



MISSE Update and New Capabilities

ISSRDC 2024

AEGIS AEROSPACE

Commercial Space Services

Spaceflight System
Development, Production, & Operations
Earth Orbit & Lunar

Engineering Services

Small, Minority Woman Owned Business
~320 People, Six States

AS9100D:2016
ISO 9001:2015
CMMI LEVEL 3
NIST 800-171 Compliant

Facility Clearance

Photos courtesy of NASA and DoD.

Company Heritage

- **32 years** of advanced engineering services for DoD and NASA
  - History of on-time/early & on/below budget performance
- **32 years** of spaceflight payload & platform DDT&E, integration & operations, >600 payloads, 135 missions, 35 free flyers, and over 3M hours of payload operations
- Leading provider of Space Testing as a Service (STaaS™) in the commercial, civil, and military space domains
  - Integrate, launch & operate at least twice/year (MISSE + DoD STP)
- Three lunar prime contracts
  - Two new testing facilities, NASA Deep Space Logistics Services (Gateway)

Aegis developed STPSat-4 Deploys from ISS

MISSE Commercial Operations

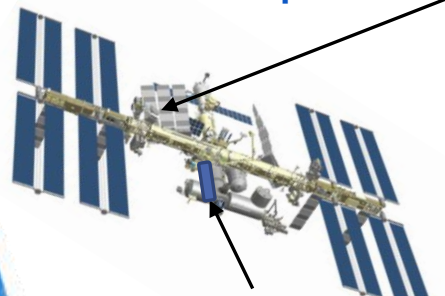
Photos Courtesy of NASA

Space Testing as a Service™ (STaaS™)

Commercial service for advancing technologies and performing experiments on Aegis Aerospace's orbital and lunar surface platforms.

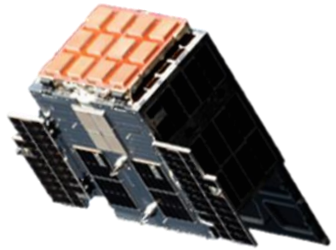
MISSE

MISSE 9-18 Complete
MISSE-19 On-Orbit
MISSE-20 Sept 2024



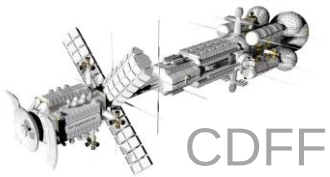
Axiom MISSE future

Ongoing Discussions



M1 Bus

100 kg Class
LEO, MEO, GEO



CDFF Platforms future

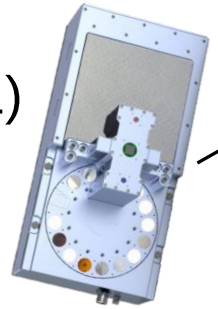
Discussions with Orbital Reef, Starlab, and others

Cis-lunar Platforms future

Exploratory Discussions

Regolith Adherence Characterization (RAC-1)

Integrated on Firefly Lander
CLPS 19D Launch 2024



Space Science Test and Evaluation Facility (SSTEF-1)

