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Northrop Grumman Space Station Overview

Northrop Grumman Station Overview

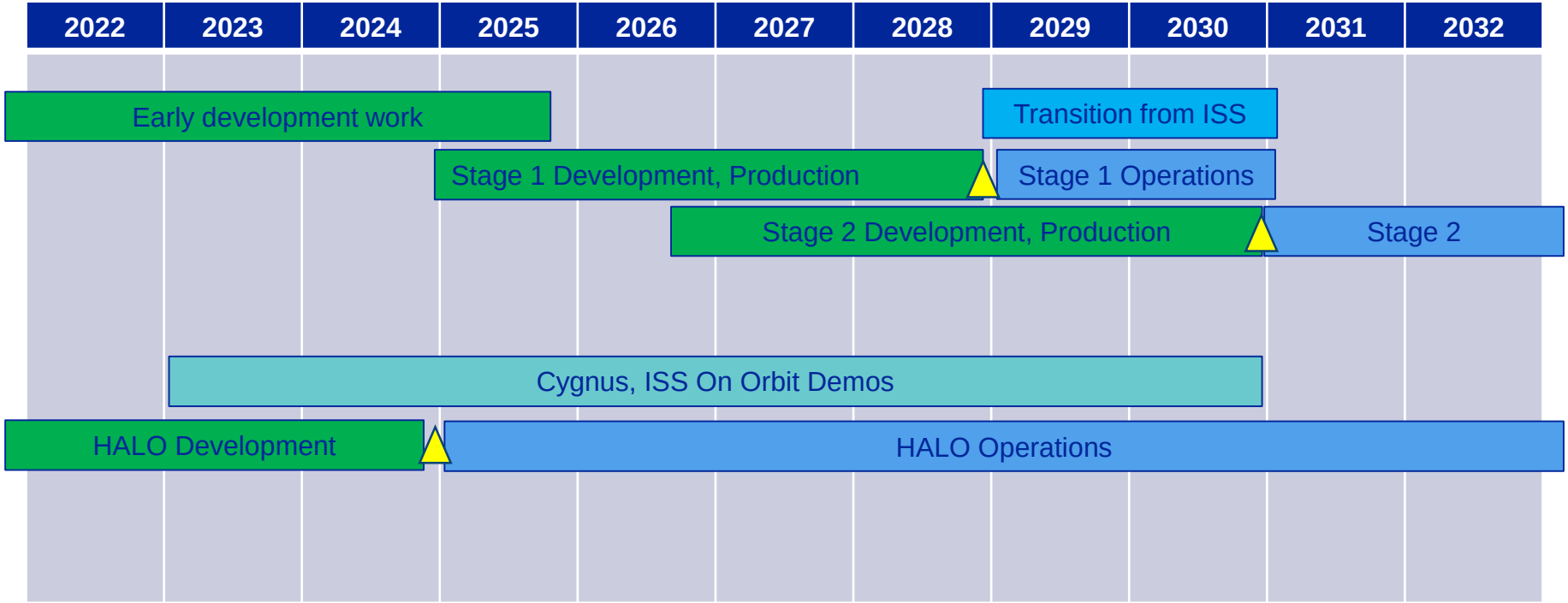
Commercial Space Station Services

- A free-flying Low Earth Orbit space station
- Safe, reliable, cost effective
- Accommodate continuous crew, internal, external payloads

Northrop Grumman provides a complete service operation

- Services available to current ISS partners, users as well as new customers
- Station Modules developed utilizing heritage hardware (Cygnus, HALO)
- Crew transport utilizing proven commercial crew providers
- Cargo, and payload transport utilizing proven Cygnus

Northrop Grumman Station Timeline



- Stage 1 launch in late 2028 to begin ISS transition
- Stage 2 launch in late 2030 near the end of ISS transition (dependent on market needs)

Northrop Grumman Station Advantages

- Utilizes existing operational hardware
  - Cygnus - ready to launch on its 17th mission
  - HALO - CDR in 2022, launch late 2024

- NG Station heritage Modules (Cygnus, HALO) are operational before competitors complete their preliminary designs
  - Greatly reduces risk to NG Station development
- Cygnus missions will be used to reduce additional risks through specific demos
- Highest technically rated provider by NASA in the recent CDFF competition

- Experienced ISS operational team
  - Currently sixteen+ missions over eight years
  - Likely thirty+ missions at Station deploy
  - Will offer similar reliability and access as ISS

