Payload Integration Agreement Increment Addendum Blank Book for Unpressurized Payloads

International Space Station Program

Baseline

August 2001

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas

Export Administration Regulations (EAR) Notice

This document contains information controlled by the Export Administration Regulations (EAR), 15 CFR 730-774, and has been classified as EAR99/No License Required.

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
-	Initial Release (Reference per SSCD 005659, EFF. 09-17-01)	10-04-01

SSP 57062
Baseline

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

CHANGE SHEET

October 2, 2001

Baseline

Space Station Control Board Directive 005659/(1-1), dated 09-19-01. (1)

CHANGE INSTRUCTIONS

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

Baseline (Reference SSCD 005659, dated 09/17/01)

LIST OF EFFECTIVE PAGES

October 2, 2001

The current status of all pages in this document is as shown below:

Page	Change No.	SSCD No.	Date
i - xiii	Baseline	005659	09-17-01
1-1 -1-2	Baseline	005659	09-17-01
2-1 - 2-4	Baseline	005659	09-17-01
3-1 - 3-14	Baseline	005659	09-17-01
4-1 - 4-8	Baseline	005659	09-17-01
5-1 - 5-13	Baseline	005659	09-17-01
6-1 - 6-9	Baseline	005659	09-17-01
7-1 - 7-15	Baseline	005659	09-17-01
8-1	Baseline	005659	09-17-01
9-1 - 9-3	Baseline	005659	09-17-01
10-1 - 10-4	Baseline	005659	09-17-01
A-1 - A-5	Baseline	005659	09-17-01
B-1 - B-7	Baseline	005659	09-17-01
C-1 - C-2	Baseline	005659	09-17-01
D-1 - D-6	Baseline	005659	09-17-01

SSP 57062
Baseline

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

AUGUST 2001

FOREWORD

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

This document, SSP 57062, Payload Integration Agreement Increment Addendum Blank Book for Unpressurized Payloads, contains the standard format that will be used by International Space Station (ISS) Program Participants to develop a payload-unique Increment Addendum for ISS attached payloads. The Research Program Office (RPO), Payload Developer (PD), or Appropriate Office, and the Payload Integration Manager (PIM) will use this blank book for the development of the unique Payload Integration Agreement (PIA) Increment Addendum. Use of the standard format will provide a consistent definition of the required integration agreements for the payload organization and the ISS Program.

The development of the PIA Increment Addendum shall be in compliance with the signed payload-unique PIA between the RPO, PD, or Appropriate Office and the ISS Program Payloads Office.

This PIA Increment Addendum Blank Book is consistent with the processes and products to be prepared by the ISS Program Participants, as referenced in SSP 50200-01, Station Program Implementation Plan, Volume 1: Station Program Management Plan. This document is under the Configuration Management (CM) control of the ISS Program Payload Control Board (PCB), and any changes or revisions will be reviewed and approved by the PCB.

Richard Nygren
Chair, Payloads Control Board
National Aeronautics and Space Administration

9/17/01
Date

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

CONCURRENCE

AUGUST 2001

Prepared by:	Robert Miley BOOK MANAGER	OZ2 ORG
	SIGNATURE	9/7/01 DATE
Concurred by:	James Scheib PAYLOAD MISSION INTEGRATION AND PLANNING MANAGER	OZ2 ORG
	SIGNATURE	9-17-01 DATE
NASA DQA:	Ann Wood CONFIGURATION MANAGEMENT REPRESENTATIVE	OL ORG
	SIGNATURE	9/17/01 DATE

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT
ADDENDUM BLANK BOOK FOR UNPRESSURIZED PAYLOADS

LIST OF CHANGES

AUGUST 2001

All changes to paragraphs, tables, and figures in this document are shown below:

PCB	Entry Date	Change	Paragraph(s)
	August 2001	Baseline	All
	October 2001	Baseline	All

