AEROJET ROCKETDYNE
An L3Harris Technologies Company

BIPROPELLANT ROCKET ENGINES

Enabling In-Space Operations and Exploration

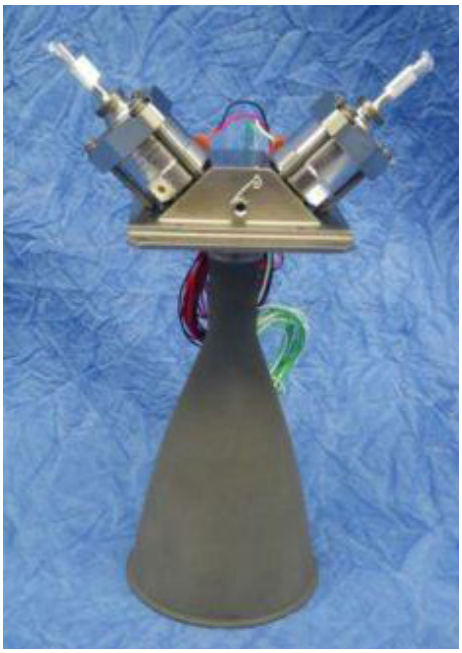
ENGINE	THRUST	SPECIFIC IMPULSE	TOTAL IMPULSE	TOTAL PULSES	MINUMUM PULSE BIT	MASS
AJ10-220	59.2-65.4 N	285 sec (lbf/lbm) (Steady firing) 268 sec (lbf/lbm) (Pulse Mode)	680,000 N-s	65,000+	4.0 N-sec	1.95 kg
R-1E	111 N	280 sec (lbf/lbm)	11,120,000 N-sec	30,000	0.89 N-sec	2 kg
R-4D-11	378-511 N	164:1 = 311 sec (lbf/lbm) 300:1= 315.5 sec (lbf/lbm)	20,016,000 N-sec	31,950	15.6 N-sec	164:1= 3.76 kg 300:1= 4.31 kg
R-4D-15	378-511 N	320.6 sec (60 sec run) 322.2 sec (1200+ sec run)	13,019,945 N-sec	391	35.6 N-sec	300:1= 5.2 kg 375:1= 5.44 kg
R-4D-15 (Dual Mode)	329-556 N	320.6 sec (60 sec run) 322.2 sec (1200+ sec run)	9.55 X 10^6 N-sec	672	35.6 N-sec	300:1= 5.2 kg 375:1= 5.44 kg
R-42	890 N	305 sec (lbf/lbm)	24,271,000 N-sec	–	44.48 N-sec	4.53 kg
R-6F	22 N	305 sec (lbf/lbm)	>89,700 N-sec	>19,881	0.53 N-sec	0.965 kg
R-42DM	890 N	27 sec (lbf/lbm)	>20,000,000 N-sec	>60	44.48 N-sec	7.3 kg
R-40B	4,000 N	293 sec (lbf/lbm)	92,073,600 N-sec	50,000	111 N-sec	10.5 kg
AR-40	6,000 N	316 sec (lbf/lbm)	1,440 MN-sec	–	–	118 kg

KEY FEATURES

Bipropellant engines are used on various spacecraft for a wide variety of missions including geosynchronous-orbiting satellites, International Space Station servicing vehicles, and interplanetary exploration to assist with orbit insertion, delta V, and reaction control.

Beginning with the Apollo missions to the Moon, Aerojet Rocketdyne has delivered more than 2,500 bipropellant rocket engines for in-space propulsion use. Aerojet Rocketdyne has bipropellant in-space rocket engines ranging in thrust level from 2.5-lbf thrust to 6,000-lbf thrust.

Bipropellant engines produce thrust when two propellant valves open and liquid fuel (typically monomethyl hydrazine, or hydrazine) and liquid oxidizer (nitrogen tetroxide) hypergolically ignite in the chamber. The resulting hot gas exits the nozzle, creating thrust.



R-4D ENGINE FAMILY

Aerojet Rocketdyne's R-4D engines – a family of 100 pound thrust bipropellant thrusters – that was originally developed for the Apollo missions and was key to the rescue of the Apollo 13 crew. Since then, the R-4D has evolved into the world's highest reliability apogee insertion engine available today. R-4D engines have flown over 300 apogee-insertion missions, with a 100 percent success rate.

Bipropellant Rocket Engines

AEROJET ROCKETDYNE
An L3Harris Technologies Company

1025 W. NASA Boulevard
Melbourne, FL 32919