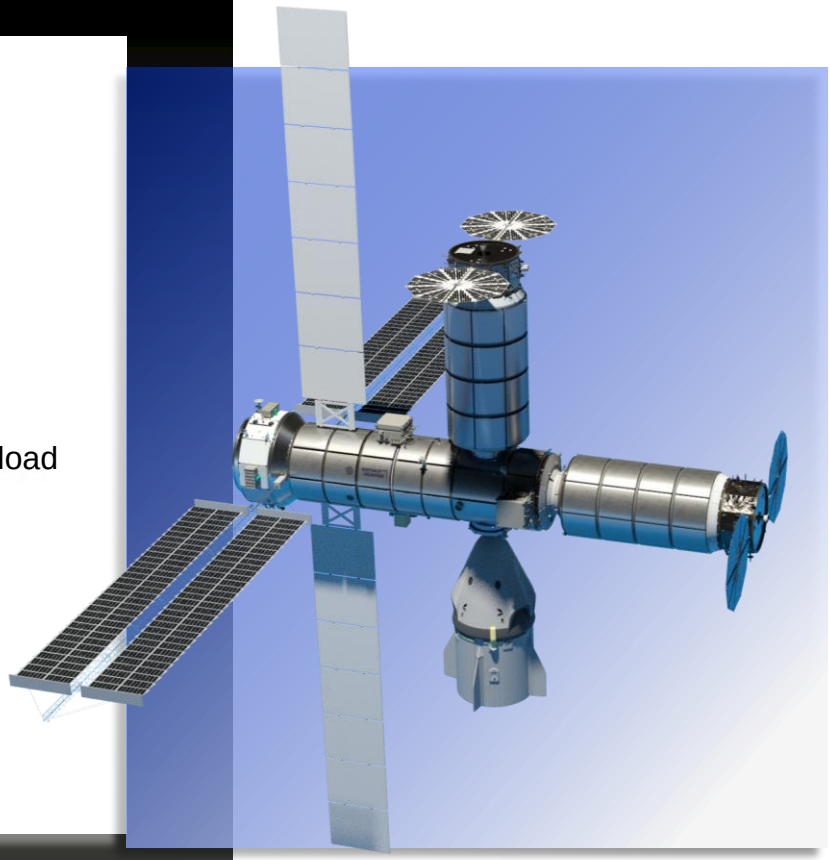
Stage 1 Services

Stage 1 includes

- Accommodations for up to four permanent crew
- Flexible frequency of crew rotation
- Crew accommodations include food, hygiene, medical, exercise, etc.

Payloads

- Able to accommodate internal pressurized payloads and facilities
  - Accommodate heritage payloads from ISS as well as future payload systems
- Able to accommodate external unpressurized payloads



Stage 1 Provides Permanent Crew Capability

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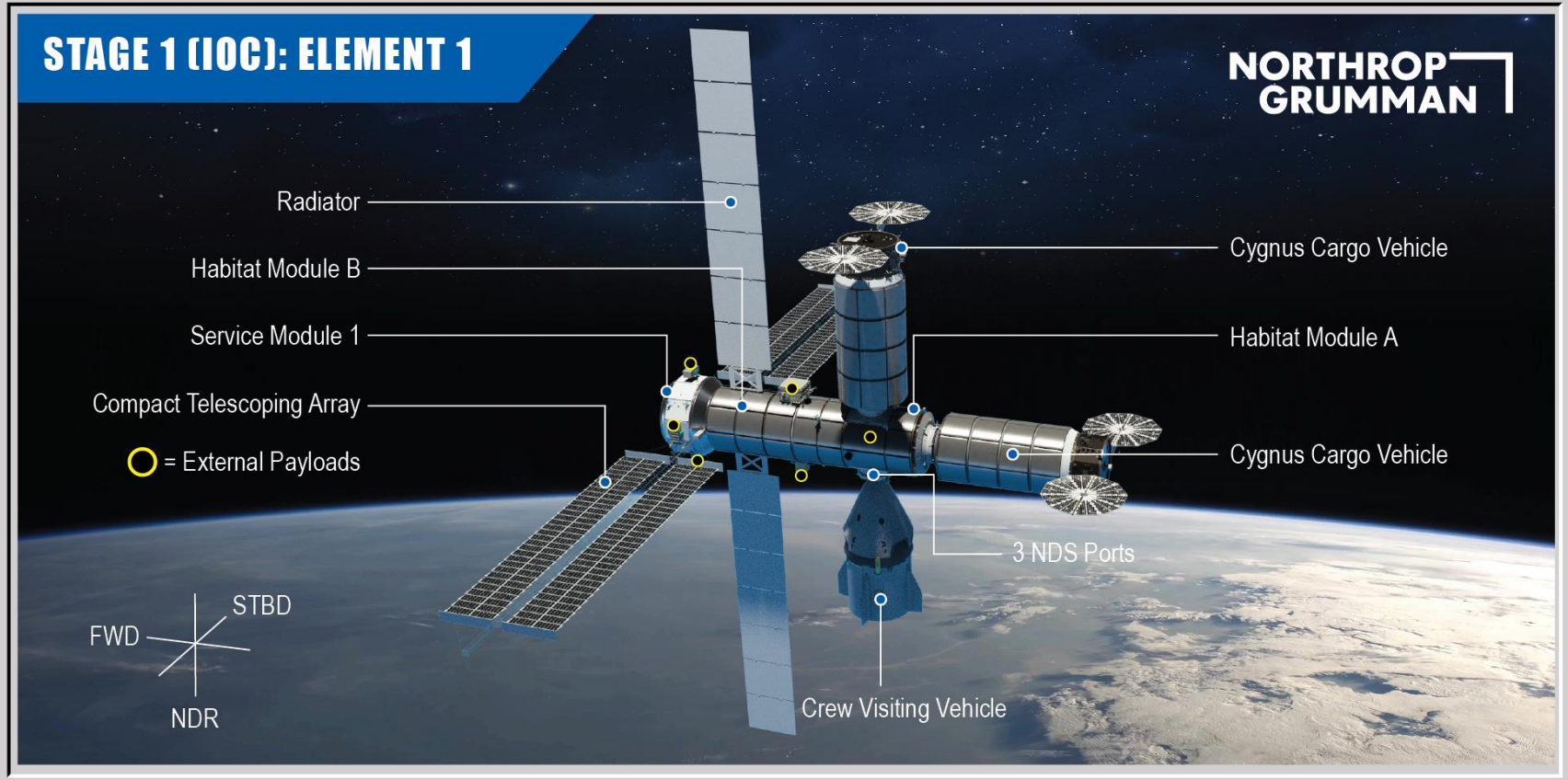