SSP 57062
Baseline

Payload Integration Agreement Increment Addendum for {Payload Name}

International Space Station Program

Baseline

{Date}

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

{DATE}

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

APPROVAL

{DATE}

Payload Acronym: {Payload Acronym}

Payload Name: {Payload Name}

Payload Developer: {Payload Developer}

Approved by: Name _____ _____
PAYLOADS OFFICE MANAGER ORG

_____ _____
SIGNATURE DATE

Approved by: Name _____ _____
RESEARCH PROGRAM OFFICE MANAGER ORG

_____ _____
SIGNATURE DATE

Approved by: Name _____ _____
PROJECT MANAGER ORG

_____ _____
SIGNATURE DATE

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

CONCURRENCE

{DATE}

Prepared by:	Name PAYLOAD INTEGRATION MANAGER	ORG
	SIGNATURE	DATE
Concurred by:	Name PAYLOAD MISSION INTEGRATION AND PLANNING MANAGER	ORG
	SIGNATURE	DATE
NASA DQA:	Name CONFIGURATION MANAGEMENT REPRESENTATIVE	ORG
	SIGNATURE	DATE

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

APPROVING REPRESENTATIVES: PAYLOADS OFFICE MANAGER

Name: Office Code:

Telephone: Fax:

E-Mail:

Address:

PAYLOAD RESEARCH PROGRAM OFFICE MANAGER OR PAYLOAD PROGRAM MANAGER

Name: Office Code:

Telephone: Fax:

E-Mail:

Address:

PAYLOAD PROJECT MANAGER

Name: Office Code:

Telephone: Fax:

E-Mail:

Address:

DEVELOPING REPRESENTATIVES: PAYLOAD INTEGRATION MANAGER

Name: Office Code:

Telephone: Fax:

E-Mail:

Address:

PREFACE

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

This Payload Integration Agreement (PIA) Increment Addendum is the agreement between the {Research Program Office (RPO), Payload Developer (PD), or Appropriate Office} and the International Space Station (ISS) Program on the flight-specific responsibilities and tasks that relate directly to integration of the payload into the ISS. Signature on this PIA Increment Addendum constitutes technical agreement on the tasks to be performed.

[Any instructional information contained in this PIA Increment Addendum Blank Book is italicized and enclosed in brackets [example]. Information to be supplied is enclosed in braces and underlined {example}*. All instructional information will be removed for the flight-specific PIA Increment Addendum.]*

Tables with shaded fields require no payload data entry.

All commitments and services to be furnished by the ISS Program to the {RPO, PD, or Appropriate Office} under this PIA Increment Addendum shall be furnished using its best efforts.

This PIA Increment Addendum, when baselined, becomes the controlling document for payload resources for a flight-specific period, superseding any previously agreed to payload Mission Evaluation Request.

Flight dates shown in this PIA Increment Addendum are for planning purposes only.

The acronyms and abbreviations list is found in Appendix A. The glossary of the terms requiring definition is found in Appendix B. Open items that have not been determined are designated as To Be Determined (TBD) and are found in Appendix C. Items that need to be resolved will be designated as To Be Resolved (TBR) and are also found in Appendix C. Appendix D describes flight-to-flight changes associated with continuing payload on-orbit operations.

INTERNATIONAL SPACE STATION PROGRAM

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM FOR {PAYLOAD NAME}

LIST OF CHANGES

{DATE}

All changes to paragraphs, tables, and figures in this document are shown below:

Board Name	Entry Date	Change	Paragraph(s)

