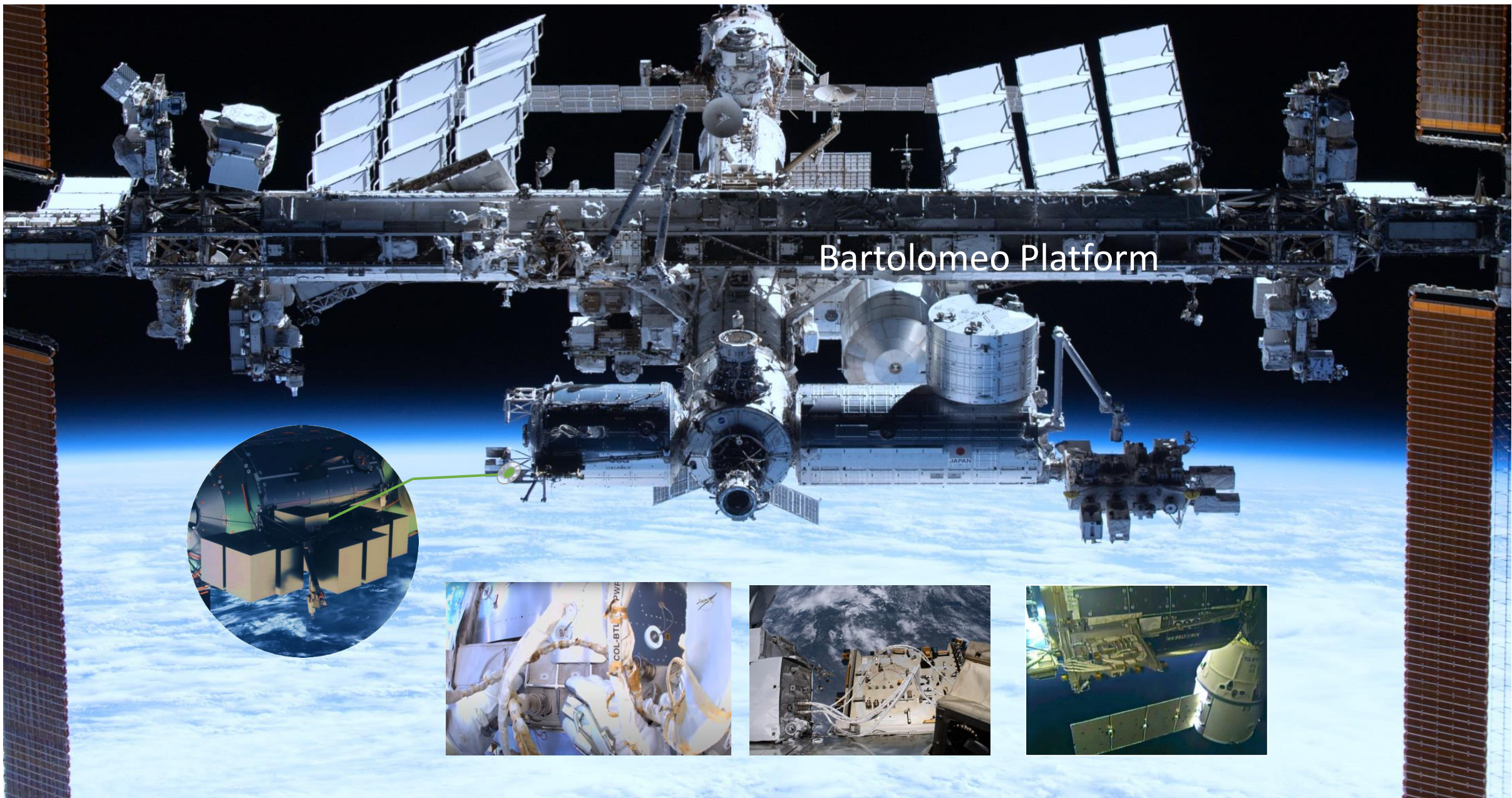


U.S. SPACE & DEFENSE

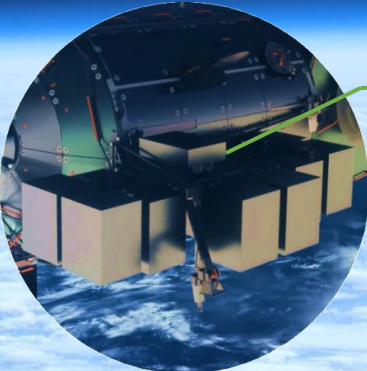
Seeing beyond the horizon

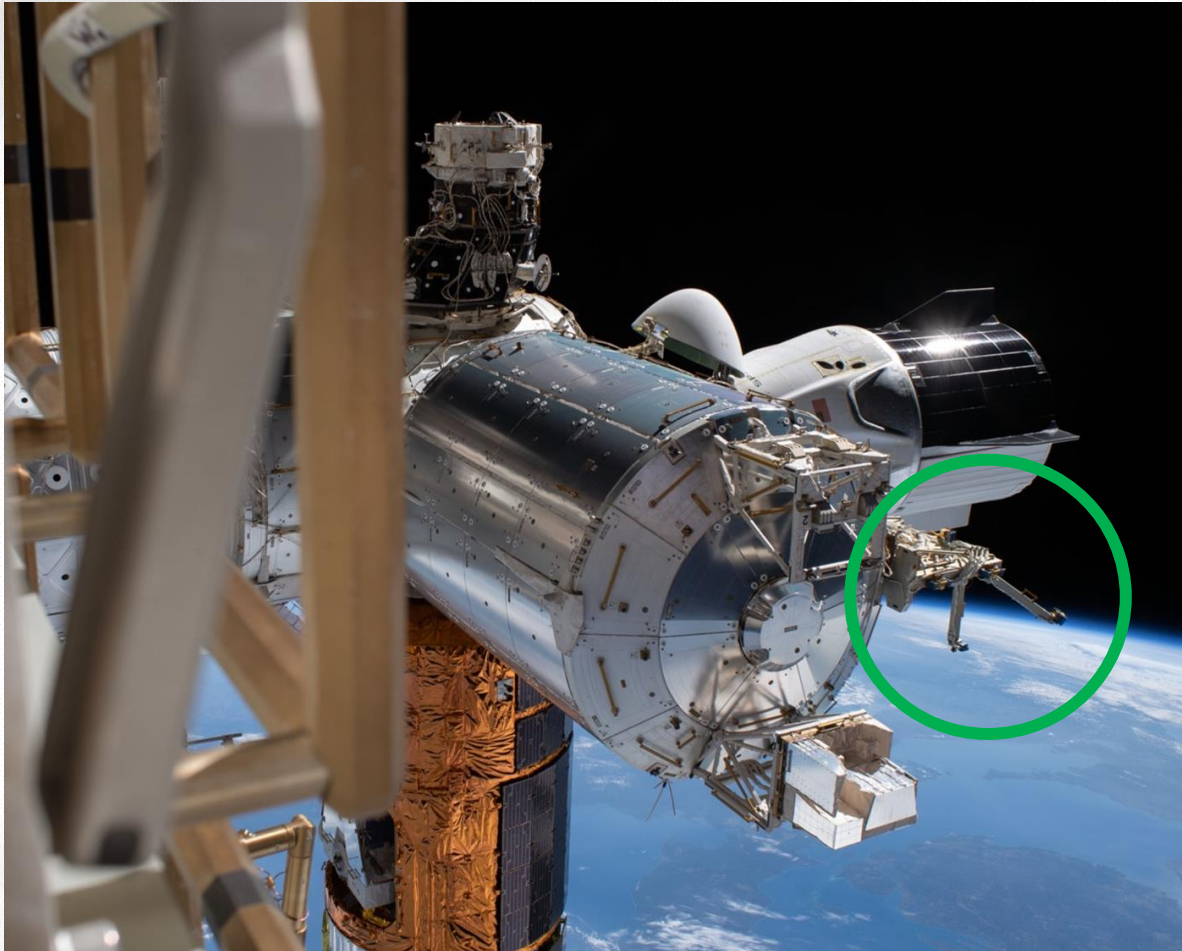
Bartolomeo External Payload & Science Hosting Facility – a cost effective commercial option for Science & Technology in LEO

