



HOSTED
PAYLOAD
and **SMALLSAT**
SUMMIT

October 15, 2014
Grand Hyatt Washington
Washington D.C.

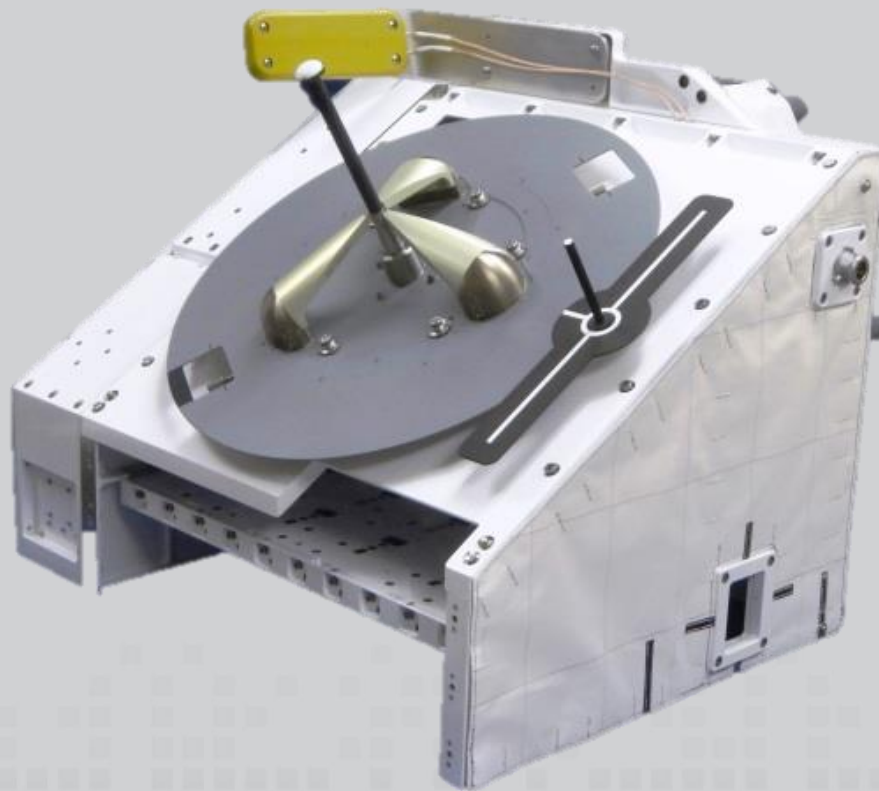
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NanoRacks External Payload Platform



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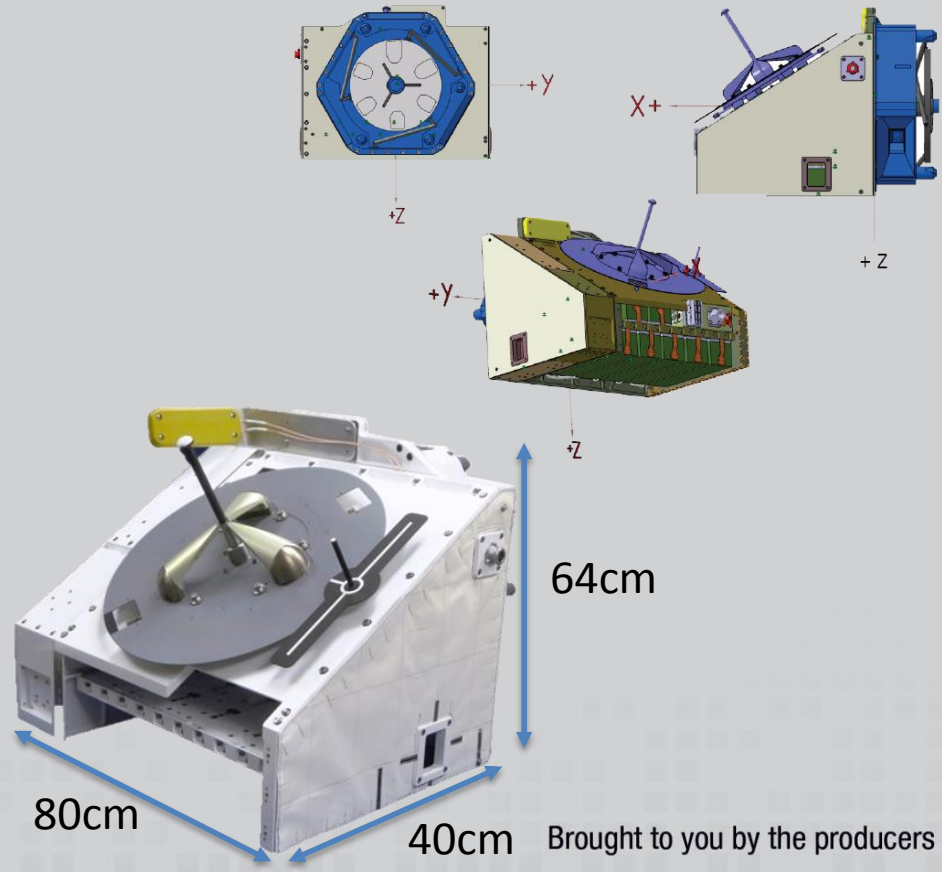
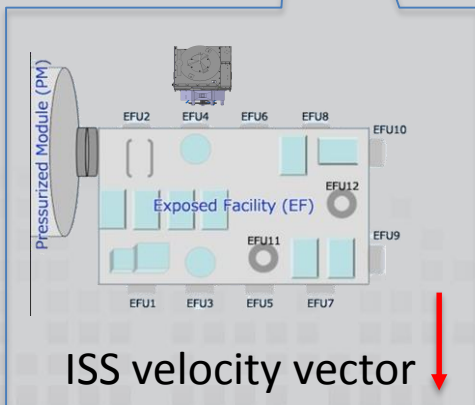
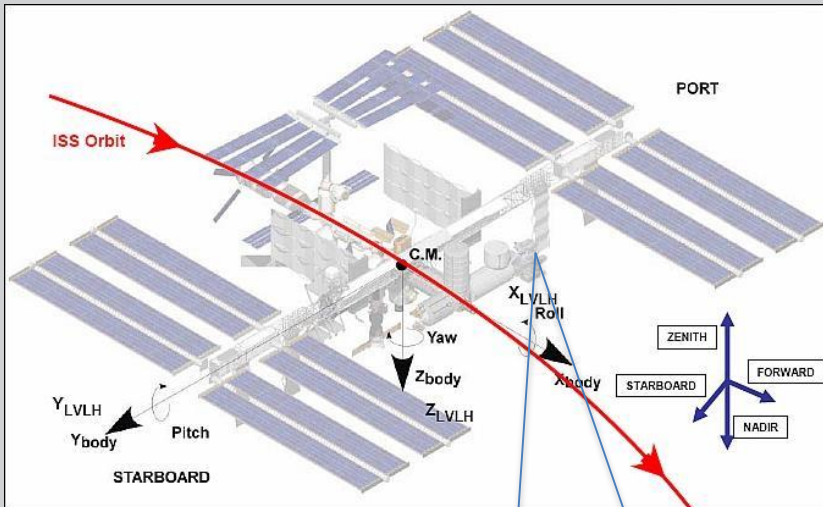
Introduction

