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REON

ROCKET ENGINE OPERATIONS - NUCLEAR

REPORT NO. 2726

TO

AEC-NASA SPACE NUCLEAR PROPULSION OFFICE

RADIATION EFFECTS PROGRAM PLANNING DETAILS

FOR

GENERAL DYNAMICS - FORT WORTH

FOR

CONTRACT YEAR 1964

MASTER

NERVA PROGRAM - CONTRACT SNP-1 - NOVEMBER 1963

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**RADIATION EFFECTS PROGRAM PLANNING DETAILS
FOR
GENERAL DYNAMICS - FORT WORTH
FOR
CONTRACT YEAR 1964**

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REPORT NO. 2726

TO

AEC-NASA SPACE NUCLEAR PROPULSION OFFICE

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

DISTRICT

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ABSTRACT

Final planning details are presented for the Radiation Effects Program to be conducted at the Reactor Facilities operated by General Dynamics/Fort Worth at Fort Worth, Texas, for Contract Year 1964, as partial fulfillment of Sub-Task 1.9, Contract SNP-1, Modification 8.

Detailed descriptions of work to be performed will be furnished as applicable in individual test specifications for the various components.

This work will be conducted under the supervision of REON, and represents the combined efforts of REON; Westinghouse Astronuclear Laboratory; Bendix Products Aerospace Division; AMF Atomics, a Division of American Machine and Foundry Co.; and the Liquid Rocket Plant of Aerojet-General Corporation.

C. M. Rice
Assistant Division Manager
REON Technical Systems Division

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I. SUMMARY OF REON AND WANL SUPPLIED EQUIPMENT

- A. Wiancko Pressure Calibrator
- B. Pallets
- C. Dewars
- D. LH_2 750-Gal Dewar
- E. Test Items
- F. Data Acquisition Equipment for WANL Tests (As Required)
- G. LH_2 Vacuum-Jacketed Line
- H. GH_2 , GHe and GN_2 Supply-Piping Systems
- I. Dewar Deluge System

II. GD/FW SUPPLIED SPECIAL TEST EQUIPMENT

- A. Tube Trailers
- B. Gas Detection System
- C. Fire Protection System
- D. Piping and Hook-up for Deluge System
- E. Remote Handling Tools for Pallet
- F. Dosimetry
- G. TV Cameras
- H. Environmental Chambers
- I. Experimental Dewars for LN_2 Investigation
- J. Additional Data Acquisition Equipment as Follows:
 - 1. Macrograph photographic equipment
 - 2. Vacuum system (10^{-6} mm Hg)
 - 3. Multipoint strip-chart temperature recorder
 - 4. Dual-beam oscilloscope
 - 5. Oscillographic and analog magnetic-tape recorders (2 kc)
 - 6. Audio oscillator (10 cps to 3 kc)
 - 7. Power amplifier (200 watts)
 - 8. Strip-chart recorder ($+100^{\circ}\text{F}$ to -350°F)
 - 9. Ohmmeter and digital meter (0.1% accuracy)
 - 10. Cryostat vacuum gage
 - 11. 28-v dc power supply (10 ma) regulated
 - 12. 5-conductor shielded wire (18 or 20 AWG) with irradiated polyolefin insulation
 - 13. Strip-chart temperature recorder (multipoint; $+100^{\circ}\text{F}$ to -350°F)
 - 14. Megohmmeter (1% accuracy)
 - 15. Strip-chart recorder (0-50 mv)
 - 16. Helium-gas regulators (0-50 and 0-200 psig)
 - 17. Tera ohmmeter
 - 18. Battery-type ohmmeter for insulation-resistance measurements
 - 19. Two-digital voltmeters (0.1% accuracy)
 - 20. Three Heise pressure gages (0-900 psig)
 - 21. Pressure transducer control panel