Nov. 30, 2023



Bartolomeo Platform

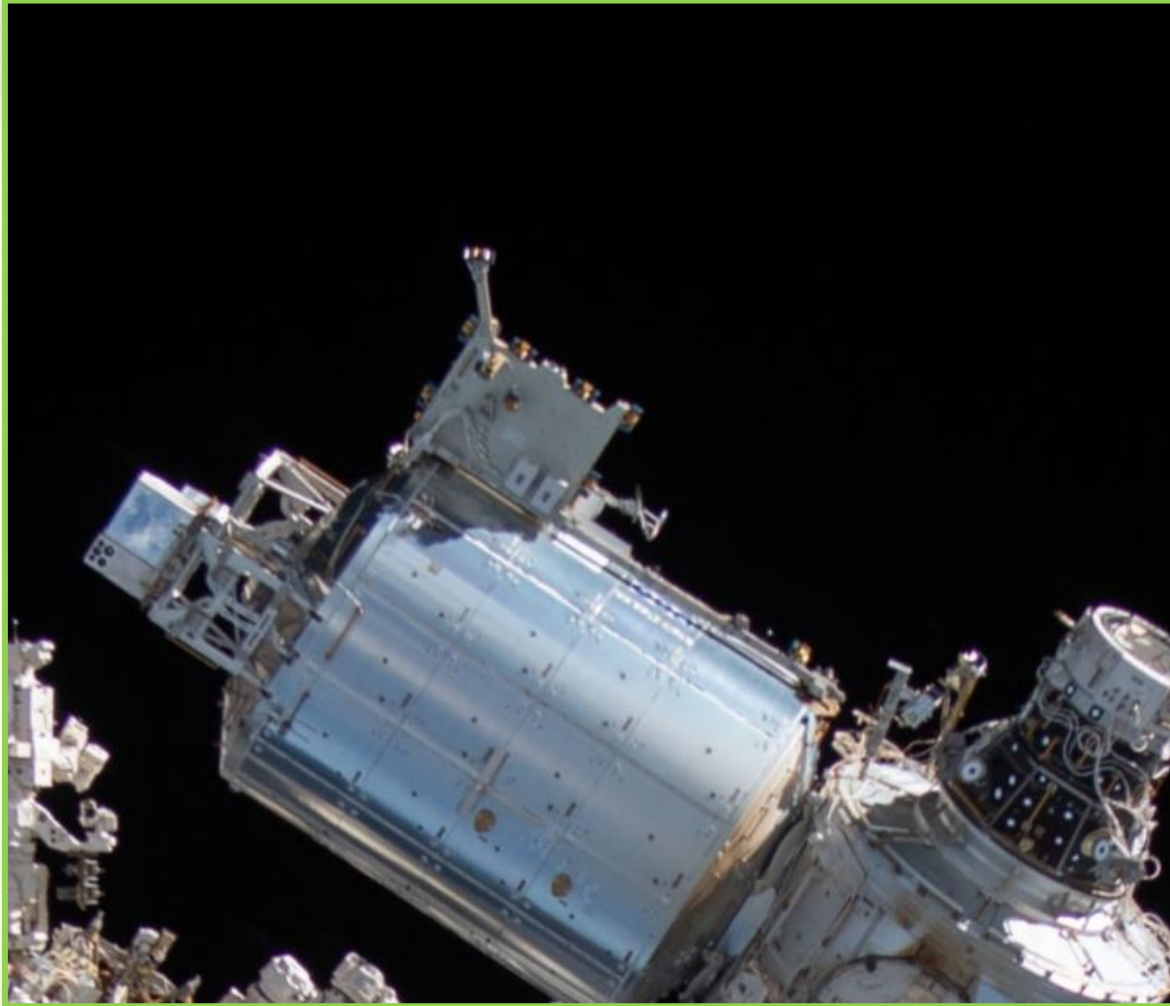




What is Bartolomeo?

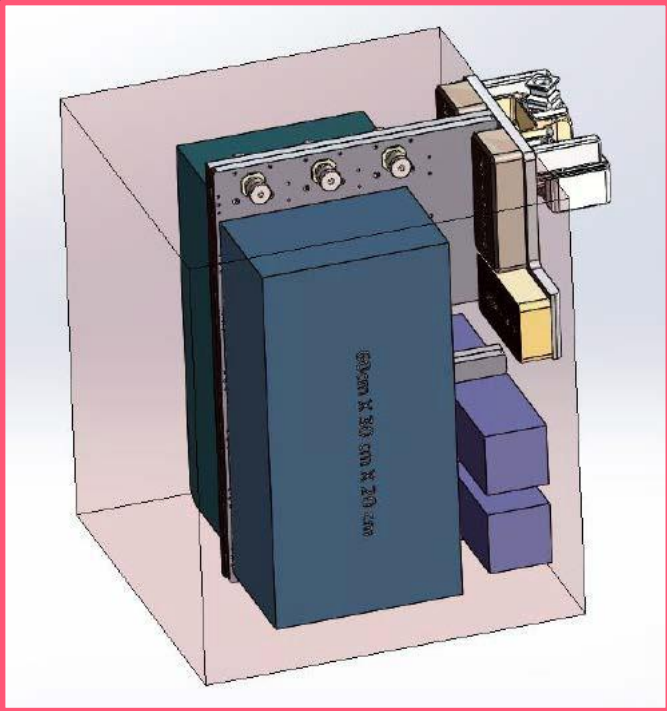
- Bartolomeo is a commercially funded External Payload Hosting Platform located on the leading edge of the Columbus module on the International Space Station (ISS)
- Bartolomeo provides expanded External Payload Hosting options and capabilities of the ISS
- Utilization of the platform is provided through the Bartolomeo All-In-One Space Mission Service via commercial B2B contract or via our NASA/Airbus IDIQ contract (80JSC020D0057)

Why Bartolomeo?