- NanoRacks has developed a hosted payload service, NanoRacks External Payload Platform (NREP)
- NREP will be installed on the JEM EF
- Hosted payloads will utilize the JEM airlock, slide table, and the JRMS for installation
- Status
 - IOC, Orbital Sciences CRS-4 (1Q2014)
 - Flight acceptance testing in progress

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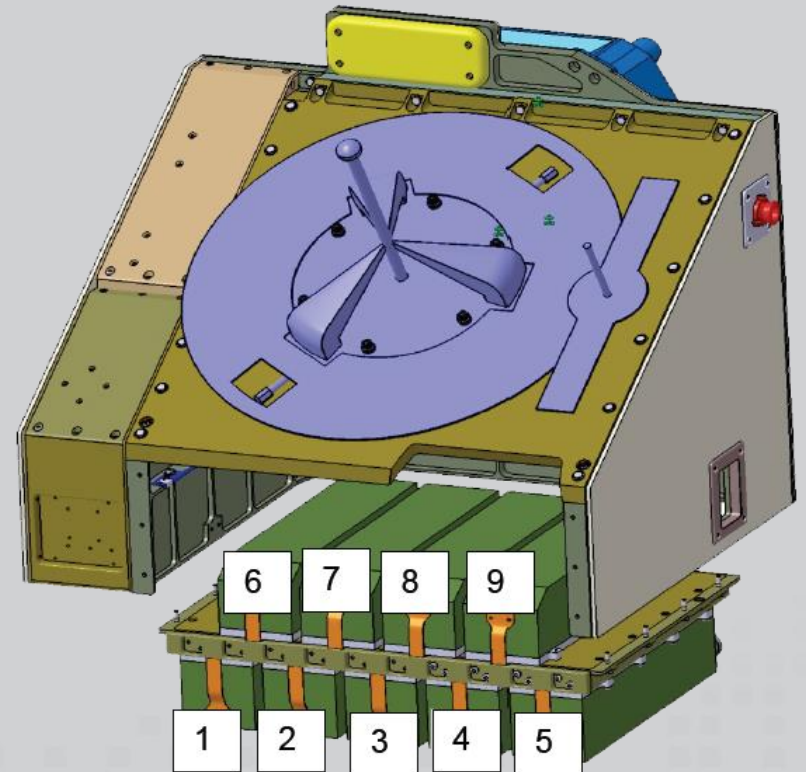
NREP ISS Location – IOC 2015



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Payload Configurations

- NREP payloads can be attached in various configurations to NREP baseplate
- Baseplate accommodates up to 5 powered 4U payloads, up to 4 unpowered 3U payloads