III. GD/FW SUPPLIED ENGINEERING

- A. Tie-Down Fixtures for Test Pallets with Drawings
- B. STE Location Drawings
- C. Design of Handling Equipment
- D. Procedures for Data Handling
- E. Personnel for Data Taking
- F. Personnel for Test-Item Removal from Test Stand
- G. Personnel for Test-Item Installation on Test Stand
- H. Reactor Operation Personnel
- I. Health Physics Personnel
- J. Data Reduction (Dosimetry and Experimental Test Data)
- K. Test Reports (Preliminary and Contributions to Final Report: 20 copies
- L. Personnel for IML Area Operation (Hot Cell)
- M. Personnel for Assembly of Data Handling Equipment
- N. Personnel for Checkout of Data Handling Equipment
- O. Photographic Coverage (Movies, Stills)
- P. Consultation on Test Fixture Design
- Q. Consultation on ASTR and GTR Radiation Environment - Predicted Fluxes and Data from Mapping Run
- R. Decontamination
- S. Shipping, Storage
- T. Liaison
 - 1. Schedule
 - 2. Hazards
 - 3. Procedures
 - 4. Test Specifications
 - 5. Reports
 - 6. Security
- U. Piping and Associated Hardware for Aerojet Dewars
- V. Perform Structural Materials Test (Formerly NP-5 Subcontract)
 - 1. Repair, modify, and checkout pulling assembly
 - 2. Perform tensile, shear, and thermal conductivity tests as specified by AGC

3. Prepare specimens for both optical and electronic micrograph examinations
 4. Present reduced data in both tabular and graphical form as specified for AGC
- W. Repair, modify, and checkout gas distribution system for ASTR tests and perform other activities formerly required by NP-8 subcontract
- X. Perform experimental program to determine the stored energy levels of irradiated liquid nitrogen, as outlined below:
1. Recording of Explosion (to determine the following)
 - a. Effect of evaporation of nitrogen
 - b. Effect of temperature
 - c. Effect of ambient
 - d. Effect of ambient with various additions
 - e. Analysis of vent gas
 2. Observation of Explosion (to determine the following)
 - a. Estimate of light intensity of general glow and flashes
 - b. Observation of activity around inserts of
 - (1) Rubber (O_3)
 - (2) Urea (HNO_2)
 - (3) NaCl (HNO and NO)
 - (4) Cu and Al-Cu alloy (H_2O_2 and heat treatment of welds)
 - c. Analysis of vent gas
 3. Spectral Analysis after Reactor or X-ray Radiation (to determine the following)
 - a. Emission spectroscopy
 - b. EPR
 4. Energy Content in Afterglowing Nitrogen (to determine the following)
 - a. Total energy
 - b. Abundance of N atoms and their energy content
 - c. Abundance of ions

IV. SUMMARY OF POST-IRRADIATION REQUIREMENTS

Approximately 2 weeks in the IML area for mechanical component tests.

Approximately 2 weeks in the IML area for all electrical component tests.

NOTE. Activated material with a total activity greater than 0.1 micro-curie cannot be returned to REON, LRP, WANL, etc., unless an AEC byproduct material license (Isotopes 3-83) has been granted.

V. SUMMARY OF IRRADIATION TIME-GTR

<u>GTR Test Number</u>	<u>RECON Scheduled Test Date</u>	<u>Test Plan Number</u>	<u>Test Item</u>	<u>Test Duration (Hours)</u>	<u>Environment</u>
11	Open	14/W004	Actuator Components	100	Amb.
		23/L101	Resistance Thermometers (502 Pallet)	100	LN ₂
		31/L001	Electronic Components (Limit Switches) (502 Pallet)	100	LN ₂
		33/L002	TSOV Linear Potentiometer (502 Pallet)	100	LN ₂
		33/L102	TSOV Solenoid (502 Pallet)	100	LN ₂
		34/L002	RCDV Rotary Potentiometer (502 Pallet)	100	LN ₂
		34/L102	RCDV Actuator (Motor) (502 Pallet)	100	LN ₂
12	11 Jan. 1964	15/W301	Upper Support Ring	100	LN ₂
		20/W001	Neutron Detectors	20	Amb.
		23/W007	Accelerometers	100	LN ₂
		23/W206	Displacement Transducers	100	LN ₂
		23/W407	Strain Gages	100	LN ₂
		23/W507	Pressure Transducers	100	LN ₂
13	1 Feb. 1964	23/A403	Development Strain Gages	100	LN ₂
		25/A003	TCA Pressure Transducers	100	LN ₂
		31/A007	Electronic Components (Diodes)	100	Amb.
		31/A009	Electronic Components (Gear Motor)	100	Amb.
		40/W005	Control Drum Bearings	100	Amb.
14	29 Feb. 1964	5/A002	TPCV Actuator	100	Amb.
		8/A002	Rotary Shaft Seals (High Temp)	100	1300°F
		14/W005	Actuator Complete (With Load)	100	Amb.
		31/A010	Electronic Components (Potting Material)	100	LN ₂
		31/A011	Electronic Components (Low Temp. Pots)	100	LN ₂
		31/A012	Electronic Components (Low Temp. Switches)	100	LN ₂
		31/A014	Electronic Components (Torque Motor and Servo Valve)	100	LN ₂

