# RL10A-4

Pratt & Whitney Rocketdyne

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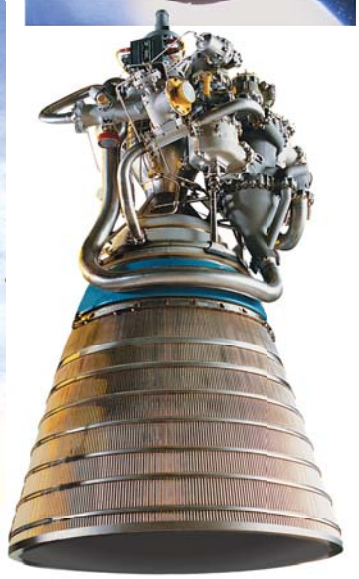
# RL10A-4
## Propulsion System



Pratt & Whitney Rocketdyne's (PWR's) RL10 rocket engine has proven itself, over nearly one-half century of successful operational service, as one of the most reliable, safe and high-performing upper-stage rocket engines in the world. Conceived in 1959 from the company's breakthrough in the harnessing of high-energy liquid hydrogen as fuel for aerospace propulsion, the RL10 went on to amass an impressive list of accomplishments, one of the most remarkable in the history of space propulsion.

The RL10 helped place numerous military, government and commercial satellites into orbit, in addition to powering space probe missions to nearly every planet in our solar system. Some of its notable interplanetary missions include the Helios A and B solar probes, Surveyor lunar landers, Viking Mars landers and Voyager flights that performed fly-bys of Jupiter, Saturn, Uranus and Neptune, and the Cassini Saturn Orbit. The RL10 has also supported the missions of MILSTAR, EUTELSAT, TDRS, ECHOSTAR, INTELSAT, GALAXY, DSCSIII and JCSAT satellites.

Today, the RL10A-4 continues its legacy as the "workhorse" of the launch industry by currently powering the Centaur upper stage of the United Launch Alliance Atlas V launch vehicle. Derived from the very core of the legendary RL10 that built a reputation as NASA's most reliable upper-stage engine, the RL10A-4 is an unparalleled propulsion system evolved from PWR's heritage of dependable rocket engines.

**RL10 Engine Milestones**

| | |
|---|---|
| 1959 | First RL10 test firing |
| 1963 | First successful Atlas Centaur flight, two RL10s power upper stage |
| 1964 | Saturn S-4 launch, six RL10s power upper stage into orbit |
| 1966 | Atlas Centaur launch, two RL10s power upper stage, propels Surveyor spacecraft towards lunar landing (Mission paves the way for future Apollo astronaut landings) |
| 1993 | First DC-X "Delta Clipper" flight, four RL10A-5s power vehicle |
| 1999 | First successful Delta III flight, one RL10B-2 powers upper stage |
| 2002 | First Atlas V flight, two RL10A-4-2s power upper stage |
| | First Delta IV flight, one RL10B-2 powers upper stage |
| 2003 | 500th production RL10 delivered |
| 2008 | RL10 marks 45 years of service |

**RL10A-4 Characteristics**

| | |
|---|---|
| Thrust: | 22,300 lb |
| Weight: | 370 lb |
| Fuel: | Liquid hydrogen |
| Oxidizer: | Liquid oxygen |
| Mixture ratio: | 5.5:1 |
| Specific impulse: | 451.0 sec |

PRATT & WHITNEY ROCKETDYNE, a United Technologies company with sites throughout the United States, is dedicated to providing advanced, reliable, and cost-effective propulsion systems for spacecraft and missile propulsion systems and service.

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www.pw.utc.com

Contact: Christine Cooley
Director, RL10 Programs
Telephone: 561-796-5233
christine.cooley@pwr.utc.com

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