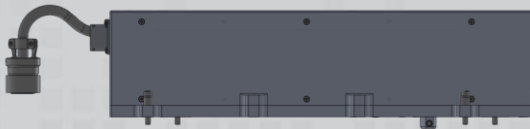
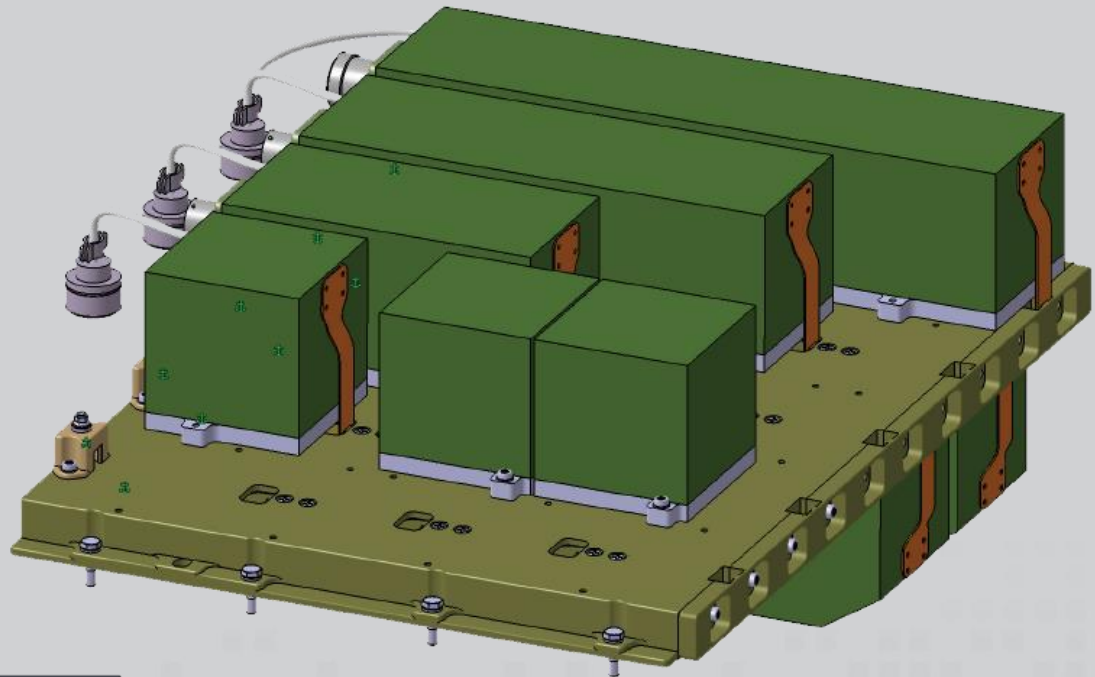
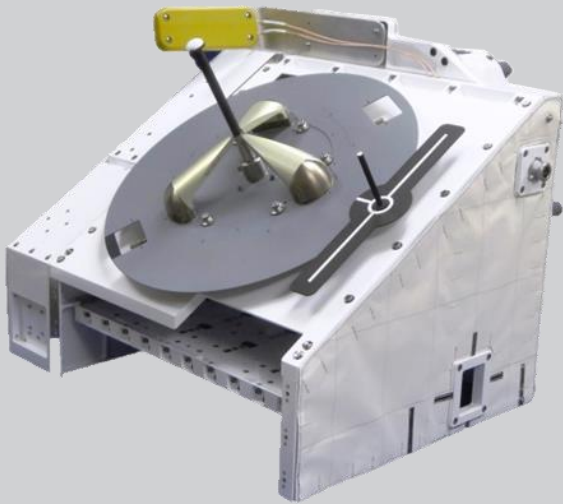


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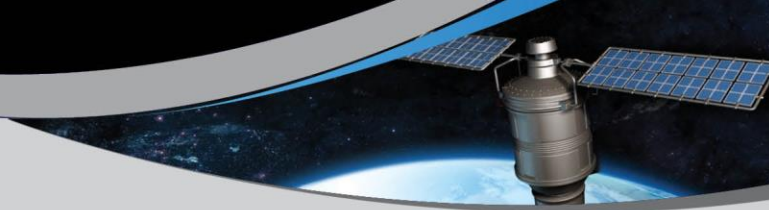