Qualification Testing Completed
Commercial Launch 2025

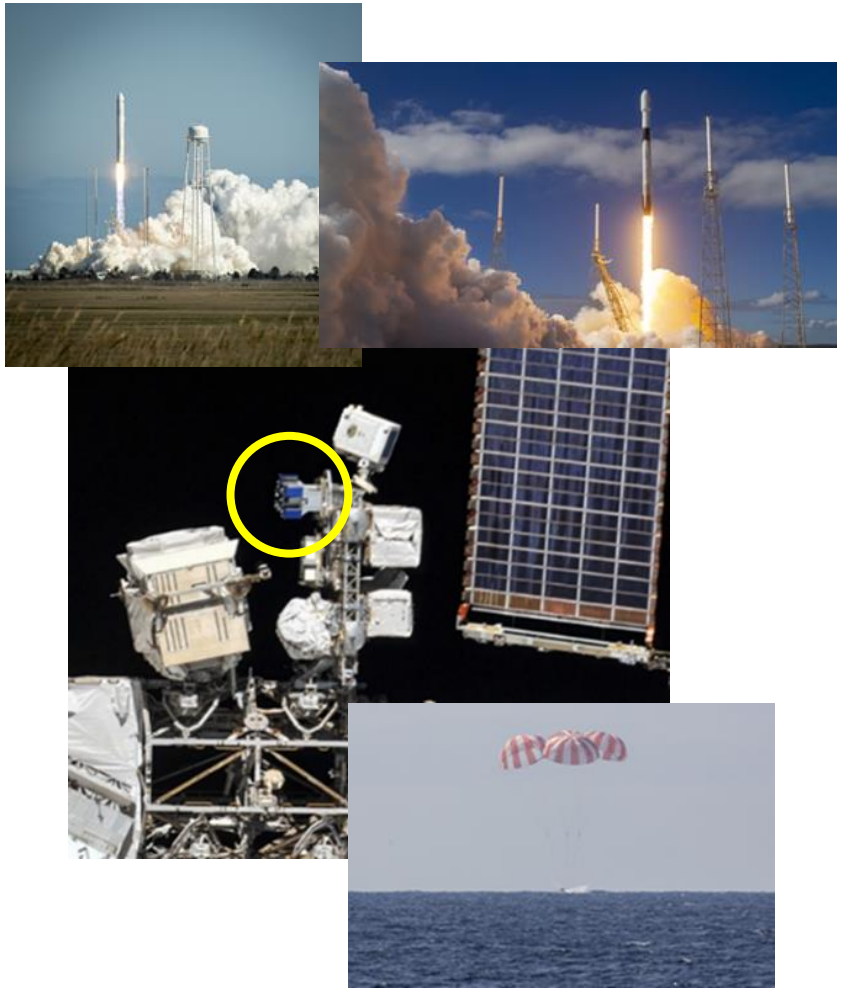
STaaS™ Customer Examples

Lunar & LEO

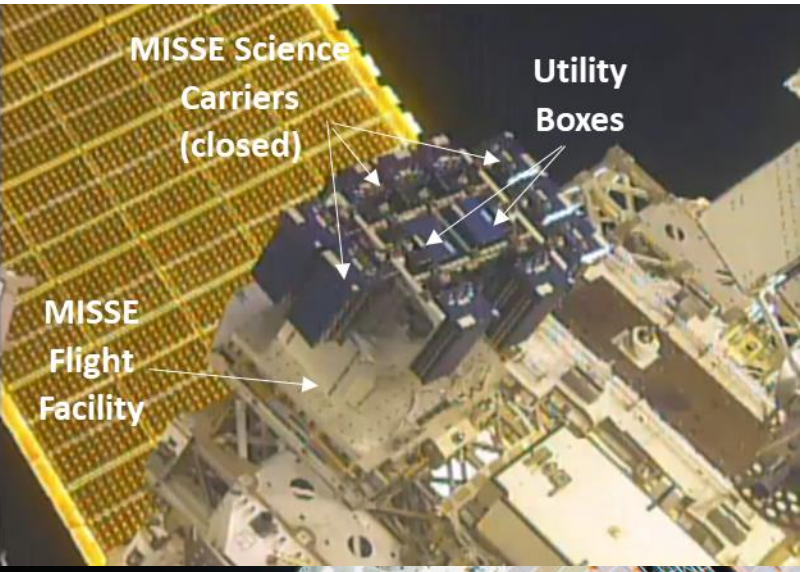
Lunar

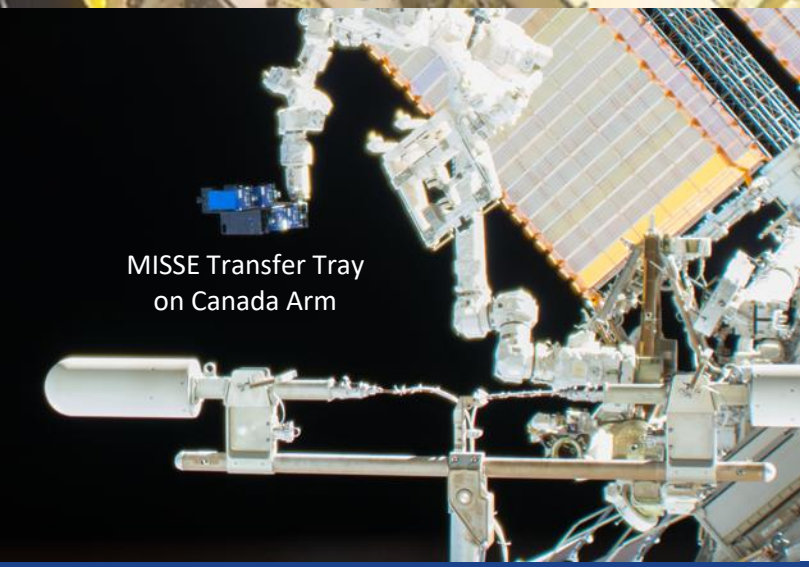
LEO Platform on ISS: MISSE

- Commercial external facility on ISS
- 2 launches & 2 returns every year
- 3 to 5 test article carriers per mission
- Flown: 10 missions, 41 carriers, >2K test articles
- 6-month (typical) to 12-month external test duration
- Passive and powered test articles
- Ram, wake, zenith and nadir facing
- Carriers accommodate a wide array of flight articles
- Customers: large/small companies, academic institutions, government agencies (NASA, STP, AFRL, MDA, etc.)
- Very competitive pricing
- Flexible contracting, commercial & government