V. SUMMARY OF IRRADIATION TIME-GTR (cont.)

<u>GTR Test Number</u>	<u>REON Scheduled Test Date</u>	<u>Test Plan Number</u>	<u>Test Item</u>	<u>Test Duration (Hours)</u>	<u>Environment</u>
15	28 March 1964	37/A002	Structural Materials	200	LH ₂
		37/W002	Structural Materials	200	LH ₂
16	25 April 1964	14/W006	Actuator Components (Secna Generation)	100	Amb.
		23/A404	Development Strain Gages	100	LN ₂
		23/A901	Microphone	100	* Amb.
		23/L002	Accelerometers (503A & 503B Pallets)	100	LH ₂ & Amb.
		23/L102	Resistance Thermometers (503B Pallet)	100	* LH ₂
		23/L502	Pressure Transducers (503A & 503B Pallets)	100	LH ₂ & Amb.
		27/A005	System Amplifiers	100	Amb.
17	23 May 1964	15/W001	Control Drum Assembly	100	LN ₂
		24/A001	TCA Temperature Sensors	50	300°F
		37/W401	Materials	100	LN ₂
		40/A102	Control Drum Bearing Material	50	740°F
18	20 June 1964	37/A101	Materials	100	LH ₂
		37/W102	Materials	100	LH ₂
19	18 July 1964	14/W007	Actuator Components (Second Generation)	100	LN ₂
		23/L003	Accelerometers (504 Pallet)	100	LH ₂
		23/L103	Resistance Thermometers (504 Pallet)	100	LH ₂
		23/L503	Pressure Transducers (504 Pallet)	100	LH ₂
		24/A002	TCA Temperature Sensors	100	300°F
20	15 Aug. 1964	5/A003	TPCV Actuator	100	Amb
		23/A902	Microphone	100	Amb.
		27/A006	System Amplifiers	100	Amb.
		37/W402	Materials	100	LN ₂
21	12 Sept. 1964	37/A003	Structural Materials	200	LH ₂
		37/W003	Structural Materials	200	LH ₂

* LH₂ or LN₂.

VI. SUMMARY OF IRRADIATION - TIME ASTR

<u>ASTR Test Number</u>	<u>REON Scheduled Test Date</u>	<u>LRP Pallet Number</u>	<u>Test Plan Number</u>	<u>Test Items</u>	<u>Test Duration (Minutes)</u>	<u>Environment</u>
2	12 Oct. 1963	902	3/L002	TPA Bearing Set	5	LH ₂
3	9 Nov. 1963	903	3/L003	TPA Bearing Set	10	LH ₂
4	18 Jan. 1964	904	3/L004	TPA Bearing Set	15	LH ₂
5	7 March 1964	906	3/L005	TPA Bearing Set	15	LH ₂
6	23 May 1964	905	2/L001	TSOV Config. No. 2	30	LH ₂
			13/L001	RCDV	30	LH ₂
			33/L001	Linear Potentiometers	30	LH ₂
			33/L101	Solenoids	30	LH ₂
			34/L001	Rotary Potentiometers	30	LH ₂
			34/L101	Motors	30	LH ₂
7	20 June 1964	908	3/L006	TPA Bearing Set	15	LH ₂
8	1 August 1964	911	3/L007	TPA Bearing Set	15	LH ₂
9	5 Sept. 1964	931	7/L001	Remote Disconnects	30	-260 to 40°F
			18/L001	Pneumatic Power Supply Lines and Bellows	30	-260 to 40°F
			18/L101	Pneumatic Power Supply Connectors	30	-260 to 40°F
			18/L201	Pneumatic Power Supply System Filters	30	-260 to 40°F

