

B-1 STATUS REPORT

Approximately one year ago, the decision was made to convert the B-1 facility into a simulated nuclear rocket engine test stand in support of the "Nerva" Program. The essential items of equipment needed to conduct tests are a liquid hydrogen tank, turbo pump assembly, nozzle and inactive reactor package. The tests objectives are to study the start-up transients of a pump fed nuclear rocket engine to include cool-down and turbo pump "bootstrapping". It is also planned to conduct limited pump mapping.

Since the initial decision to convert the facility, extensive work has been done in determining modifications required to accommodate the new program. The bulk of the design work was completed approximately one month ago which included process piping, electrical, structural modification, and exhaust system modification. Almost all major contracts have been let to date. Present scheduling calls for facility checkout in mid January 1963. It appears that some of the major tasks which could delay this date are:

- a. Procurement and Fabrication of nozzle components
- b. Fabrication and instruction of reactor package instrumentation, and:
- c. Availability of the Mark 9 turbo pump assembly. According to present best estimates, this could result in a delay of as much as 5 months.

PLUM BROOK ROCKET SYSTEMS DIVISION

STATUS REPORT

for the month of

APRIL 1963

SITE	LABORATORY	RESEARCH INSTALLATION (FOR)	DESCRIPTION
B-1	HIGH ENERGY ROCKET ENGINE RESEARCH FAC	<u>NERVA</u> A2G, A2F, A6B (Henneberry)	<p>NERVA engine propellant feed system tests. The investigation will include turbo pump "boot strapping" tests, fluid instabilities in the engine flow passages and equipment performance evaluations.</p> <p>STATUS: The reactor and nozzle, and Rocketdyne turbopump were delivered to the test stand on April 11 and April 24, 1963 respectively. The research installation piping, instrumentation, and electrical work has commenced and is scheduled for completion on June 15, 1963.</p> <p>The steam system and ejectors have been operationally checked and work is in progress to correct deficiencies uncovered during this checkout. Specifically work is underway in the following areas; (a) Pressure Regulation - The existing unit was found to be unreliable in automatic mode. Design has started on a new control system using electro-hydraulics. This problem will not result in a delay as the present system can be operated on a manual basis. (b) S. M. Smith Rotovalves - These shut off valves upstream of the pressure regulating station have malfunctioned and would require new actuator cylinders. Review of operational procedures indicates that there is no necessity for these valves and they are consequently being replaced with spool pieces. (c) Preheat System - Based on experience during check out it is advisable to relocate the preheat line to the 24" high pressure header. Work is underway. (d) John Zink Flares - The flares have been extinguished during steam flow. A representative of the company has observed this problem and has recommended installation of a gas compressor to boost inlet pressure with a possibility of some modifications being required on the overhead lines. Gas compressor installation is scheduled for completion on June 3, 1963. (e) Limitorque Operators - These valve operators on the accumulator shut off valves have caused considerable</p> <p>(B-1 STATUS Continued on next page)</p>

SECTION II

PLUM BROOK ROCKET SYSTEMS DIVISION

STATUS REPORT

OCTOBER 1963

SITE	LABORATORY	RESEARCH INSTALLATIONS (FOR)	DESCRIPTION
B-1	HIGH ENERGY ROCKET ENGINE RESEARCH FAC.	<u>NERVA</u> OT0250 (H.M.Henneberry)	<p>NERVA engine propellant feed system tests. The investigation will include turbopump "bootstrapping" tests, fluid instabilities in the engine flow passages and equipment performance evaluations.</p> <p><u>STATUS:</u> Eight data runs were made during the month of October. Tests were made with helium gas, at maximum flow rates of approximately 3 lb./sec. No movement of the reactor core modules was evident.</p> <p>Accelerations as high as 40 g's were measured on the nozzle during these tests. An investigation to determine the cause of these accelerations is currently underway.</p> <p>Following the completion of the gas test on October 25, 1963, all instrumentation was removed from the reactor and nozzle. Also, at this time, all other pressure transducers were disconnected. The following work must be done prior to liquid runs:</p> <ol style="list-style-type: none">1. All pressure transducers will be checked, recalibrated cleaned and reinstalled.2. All pressure channels will be checked.3. All thermocouples on the reactor and nozzle will be reconnected and checked.4. All pressure balance panels will be modified.