Stage 2 Services

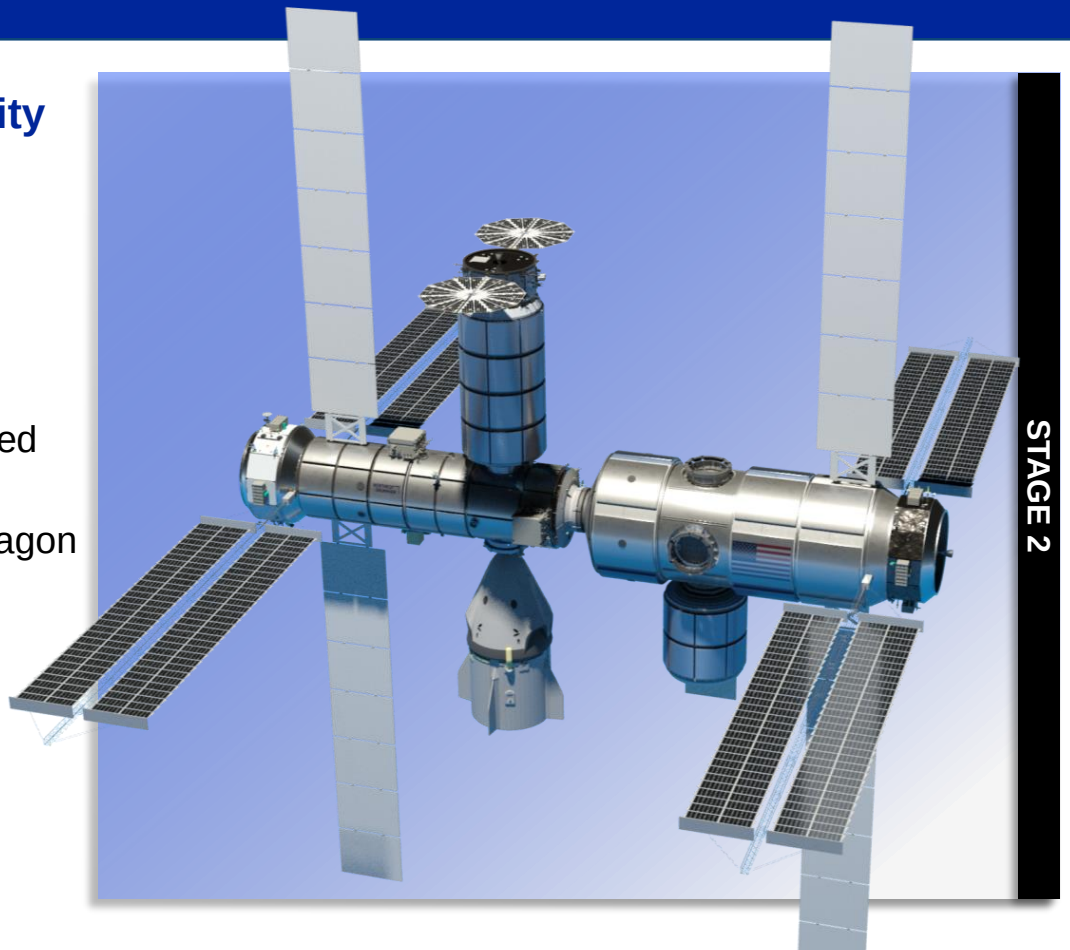
Increased Volume & Power capability

- Accommodates up to 8 crew members

Four ports for crewed and cargo visiting vehicles

- Cygnus provides cargo delivery, payload volume, trash removal, reboost, customized customer outfitting of PCM
- NG Station is compatible with SpaceX Dragon or Boeing CST 100 crewed capsules