VII. SUMMARY OF CABLE REQUIREMENTS-GTR

<u>GTR Test Number</u>	<u>Test Plan Number</u>	<u>Test Item</u>	<u>Cable Requirements</u>
11	14/W004	Actuator Components	40 cables
	23/L101	Resistance Thermometers	80 cables
	31/L001	Electronic Components (Limit Switches)	125 cables
	33/L002	TSOV Linear Potentiometer	25 cables & 3 TCS
	33/L102	TSOV Solenoid	4 cables & 6 TCS
	34/L002	RCDV Rotary Potentiometer	20 cables & 8 TCS
	34/L102	RCDV Actuator Motor	10 cables & 10 TCS
12	15/W301	Upper Support Ring	5 cables
	20/W001	Neutron Detector	7 coaxial
			2 (3-conductor shielded)
	23/W007	Accelerometers	20 cables
	23/W206	Displacement Transducers	91 single conductor shielded
	23/W407	Strain Gages	15 five conductor shielded
	23/W507	Pressure Transducers	
13	23/A403	Development Strain Gages	24 cables
	25/A003	Pressure Transducers (TCA)	25 cables
	31/A007	Electronic Components (Diodes)	16 cables & 6 TCS
	31/A009	Electronic Components (Gear Motor)	10 cables & 10 TCS
	40/W005	Control Drum Bearings	5 cables
14	5/A002	TPCV Actuator	20 cables & 5 TCS
	8/A002	Rotary Shaft Seals (High Temp.)	10 cables & 10 TCS
	14/W005	Actuator-Complete (With Load)	30 cables
	31/A010	Electronic Components (Potting Material)	16 wires & 6 TCS
	31/A011	Electronic Components (Low Temp. Pots)	4 cables and 2 TCS
	31/A012	Electronic Components (Low Temp. Switches)	5 cables and 2 TCS
	31/A014	Electronic Components (Torque Motor and Servo Valve)	12 cables and 10 TCS

VII. SUMMARY OF CABLE REQUIREMENTS-GTR (cont.)

<u>GTR Test Number</u>	<u>Test Plan Number</u>	<u>Test Item</u>	<u>Cable Requirements</u>
15	37/A002	Structural Materials }	100 cables
	37/W002	Structural Materials }	
16	14/W006	Actuator Components (Second Generation)	40 cables
	23/A404	Development Strain Gages	24 cables
	23/A901	Microphone	25 cables
	23/L002	Accelerometers	225 cables
	23/L102	RTT's	125 cables
	23/L502	Pressure Transducers	225 cables
	27/A005	Amplifiers	65 cables and 24 TCS
17	15/W001	Control Drum Assembly	5 cables
	24/A001	Temperature Sensors (TCA)	25 cables
	37/W401	Materials	40 cables
	40/A102	Control Drum Bearing Material	10 cables and 12 TCS
18	37/A101	Materials }	100 cables
	37/W102	Materials }	
19	14/W007	Actuator Components (Second Generation)	40 cables
	23/L003	Accelerometers	115 cables
	23/L103	RTT's	125 cables
	23/L503	Pressure Transducers	115 cables
	24/A002	Temperature Sensors (TCA)	25 cables
20	5/A003	TPCV Actuator	20 cables and 5 TCS
	23/A902	Microphone	25 cables
	27/A006	Amplifier	65 cables and 24 TCS
	37/W402	Materials	40 cables
21	37/A003	Structural Materials }	100 cables
	37/W003	Structural Materials }	

VIII. SUMMARY OF CABLE REQUIREMENTS-ASTR

<u>ASTR Test Number</u>	<u>Test Plan Number</u>	<u>Test Item</u>	<u>Cable Requirements</u>
2	3/L002	TPA Bearing Set	50 cables
3	3/L003	TPA Bearing Set	50 cables
4	3/L004	TPA Bearing Set	50 cables
5	3/L005	TPA Bearing Set	50 cables
6	2/L001	TSOV No. 2	40 instrumentation and 20 control cables
	13/L001	RCDV	
	33/L001 & 33/L101	Linear Pots and Solenoids	
	34/L001 & 34/L101	Rotary Pots and Motors	
7	3/L006	TPA Bearing Set	50 cables
8	3/L007	TPA Bearing Set	50 cables
9	7/L001	Remote Disconnects	25 cables
	18/L101, 18/L101, & 18/L201	Pneumatic Power Supply Comp.	25 cables

