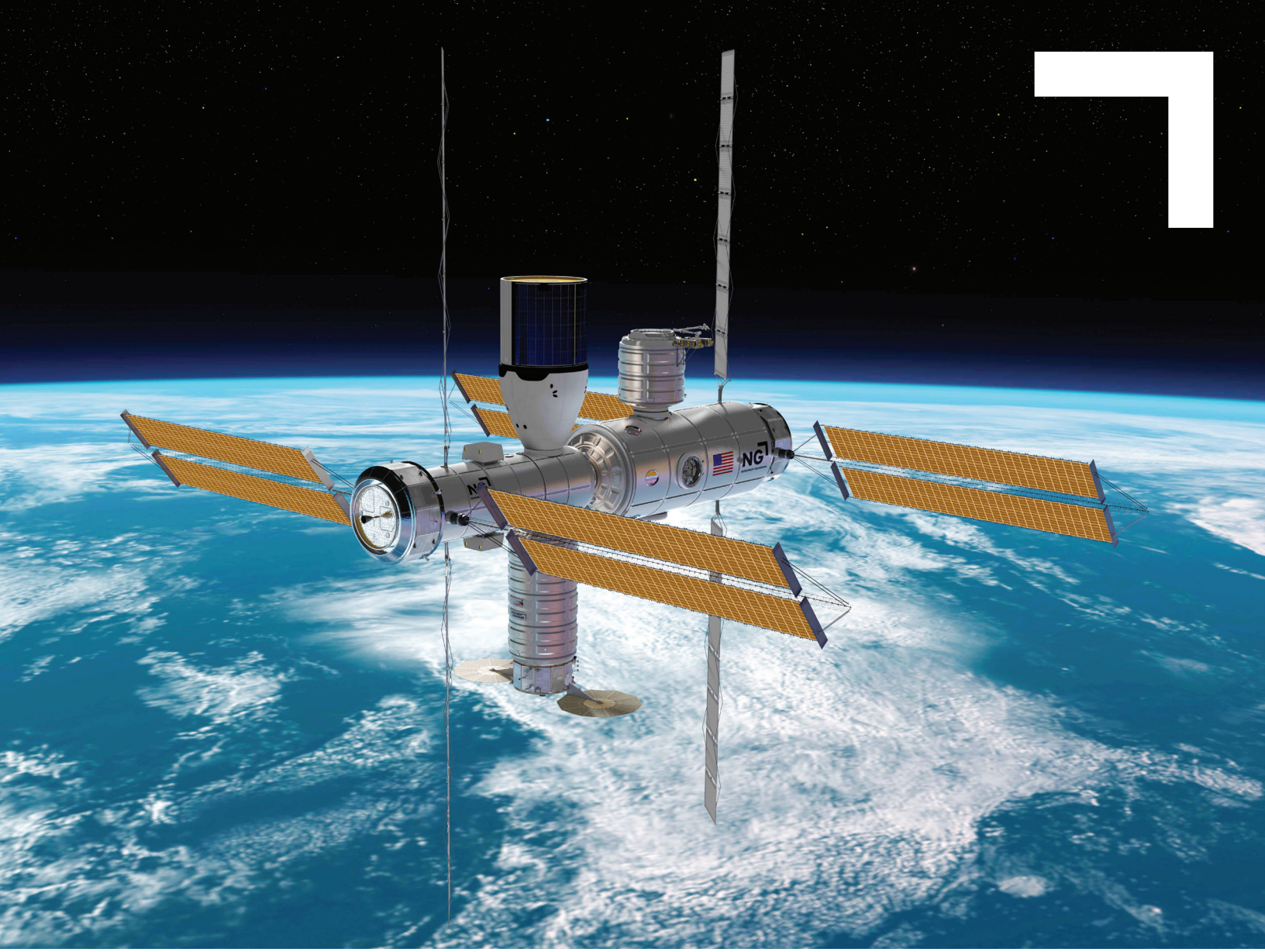

NORTHROP GRUMMAN COMMERCIAL SPACE STATION

Expanding the Commercial LEO Market

Under a NASA Space Act Agreement, Northrop Grumman's vision for a commercial free-flying space station in low Earth orbit (LEO) focuses on delivering a safe, reliable and cost-effective solution that will continue the work of the International Space Station (ISS), enabling a smooth transition to commercial operations. Northrop Grumman envisions an accessible marketplace, optimized and tailored to support a variety of customers across multiple markets.