Standard Payload Configurations

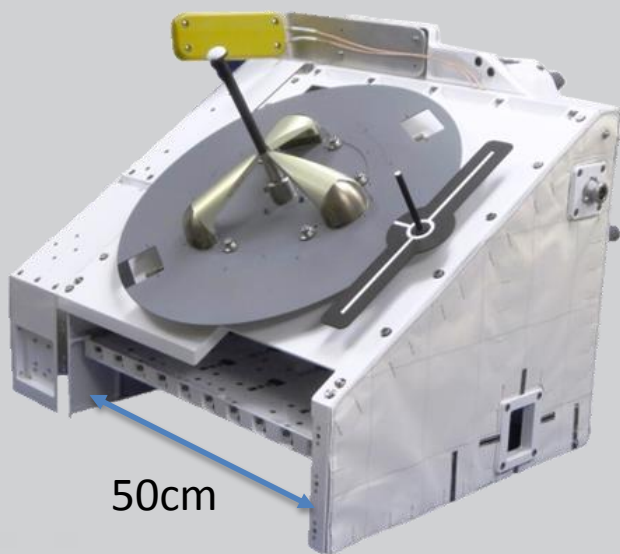


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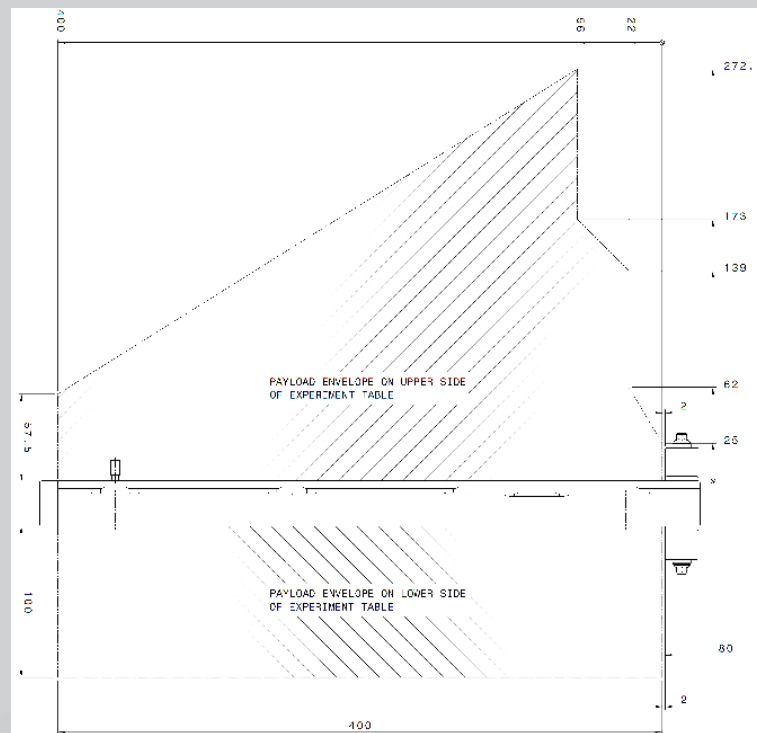
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Non-standard Payload Configurations



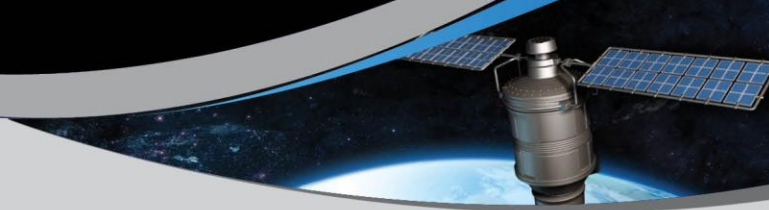
40cm



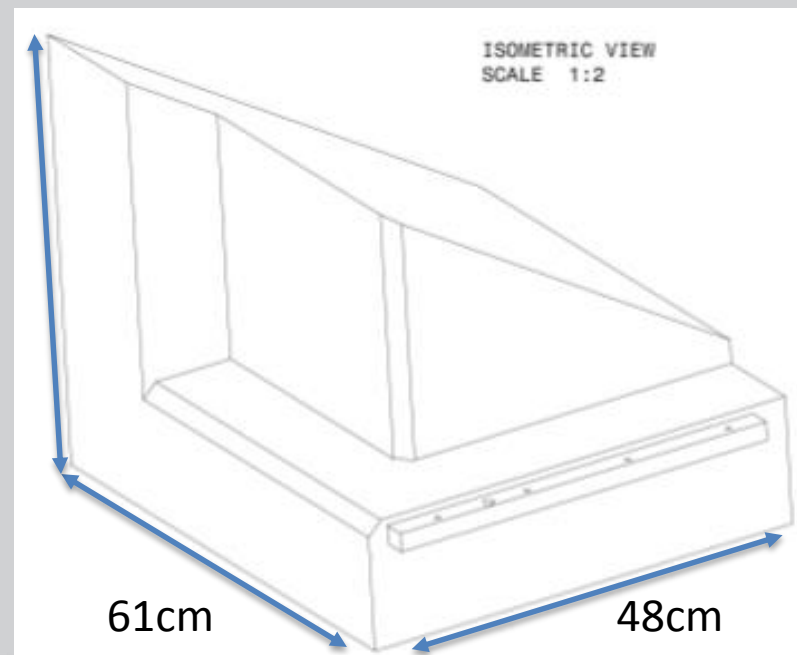
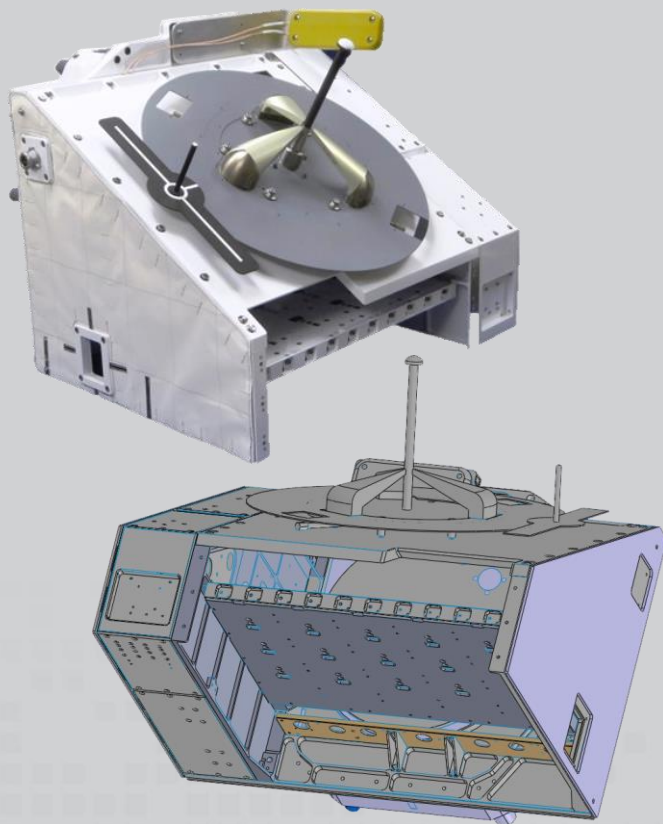
27cm

