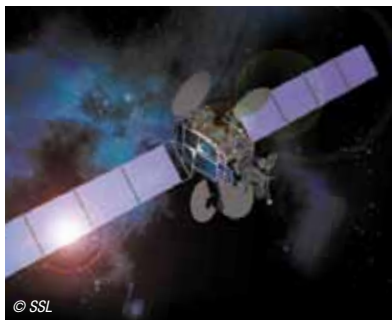


Bipropellant Attitude Control System (ACS) Thrusters

Moog – ISP is a world leader in Bipropellant attitude control propulsion for commercial and defense satellites for an international customer base. Our DST family of 5 lbf thrusters combines a high performance injector design with a high temperature Platinum/Rhodium chamber to provide industry leading performance in both steady state and pulse mode operation. We also supply our heritage 5 lbf and 2 lbf thrusters, which have been providing reliable attitude control for more than twenty years. Moog - ISP's ACS engines have been the industry standard for nearly 30 years with more than 2,000 delivered.



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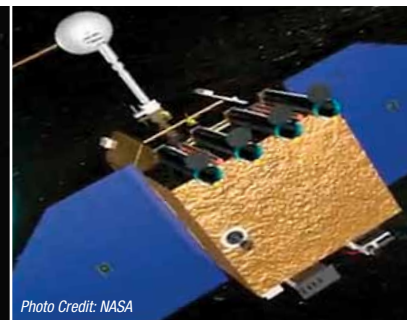

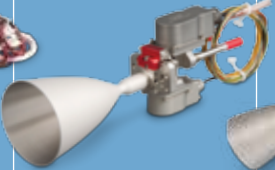
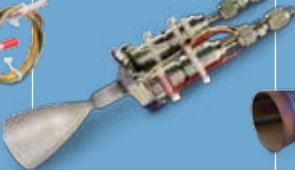
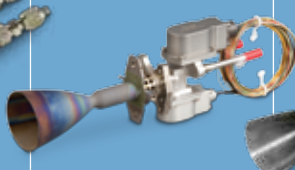



Photo Credit: NASA

Bipropellant Thrusters

Performance Characteristics					
Design					
Propellant	Hydrazine/MON	MMH/MON	MMH/MON	MMH/MON	MMH/MON
Nominal Steady State Thrust	5 lbf (22N)	5 lbf (22N)	5 lbf (22N)	5 lbf (22N)	2 lbf (9N)
Feed Pressure	80 – 400 psia (5.5 – 27.6 bar)	60 – 400 psia (4.1 - 27.6 bar)	80 – 400 psia (5.5 - 27.6 bar)	39 - 320 psia (2.8 - 22.1 bar)	120 – 286 psia (8.3 – 19.7 bar)
Nozzle Expansion	300:1	300:1	300:1	150:1/300:1	350:1
Nominal Mixture Ratio	0.85	1.61	1.65	1.61/1.65	1.65
Valve	Solenoid	Latching Torque Motor	Solenoid	Latching Torque Motor or Solenoid	Solenoid
Valve Power	41 watts max (2 coils wired in series)	6 watts max (Latch) 7 watts max (primary) 9 watts max (secondary)	41 watts max (2 coils wired in series)	6 watts max (Latch) 7 watts max (primary) 9 watts max (secondary) (Torque Motor) 15.6 watts max (solenoid)	27 watts
Mass	1.7 lbm (0.77 kg)	1.4 lbm (0.64 kg)	1.5 lbm (0.68 kg)	1.4 – 2.0 lbm (0.64 – 0.91 kg)	1.7 lbm (0.78 kg)
Length	10.3 in (262 mm)	9.6 in (244 mm)	10.4 in (264 mm)	9.7-13.5 in (248 - 343 mm)	10.6 in (270 mm)
Chamber Material	Platinum/Rhodium Alloy	Platinum/Rhodium Alloy	Platinum/Rhodium Alloy	C-103	C-103
Performance	DST-11H	DST-12	DST-13	5 lbf	LTT
Specific Impulse	310 secs	302 secs	298 secs	288 secs/292 secs	274 secs
Throughput	907 kg (2000 lbm)	1073 kg (2365 lbm)	637 kg (1404 lbm)	484 kg (1068 lbm)	432 kg (953 lbm)
Programs	Intelsat, BepiColombo, Wild Geese, Tenacious, GOES-R	AsiaSat 5, Telstar, Himawari, Turksat	NASA SDO	ETS-8, QZSS, Superbird-7, ST-2, WGS, Intelsat	WGS, Intelsat, TDRS
Highlights	DST-11H provides highest performance available in a hydrazine/MON ACS Thruster	DST-12/13 Provides highest performance available in MMH/MON ACS Thruster		Engine has been in production for more than 30 years, with > 2000 delivered and flown	For over 15 years the LTT has been produced and in that time over 500 engines have been delivered



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