Agenda

- Introduction
- Payload Integration Manager (PIM)
- ISS Payload Integration Process
- Integration Timeframes
  - Strategic, Tactical, and Operations
- Documentation
  - Joint Agreements, Integration Products
- Getting Manifested!
- Payload Tactical Plan
- Change Evaluation Process
- Summary
Introduction

This briefing provides a basic understanding of the ISS Payload Integration Process, including ISS-provided support to the payload and payload-provided data for the ISS.
Payload Integration Manager

- NASA Payload Integration Manager (PIM)
  - Functions as the Payload Developer’s primary interface to the ISS Program
  - Serves as payload advocate – but also protects ISS Program Requirements

- Ensures payload requirements are accurately defined and documented
- Facilitates payload integration product development, delivery schedules, and communications with the ISS Program
**ISS Payload Integration Process**

- **NASA PI Ms provide integration leadership during all phases of the payload’s life cycle**
  - **Strategic** - ISS integration requirements, products, and schedule development to ensure that an ISS compatible payload is built; support manifest process (payload data collection and feasibility assessments)
  - **Tactical** - represent PD interests to Increment and Flight-specific teams to ensure that integration and operations requirements are addressed; provide oversight for payload CoFR and verification submittals
  - **Operations** - assist with operations issue resolution between the PD and the Increment Payload Manager; maintains payload insight; and coordinates payload resupply or return requirements; assure payload CoFR and verification submittals during payload lifetime on-orbit
  - **Post-flight** - coordinate vehicle deintegration requirements; return of payload material from the landing site to the PD; and Lessons Learned submittals
Strategic Timeframe Overview

Typical Strategic Timeframe

- Preliminary Design Review
  - Export Classification Letter
  - ISS Design Support Teams
- Payload Integration Agreement (PIA) Development
  - Develop Product Delivery Schedule
  - Phase 0/I Safety Review
  - Begin Technical Interchange Meetings, & IPLAT, IDAGS, Ops Nomenclature
  - Hardware Interface Control Document (ICD)
- Critical Design Review
  - Payload Tactical Plan (Inc/Flt Assignment)
  - Resource Requirements Definition
  - Payload Displays, Software ICD Development
  - Payload Development and Verification
  - PIA Update (if req'd), Baseline Hardware ICD
  - Phase II Safety Review
- Payload Development and Verification
  - Payload Displays, Software ICD Development
  - Payload Tactical Plan (Inc/Flt Assignment)
  - Resource Requirements Definition
  - Payload Displays, Software ICD Development
  - Payload Development and Verification
  - PIA Update (if req'd), Baseline Hardware ICD
  - Phase II Safety Review

Identifies the initial processes for the Payload Integration activity
**Tactical Timeframe Overview**

**Typical Tactical Timeframe**

- **~L-16 to L-12M**
  - Manifest and Stowage, Drawings, KSC Data Sets
  - Training Units Delivered, Planning Data Set, Operations Data Set
  - Initial Procedure Development

- **~L-12 to L-6M**
  - Phase III Safety Review
  - Crew Training
  - Baseline Datasets: Command & Data Handling, Manifest and Stowage, Drawing, Procedures and Displays
  - ISS Interface Verification

- **~L-6 to L-1M**
  - Payload Rack Checkout Unit (PRCU) Testing at KSC
  - Payload Turnover for Launch Vehicle Integration
    - Shuttle Middeck
    - Multipurpose Pressurized Logistics Module (MPLM)
    - Soyuz/Progress
    - ATV
    - HTV
    - COTS

*Note: EXPRESS Sub-rack payloads will have a compressed integration cycle.*
Operations Timeframe Overview

Typical Operations Timeframe

- L+2 days up through 6 months or more on-orbit

Certification of Flight Readiness

Launch

On-Orbit Operations

Landing

Post-Landing Payload Processing

- Hardware De-integration
- Sample Return

Requirements Documentation and Verification Paperwork

CoFR documentation addresses both hardware launch and Stage operations
Joint Agreements

Negotiated Agreements

Unique PIA
Documents joint agreements to manage and execute roles and responsibilities for payload integration.

PI M Schedule
Documents negotiated product and hardware delivery dates.

Payload Unique ICD/Verification Requirements
Defines payload hardware and software interfaces with ISS. Details interface verification requirements.

Payload Safety Data Package
Documents payload hazards, hazard controls, and hazard control verification.

What they do for the Payload Developer

Strategic

Payload Tactical Plan
Documents detailed payload resource requirements.

Tactical

Payload Unique Data Sets
Document detailed payload requirements for technical disciplines:
- Payload Training
- Ground Data Services
- Payload Planning Requirements
- Command and Data Handling
- Payload Operations
- KSC Support Requirements
- KSC Technical Requirements
- Payload Configuration and Drawings
- EVA/EVR
- Payload Procedures and Displays
- Manifest and Stowage

Payload Safety Data Package

PI M Schedule

Unique PIA

Payload Unique ICD/Verification Requirements
Integration Products

Payload Integration Manager Schedule

**STRATEGIC**
- PDR
- Safety Phase 0/I
- Prelim Design Data Package
- Safety Data (Phase 0-I)
- Training Strategy TIMs
- Payload Integration Agreement (PIA)
- Critical Design Data Package
- Safety Data (Phase II)
- ICD/Verification Requirements
- Resource Requirements Definition
- Procedures & Displays DS (P)

