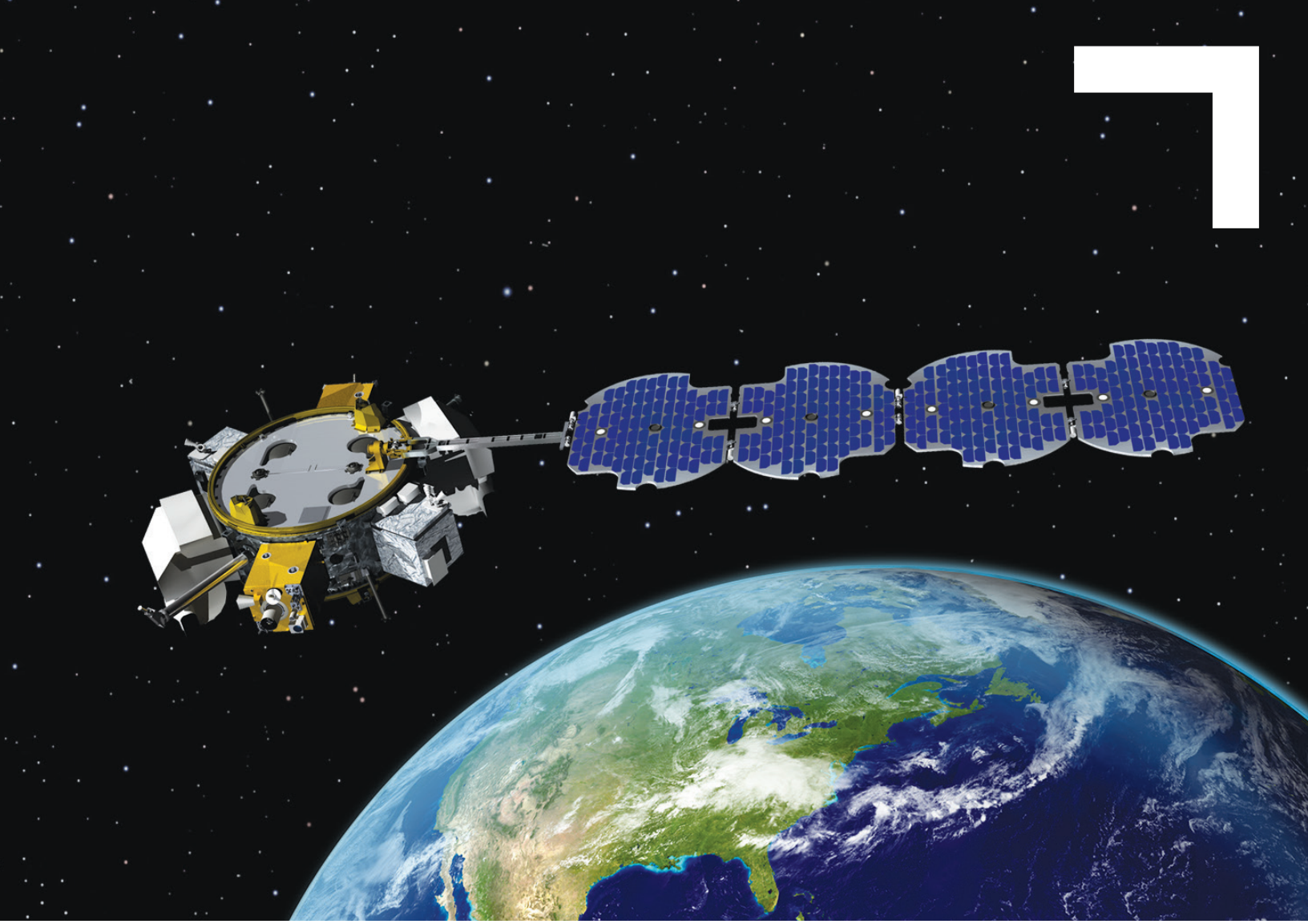


ESPASTAR™ PRODUCT LINE

Flexible, Affordable Access to Space

Northrop Grumman is excited to introduce the updated ESPAStar Product Line. Building on the success of the flight-proven ESPAStar platform, the five ESPAStar variants provide users the flexibility to meet unique mission requirements while maintaining the affordability and reliability of ESPAStar. The ESPAStar platform uses a customized EELV Secondary Payload Adapter (ESPA) ring as part of its structure and is capable of being launched aboard any launch vehicle that meets the Evolved Expendable Launch Vehicle (EELV) standard interface specification, or on the Northrop Grumman Space Systems Minotaur IV launch vehicle using the ESPAStar-SLV. The ESPAStar platform's standardized payload ports are capable of accommodating any combination of up to six hosted and 12 separable (fly-away) payloads.