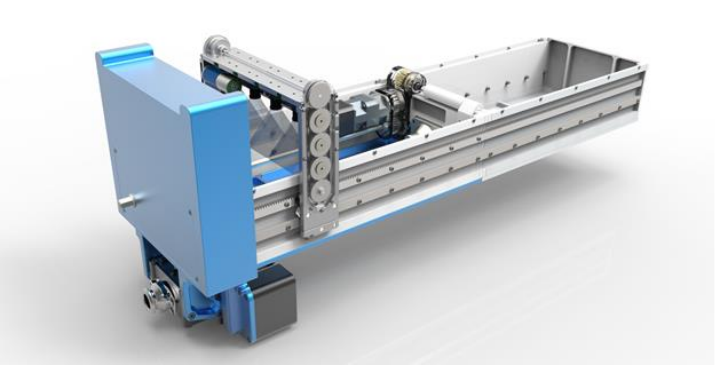
The MISSE System

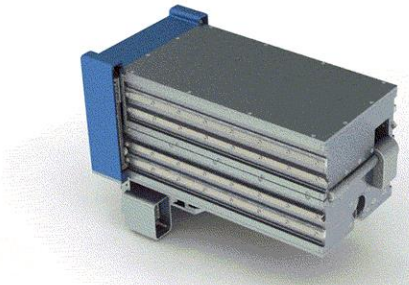




- Three primary components
  - MISSE Flight Facility (MISSE-FF)
  - MISSE Science Carriers (MSC)
  - MISSE Transfer Tray (MTT)
- Carriers launched/returned as pressurized cargo using ISS cargo resupply missions
- MTT is used to transfer carriers through the airlock and facility exchange of carriers between missions
- ISS robotics exchanges MSCs on the MISSE-FF
- MISSE operations controlled from Aegis Aerospace Payload Operations Control Center (POCC)
- Carriers that completed their external exposure are returned

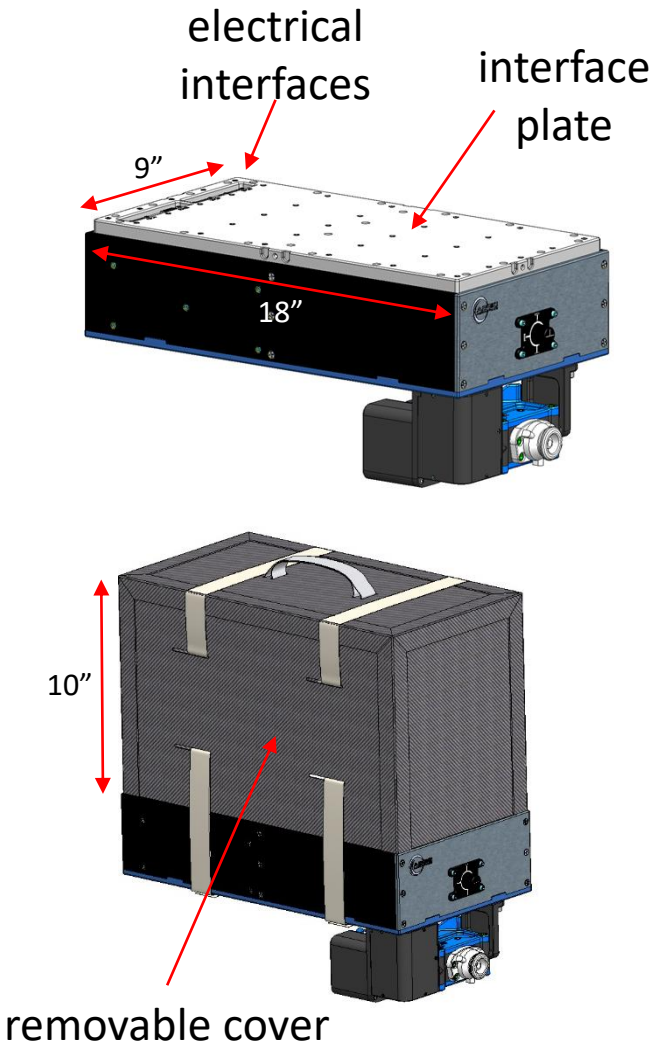
MISSE Science Carrier (MSC)





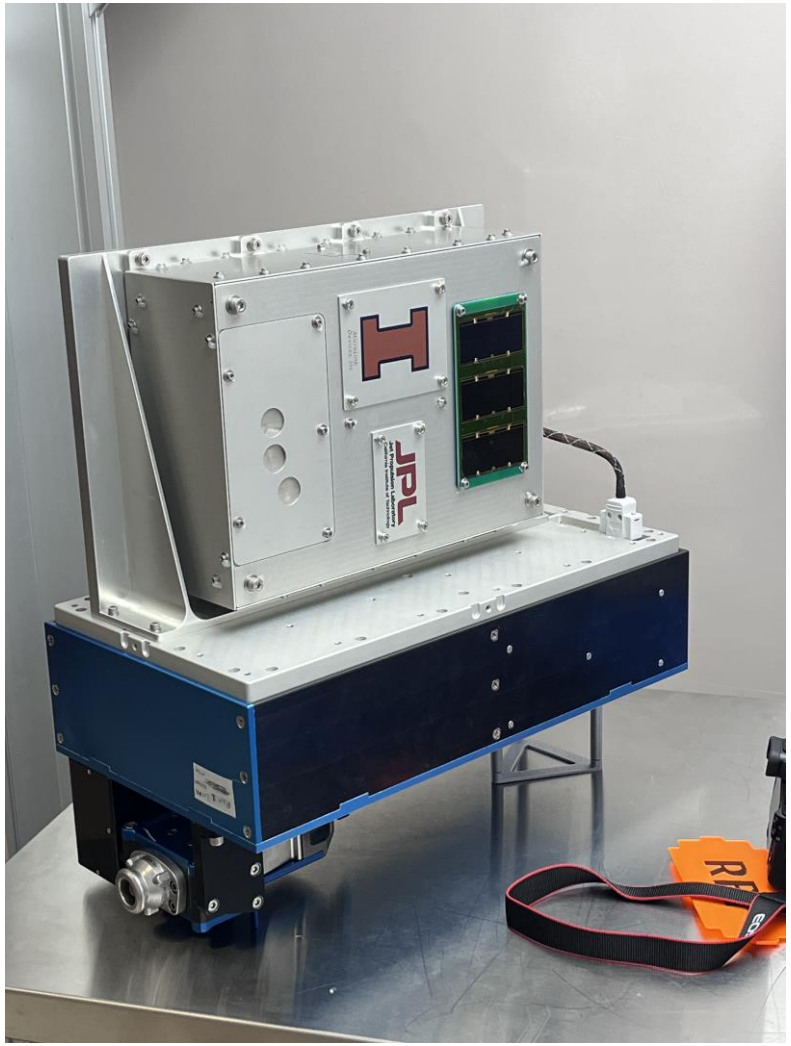
- Multiple test articles per MSC
- Standard Carrier Dimensions
  - Two 33cm X 17.8cm X 7.6cm (13” X 7” X 3”) containers per MSC
- Protection: hinged to close for launch/return
- Mass: 10 kg of test articles per carrier
- Power: 50W at 28VDC (12V, 5V, 3V) of test article power
- Communication: Ethernet, USB, CAN, RS422
- Data Downlink: Nominal 5Mbps shared
- Uplink: Commands and software update uploads
- Photos: monthly HD images of exposed test articles
- Environmental Sensors
  - AO, UV, TID radiation, contamination, temperature