IX. SUMMARY OF ESTIMATED FLUID REQUIREMENTS-GTR

<u>GTR Test</u>	<u>Test Plan</u>	<u>Fluid</u>	<u>Flow Rate</u>	<u>Total Required</u>
11	14/W004	None		
	23/L101	{ GHe }	{ Purging }	{ 13,000 C.F. }
	31/L001			
	33/L002			
	33/L102			
	34/L002			
	34/L102	{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
12	15/W301	{ GHe LN ₂ }	{ Purging 175 gal/hr }	{ 13,000 C.F. 17,500 gal }
	20/W001	None		
	23/W007	{ GHe LN ₂ }	{ Purging 175 gal/hr }	{ 13,000 C.F. 17,500 gal }
	23/W206			
	23/W407	{ GHe LN ₂ }	{ Purging 175 gal/hr }	{ 13,000 C.F. 17,500 gal }
	23/W507			
13	23/A403	{ GHe LN ₂ }	{ Purging 175 gal/hr }	{ 13,000 C.F. 17,500 gal }
	25/A003	{ GHe LN ₂ }	{ Purging 175 gal/hr }	{ 13,000 C.F. 17,500 gal }
	31/A007	None		
	31/A009	GHe	25 lb/hr	2,600 lb
	40/W005	None		
14	5/A002	GH ₂	54 lb/hr	5,400 lb
	8/A002	None		
	14/W005	None		
	31/A010	{ GH ₂ LN ₂ }	{ 12 lb/hr }	{ 1,500 lb }
	31/A011			
	31/A012			
	31/A014			
		{ LH ₂ }	{ 150 gal/hr }	{ 15,000 gal }

IX. SUMMARY OF ESTIMATED FLUID REQUIREMENTS-GTR (cont.)

<u>GTR Test</u>	<u>Test Plan</u>	<u>Fluid</u>	<u>Flow Rate</u>	<u>Total Required</u>
15	37/A002	{ GHe }	{ Purging }	{ 40,000 C.F. }
	37/W002	{ LH ₂ }	{ 525 gal/hr }	{ 105,000 gal }
16	23/L002	{ GHe }	{ Purging }	{ 13,000 C.F. }
	23/L102	{ LH ₂ or }	{ }	{ }
	23/L502	{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	23/A404	{ GHe }	{ Purging }	{ 13,000 C.F. }
		{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	14/W006	None		
	23/A901	None		
	27/A005	None		
17	15/W001	{ GHe }	{ Purging }	{ 13,000 C.F. }
		{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	24/A001	None		
	37/W401	{ GHe }	{ Purging }	{ 13,000 C.F. }
		{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	40/A102	GH ₂	4 lb/hr	400 lb
18	37/A101	{ GHe }	{ Purging }	{ 40,000 C.F. }
	37/W102	{ LH ₂ }	{ 525 gal/hr }	{ 105,000 gal }
19	14/W007	{ GHe }	{ Purging }	{ 13,000 C.F. }
		{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	23/L003	{ GHe }	{ Purging }	{ 13,000 C.F. }
	23/L103	{ LN ₂ or }	{ }	{ }
	23/L503	{ LH ₂ }	{ 175 gal/hr }	{ 17,500 gal }
	24/A002	None		
20	5/A003	GH ₂	54 lb/hr	5,400 lb
	23/A902	None		
	27/A006	None		
	37/W402	{ GHe }	{ Purging }	{ 13,000 C.F. }
		{ LN ₂ }	{ 175 gal/hr }	{ 17,500 gal }
21	37/A003	{ GHe }	{ Purging }	{ 40,000 C.F. }
	37/W003	{ LH ₂ }	{ 525 gal/hr }	{ 105,000 gal }