TABLE OF CONTENTS

PARAGRAPH		PAGE
1.0	INTRODUCTION	1-1
1.1	PURPOSE	1-1
1.2	SCOPE	1-1
1.2.1	APPROVAL AUTHORITY	1-2
1.2.2	CONFIGURATION MANAGEMENT	1-2
1.3	PRECEDENCE	1-2
2.0	DOCUMENTS	2-1
2.1	APPLICABLE DOCUMENTS	2-1
2.2	REFERENCE DOCUMENTS	2-3
3.0	PAYLOAD INFORMATION	3-1
3.1	PAYLOAD OBJECTIVES/DESCRIPTION	3-1
3.1.1	PAYLOAD/OBJECTIVES STATEMENT	3-1
3.1.2	PAYLOAD DESCRIPTION STATEMENT	3-1
3.1.3	FLIGHT-SPECIFIC PAYLOAD DRAWING	3-1
3.2	ISS PAYLOAD/CARGO CARRIER COMPATIBILITY	3-1
3.2.1	ISS ATTACHED PAYLOAD CARGO CARRIER COMPATIBILITY	3-1
3.2.2	ISS ATTACHED PAYLOAD INTERFACES	3-2
3.2.2.1	ISS ATTACH SITES/PAYLOAD COMPATIBILITY	3-2
3.2.3	PAYLOAD CATEGORY TYPE SELECTION	3-3
3.3	PAYLOAD MICROGRAVITY CHARACTERISTICS	3-4
3.4	VIEWING REQUIREMENTS/LOCATION	3-5
3.5	PAYLOAD ATTITUDE AND POINTING REQUIREMENTS	3-5
3.6	ISS LAPTOP COMPUTERS	3-6
3.6.1	PORTABLE COMPUTER SYSTEM LAPTOP COMPUTERS	3-6
3.6.2	SPACE STATION COMPUTER LAPTOP COMPUTERS	3-6
3.7	PAYLOAD-PROVIDED LAPTOP COMPUTER REQUIREMENTS	3-7
3.7.1	LAPTOP COMPUTER REQUIREMENTS DESCRIPTION	3-7
3.8	PAYLOAD PHOTO/TELEVISION REQUIREMENTS	3-8
3.9	PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENT REQUIREMENTS	3-9
3.9.1	PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENTS OF COMPATIBILITY REQUIREMENTS	3-9
3.9.2	PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENTS COMPATIBILITY DESCRIPTION	3-9
3.10	SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES	3-10
3.10.1	SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES REQUIREMENTS	3-10
3.11	PAYLOAD OPTIONAL SERVICES	3-12
3.11.1	EXTRAVEHICULAR ROBOTICS EQUIPMENT REQUIREMENTS	3-12
3.11.2	FLIGHT EQUIPMENT - PROCURED OR PROGRAM-FURNISHED	3-13

3.11.2.1 PROCURED EQUIPMENT - UMBILICAL MECHANISM ASSEMBLY 3-13
3.11.2.2 PROGRAM-FURNISHED EQUIPMENT - FLIGHT REQUIREMENTS 3-13
3.11.2.3 PAYLOAD FLIGHT EQUIPMENT REQUIREMENTS 3-13
3.12 LAPTOP COMPUTER EQUIPMENT 3-14
4.0 PAYLOAD PRELAUNCH TO DOCKED REQUIREMENTS 4-1
4.1 PAYLOAD HARDWARE 4-1
4.1.1 PRELAUNCH PROCESSING AND PAYLOAD TRANSPORTATION TO ISS ACTIVITIES 4-1
4.1.2 PAYLOAD HARDWARE DESCRIPTION FOR ASCENT 4-1
4.2 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS 4-3
4.2.1 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS 4-3
4.3 LAUNCH COMMIT CRITERIA 4-3
4.3.1 LAUNCH COMMIT CRITERIA REQUIREMENTS 4-3
4.4 PAYLOAD MAXIMUM LAUNCH CONFIGURATION 4-4
4.4.1 PAYLOAD MAXIMUM LAUNCH CONFIGURATION DURATION 4-5
4.5 PRELAUNCH TO DOCKED PAYLOAD RESOURCE REQUIREMENTS 4-5
4.5.1 PRELAUNCH TO DOCKED PAYLOAD RESOURCE TABLE 4-6
4.6 PRELAUNCH TO DOCKED CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME 4-8
5.0 TRANSFER AND INTEGRATION ONTO ISS REQUIREMENTS 5-1
5.1 SHUTTLE REMOTE MANIPULATOR SYSTEM HANDOFF AND TRANSFER REQUIREMENTS FROM THE ORBITER TO THE ISS 5-1
5.2 SPACE STATION REMOTE MANIPULATOR SYSTEM HANDOFF AND TRANSFER REQUIREMENTS FOR PLACEMENT ON THE ISS ATTACH SITE 5-1
5.3 EXTRAVEHICULAR ACTIVITY REQUIREMENTS 5-2
5.3.1 STANDARD EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS 5-2
5.3.2 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS 5-3
5.3.3 EXTRAVEHICULAR ACTIVITY INTERFACES 5-3
5.3.3.1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS 5-3
5.3.3.2 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS 5-4
5.3.3.3 EXTRAVEHICULAR ACTIVITY DANGER AND WARNING LABEL LOCATIONS 5-4
5.3.4 EXTRAVEHICULAR ACTIVITY TASK HAZARDS 5-4
5.3.4.1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS 5-4
5.4 EXTRAVEHICULAR ROBOTICS REQUIREMENTS 5-5
5.4.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS 5-5
5.4.1.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS IDENTIFIED 5-5
5.4.1.2 EXTRAVEHICULAR ROBOTICS STANDARD GRAPPLE FIXTURE LOCATION 5-6
5.4.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS 5-6