MISSE Pallet Carrier (MPC)



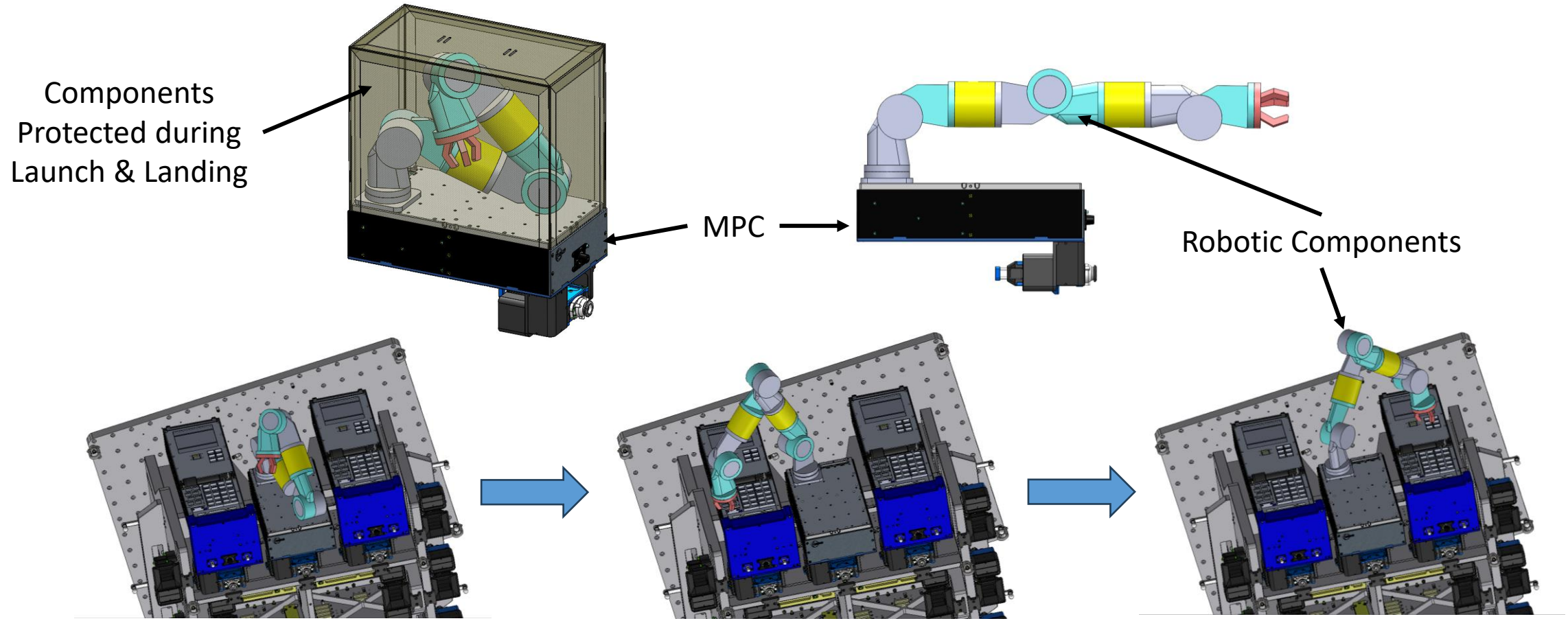
- MPC used for larger flight articles
  - One integration plate ~45cm X ~24cm (~18” X ~9”)
  - Flight article can be up to ~25cm (10”) off the interface plate surface
  - ~24U of flight article volume under removeable cover
- Protection: covered during launch and landing
  - Cover removed/installed by crew
- Mass: ~20 kg of test articles
- Power: 50W continuous at 28VDC
- Communication: Ethernet, USB, CAN, RS422
- Data Downlink: Nominal 5Mbps shared
- Uplink: Commands and software update uploads
- Environmental Sensors
  - AO, UV, TID radiation, contamination, temperature

SEAQUE on an MPC



- Space Entanglement & Annealing Quantum Experiment (SEAQUE)
  - Integration onto a MISSE Pallet Carrier (MPC)
- SEAQUE is a quantum experiment that will create and verify entanglement in space.
- Collaboration between JPL, the University of Illinois Urbana-Champaign (UIUC), and other universities.
- SEAQUE is part of the MISSE-20 mission, which is scheduled to launch in September 2024.