X. SUMMARY OF ESTIMATED FLUID REQUIREMENTS-ASTR

<u>ASTR</u>	<u>Test Plan</u>	<u>Fluid</u>	<u>Flow Rate</u>	<u>Total Required</u>
2	3/L002	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.05 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 150 \text{ lb} \\ 150 \text{ gal} \end{array} \right\}$
3	3/L003	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.05 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 300 \text{ lb} \\ 300 \text{ gal} \end{array} \right\}$
4	3/L004	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.5 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 450 \text{ lb} \\ 450 \text{ gal} \end{array} \right\}$
5	3/L005	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.5 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 450 \text{ lb} \\ 450 \text{ gal} \end{array} \right\}$
6	2/L001	$\left\{ \begin{array}{c} \text{GH}_2 \\ \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.1 \text{ lb/sec} \\ 0.5 \text{ lb/sec} \\ 1.0 \text{ lb/sec} \end{array} \right\}$	$\left\{ \begin{array}{c} 180 \text{ lb} \\ 900 \text{ lb} \\ 1800 \text{ lb} \end{array} \right\}$
	13/L001			
	33/L001			
	33/L101			
	34/L001			
	34/L101			
7	3/L006	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{LH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.5 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 450 \text{ lb} \\ 450 \text{ gal} \end{array} \right\}$
8	3/L007	$\left\{ \begin{array}{c} \text{GN}_2 \\ \text{GH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.5 \text{ lb/sec} \\ 30 \text{ gal/min} \end{array} \right\}$	$\left\{ \begin{array}{c} 450 \text{ lb} \\ 450 \text{ gal} \end{array} \right\}$
9	7/L001	$\left\{ \begin{array}{c} \text{GH}_2 \end{array} \right\}$	$\left\{ \begin{array}{c} 0.1 \text{ lb/sec} \end{array} \right\}$	$\left\{ \begin{array}{c} 180 \text{ lb} \end{array} \right\}$
	18/L001			
	18/L101			
	18/L201			

TEST FACILITY GTR

TEST DATE OPEN

TEST NO. 11

DUR. <u>100 HOURS</u> W DEWAR #1 (LN ₂) 23/L101 31/L001 33/L002 33/L102 34/L002 34/L102	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto; position: relative;"> N <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);"> DEWAR #2 (LN₂) </div> <div style="position: absolute; bottom: 10%; left: 10%;"> 33/L102 34/L002 34/L102 DUR. <u>100 HRS.</u> </div> </div>
<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto; position: relative;"> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%);"> 15/W301 AMBIENT PALLET </div> </div>	

E DUR. 100 HOURS

SPECIAL SERVICES
1. TWO LN₂ DEWARS

TEST ITEM DESCRIPTION

TEST NO.

LOCATION

RESP. AGENCY

ACTUATOR COMPONENTS
RESISTANCE THERMOMETERS
ELECTRONIC COMPONENTS
POTENTIOMETER LINEAR
SOLENOIDS
ROTARY POT
MOTORS

14/W301
23/L101
31/L001
33/L002
33/L102
34/L002
34/L102

EAST
WEST
WEST
WEST
NORTH
NORTH
NORTH

WANL
LRP
LRP
LRP
LRP
LRP
LRP

TEST SCHEDULE (WEEKS)

TEST SPECIFICATION																				
SHIP	△																			
INSTALLATION	△																			
PRE-IRRADIATION TEST																				
TEST																				
PREL. REPORT																				

TEST FACILITY GTR

TEST DATE 11 JAN 1964

TEST NO. 12

SPECIAL SERVICES

1. THREE LN₂ DEWARs

TEST ITEM DESCRIPTION

TEST NO.

LOCATION

RESP. AGENCY

UPPER SUPPORT RING	15/W301	NORTH	WANL
NEUTRON DETECTOR (PREAMP & CABLES COMBINED)	20/W001	POOL	WANL
DISPLACEMENT TRANSDUCERS	23/W206	EAST	WANL
STRAIN GAGES	23/W407	WEST	WANL
PRESSURE TRANSDUCERS	23/W507	WEST	WANL

TEST SCHEDULE (WEEKS)

	1-2-14	1-2-21	1-2-28	1-4	1-11	1-18	1-25	2-1	2-8	2-15	2-22	2-29	3-7	3-14
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT												△		

TEST FACILITY GTR

TEST DATE 1 FEB 1964 TEST NO. 13

SPECIAL SERVICES

1. TWO LN₂ DEWARs

TEST ITEM DESCRIPTION

TEST NO.

