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**Test Plan for Structural Proof and
Evaluation Test - Seal Test Vessel**

11 December 1963

MASTER

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**Contract SNP-1
LRP NERVA Rocket Operations**

The work specified in this document is being performed as part of the engineering complex of sub-subtask 1.4.3, Pressure Vessel.

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Document Approval Signatures

Document Prepared by:

Dept.

Date

J N Locke

8200

12/12/63

Thrust Systems
NERVA Rocket Operations
Liquid Rocket Plant

Approval Signatures:

for C R Snyder, Supervisor

8200

12-12-63

Thrust Systems
NERVA Rocket Operations
Liquid Rocket Plant

G S Kaveney, Manager

8200

12-12-63

Thrust Systems
NERVA Rocket Operations
Liquid Rocket Plant

L K Severud, Supervisor

9745

12-13-63

Structural Design
Liquid Rocket Plant

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I. INTRODUCTION

This document describes the general test specifications for a structural proof test of the seal test vessel.

The test will consist of hydrostatically pressurizing the vessel assembly, consisting of a mockup cylinder and closure at ambient temperature. The test pressure value is classified but is the same value as supplied in Memorandum 8207:317M⁽¹⁾ and used for the proof testing of aluminum pressure vessels per Report No. 9443-63-12⁽²⁾.

II. OBJECTIVE

The objectives of this test are to demonstrate that the seal test vessel is capable of withstanding ambient temperature proof pressure and to measure flange rotation and displacement.

III. HARDWARE

The seal test vessel assembly consists of a forward closure P/N 298252 attached to a mockup cylinder P/N 29695; both components are made from 6061 aluminum forgings heat treated to the T6 condition. The closure and mockup cylinder are joined together using 120 high strength A-286 bolts P/N 286664 with 120 SPSW39969WC 22-10 washers. One set of bolts and washers with spares will be furnished to the testing facility. The testing facility will procure all "O" ring seals and plugs and supply all tooling and equipment with which to assemble, fill and pressurize the test assembly.

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- (1) Memorandum 8207:317M, GS Kaveney to RB Ringer, subj: "Test Pressure for Aluminum Pressure Vessel Acceptance Proof Test", dtd 23 July 1963 (C).
- (2) Report No. 9443-63-12, Test Plan for Vendor Aluminum Pressure Vessel Acceptance Proof Test

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IV. TEST SPECIFICATIONS

A. Component Inspection

The vessel cylinder and closure will be dimensionally measured before and after the test as shown in Figures 4 and 5; actual dimensions and part temperatures are to be recorded.

B. Assembly

Fastening procedures for the closure to cylinder bolted joint will be as follows: Led Plate 250 prepared by Armite Laboratories* will be used to lubricate the thread inserts in the cylinder flange and under the bolt heads. Caution is to be taken to keep mating surfaces free of lubricant and foreign matter. The tightening of the bolts will be accomplished in diametrically opposite pairs alternating 90° in increments of approximately 25% of the full torque value of 180-200 ft-lbs. A suggested test setup is presented in Figure 1.

C. Instrumentation

Deflection measurement through the use of dial indicators will be the prime source of data. A minimum number of strain gages placed at strategic locations for monitoring purposes will be used. Deflection measurements will be made to indicate deflection and rotation of the bolted joint during pressurization. Locations for instrumentation will be in accordance with Figures No. 2 and 3. The deflection measurements will

* Address: 1845 Randolph, Los Angeles, California, phone:
LU 7-7744.

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be taken at two circumferential locations 180° apart. Strain gages will be biaxial and located at one circumferential location on inside and outside surfaces at each gage location.

The type of pressure transducers, strain gages, and data recording equipment will be selected by the testing facility.

D. Test

Prior to the test, a quality control inspector shall inspect the pressure gage to insure that proper calibration has been accomplished within 30 days prior to the test. Pressure shall be continuously measured during pressurization. An authorized Aerojet representative shall witness the test.

After filling the test assembly with oil* the testing facility shall insure proper bleeding of all air. The test assembly shall then be pressurized and depressurized at a rate of 200 psig per minute maximum to the selected maximum pressure, holding for data recordings at 20% of maximum pressure increments while pressurizing and 20% increments when depressurizing. Appropriate control is to be maintained to prevent an increase in pressure above the maximum test value. This cycle is to be repeated two times to provide assurance of repeatable data.

* Water may be used if there is no compromise in strain gage instrumentation.

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V. REPORTING

A. Data Acquisition

The following measurements will be made:

1. Pressure vs time.
2. Strain vs pressure.
3. Deflection vs pressure.

B. Data Reduction

1. Pressure-time profiles for each cycle.
2. Strain-pressure plots for each gage location and each cycle.
3. Deflection-pressure plots for each deflection gage for each cycle.

C. Test Data Report

A test data report shall be submitted to Department 8200, AGC within twenty working days following test completion and shall include the following:

1. A test engineer's report including deviations from the test plan, problems encountered and recommendations.
2. A test log with primary emphasis on actual events during the test.
3. Data requested for each cycle of the test.
4. Test setup photographs.
5. A description of equipment and instrumentation.
6. The location of instrumentation as placed.
7. An evaluation of data reliability and accuracy.

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VI. SECURITY

Due to the classification of the test pressure, the record shall refer to percentages of ambient proof pressure. The classified memorandum specifying the ambient proof pressure shall be referenced on each record.

FIGURE 1 Suggested Test Setup

Seal all ports and joints with "O" rings.

Figure 2

Joint Separation and Rotation Deflection Locations

Radial Deflection Instrumentation Locations

Figure 3 Biaxial Strain Gage Instrumentation Locations

Figure 4 Cylinder Critical Dimensions

Figure 5 Closure Critical Interface Dimensions

Reference Drawing: 298252