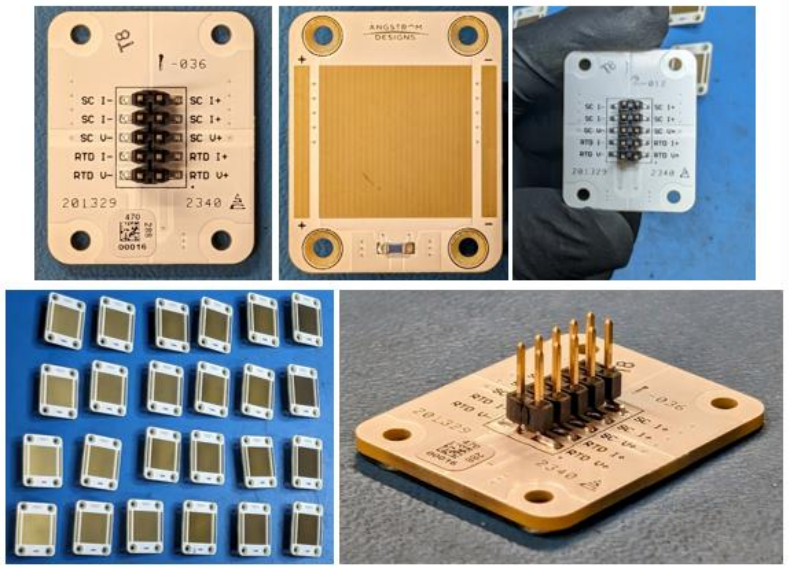
MPC Use Case: Robotics Testbed

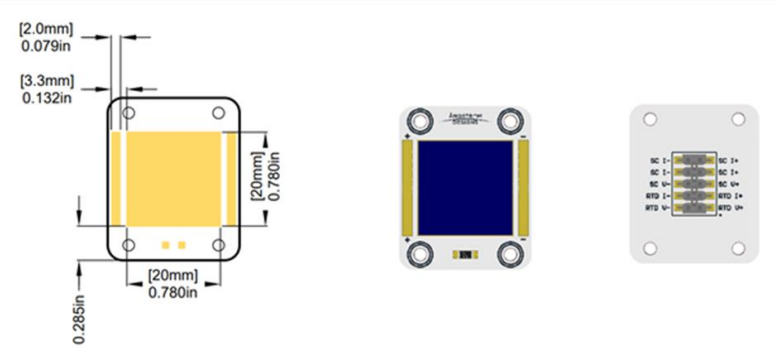


On orbit robotic component testing using the MPC.

Orbital Electronics Laboratory (OEL)

- Characterize solar cells on MISSE in LEO
  - All solar cells returned after about six months in orbit
- Collaboration between Angstrom Designs and Aegis Aerospace
  - Angstrom Designs specializes in solar cell characterization in the laboratory and using high altitude balloons
- Based on the industry standard Aerospace Measurement Unit
- Direct sun pointing for over 150 orbits (< ±5 degree beta angle)
- Solar cell IV curves
  - Max I_{sc} = 1A, Max V_{oc} = 10V
  - Up to 80 IV, I_{sc}, V_{oc}, curve point per orbit
- Direct temperature measurements of the solar cells
- Cell sizes
  - 2x2cm, 1-per or 2-per cells from 10cm (4”) or 15cm (6”) wafers, custom sizes
- Mount cells on holders and ship for MISSE integration





BioMISSE on an MPC

- BioMISSE enables life science experiments external to ISS modules
  - Unique high-energy, low-density radiation environment
  - Minimizes confounding species (neutrons) present in shielded environments
  - More realistic exploration radiation environment than ground-based simulators
- Uses proven life science experiment hardware from current ISS Implementation Partners
- Most infrastructure is already in place
  - Pressurized, environmentally-controlled module in development to attach to an MPC