- Affordable, fast and easy access to Space
- Unprecedented hosting options & flexibility
- Ability to fly multiple payloads as single mission
- Reliable
- Scalability of missions
- Launch opportunities on all ISS Visiting Vehicles
- Easy, streamlined process
- Best viewing conditions on the ISS
- Return of payloads/ samples as an option

ArgUS Multi-Payload Adapter



Columbus
Module

Zenith



Nadir



Bartolomeo

Ram

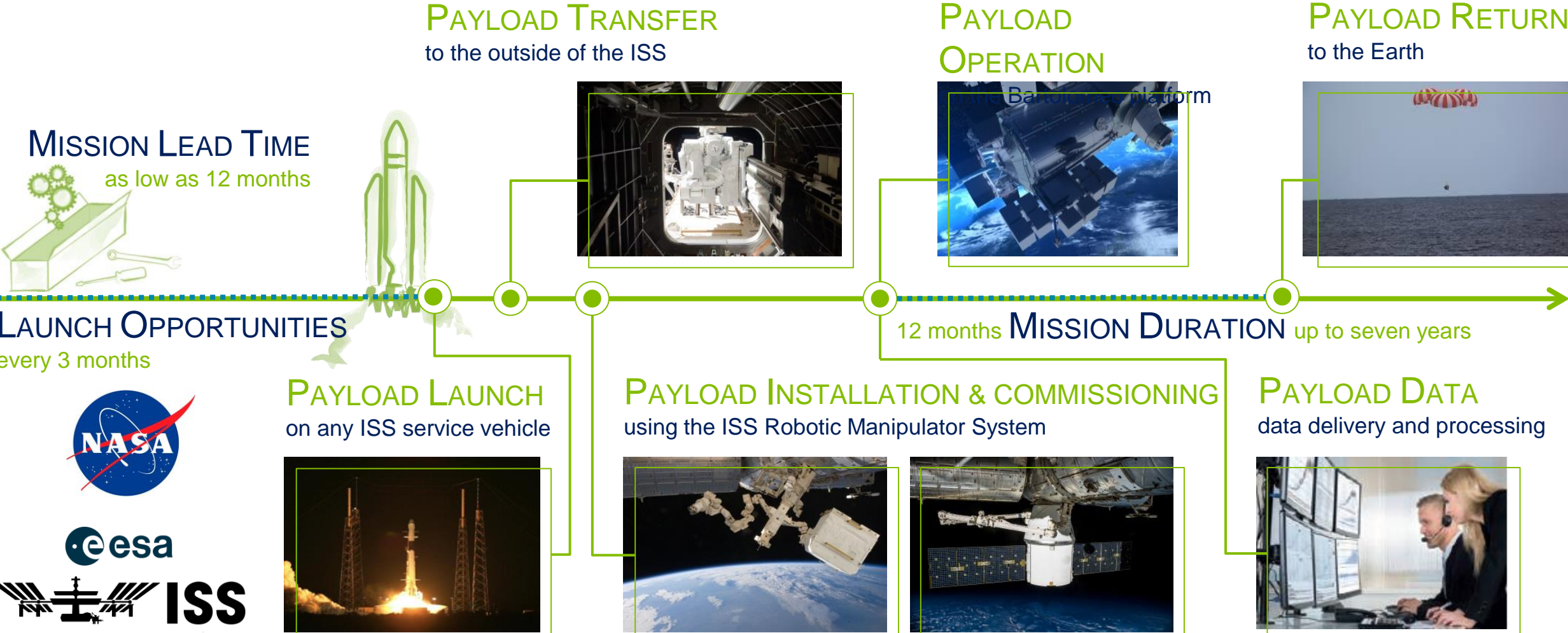
Optical Data Link

At a Glance

- Independent accommodation & operation of 8 - 12 external payloads on International Space Station
- Best Nadir, Zenith and Limb viewing conditions
- Good platform stability
- Payload volume from **1U to 1 m³**
- Payload mass up to **450 kg** including FSE
- Payload power **180 - 800 W** in standard configuration
- Heater power up to **100 W**, redundant
- Two-fault tolerant protection against inadvertent power activation, enabling operation of hazardous payloads in compliance with ISS Safety regulations
- Payload TM / TC and data provision with **10 Mbps** bandwidth available ~75% of orbit
- Ethernet-based VPN with recoverable file exchange, data provided on ground through Airbus secure cloud or customer-specific front end



The All-in-One Space Mission Service: All Required Mission Elements in One Single Commercial Contract



NASA

esa

ISS
U.S. NATIONAL LABORATORY
U.S. SPACE & DEFENSE

AIRBUS

Payload Accommodation

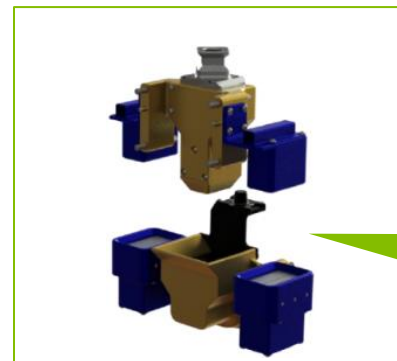
Flexibility to host payloads from 1U to 1m³

- 8 main payload sites
- 4 additional payload sites for daisy chain configuration
- Payload site sharing on ArgUS Multi-Payload Carrier for smaller payloads



Small payloads on ArgUS Multi-Payload Carrier

Could provide anyone with a dedicated ArgUS platform enabling up to 10 payloads to be flown as a single mission



All payloads connect via standardized GOLD-2 interface

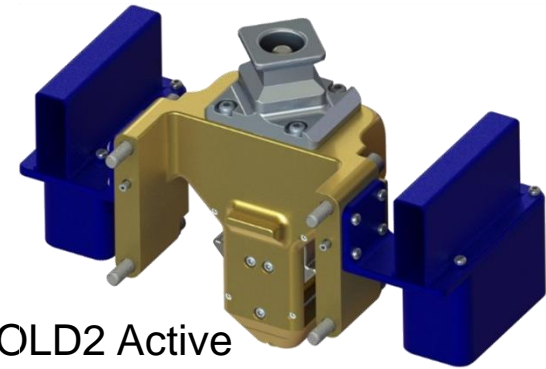
Standard Payload Interface

General-purpose Oceaneering Latching Device 2 (GOLD2)