10cm

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Large Non-standard Payload



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Service Level

- NanoRacks
 - Hosted Payload Platform (Space Environment, Power, CD&H)
 - Transport to/from ISS
 - Mission CD&H
 - ISS Flight Certification
- Payload Developer
 - Payload Experiment
 - Payload Enclosure, (physical and power connects)
 - Payload S/W CD&H Interfaces
 - ISS Required Flight Acceptance Testing

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Service Model Overview

- Classes of payloads; form factor and passive/active
 - Passive/Active – use power and data services
 - Form factor – standard, non-standard or Large
- Nominal Mission Duration
 - Standard payload - 15 Weeks
 - Non-standard payloads- negotiable
- Additional Services
 - Mission Extension beyond nominal 15 weeks
 - Return to Earth, 1 to 4U Payload Enclosures
 - Payload Experiment Integration

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Flight Safety Requirements

- NanoRacks represents the customer at NASA Payload Safety Reviews
- Payload Safety Reviews- Phase 1, 2 and 3
- NanoRacks provides consolidated safety data call template and procedures for required tests
- Flight Acceptance Testing (if required)
 - Random Vibration
 - Battery Testing
 - EMI
- Hazardous Materials Review- Bill of Materials analysis
- Payload enclosure briefly exposed to ISS crew- human rating for external surfaces (sharp edges, etc.)
- RF systems evaluated for human exposure and ISS communications interference
- Captive fasteners (either mechanical or locking compound)

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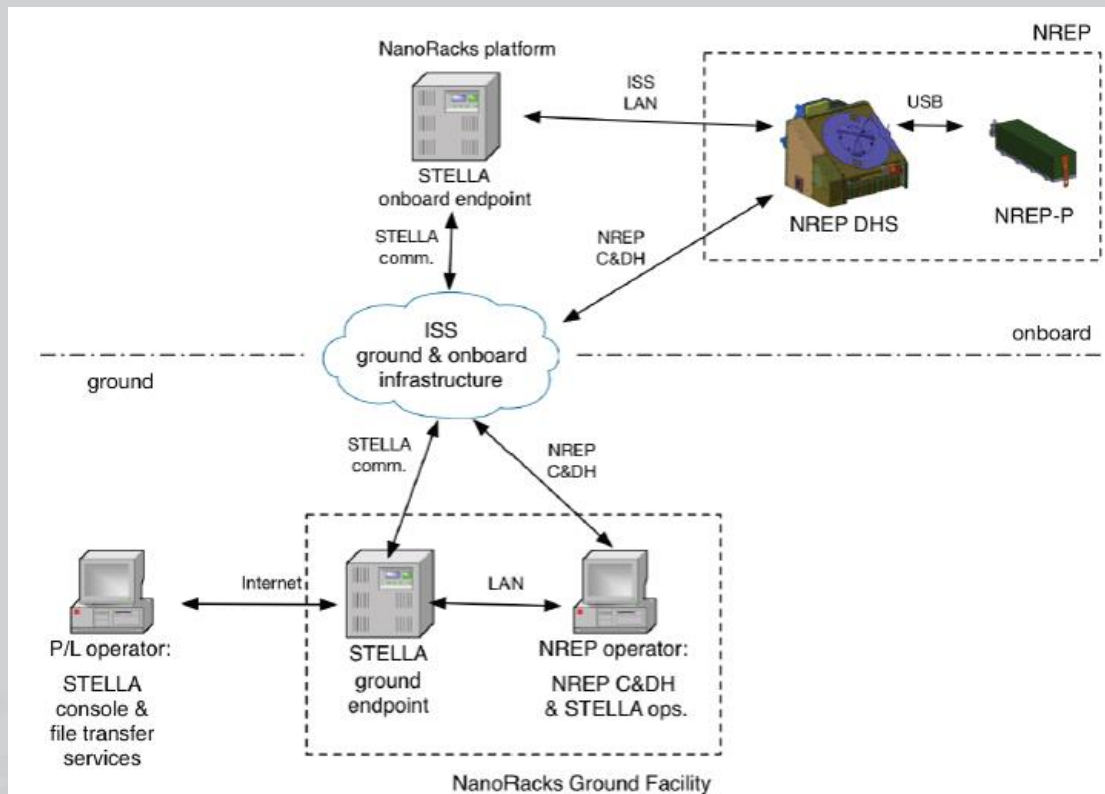


Payload Interfaces

- Physical
 - Standard payload enclosures (1-4U) < 4Kg
 - Non-standard payloads < 35Kg
 - Large Non-standard Payloads, established in Mission Specific Interface Control Agreement
- Electrical (Active)
 - MS 27468 Umbilical, Switchable 50W @ 28 VDC
 - USB 2.0, 5 VDC/500mA
- CD&H, 2 modes
 - Store & Forward
 - Near Real-time via NREP Shared T&M Stream
- Software
 - Client (Payload)- Server (NREP Data Handling System),
 - RS-232 Serial protocol for Store & Forward mode
 - IP networking over USB for Near Real-time mode
- Thermal
 - Generally enveloped by worst-case on-orbit LEO excursions