5.4.2.1 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS IDENTIFIED 5-6
5.4.2.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE LOCATIONS 5-7
5.4.3 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS 5-7
5.4.3.1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS IDENTIFIED 5-7
5.4.3.2 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATION 5-8
5.4.4 EXTRAVEHICULAR ROBOTICS SOFTWARE INTERFACE REQUIREMENTS 5-8
5.4.5 PAYLOAD ROBOTIC PROPERTIES 5-9
5.5 COMMON ATTACH SYSTEM EXTERNAL BERTHING CAMERA SYSTEM OPERATIONS 5-9
5.5.1 EXTERNAL BERTHING CAMERA SYSTEM REQUIREMENTS 5-9
5.5.2 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS 5-9
5.6 TRANSFER FROM ORBITER AND INTEGRATION ONTO ISS RESOURCE REQUIREMENTS 5-9
5.6.1 TRANSFER AND INTEGRATION ONTO ISS RESOURCE TABLE 5-10
5.7 TRANSFER AND INTEGRATION ONTO ISS CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME 5-13
6.0 ON-ORBIT RESOURCE REQUIREMENTS 6-1
6.1 ON-ORBIT OPERATING REQUIREMENTS 6-1
6.2 ON-ORBIT RESOURCE REQUIREMENTS 6-1
6.2.1 ON-ORBIT OPERATIONS ISS RESOURCE TABLE 6-1
6.2.2 ON-ORBIT INTRAVEHICULAR ACTIVITY PAYLOAD OPERATIONS AND PERFORMANCE REQUIREMENTS 6-4
6.2.2.1 INTRAVEHICULAR ACTIVITY PAYLOAD OPERATION PERFORMANCE DESCRIPTION 6-4
6.3 ON-ORBIT STOWAGE 6-5
6.3.1 ON-ORBIT STOWAGE VOLUME REQUIREMENTS 6-5
6.4 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT/LABORATORY SUPPORT EQUIPMENT AND ACCOMMODATIONS FOR PAYLOAD OPERATION 6-7
6.4.1 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT AND ACCOMMODATIONS ITEMS REQUIREMENTS 6-7
6.4.2 ON-ORBIT ISS PRESSURIZED VOLUME LABORATORY SUPPORT EQUIPMENT AND ACCOMMODATIONS ITEMS REQUIREMENTS 6-7
6.5 PRESSURIZED ACCOMMODATIONS - OTHER 6-8
6.6 ON-ORBIT CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME 6-9
7.0 ISS DEINTEGRATION AND POST-LANDING REQUIREMENTS 7-1
7.1 SPACE STATION REMOTE MANIPULATOR SYSTEM CAPTURE AND TRANSFER REQUIREMENTS FOR REMOVAL FROM THE ISS ATTACH SITE 7-1