**TACTICAL**
- C&DH DS (P)
- KSC Support Rqmts DS
- KSC Technical Rqmts DS
- Ground Data Services DS
- Procedures & Displays (U)
- Payload Planning DS (P)
- Manifest/Stowage DS (P)
- Drawing DS (P)
- C&DH DS (U)
- Payload Trainer H/W & S/W
- Training Plans & Courseware
- Payload Planning DS (F)
- Interface Control Document (ICD) (U)
- Payload Verification Plan (PVP) (U)
- Requirements Exceptions

**KEY**
- P - Preliminary
- U - Update
- F - Final

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**Payload Integration Agreement**
- CoFR Endorsement

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**Safety Data Pack**
- Safety Data Pack
- Manifest/Stowage DS (U)
- Drawing DS (U)
- Integration Data Pack (IDP)

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**Safety Data (Phase II)**
- Safety Data Pack
- Manifest/Stowage DS (U)
- Drawing DS (U)
- Integration Data Pack (IDP)

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**Safety Data (Phase III)**
- Safety Data Pack
- Manifest/Stowage DS (U)
- Drawing DS (U)
- Integration Data Pack (IDP)

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**Payload Manifested**
- Safety Data Pack
- Manifest/Stowage DS (U)
- Drawing DS (U)
- Integration Data Pack (IDP)

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**Payload Pre-Ship**
- Safety Data Pack
- Manifest/Stowage DS (U)
- Drawing DS (U)
- Integration Data Pack (IDP)

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**Payload Integration Manager Schedule**
- Export Classification Letter
- Prelim Design Data Package
- Safety Data (Phase 0-I)
- Training Strategy TIMs
- Payload Integration Agreement (PIA)
- Critical Design Data Package
- Safety Data (Phase II)
- ICD/Verification Requirements
- Resource Requirements Definition
- Procedures & Displays DS (P)
- Interface Control Document (ICD) (U)
- Payload Verification Plan (PVP) (U)
- Requirements Exceptions
- CoFR Endorsement
Getting Manifested!

Research Planning Working Group (RPWG)

Increment-specific Research Plan

Payload Tactical Plan (PTP)

ISS Payloads Control Board/ Multilateral Payloads Control Board

ISS Payloads Office Feasibility Assessments (Mission Integration)

~ Increment minus 12 months
Payload Tactical Plan – IDRD Annex 5

• Payload Tactical Plan – IDRD Annex 5

• Purpose:
  This document provides the integrated ascent, descent, and on-orbit resource requirements, research objectives, utilization priorities and on-orbit payload topologies of the utilization complement for a given set of Increments.

• The Payload Tactical Plan is used as a top level requirements document to define resource requirements which can then be flowed to downstream payload documentation (e.g. Hardware and Software ICDs, Procedures, Planning Data, Stage Analysis, etc.)

• The Payload Tactical Plan is also used to communicate utilization resource requirements to the other ISS offices (e.g. Mission Integration, Vehicle Office, MOD, etc.)
Summary

- Our job is to increase the potential of Mission success for ISS payloads

Clearly defining and communicating requirements and expectations

leads to

Safe payload operations and successful research

resulting in

Maximum Science Return
ISS Payload Integration
Back-up Charts
**Acronyms and Terms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATV</td>
<td>Automated Transfer Vehicle</td>
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<tr>
<td>AWG</td>
<td>Acoustics Working Group</td>
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<td>CDR</td>
<td>Critical Design Review</td>
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<td>CoFR</td>
<td>Certification of Flight Readiness</td>
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<td>C&amp;DH</td>
<td>Command and Data Handling</td>
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<td>DS</td>
<td>Data Set</td>
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<tr>
<td>EDMS</td>
<td>Electronic Data Management System</td>
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<tr>
<td>EEE</td>
<td>Electrical, Electronic, and Electromechanical</td>
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<tr>
<td>ExPRESS</td>
<td>Expedite the Processing of Experiments to Space Station</td>
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<td>FLT</td>
<td>Flight</td>
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<td>GSRP</td>
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<td>Human Factors Integration Team</td>
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<td>H/W</td>
<td>Hardware</td>
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<td>JAXA launch vehicle</td>
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<td>ICD</td>
<td>Interface Control Document</td>
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<td>Integration Data Pack</td>
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<td>Inc</td>
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<td>IP</td>
<td>Internet Protocol</td>
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<td>Iplat</td>
<td>ISS Payload Label Approval Team</td>
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<td>ISS</td>
<td>International Space Station</td>
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<tr>
<td>JSC</td>
<td>Johnson Space Center</td>
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<tr>
<td>KSC</td>
<td>Kennedy Space Center</td>
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<tr>
<td>L-6</td>
<td>Launch minus (month or day)</td>
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<td>MPCB</td>
<td>Multilateral Payload Control Board</td>
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<td>MPLM</td>
<td>Multipurpose Pressurized Logistics Module</td>
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<td>MSFC</td>
<td>Marshall Space Flight Center</td>
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<td>Software</td>
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<td>Technical Interchange Meeting</td>
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<td>Telescience Resource Kit</td>
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<td>User Requirements Collection</td>
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<td>User-identification</td>
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<td>US PODFCB</td>
<td>US Payload Operations Data File Control Board</td>
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<td>VPN</td>
<td>Virtual Private Network</td>
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<td>Increment Definition and Requirements Document</td>
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<td>L-6M</td>
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**Definitions**

- **Increment**: ISS period supporting crew rotation. The duration of an Increment is the time period from the launch of a designated Expedition crew to the undocking of the return vehicle for that Expedition crew.

- **Questionnaire**: Web-based software data entry tool used to collect payload resource requirements in support of the RPWG manifesting process.

- **Stage**: ISS timeframe between manned vehicle dockings.