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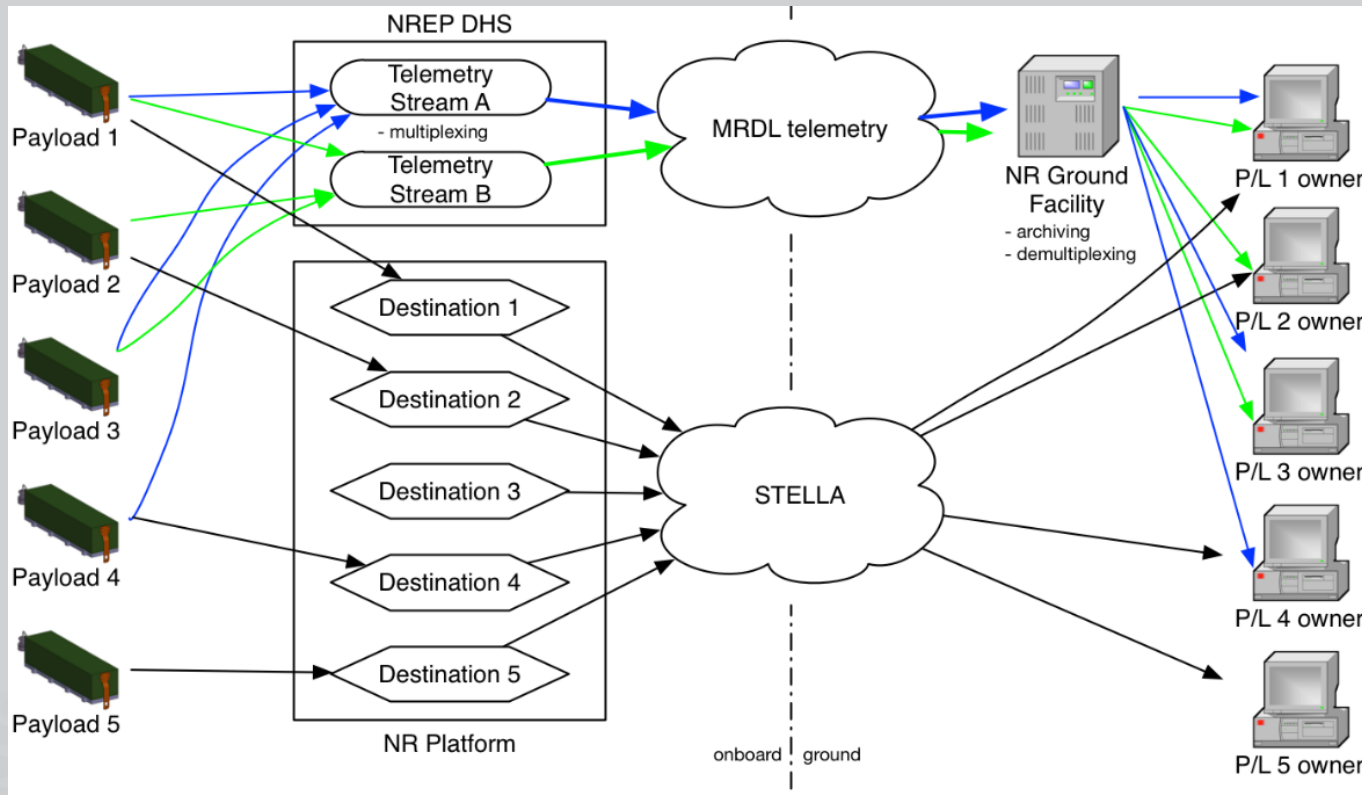
CD&H: Store & Forward



RS-232 serial protocol

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CD&H: Near Real-Time



Requires IP networking over USB

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Payload Developer Timeline

Milestone/Activity	Launch minus Months
Authority to Proceed	L – 12
*Payload Data Submission	L – 11
Phase 1 Payload Safety Review	L – 7 to 6
Phase 2 Payload Safety Review	L – 4 to 5
*Flight Acceptance Testing	L – 4 to 5
Customer Delivery to NanoRacks	L – 3 to 4
Phase 3 Payload Safety Review	L – 1 to 2
NanoRacks Delivery to NASA	L – 1
Launch	0
Payload Mission Operations	L + 4 to L + Customer Need
Payload return to Earth	Availability of Down Mass

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Manifest & Flight Opportunities

Current Manifest

Payload	ISS Cargo Mission
NREP EXT1 4U	OSC, CRS-4 Apr 1, 2015
NREP EXT2 2U	OSC, CRS-5 Oct 12, 2015
NREP EXT3 2U	OSC, CRS-5 Oct 12, 2015
NREP EXT4 2U	TBD
NREP EXT5	TBD