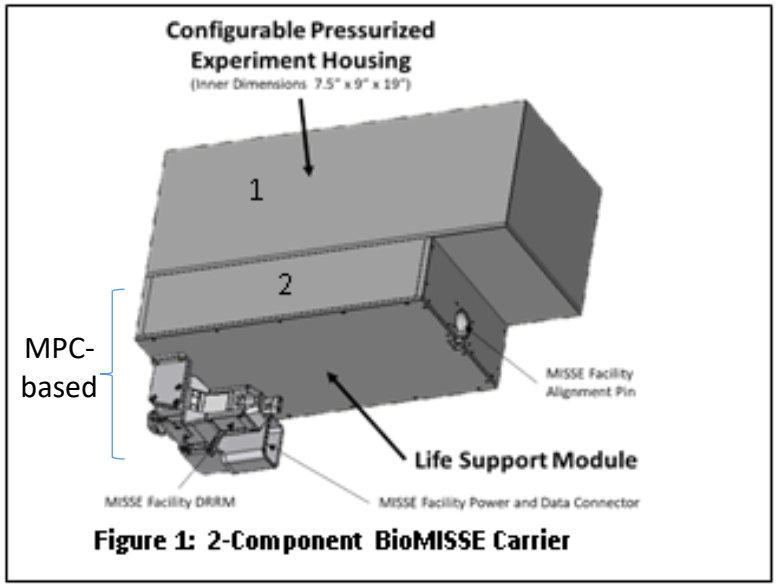


Figure 1: 2-Component BioMISSE Carrier

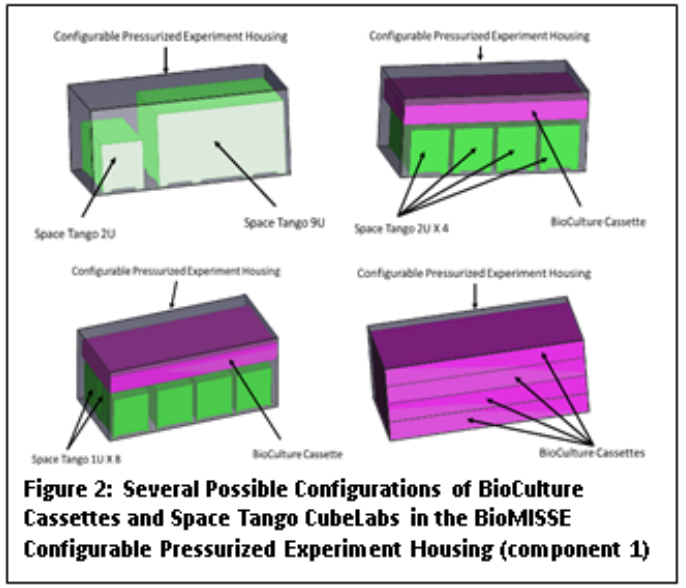


Figure 2: Several Possible Configurations of BioCulture Cassettes and Space Tango CubeLabs in the BioMISSE Configurable Pressurized Experiment Housing (component 1)