Borrowing from its proven design and ongoing human spaceflight and space operations program, Northrop Grumman's commercial space station concept employs adaptable technology, centered on a modular design, to enable more affordable future civil and commercial missions. When paired with Northrop Grumman's deep heritage with commercial spacecraft, the result will be a cost-efficient, and dependable design that supports multiple markets with room for growth, well-suited to aid in the creation and sustainment of a vibrant LEO economy.

Building on Northrop Grumman's flight-proven commercial spacecraft, the commercial space station design leverages trusted technology from our Cygnus cargo resupply vehicle, our satellite-servicing Mission Extension and Mission Robotics Vehicles (MEV and MRV) and the in-production Habitation and Logistics Outpost (HALO). This approach allows Northrop Grumman to minimize initial costs, provide revenue to offset subsequent development and allow later capabilities to be incorporated based on market needs.

NORTHROP GRUMMAN

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In its first phase, Northrop Grumman's space station will support a crew of up to four astronauts. Future expansions will enable support of eight.

FEATURES & CAPABILITIES

Northrop Grumman's concept for a commercial space station in LEO expands on its demonstrated and ongoing technical expertise in human spaceflight to create an adaptable destination and marketplace in space that can be customized to support the evolving needs of this new economy.

Preliminary design capabilities and features include, but are not limited to:

- Crew capacity of up to four in initial configuration
- Crew capacity of up to eight in second stage configuration
- Up to six docking ports that allow for multiple visiting vehicles and future expansion of new capabilities:
- Full crew services, including food, clothing, facilities, transport, training and entertainment
- Payload services, including delivery, facilities, power and data/communication
- Science facilities, including glovebox, cold stowage and incubators to name a few.
- Tailored crew and payload training services
- Launch and recovery/return services
- External payload services that allow orientation of payloads with variety of boresights
- Regularly scheduled crew and cargo services with proven providers
- On-orbit power generation distributed at regulated 120V and 28V bus lines
- Data interface support for multiple digital-serial and ethernet interfaces
- Communication pathways from 300 Mbps to >1 Gbps downlink rate capability
- Vibration isolation to support microgravity science payloads
- Visual documentation services

WHAT WILL YOU DO IN LEO?

WORK AND LIVE IN SPACE: HABITATION SERVICES

Designed for long-duration presence in low Earth orbit, the station will have ample volume and payload capacity to support necessary crew facilities.

DISCOVER IN SPACE: SCIENCE AND RESEARCH SUPPORT

Science and technology facilities will be designed to augment research across a broad range of disciplines, including biology, human physiology, physical and materials sciences and Earth and space sciences, utilizing both internal and external payload platforms.

BUILD IN SPACE: IN-SPACE MANUFACTURING AND PRODUCTION

The station's long-duration microgravity environment will provide accessible volume, optimized for the production of materials and hardware.

VISIT SPACE: SPACE TOURISM

The trek to space will no longer be limited to a select few. Northrop Grumman's destination-centric station design will provide the essentials for an out-of-this-world experience in low Earth orbit.

SHARE SPACE: EDUCATE & ENTERTAIN

Northrop Grumman envisions the use of its space station as a platform for storytellers and teachers to inspire, engage and entertain the generations to come.

NORTHROP GRUMMAN ENABLING TECHNOLOGY

- **Cygnus:** With 18 missions completed since 2013, our Cygnus spacecraft has carried more than 112,000 lbs. of critical cargo and scientific experiments to the International Space Station.
- **Habitation and Logistics Outpost (HALO):** Northrop Grumman is NASA's contracted partner to build and integrate the first living quarters and workspace for the lunar Gateway.
- **Mission Extension and Mission Robotics Vehicles (MEV & MRV):** MEV is the industry's first and only operational satellite servicing vehicle to extend the life of existing assets in space. MRV will add robotic capabilities for mission extension, repair and augmentation.

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