Flight Opportunities

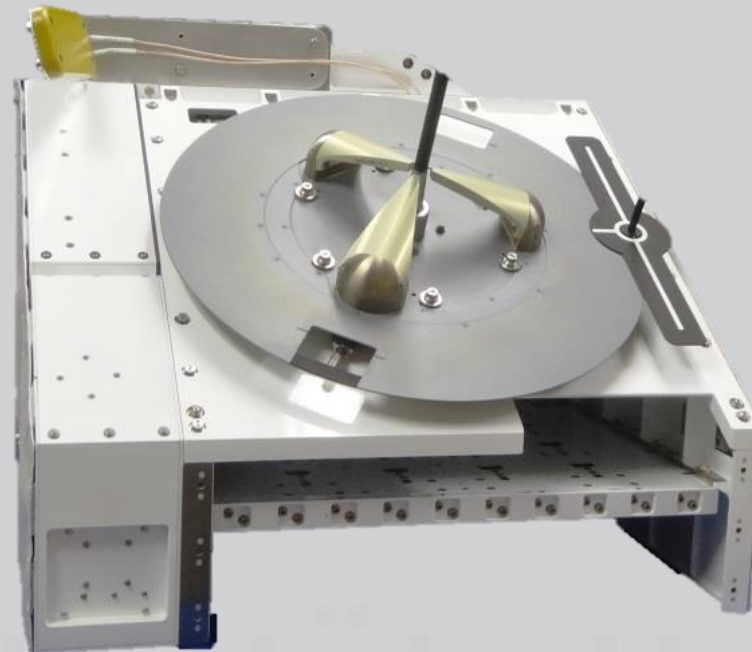
ISS Cargo Mission	Launch
SpaceX-7	Jun 13, 2015
SpaceX-8	Sep 2, 2015
OSC-5	Oct 12, 2015
SpaceX-9	Dec 5, 2015
SpaceX-10	Feb 9, 2016
OSC-6	Apr 1, 2016
OSC-7	Jun 5, 2016
SpaceX-11	Jul 13, 2016
Orb-8	Aug 19, 2016
SpaceX-12	Oct 8, 2016

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Questions?

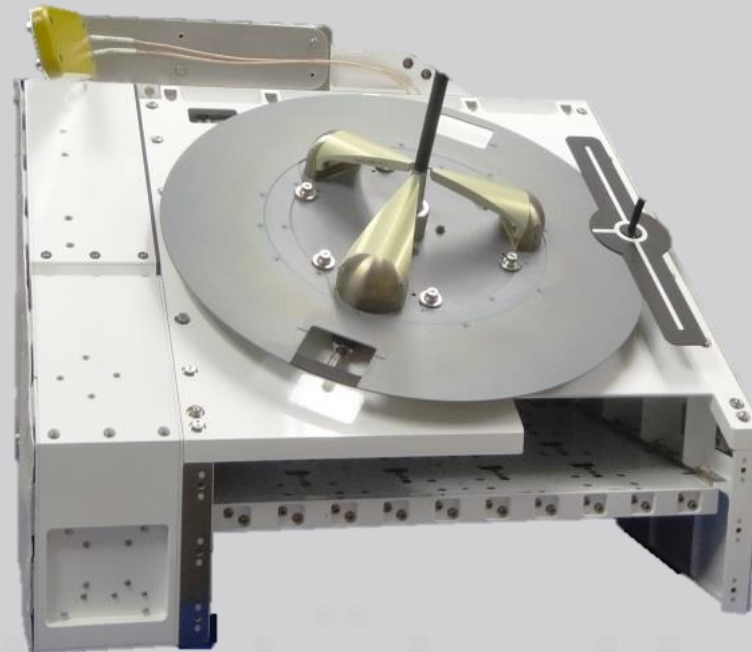


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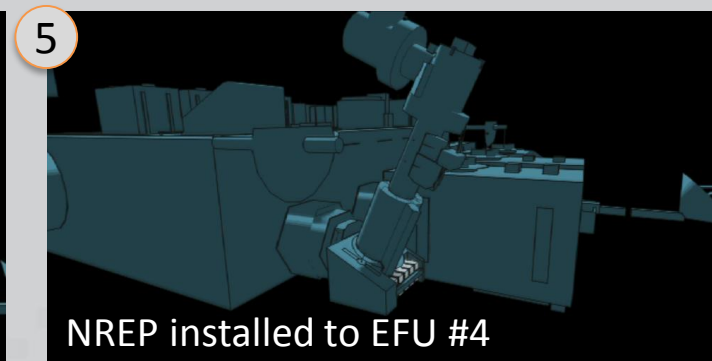
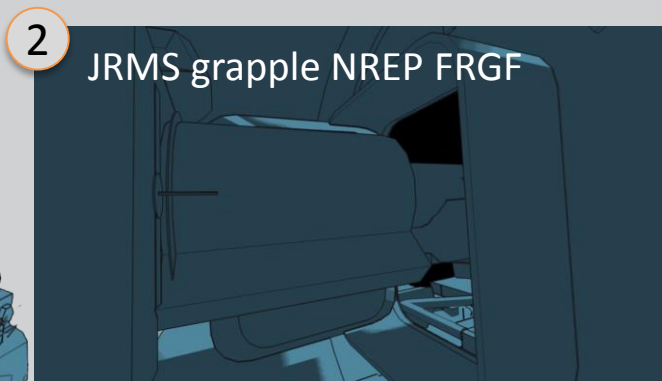
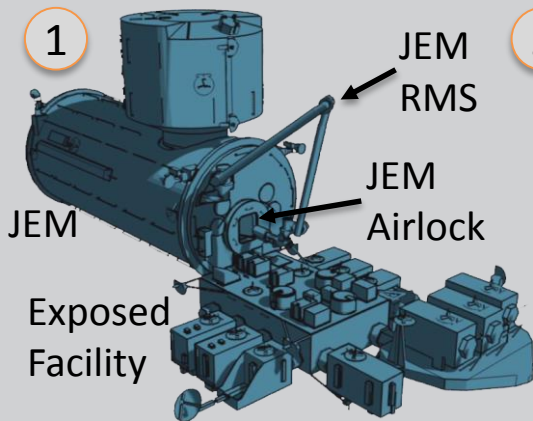
Backup Data