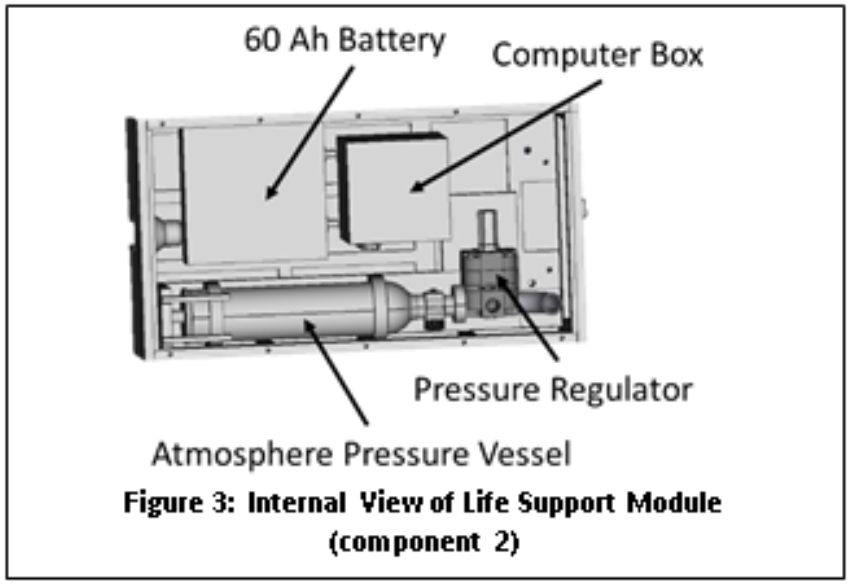
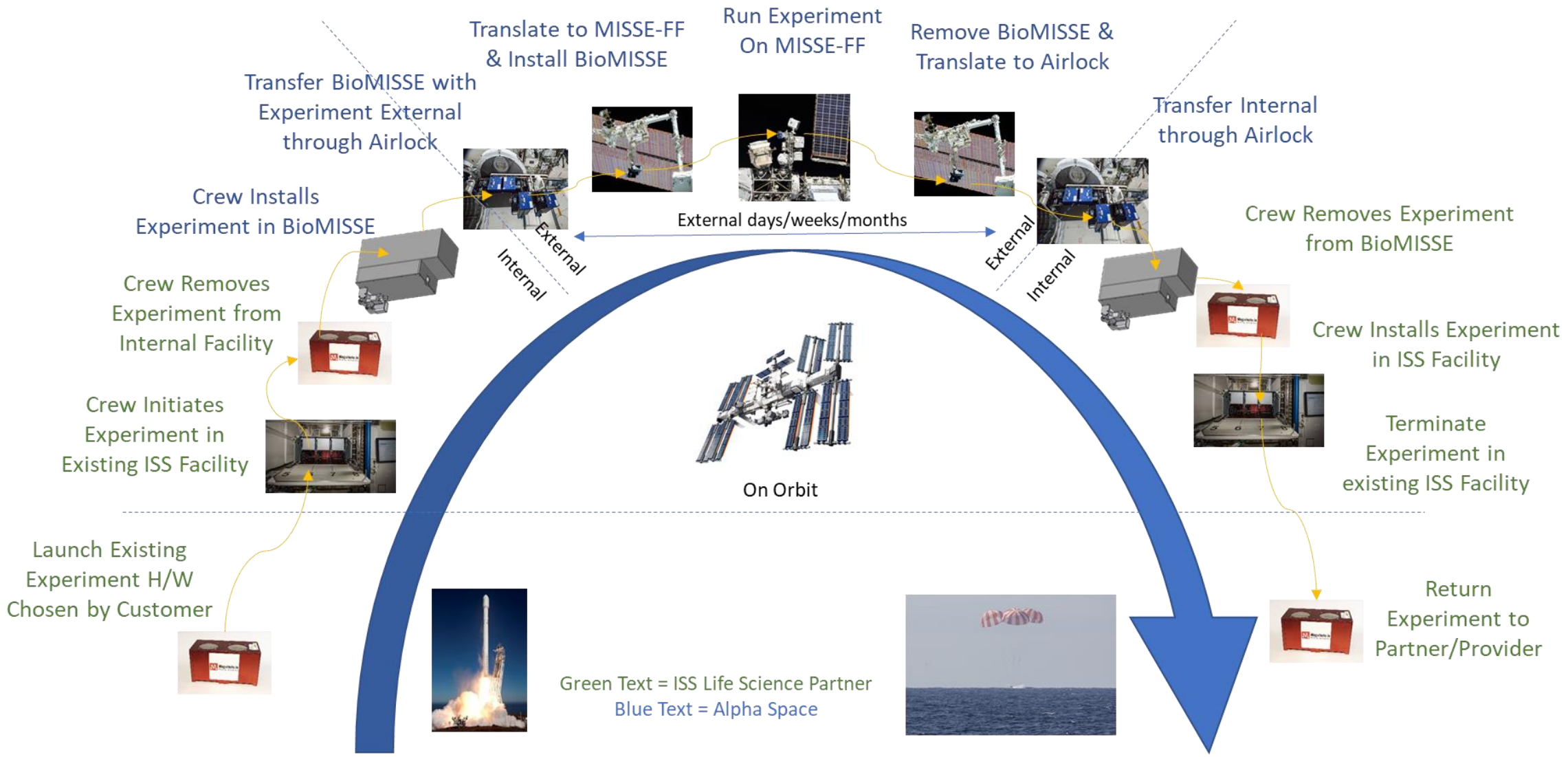
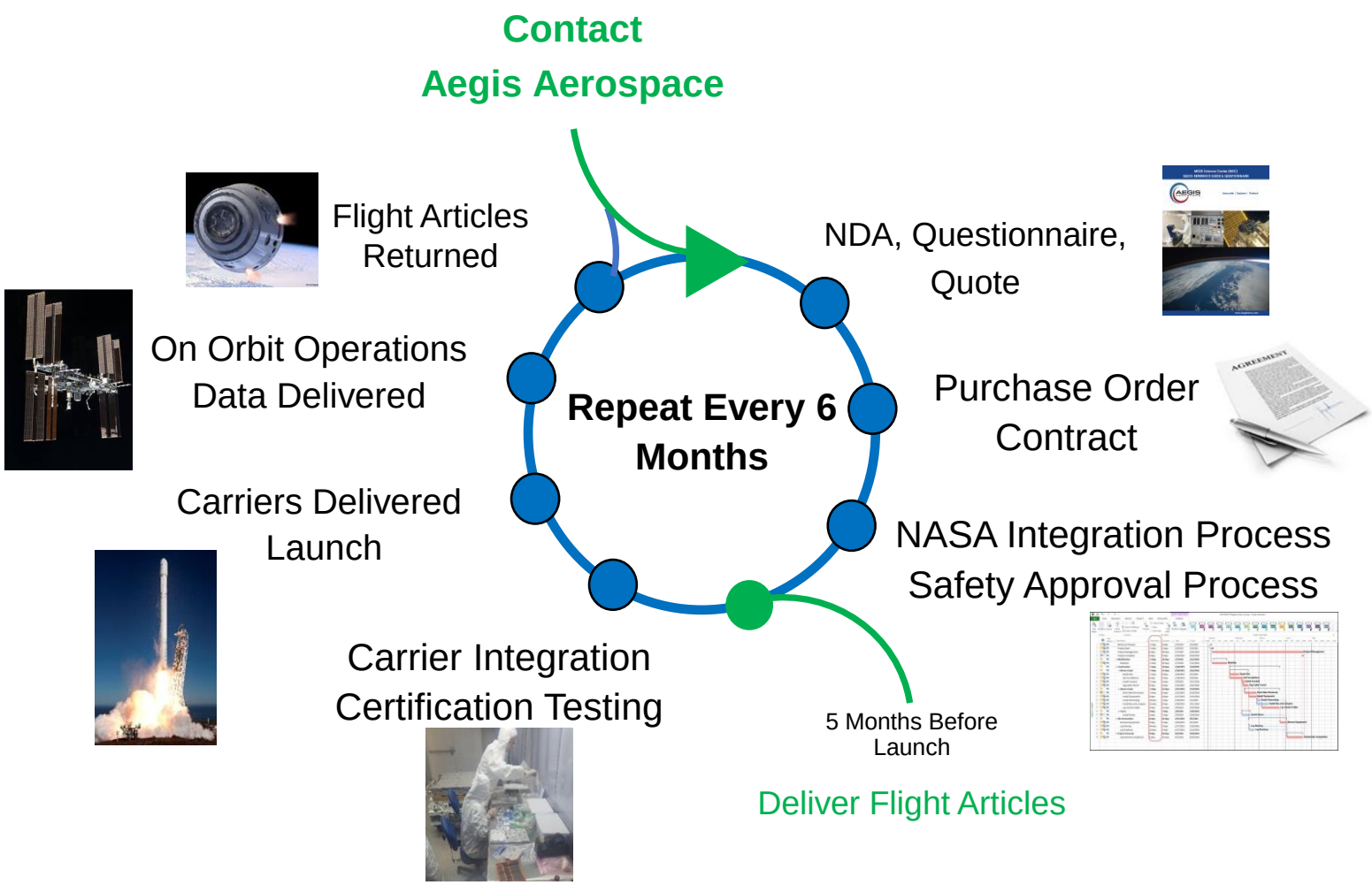