Payload power increased



Future Elements & Capabilities

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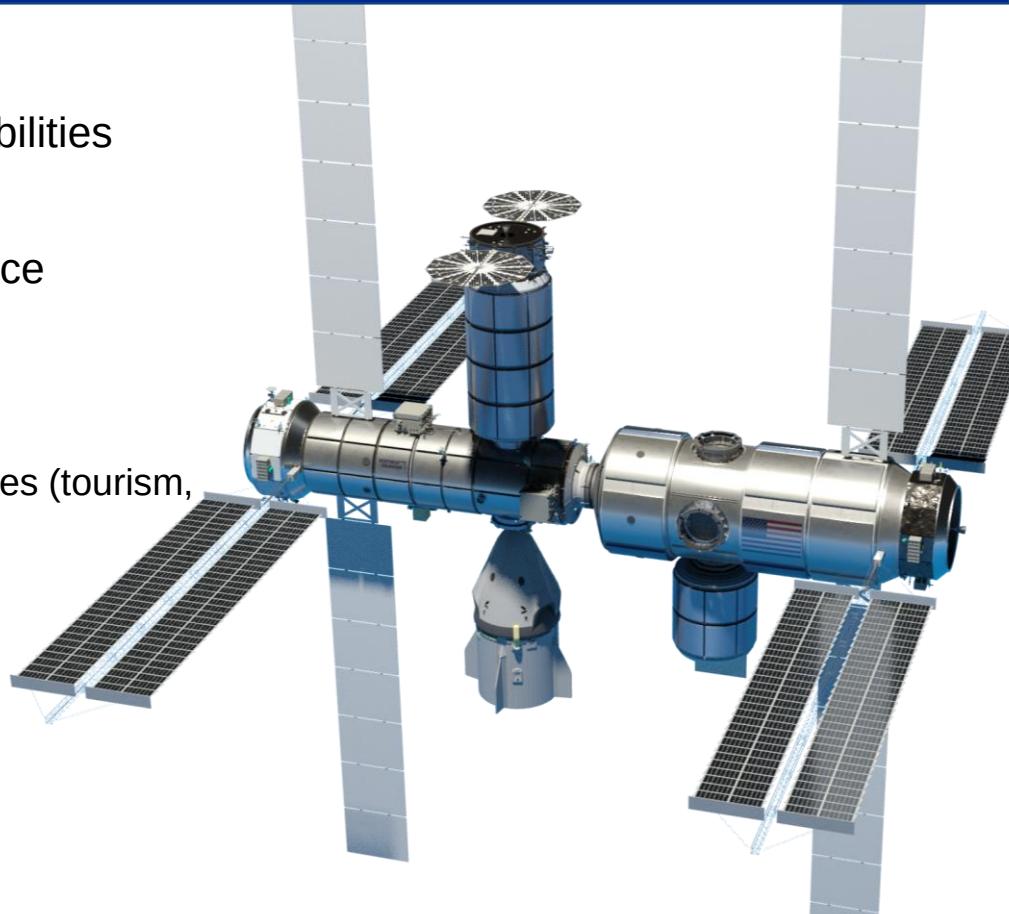
Planned

- Payload Airlock – Increased External Capabilities
- External Pallet
- Robotic Arm - Payload Transfer, Maintenance

Capability

- Addition of larger / specialized pressurized modules (tourism, deep space training, manufacturing)
- Crew EVA capable airlock
- Multiple robotic arms
- Additional docking ports



Stage 1 Station Services Offered

- Crew Member Transport includes
  - Crew transport to & from Space Station on proven crew transport
  - Crew associated cargo transport (clothing, food, gear, etc) on Cygnus cargo vehicles

- Crew On Orbit Services includes use of all crew facilities
  - Earth/space viewing stations (windows, workstations)
  - Communication, computer network, cameras
  - Exercise, food prep, personal hygiene stations
  - Emergency equipment, Medical

- Internal Payload and Science Services includes use of all payload facilities
  - ISS compatible racks with power, data
  - Specialized racks, payloads can be accommodated
  - Cargo stowage volume

- External Payload Services
  - External mounting locations available on station modules and Cygnus Visiting Vehicles
  - Future capability includes the exchange of external payloads through an airlock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