PAST/LAUNCHED MISSIONS

EAGLE (ESPA AUGMENTED GEOSTATIONARY LABORATORY EXPERIMENT)

- Launched April 2018
- Successful demonstration

LDPE-1 (LONG DURATION PROPULSIVE ESPA)

- Launch December 2021
- Successful operations on orbit

ESPAStar-1

- Launched June 2022
- Successful operations on orbit

CURRENT MISSIONS

CONTRACT BACKLOG FOR ESPAStar-D MISSIONS = 10

CONTRACT BACKLOG FOR ESPAStar -HP MISSIONS = 1

ADVANTAGES

- Designed to maximize opportunities for launch
- Modular ESPA-based design provides mission flexibility
- Open and published standard payload interfaces
- Standardized product lines and processes reduces vehicle cost and streamlines integration processes
- Enables users to achieve mission goals on aggressive schedule and cost baselines
- Supports variety of payload sizes (ESPA/Nano/CubeSat)
- Stackable configurations

NORTHROP GRUMMAN

ESPASTAR™ PRODUCT LINE

	ESPAStar-D	ESPAStar-HP (High Power)	ESPAStar-SLV (Small Launch Vehicle)	ESPAStar-LT (LEO Tug)	ESPAStar-EP (Electric Propulsion)
					
Summary	• Propulsive ESPA satellite platform based on AFRL EAGLE design • Six ESPA payload slots with standardized I/Fs for combinations of hosted or separable payloads • GEO orbit baseline (GTO, MEO, and LEO capable) • Compatible with all ESPA-capable LVs • Ideally suited for 1-3 year missions	• Operational variant of ESPAStar product • Improved performance and reliability • High power options • Twelve ESPA payload slots with standardized I/Fs for combinations of hosted or separable payloads • Compatible with all ESPA-capable LVs • Supports > 5 year missions	• Low-cost ESPAStar designed for constellation deployment and short duration missions in LEO • Reduced payload services – two ring ports and aft/fwd panel space available for hosted and separable payloads • Compatible w/ Minotaur IV LV • Ideally suited for 1-3 year missions	• Low-cost LEO ESPAStar platform for constellation deployment • Fixed single panel solar array and reduced cost avionics • Compatible with all ESPA-capable LVs • Ideally suited for missions with ~1 year duration	• ESPAStar platform integrated with medium power electric propulsion module to provide high ΔV, LEO/MTO to GEO orbit raising • Uses UltraFlex-M™ BOL array power of 6.8 kW • Hydrazine propulsion for high Isp maneuvers • Supports > 5 year missions • Based on ESPAStar-HP variant
Key Performance Parameters					
ΔV:	400-800 m/sec	≥ 500 m/sec	235 m/sec	~ 400-800 m/sec	2,000 m/sec
Pointing Control:	< 50 µrad (1σ)	< 50 µrad (1σ)	< 50 µrad (1σ)	< 250 µrad (1σ)	< 50 µrad (1σ)
Payload Mass:	> 1,920 kg	> 1,920 kg	600 kg	> 1,920 kg	> 1,920 kg
Payload Power: (OAP)	> 800 W (EOL), 4 panel array	> 4 kW (EOL) allocation from 6.8 kW UltraFlex-M arrays	275 W (EOL), 2 panel array	> 25 W (EOL), 1-2 panel array for trickle charge	> 4 kW (EOL) allocation from 6.8 kW UltraFlex-M arrays

SERVICES OFFERED

MISSION ANALYSIS

- Optimized payload deployment/insertion

PAYLOAD INTEGRATION TO ESPAStar PLATFORM

- Interfaces detailed in industry available PPICD

TESTING AND VERIFICATION

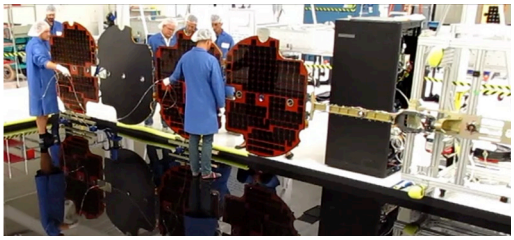
- Tailored options available

LAUNCH VEHICLE INTEGRATION

LAUNCH OPERATIONS SUPPORT

MISSION OPERATIONS

SAFETY AND MISSION ASSURANCE



FOR MORE INFORMATION

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