Figure 3: Internal View of Life Support Module (component 2)

BioMISSE Concept of Operations



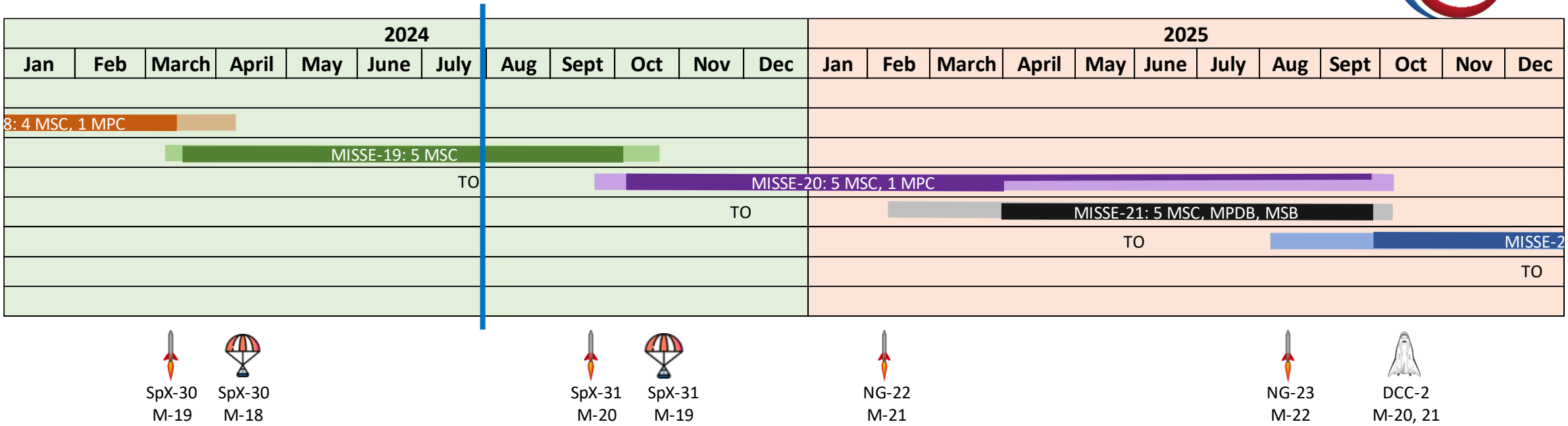
Accessing MISSE: Easy, Rapid, Turnkey



Contact Aegis Aerospace, and then focus on your flight articles.

Aegis Aerospace does the rest.

MISSE Mission Schedule



Mission	Launch	Vehicle	Return	Vehicle	Exposure	Comments
MISSE-19	03/04/24	SpX-30	10/15/24	SpX-31	6 months	5 MSC
MISSE-20	09/24/24	SpX-31	09/15/25	DCC-2	6 & 12 months	5 MSC, 1 MPC
MISSE-21	02/01/25	NG-22	09/15/25	DCC-2	6 months	Tentative dates
MISSE-22	08/05/25	NG-23	09/20/26	SpX-34	6 months	Tentative dates

Summary

- Aegis' commercial Space Testing as a Service™ (STaaS™) on MISSE
  - Rapidly increase TRL
  - Obtain flight heritage
  - Reduce risk
  - Two MISSE missions every year – all flight hardware returned
  - Turnkey service – customers focus on their technology
- New MISSE Pallet Carrier enables larger, more complex experiments
- New Orbital Electronics Laboratory available for solar cell characterization
- Future BioMISSE will enable complex life science experiments in the full spectrum of low dose, high energy radiation
- Commercial and government contracting mechanisms available

www.AegisAero.com

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Thank You!

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