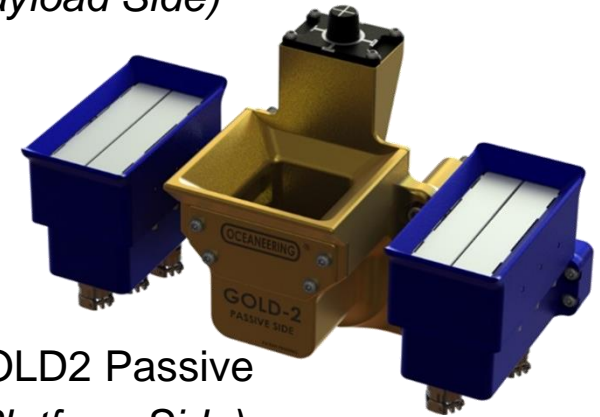
- Provides structural, electrical and data interfaces
- Enables robotic payload installation and removal
- Fully flight / safety certified by NASA ISS Program

- Interface is restricted to 450 kg payload mass
- Further restriction apply regarding the payload center of gravity position and volume, originating from the on-orbit load requirements

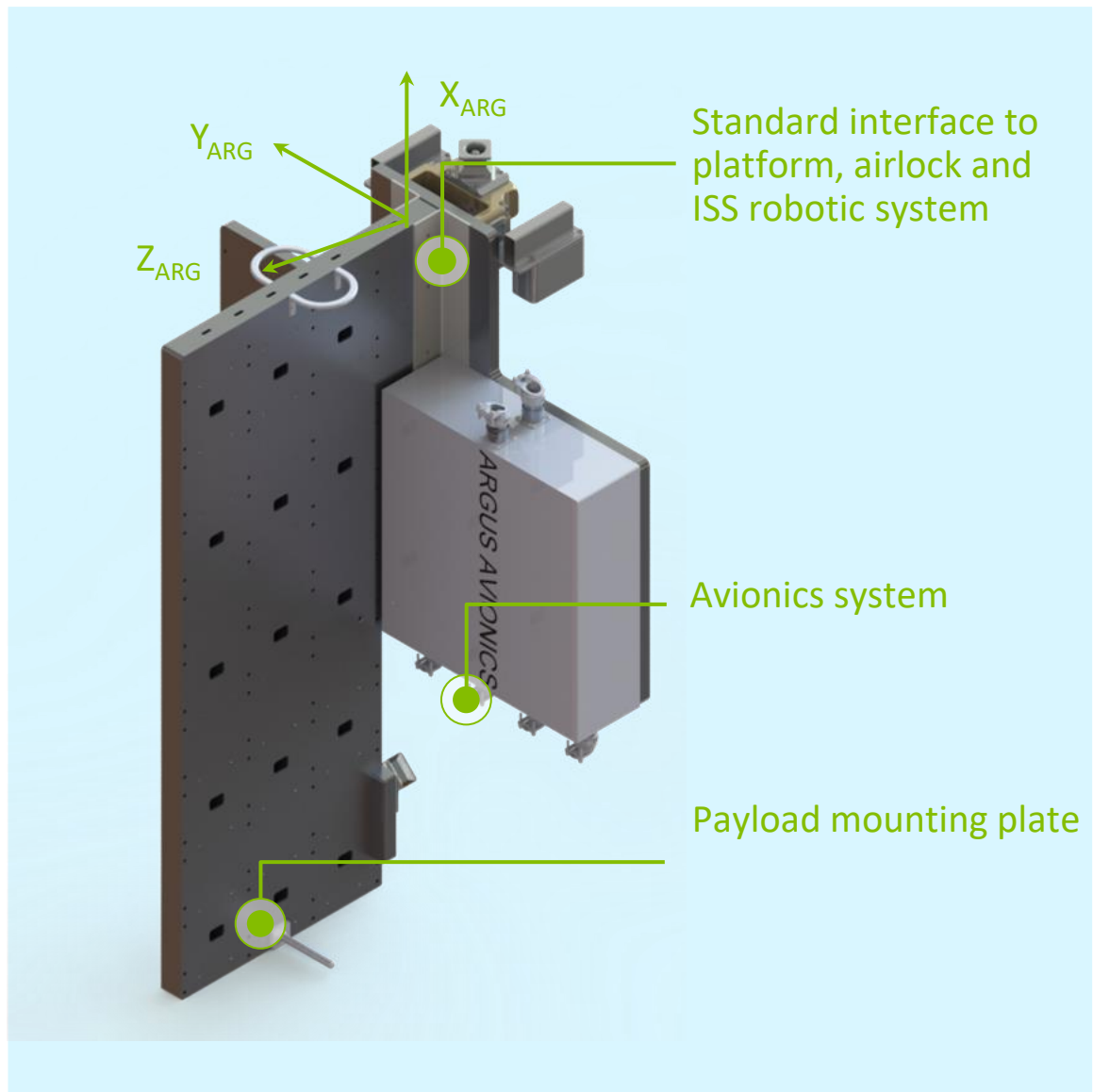
- Interface is provided as part of the Bartolomeo mission service from supplier Oceaneering Space Systems, Inc.



GOLD2 Active
(Payload Side)



GOLD2 Passive
(Platform Side)



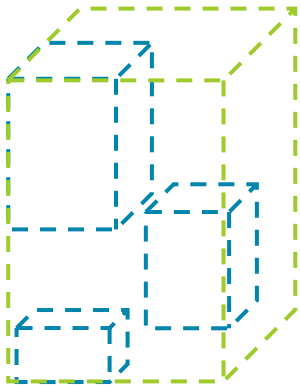
ArgUS Multi-Payload Carrier

TOTAL CAPACITY	10 active payloads
PAYLOAD SIZES	max. 88 U (max 383 x 423 x 998 mm ³)
PAYLOAD MASS	max. 80 kg
POWER SUPPLY	28 VDC, max. 100 W
DATA DOWNLINK	0.1 – 10 Mb/s over 75% of the orbit
P/L COMMAND/ CONTROL INTERFACES	* Ethernet (standard) * MIL-STD-1553, SpaceWire, CAN Bus on request

Standard Payload Classes

SHARED SLOT

[on ArgUS]



up to 88U:
360 x 250 x 990 mm³
~14" x 10" x 39"

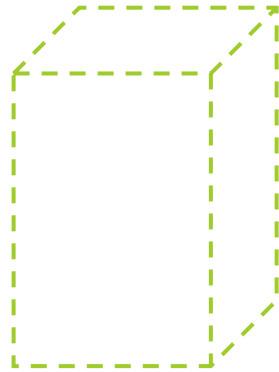
up to 80kg ~176lb

up to 100W

up to 1 Mbps
75% of orbit

SINGLE SLOT

[STANDARD]



