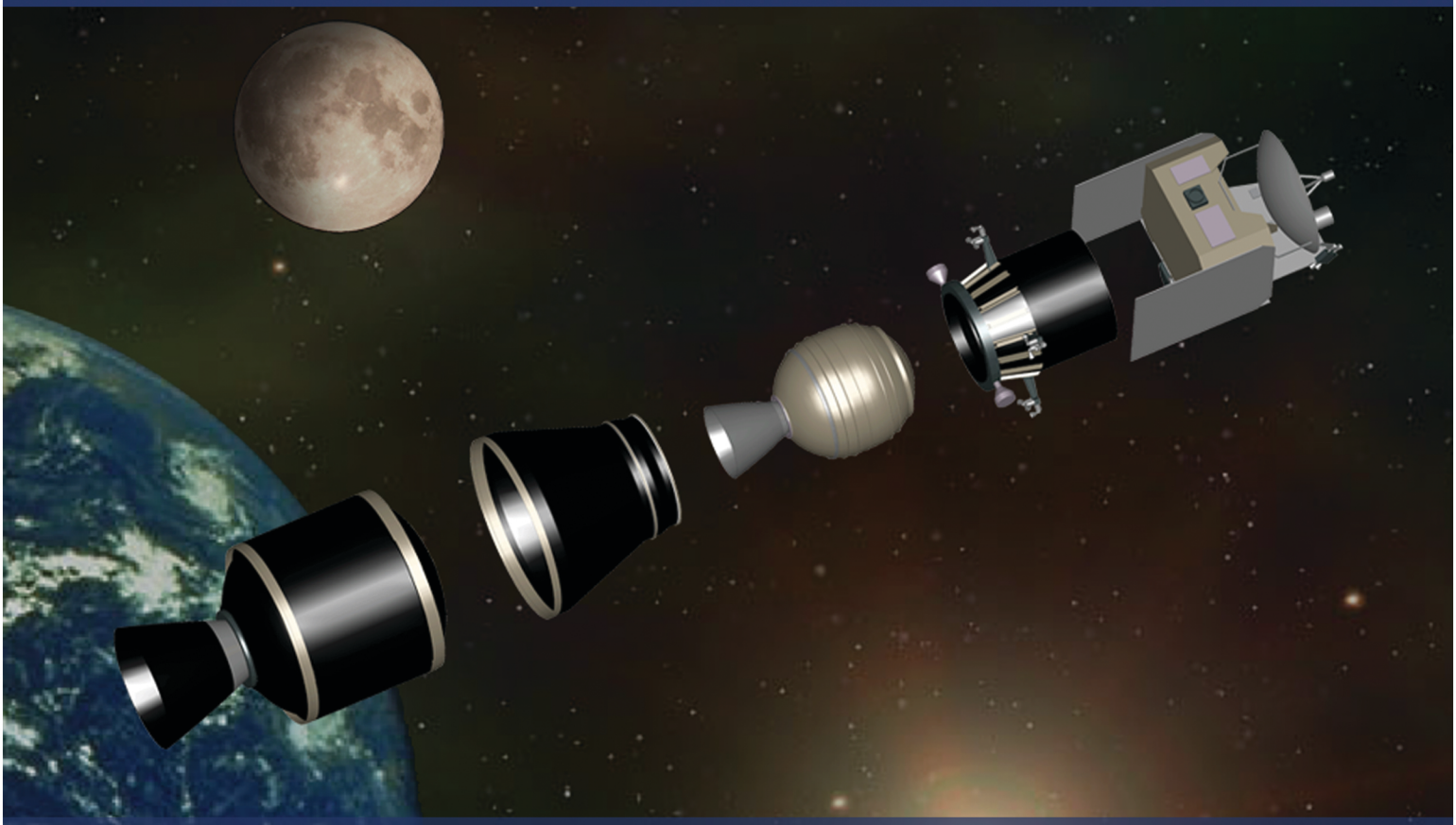
STAR™ Motors/Stages



Orbital ATK STAR™ Motors/Stages Provide High Reliability and Low Cost for Multiple Missions

- STAR™ motor upper stages can be customized to meet your mission requirements.
  - Apogee topping/kick motors for orbit insertion can save spacecraft fuel and energy for longer life.
  - Spin/despin and satellite deorbit options are available.
  - We can provide braking and sample return propulsion for planetary missions.