7.2 SHUTTLE REMOTE MANIPULATOR SYSTEM HAND-OFF AND TRANSFER REQUIREMENTS TO THE SHUTTLE REMOTE MANIPULATOR SYSTEM TO THE ORBITER 7-1
7.3 EXTRAVEHICULAR ACTIVITY REQUIREMENTS 7-2
7.3.1 STANDARD EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS 7-2
7.3.2 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS 7-3
7.3.3 EXTRAVEHICULAR ACTIVITY INTERFACES 7-3
7.3.3.1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS 7-3
7.3.3.2 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS 7-3
7.3.3.3 EXTRAVEHICULAR ACTIVITY DANGER AND WARNING LABEL LOCATIONS 7-4
7.3.4 EXTRAVEHICULAR ACTIVITY TASK HAZARDS 7-4
7.3.4.1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS 7-4
7.4 EXTRAVEHICULAR ROBOTICS REQUIREMENTS 7-5
7.4.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS 7-5
7.4.1.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS IDENTIFIED 7-5
7.4.1.2 EXTRAVEHICULAR ROBOTICS STANDARD GRAPPLE FIXTURE LOCATION 7-5
7.4.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS 7-6
7.4.2.1 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS IDENTIFIED 7-6
7.4.2.2 EXTRAVEHICULAR ROBOTICS SPECIAL DEXTEROUS GRASP FIXTURE LOCATIONS 7-7
7.4.3 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS 7-7
7.4.3.1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS IDENTIFIED 7-7
7.4.3.2 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATION 7-8
7.4.4 EXTRAVEHICULAR ROBOTICS SOFTWARE INTERFACE REQUIREMENTS 7-8
7.4.5 PAYLOAD ROBOTIC PROPERTIES 7-8
7.5 COMMON ATTACH SYSTEM EXTERNAL BERTHING CAMERA SYSTEM OPERATIONS 7-8
7.5.1 EXTERNAL BERTHING CAMERA SYSTEM REQUIREMENTS 7-9
7.5.2 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS 7-9
7.6 RETURN REQUIREMENTS 7-9
7.6.1 HARDWARE RETURN READINESS 7-10
7.6.2 PAYLOAD HARDWARE DESCRIPTION FOR DESCENT 7-10
7.7 RETURN RESOURCE REQUIREMENTS 7-11
7.7.1 ISS DEINTEGRATION AND RETURN OPERATIONS RESOURCE TABLE 7-11
7.8 RETURN CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME 7-15

8.0 FERRY FLIGHT REQUIREMENTS 8-1
8.1 FERRY FLIGHT OPERATIONS REQUIREMENTS 8-1
9.0 PAYLOAD DEVELOPER-PROVIDED CREW TRAINING, GROUND SUPPORT TRAINING, AND TRAINER MOCKUP REQUIREMENTS 9-1
9.1 CREW AND GROUND SUPPORT PERSONNEL TRAINING REQUIREMENTS 9-1
9.1.1 TRAINING CLASSIFICATION AND LOCATION REQUIREMENTS 9-1
9.2 TRAINER/SIMULATOR REQUIREMENTS 9-2
9.2.1 TRAINING FACILITY AND EQUIPMENT REQUIREMENTS 9-3
10.0 GROUND DATA SERVICES REQUIREMENTS – FLIGHT OPERATIONS 10-1
10.1 GROUND DATA SERVICES OPERATIONAL REQUIREMENTS 10-1
10.1.1 GROUND DATA SERVICES REQUIREMENTS SUPPORTING FLIGHT OPERATIONS 10-1
10.1.2 ADDITIONAL REQUIREMENTS/SERVICES SUPPORTING FLIGHT OPERATIONS 10-3

