MA001-A50-2H
JULY 1, 1965

IX. 3

RL-10
Test stands.

SPACE
FLIGHT
CENTER
HUNTSVILLE, ALABAMA

Incomplete document
RL-10

LAUNCH VEHICLE ENGINES

PROJECT DEVELOPMENT PLAN

JULY 1, 1965

National Aeronautics and Space Administration

3. J-2 Engine. The primary mission objective of the J-2 Engine Project is to continue development of a liquid oxygen/liquid hydrogen engine, capable of high-altitude restart. Both Saturn IB and Saturn V vehicles will use the J-2 engine; the S-IVB stage of Saturn IB vehicles and S-IVB stage of Saturn V vehicles will be equipped with a single J-2 engine. The S-II stage of Saturn V vehicles will use a cluster of five J-2 engines. Figure 1-3 illustrates these stages.

4. RL10 Engine. The primary mission objective of the RL10 Engine Project is to continue development and vehicle flight support of a liquid oxygen/liquid hydrogen engine for the Atlas Centaur vehicle. The S-IV stage of Saturn I vehicles also used these engines. RL10A-1 models were used in early Centaur stages and in Saturn S-IV stage ground tests. The common engine model, RL10A-3 applies to Saturn I flight vehicles SA-5 through SA-10, and to research and development Centaur stages. Operational model RL10A3-1 and RL10A3-3 will be used in operational Centaur stages. See figure 1-4 for these applications.

5. Space Engines.

a. S-IVB ullage engine. The primary mission objective of the S-IVB Ullage Engine Project is to insure the operational capabilities of the Gemini engine when exposed to conditions that are unique to the Saturn V, S-IVB auxiliary propulsion system.

b. C-1 Engine. Mission objective of the C-1 Engine Project is to provide a 100-pound thrust engine capable of meeting collective requirements of the following applications:

- Re-entry Control for the Apollo Command Module.
- Ullage settling for the Saturn V/S-IVB stage.
- Reaction control for the Saturn IB and V/S-IVB stage.
- Reaction control for the Apollo Service Module.
- Reaction control for the Apollo Lunar Excursion Module.
- Extended mission requirements of Reaction Control System on AAP flights.

Figure 1-2. H-1 Engine Application

Test stand Delta-2 is a dual facility consisting of positions 2A and 2B. Both positions have a run duration capability of 500 seconds. Delta-2B was completed in November 1963, while Delta-2A was completed in December 1963. The facility is for sea-level testing in support of development and production acceptance testing.

Engine component testing is performed in the following Santa Susana facilities: CTL-1, CTL-2, CTL-3, and CTL-4. Each of the test areas has several test cells used for component development.

Additional engine systems testing is planned at USAF Arnold Engineering Development Center after test cell modification. Modification of the test cell J-4, which will include installing the S-IVB battleship stage, is scheduled for completion by March 1966. This testing will verify J-2 engine environmental capability for the Saturn launch vehicle, and will include engine restart modes.

4. RL10 Engine. The RL10 project engineering and manufacturing activities and the research and development activities are performed at Pratt & Whitney's Florida Research and Development Center (FRDC), West Palm Beach, Florida.

With the exception of minor modifications, existing facilities, including test stands outlined below, are considered adequate to support the continued RL10 development plan.

a. P&WA test stands. Test stand E-1 through E-7, B-3 and B-6 are located at the FRDC. Test stands E-1 through E-7 are illustrated by figure 9-12; all stands are horizontal single engine development stands with the exception of E-5, which is a dual engine vertical test stand and E-6 and E-7, which are single engine vertical test stands.

b. Related test stands. Horizontal engine system test stands are located at NASA George C. Marshall Space Flight Center, Huntsville, Alabama, and at NASA Lewis Research Center, Cleveland, Ohio. Two-engine cluster test stands for Centaur stage applications are located at Point Loma, California, Edwards AFB, California, and at Sycamore Canyon, California. A six-engine cluster test stand for Saturn I, S-IV stage applications is located at the Douglas Aircraft facilities, Sacramento, California.

D. LOGISTICS SUPPORT PLAN

1. General. The primary goal of the engine logistics support program is to insure that support of the Saturn/Apollo operations is planned, accomplished, and managed as an integrated whole to

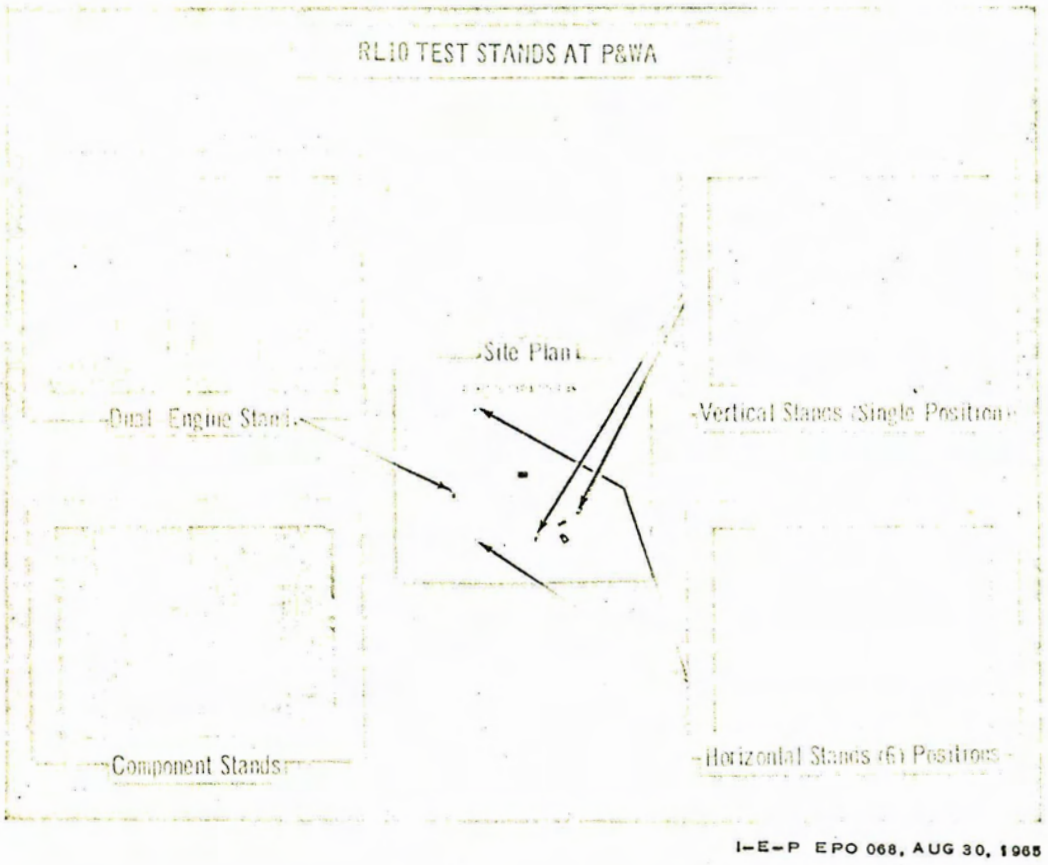

Figure 9-8. RL10 Engine Typical Test Facilities at Pratt & Whitney