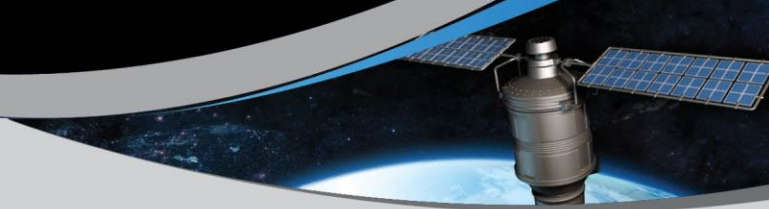
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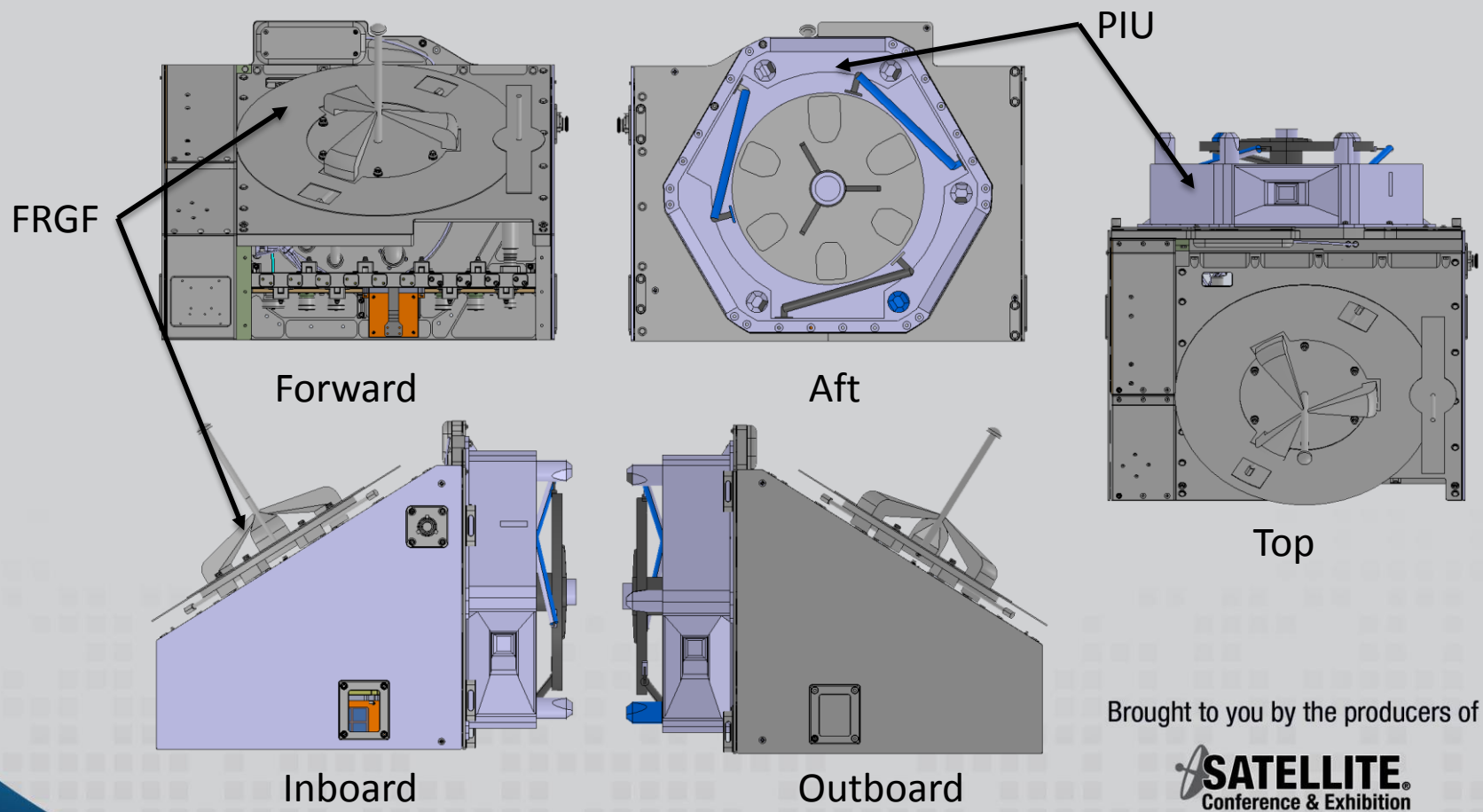
NREP Install Overview



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NanoRacks Functional Overview



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