LOCATION

RESP. AGENCY

DEVELOPMENT STRAIN GAGES
TCA PRESSURE TRANSDUCERS
ELECTRONIC COMPONENTS (DIODES)
ELECTRONIC COMPONENTS (GEAR MOTORS)
CONTROL DRUM BEARINGS

23/A403
25/A003
31/A007
31/A009
40/W005

NORTH
WEST
EAST
EAST
EAST

AZUSA
AZUSA
AZUSA
AZUSA
WANL

TEST SCHEDULE (WEEKS)

	1-4	1-11	1-18	1-25	2-1	2-8	2-15	2-22	2-29	3-7	3-14	3-21	3-28	4-4
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT												△		

TEST FACILITY GTRTEST DATE 29 FEB 1964TEST NO. 14 SPECIAL SERVICES

1. ONE LN₂ DEWAR
2. ONE MARK II ENVIRONMENTAL CHAMBER

TEST ITEM DESCRIPTIONTEST NO.LOCATIONRESP. AGENCY

<u>TEST ITEM DESCRIPTION</u>	<u>TEST NO.</u>	<u>LOCATION</u>	<u>RESP. AGENCY</u>
TPCV ACTUATOR	5/A002	EAST	AZUSA
ROTARY SHAFT SEALS (HIGH TEMP.)	8/A002	WEST	AZUSA
ACTUATOR - COMPLETE WITH LOAD	14/W005	EAST	WANL
ELECTRONIC COMPONENTS (POTTING MATERIALS)	31/A010	NORTH	AZUSA
ELECTRONIC COMPONENTS (LOW TEMP. POTS)	31/A011	NORTH	AZUSA
ELECTRONIC COMPONENTS (LOW TEMP. SWITCHES)	31/A012	NORTH	AZUSA
ELECTRONIC COMPONENTS (TORQUE MOTOR & SERVO VALVE)	31/A014	NORTH	AZUSA

TEST SCHEDULE (WEEKS)

	2-1	2-8	2-15	2-22	2-29	3-7	3-14	3-21	3-28	4-4	4-11	4-18	4-25	5-2
TEST SPECIFICATION _____	△													
SHIP _____	△													
INSTALLATION _____			△											
PRE-IRRADIATION TEST _____				△										
TEST _____					△									
PREL. REPORT _____												△		

TEST FACILITY GTR

TEST DATE 28 MARCH 64 TEST NO. 15

TEST ITEM DESCRIPTION

LOCATION

RESP. AGENCY

STRUCTURAL MATERIAL
STRUCTURAL MATERIAL

37/A002
37/W002

N, E & W
N, E & W

AZUSA
WANL

SPECIAL SERVICES

1. THREE LH₂ DEWARS

TEST SCHEDULE (WEEKS)

	2-29	3-7	3-14	3-21	3-28	4-4	4-11	4-18	4-25	5-2	5-9	5-16	5-23	5-30
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT													△	

TEST FACILITY GTR

TEST DATE 25 APRIL 1964 TEST NO. 16

- SPECIAL SERVICES
1. ONE LH₂ DEWAR
 2. ONE LN₂ DEWAR

TEST ITEM DESCRIPTION

TEST NO.

LOCATION

RESP. AGENCY

ACTUATOR COMPONENTS	14/W006	NORTH	WANL
DEVELOPMENT STRAIN GAGES	23/A404	EAST	AZUSA
MICROPHONES	23/A901	NORTH	AZUSA
ACCELEROMETERS	23/L002	NORTH & WEST	LRP
RESISTANCE THERMOMETERS	23/L102	WEST	LRP
PRESSURE TRANSDUCERS	23/L502	NORTH & WEST	LRP
SYSTEM AMPLIFIERS	27/A005	NORTH	AZUSA

TEST SCHEDULE (WEEKS)

	3-28	4-4	4-11	4-18	4-25	5-2	5-9	5-16	5-23	5-30	6-6	6-13	6-20	6-27
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT												△		

TEST FACILITY GTR

TEST DATE 23 MAY 1964 TEST NO. 17

SPECIAL SERVICES

1. TWO LN₂ DEWARs
2. ONE MARK II ENVIRONMENTAL CHAMBER

TEST ITEM DESCRIPTION

CONTROL DRUM ASSEMBLY
TEMPERATURE SENSORS (TCA)
MATERIALS
BEARING MATERIALS

TEST NO.