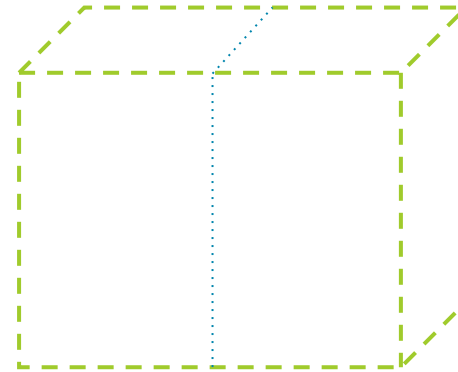
up to
700 x 800 x 1,000mm³
~27.5" x 31.5" x 39"

up to 450kg ~990lb

up to 800W

Up to 10 Mbps
75% of orbit

DOUBLE SLOT



up to
800 x 1,500 x 1,000mm³
~31.5" x 59" x 39"

up to 450kg ~990lb

up to 800W + up to 180W

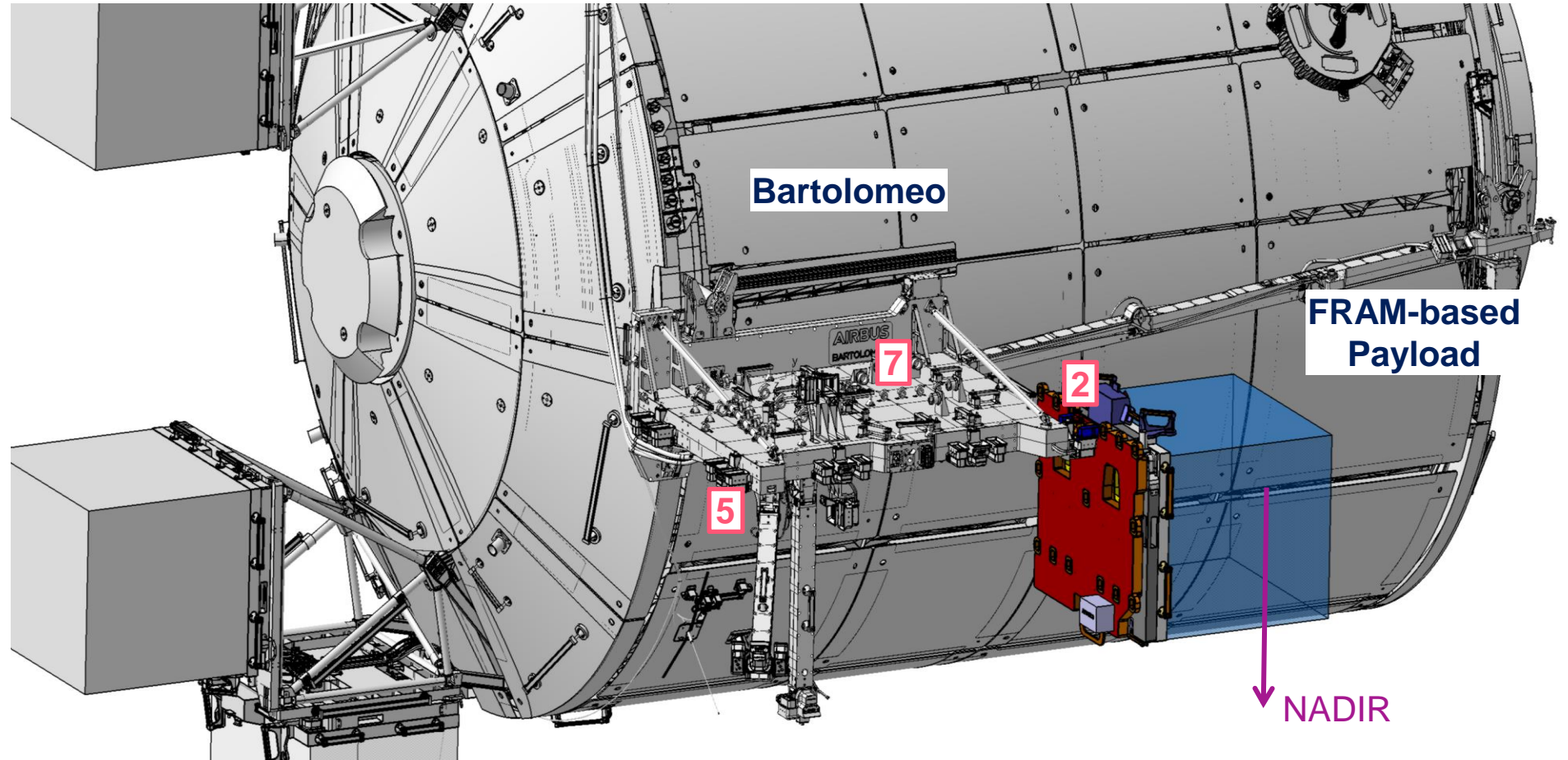
Up to 10 Mbps
75% of orbit



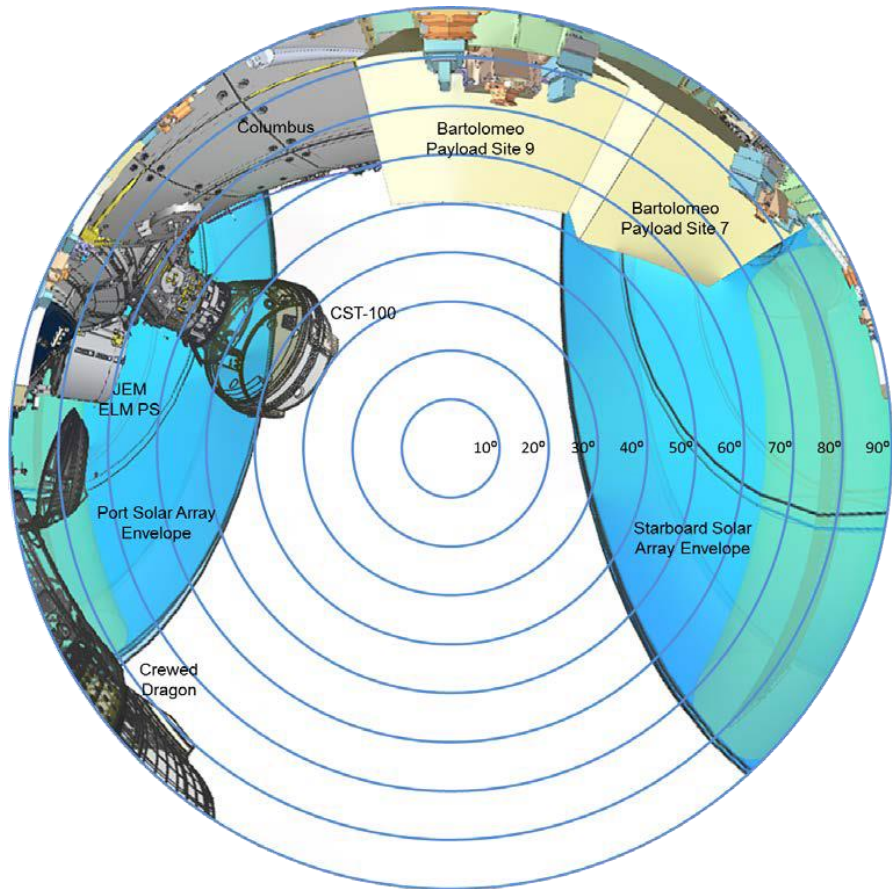
Bartolomeo for FRAM-based Payloads

Example accommodation on Payload Site 2