- The STAR™ motor family offers unmatched performance flexibility with a 100% success rate.
  - Reliability has been proven on more than 2440 flights using the current designs with a carbon/phenolic exit cone .

- STAR™ motors feature a flexible design with propellant offloading up to 20% without requalification.
  - Performance tailoring allows actual satellite and payload weights to be accommodated for maximum capability.

- Total 3-sigma impulse variation of ± 0.56% is well within mission parameters.

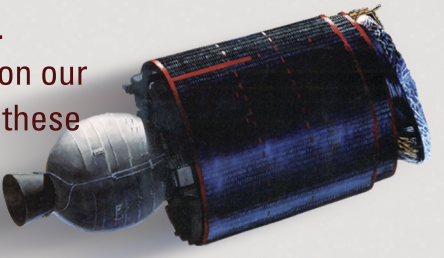
- Interfaces to multiple launch vehicles have been demonstrated.

- Combinations of STAR™ motors can accommodate both single or multiple payloads, placing payloads in either a single orbit plane or multiple orbit planes by use of ESPA rings.

- STAR™ motor upper stages are available with space-qualified hardware and software.
  - The forward adapter can incorporate the avionics, attitude control system, spacecraft interface, and separation system.
  - Aft interstage attach designs fit to the launch vehicle.

Orbital ATK STAR™ Motors/Stages Support Multiple Missions

- The STAR™ motor numerical designation is the diameter of the case, which ranges from 3 inches to 75 inches.
- Our motors span a significant range of impulse capability to suit the mission-specific needs.
- Ballistic performance can be tailored with increased propellant or offloading.
- The peak thrust/acceleration levels on the satellite can be limited by altering propellant formulations, grain geometry, operating pressure, or a combination of two or all three of these.
- The nozzle can also be modified to adjust the thrust profiles.
- Many more motor designs and specifications can be found on our OrbitalATK.com website; the table below has a selection of these designs and specifications and includes some of the key features of a selection of spin-stabilized and three-axis vectoable motors.



STAR™ Motor/Stage Features	STAR™ 5C	STAR™ 15G	STAR™ 24	STAR™ 27H	STAR™ 37GV	STAR™ 48BV
Total impulse, lb_f-sec	1,252	50,210	126,000	219,195	634,760	1,303,700
Effective specific impulse, lb_f-sec/lb_m	268.1	281.8	282.9	291.4	290	292
Maximum thrust, lb_f	455	2,800	4,420	5,250	15,250	17,490
Burn/action time, sec	2.8/2.94	33.3/36.4	29.6/31.1	46.3/47.3	49.0/50.2	84.1/85.2
Weight loaded, lb_m*	9.86	206.6	481	810.9	2,390	4,780
Propellant mass fraction	0.46	0.85	0.92	0.92	0.92	0.93
Diameter, in.	4.77	15.04	24.5	27.3	35.2	49
Length, in.	13.43	31.57	40.5	48.7	66.2	81.7
*Includes igniter propellant						

For information, contact: Orbital ATK Defense Systems Group
Missile Products Division
55 Thiokol Road
Elkton, Maryland 21921
Tel 410-392-1111

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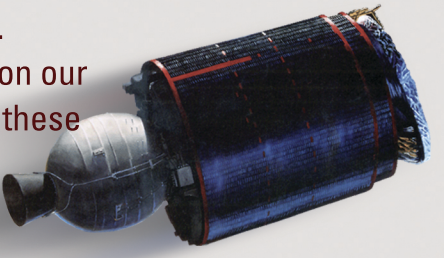

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