15/W001
24/A001
37/W401
40/A102

LOCATION

WEST
EAST
NORTH
EAST

RESP. AGENCY

WANL
AZUSA
WANL
AZUSA

TEST SCHEDULE (WEEKS)

	4-25	5-2	5-9	5-16	5-23	5-30	6-6	6-13	6-20	6-27	7-4	7-11	7-18	7-25
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT												△		

TEST FACILITY GTR

TEST DATE 20 JUNE 1964 TEST NO. 18

SPECIAL SERVICES

1. THREE LH₂ DEWARs

TEST ITEM DESCRIPTION

MATERIALS
MATERIALS

TEST NO.

37/A101
37/W102

LOCATION

NO. & W.
EAST

RESP. AGENCY

AZUSA
WANL

TEST SCHEDULE (WEEKS)

	5-23	5-30	6-6	6-13	6-20	6-27	7-4	7-11	7-18	7-25	8-1	8-8	8-15	8-22
TEST SPECIFICATION _____	△													
SHIP _____	△													
INSTALLATION _____			△											
PRE-IRRADIATION TEST _____				△										
TEST _____					△									
PREL. REPORT _____												△		

TEST FACILITY GTR

TEST DATE 18 JULY 1964 TEST NO. 19

- SPECIAL SERVICES
1. ONE LN₂ DEWARE
 2. ONE MARK II ENVIRONMENTAL CHAMBER
 3. ONE LH₂ DEWAR

TEST ITEM DESCRIPTION	TEST NO.	LOCATION	RESP. AGENCY
ACTUATOR COMPONENTS (2nd GENERATION)	14/W007	EAST	WANL
ACCELEROMETERS	23/L003	NORTH	LRP
RESISTANCE THERMOMETERS	23/L103	NORTH	LRP
PRESSURE TRANSDUCERS	23/L503	NORTH	LRP
TCA TEMPERATURE SENSORS	24/A002	WEST	AZUSA

	TEST SCHEDULE (WEEKS)													
	6-20	6-27	7-4	7-11	7-18	7-25	8-1	8-8	8-15	8-22	8-29	9-5	9-12	9-19
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT												△		

TEST FACILITY GTR

TEST DATE 15 AUG 1964 TEST NO. 20

DUR. <u>100 HOURS</u> W DEWAR #1 (LN ₂)	
37/W402	
X	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> 5/A003 23/A902 27/A006 </div> AMBIENT TEMPERATURE PALLET DUR. <u>100 HOURS</u> E	

SPECIAL SERVICES

1. ONE LN₂ DEWAR

TEST ITEM DESCRIPTION

TPCV ACTUATOR
 MICROPHONE
 AMPLIFIER
 MATERIALS

TEST NO.

5/A003
 23/A902
 27/A006
 37/W402

LOCATION

EAST
 EAST
 EAST
 WEST

RESP. AGENCY

AZUSA
 AZUSA
 AZUSA
 WANL

TEST SCHEDULE (WEEKS)

	7-18	7-25	8-1	8-8	8-15	8-22	8-29	9-5	9-12	9-19	9-26	10-3	10-10	10-24
TEST SPECIFICATION —	△													
SHIP —	△													
INSTALLATION —			△											
PRE-IRRADIATION TEST —				△										
TEST —					△									
PREL. REPORT —												△		

TEST FACILITY GTR

TEST DATE 12 SEPT 1964 TEST NO. 21

TEST ITEM DESCRIPTION

TEST NO.

LOCATION

RESP. AGENCY

STRUCTURAL MATERIALS
STRUCTURAL MATERIALS

37/A003
37/W003

N,E & W
N,E & W

AZUSA
WANL

SPECIAL SERVICES

1. THREE LH₂ DEWARS

TEST SCHEDULE (WEEKS)

	8-15	8-22	8-29	9-5	9-12	9-19	9-26	10-3	10-10	10-17	10-24	10-31	11-7	11-14
TEST SPECIFICATION	△													
SHIP	△													
INSTALLATION			△											
PRE-IRRADIATION TEST				△										
TEST					△									
PREL. REPORT													△	