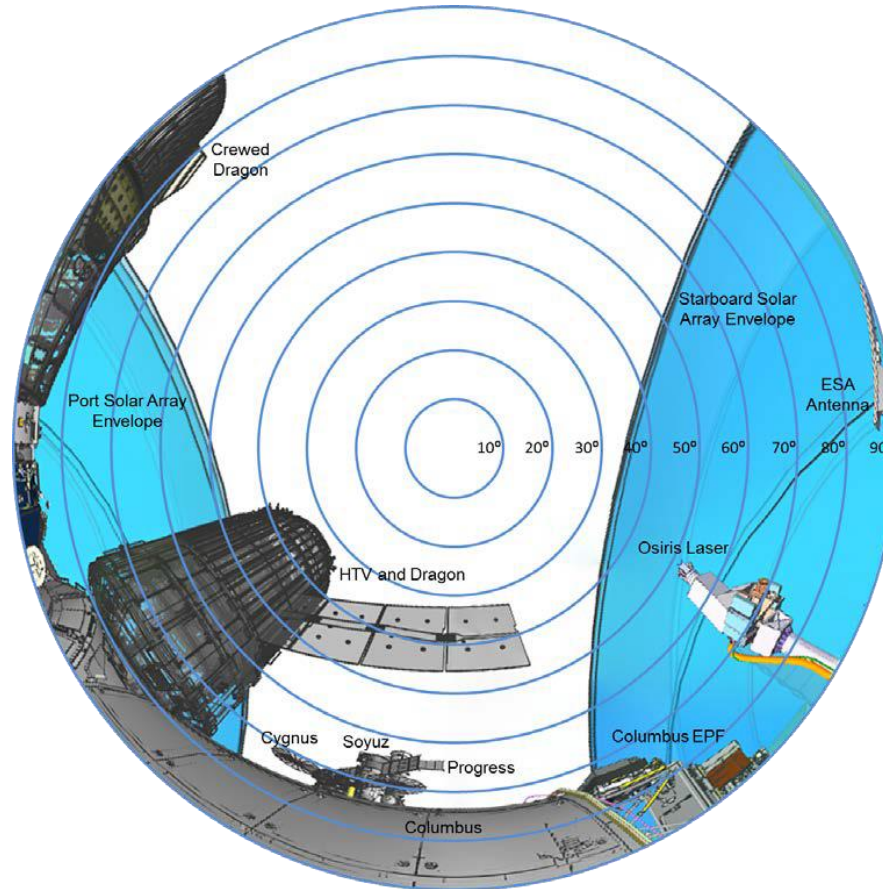
- Accommodation with unconstrained Nadir and Zenith views
- Exceedance of Bartolomeo standard payload envelope acceptable with EVA Keep Out Zone to be defined
- Candidate sites are Site 2, 5, 7



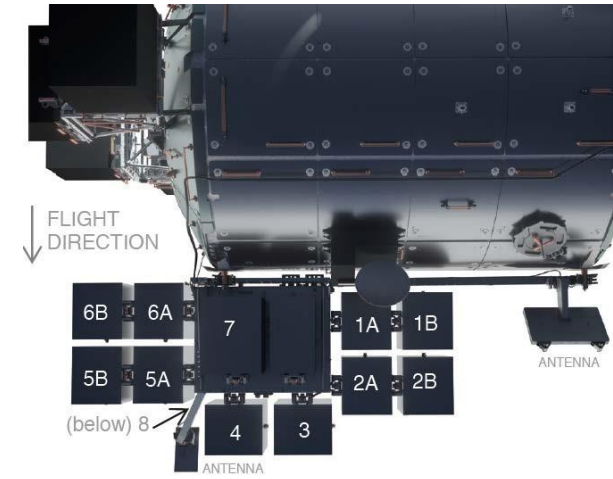
Payload Fields of View



Slot 3 Zenith View
[image credit: NASA]



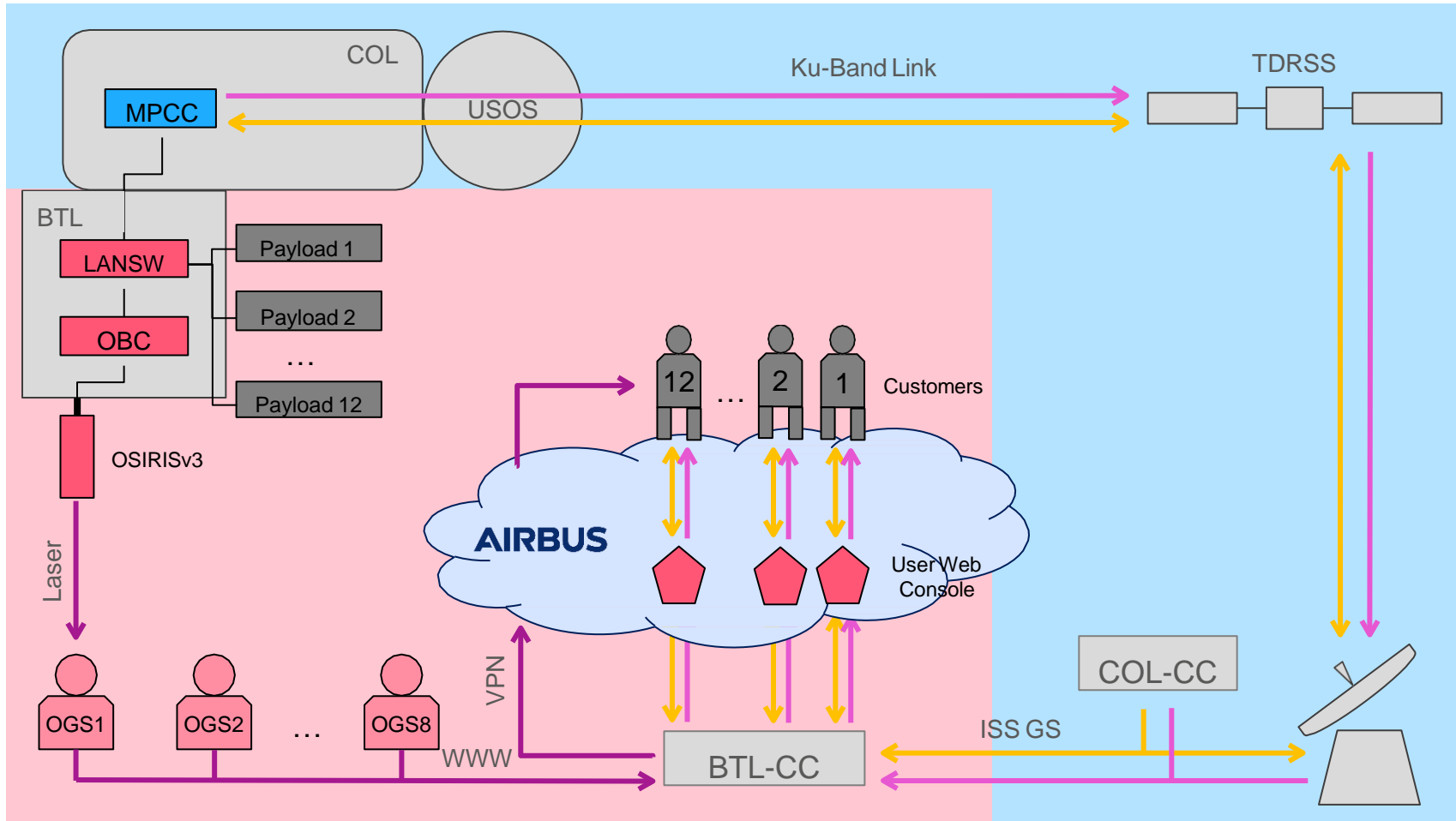
Slot 3 Nadir View
[image credit: NASA]



