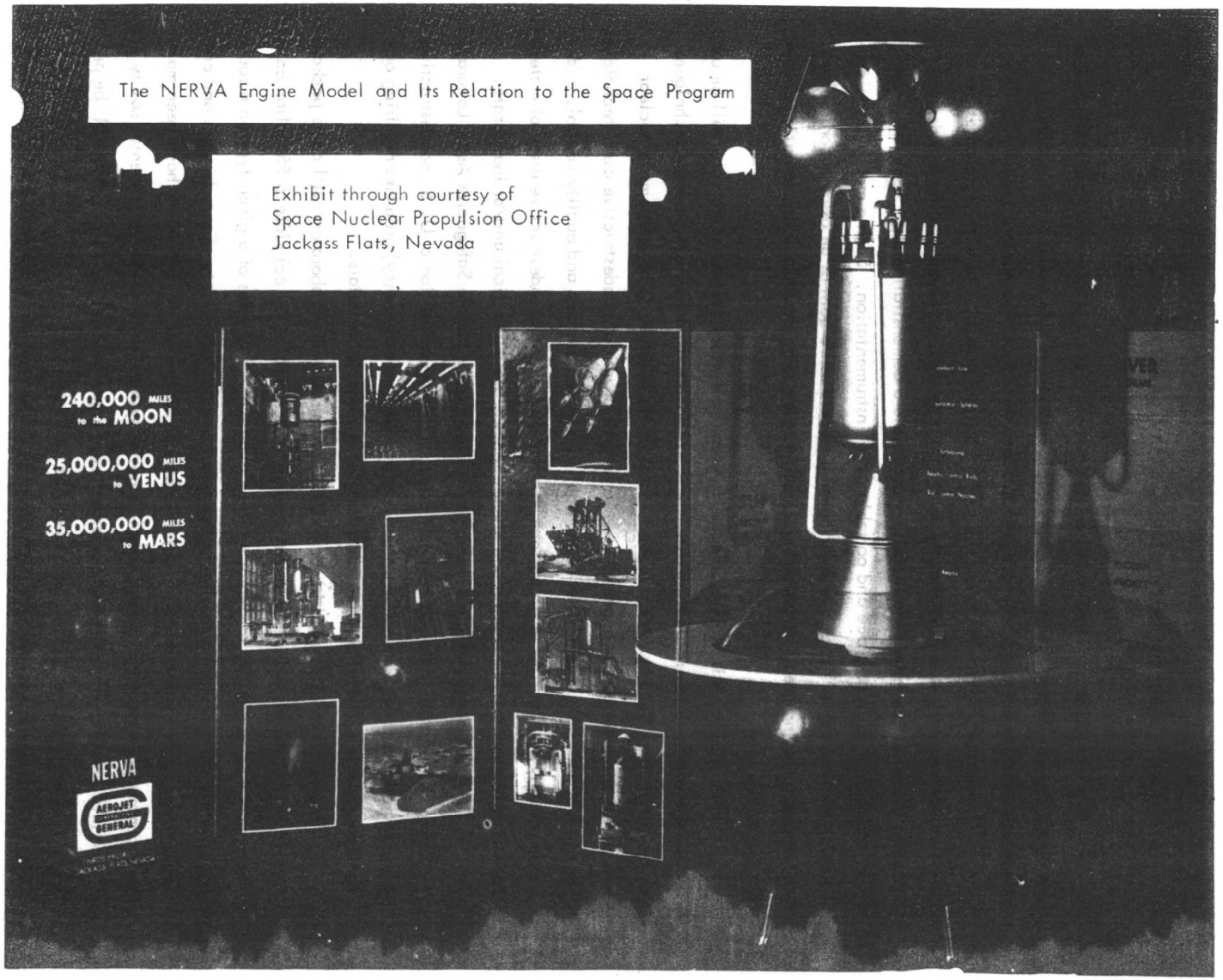
In discussions between LASL and OSMM officials, as well as with representatives of the nuclear industry, it seemed that the most effective way of communicating and demonstrating these new techniques to industry was to field a demonstration unit, such as a roadable van, containing both in-place and portable assay instrumentation. Such a mobile unit, employing methods as well as active interrogation, would serve both as an assay laboratory per se, and as a staging area for conducting in-plant assay using portable instrumentation carried in the mobile unit.

Specifically, this Mobile Safeguards Assay Laboratory, or so-called van, will be used 1) to demonstrate to the nuclear industry the capabilities of nondestructive assay techniques at the plant site, 2) to provide a laboratory for in-the-field study of problems in nuclear safeguards and materials management, 3) to provide practical nondestructive assay techniques for nuclear materials inventories, accountability surveys, process and quality control, and nuclear safety studies, and 4) to perform in-plant and on-site nondestructive assay of materials for which representative sampling and chemical assay are impractical and/or inaccurate.

The LASL cargo container concept provides a truly Mobile Safeguards Assay Laboratory, including the capability for sea transport and overseas demonstration of U. S. nondestructive assay techniques as well as solving practical (and perhaps emergency) problems requiring on-the-spot detection, identification, and assay of fissionable materials.

Materials to be assayed in the Mobile Safeguards Assay Laboratory will come packaged in a variety of container sizes and shapes ranging from small (few cc) vials to 55-gallon barrels. There must be a capability for handling large quantities of samples of a given type on a routine basis, while still preserving the flexibility to accommodate a variety of sample sizes and configurations. For routine assay of large numbers of small samples, provisions have been made to accommodate a pneumatic small sample transfer system between the experimental cavity and the control console. In addition, an automated, magazine-type handling system will be provided for large samples, i.e., up to 55-gallon barrel size.

LASL's extensive use of mobile laboratories has resulted in a broad base of extremely valuable experience in the design, procurement, outfitting, and long-term operation of such laboratories both domestically and abroad. The first demonstration of the completed Mobile Safeguards Assay Laboratory is scheduled for October 20, 1969.


The NERVA Engine Model and Its Relation to the Space Program
Exhibit through courtesy of
Space Nuclear Propulsion Office
Jackass Flats, Nevada
240,000 MILES to the MOON
25,000,000 MILES to VENUS
35,000,000 MILES to MARS
NERVA
AEROJET GENERAL