Aerojet Rocketdyne

RL10

PROPULSION SYSTEM

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More than half a century of powering space exploration and national security

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For more than fifty years, Aerojet Rocketdyne's RL10 engine has played a vital role in placing hundreds of military, government and commercial satellites into Earth's orbit, and has helped send spacecraft to explore every planet in our solar system, including Voyager 1 and Voyager 2, the first two spacecraft to reach interstellar space.

Today, several models of the RL10 carry the engine's legacy forward as the launch industry's "workhorse" by powering the upper stages of United Launch Alliance's Atlas V and Delta IV launch vehicles. Additionally, a new model of the RL10 has been selected to provide upper stage propulsion for the Vulcan rocket that is being developed by United Launch Alliance.

RL10 engines also are slated to help power NASA's Space Launch System (SLS) rocket that is in development to lift astronauts to deep-space destinations aboard the Orion spacecraft. A single RL10 will power the Interim Cryogenic Propulsion Stage during the first un-crewed test flight of SLS and Orion, known as Exploration Mission-1. Four RL10 engines will support the more powerful Exploration Upper Stage that is being developed for future versions of SLS.

Aerojet Rocketdyne is also working to qualify a modern version of the engine known as the RL10C-X that will include major components built using 3-D printing technology. Incorporating 3-D printing into the manufacturing process will reduce lead times and cost while maintaining the outstanding performance and reliability customers have come to expect.

Program Milestones

1959 First RL10 test

1963 First successful Atlas Centaur flight (two RL10 engines powered upper stage)

1964 Saturn S-4 Launch (six RL10 engines powered upper stage)

1993 First DC-X "Delta Clipper" flight (four RL10A-5 engines powered vehicle)

2002 First Atlas V flight (two RL10A-4-2 engines powered Centaur upper stage)

2009 400th RL10 engine flight

2010 Demonstrated deep-throttling from 104 percent of rated power down to 5.9 percent (an unprecedented thrust range of 17.6:1)

2013 RL10 marks 50 years of service

2014 First flight of RL10C-1

Specifications

Launch Vehicle	**Atlas V**	**Delta IV**	**Atlas V**	**Atlas V, Vulcan**	**SLS EUS**
RL10 Model	**RL10A-4-2**	**RL10B-2 RL10C-2-1**	**RL10C-1**	**RL10C-1-1**	**RL10C-3**
Thrust:	22,300 lbf	24,750 lbf	22,890 lbf	23,825 lbf	24,340 lbf
Weight:	370 lbs	664 lbs	420 lbs	415 lbs	508 lbs
Fuel:	Liquid hydrogen	Liquid hydrogen	Liquid hydrogen	Liquid hydrogen	Liquid hydrogen
Oxidizer:	Liquid oxygen	Liquid oxygen	Liquid oxygen	Liquid oxygen	Liquid oxygen
Nominal Mixture Ratio:	5.5:1	5.88:1	5.5:1	5.5:1	5.7:1
Specific Impulse:	451.0 sec	465.5 sec	449.7 sec	453.8 sec	460.1 sec
Length:	90"	86.5" (stowed)	86"	96.7"	124.3"
	–	163.5" (deployed)	–	–	–
Nozzle Diameter:	46"	84.5"	57"	62"	73"

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