Payload viewing quality

Slots	Nadir	Zenith	Ram
1A	Green	Green	Red
1B	Green	Green	Red
2A	Green	Green	Yellow
2B	Green	Green	Green
3	Green	Green	Green
4	Green	Green	Green
5A	Green	Green	Yellow
5B	Green	Green	Green
6A	Green	Green	Red
6B	Green	Green	Red
7	Red	Green	Green
8	Green	Red	Yellow

Payload Operation



- ↔ TM/TC link
- Near Real Time Data downlink (1 Mbps)
- High capacity data downlink

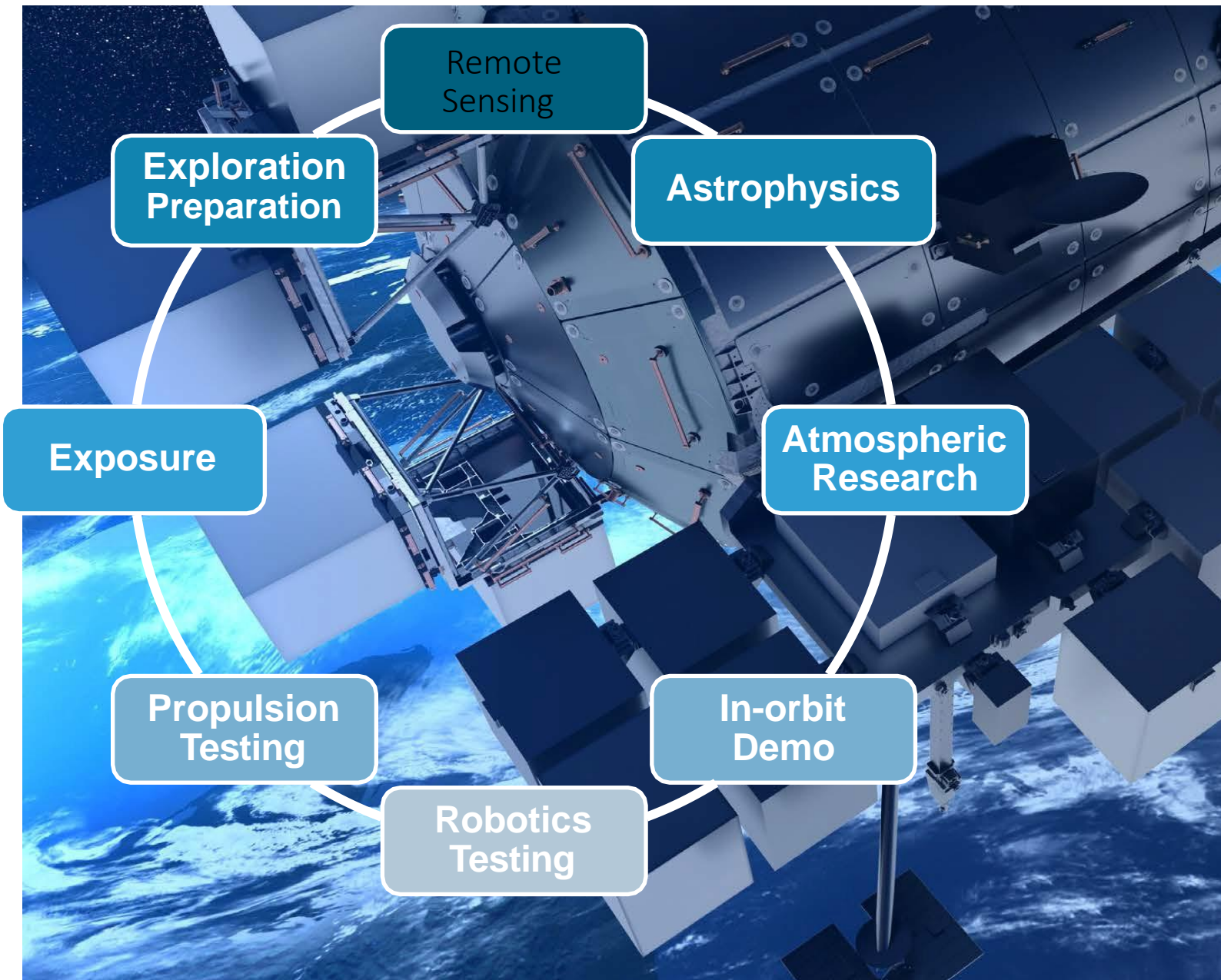
Link	NRT Link	HC Link
Downlink	1-10 Mbps	2.5 TB/day
Uplink	1 Mbps	None
Latency	below 1 s	N/A



Payload Retrieval

Payload / sample
retrieval option
through the payload
airlock

[Image credit: NASA]



MISSION

Bartolomeo operated aboard the ISS in **low-Earth-orbit** (altitude: ~400 km)



● Bartolomeo in operation:



The ISS' only unobstructed view of Earth and outer space...



... and enables the hosting of external payloads in low-Earth-orbit



i.e. approximately every **3 months** (average)



Payloads can be launched pressurised or unpressurised

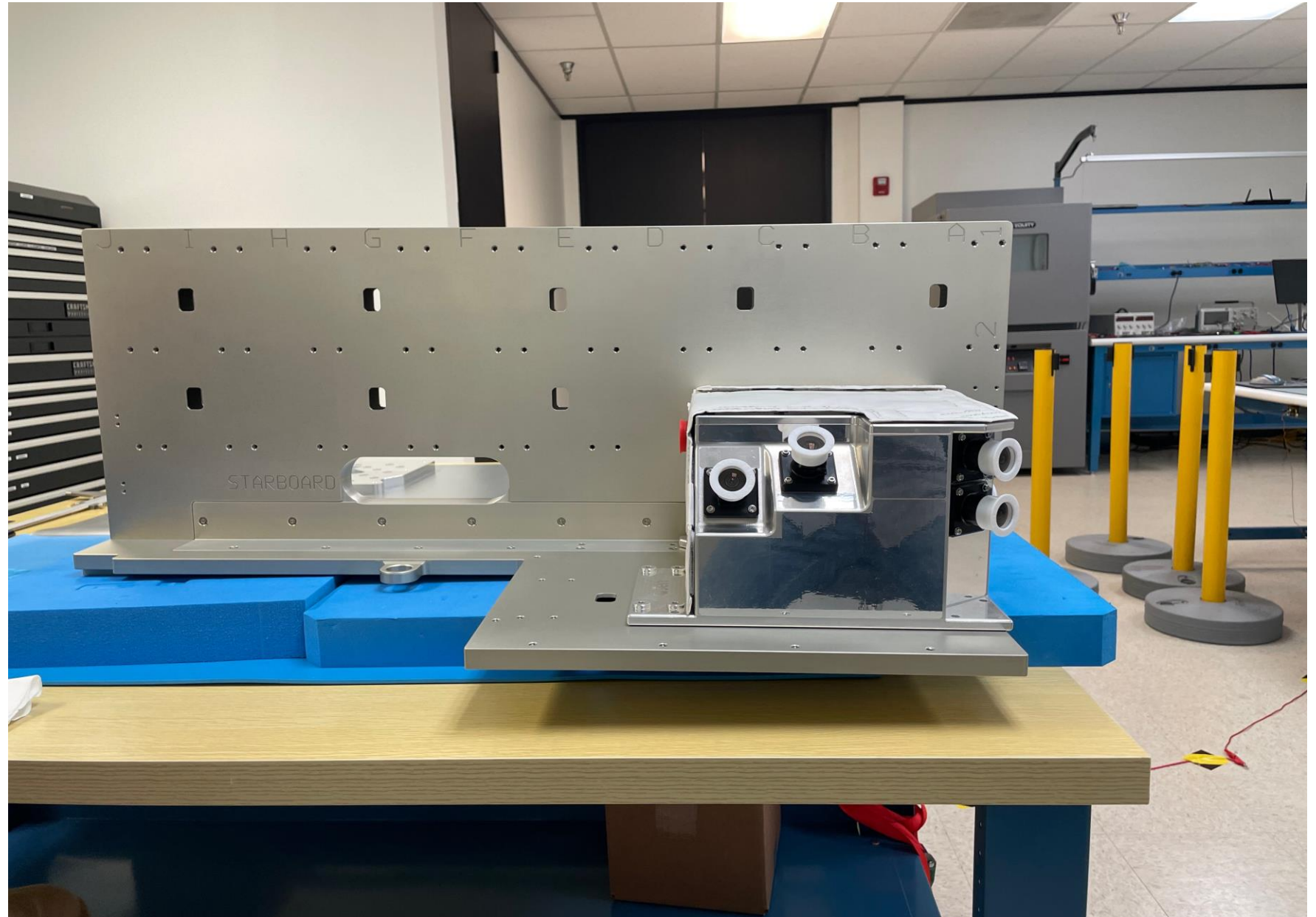


High performance optical data downlink **1 – 2 Terabyte /day** capacity is available during launch and in Space

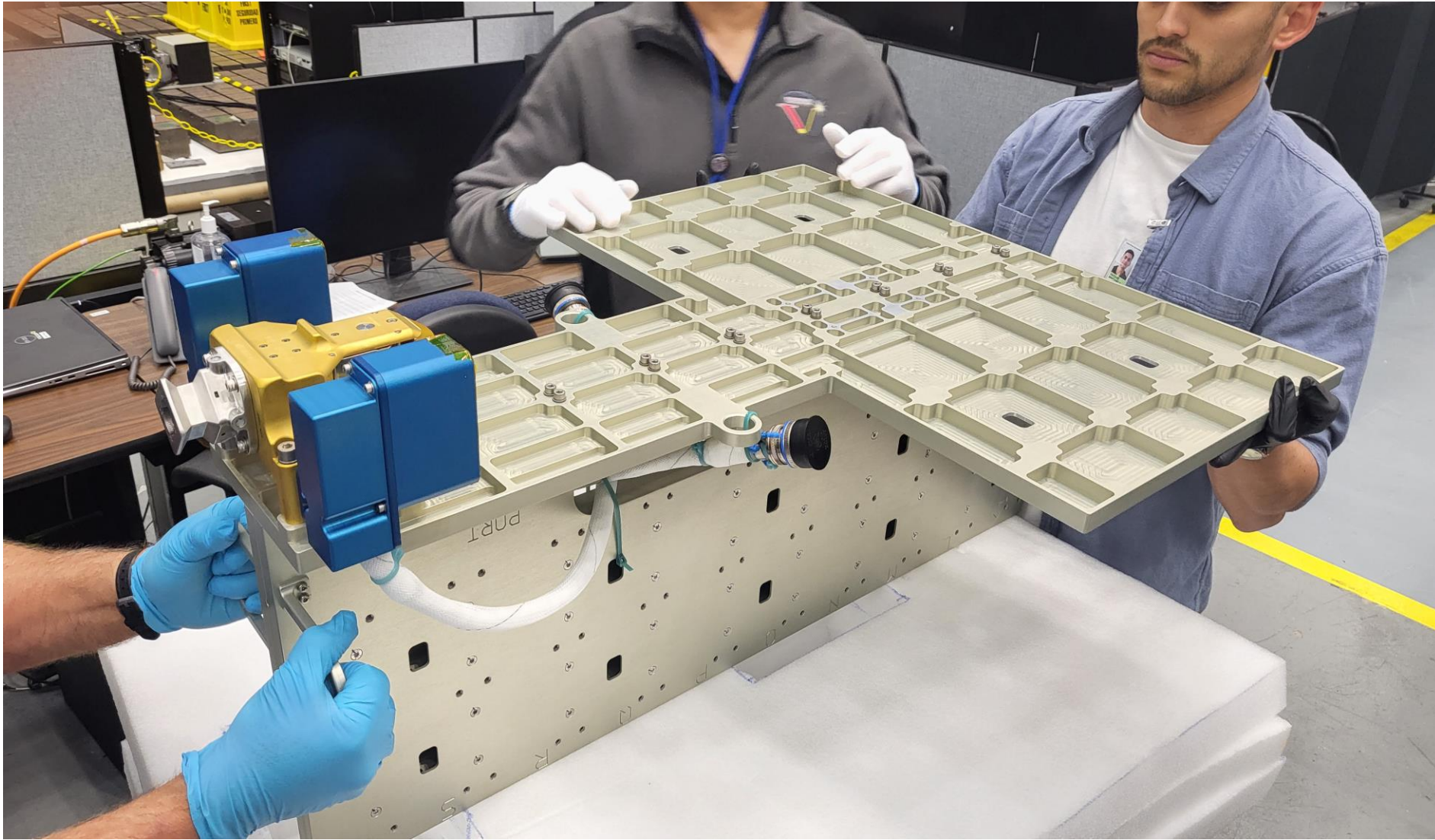


Versatile payload accommodation in the **5 – 450 kg** range

The SEN Space TV fit-check on the ArgUS plate



The ArgUS - 1
being packed
in foam for
launch on
SpaceX - 30





Thank You