APPENDIX

A ACRONYMS AND ABBREVIATIONS A-1
B GLOSSARY OF TERMS B-1
C OPEN WORK C-1
D FLIGHT-BASED ADDENDUM D-1

TABLE

3.2.1-1 ISS PAYLOAD CARGO CARRIERS 3-2
3.2.2.1-1 ISS PAYLOAD ATTACH SITES 3-3
3.2.3-1 PAYLOAD CATEGORY TYPE SELECTION/SPECIFICATION 3-3
3.3-1 PAYLOAD OPERATING MODE MICROGRAVITY CHARACTERISTICS 3-5
3.4-1 ISS VIEWING LOCATIONS FOR ATTACHED PAYLOADS 3-5
3.5-1 PAYLOAD ATTITUDE AND POINTING REQUIREMENTS 3-6
3.7.1-1 PAYLOAD LAPTOP COMPUTER REQUIREMENTS DESCRIPTION 3-8
3.8-1 PAYLOAD PHOTO/TELEVISION REQUIREMENTS 3-8
3.9.2-1 ENVIRONMENTAL COMPATIBILITY DESCRIPTION 3-9
3.10.1-1 SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES REQUIREMENTS 3-12
3.11.1-1 EXTRAVEHICULAR ROBOTICS EQUIPMENT REQUIREMENTS 3-13
3.11.2.3-1 PAYLOAD FLIGHT EQUIPMENT REQUIREMENTS 3-14
4.1.1-1 SCENARIO OF PRELAUNCH PROCESSING AND PAYLOAD TRANSPORTATION TO DOCKED ACTIVITIES 4-1
4.1.2-1 PAYLOAD HARDWARE DESCRIPTION FOR ASCENT 4-2
4.2.1-1 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS 4-3
4.3.1-1 PAYLOAD LAUNCH COMMIT CRITERIA 4-4
4.4.1-1 PAYLOAD MAXIMUM LAUNCH CONFIGURATION DURATION 4-5
4.5.1-1 PRELAUNCH TO DOCKED PAYLOAD RESOURCE TABLE 4-8
5.1-1 SCENARIO OF PAYLOAD SHUTTLE REMOTE MANIPULATOR SYSTEM UNBERTH TO SPACE STATION REMOTE MANIPULATOR SYSTEM HANDOFF ACTIVITIES 5-1

5.2-1 SCENARIO OF SPACE STATION REMOTE MANIPULATOR SYSTEM PAYLOAD ACTIVITIES TO PAYLOAD ATTACH SITE ACTIVITIES 5-2
5.3.1-1 EXTRAVEHICULAR ACTIVITY STANDARD TOOLS AND CREW AIDS REQUIREMENTS 5-2
5.3.2-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS 5-3
5.3.4.1-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS 5-5
5.4.1.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURES 5-6
5.4.2-1 SCENARIO OF PAYLOAD SPECIAL PURPOSE DEXTEROUS MANIPULATOR ACTIVITIES 5-6
5.4.2.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND STANDARD DEXTEROUS GRASP FIXTURE 5-7
5.4.3.1-1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURES 5-8
5.4.4-1 EXTRAVEHICULAR ROBOTICS MOBILE SERVICING SYSTEM SOFTWARE INTERFACE REQUIREMENTS 5-8
5.6.1-1 TRANSFER AND INTEGRATION ONTO ISS RESOURCE TABLE 5-12
6.1-1 ON-ORBIT OPERATING REQUIREMENTS 6-1
6.2.1-1 ON-ORBIT OPERATIONS ISS RESOURCE TABLE 6-4
6.2.2.1-1 PAYLOAD OPERATION PERFORMANCE DESCRIPTION 6-5
6.3.1-1 ON-ORBIT STOWAGE VOLUME REQUIREMENTS 6-6
6.4.1-1 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT PARTS TABLE 6-7
6.4.2-1 ON-ORBIT ISS PRESSURIZED VOLUME LABORATORY SUPPORT EQUIPMENT PARTS TABLE 6-8
6.5.1-1 PRESSURIZED ACCOMMODATIONS - OTHER REQUIREMENTS 6-9
7.1-1 ISS UNBERTH AND READINESS FOR SHUTTLE REMOTE MANIPULATOR SYSTEM CAPTURE ACTIVITIES 7-1
7.2-1 SHUTTLE REMOTE MANIPULATOR SYSTEM TRANSFER TO ORBITER PAYLOAD BAY 7-2
7.3.1-1 EXTRAVEHICULAR ACTIVITY STANDARD TOOLS AND CREW AIDS REQUIREMENTS 7-2
7.3.2-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS 7-3
7.3.4.1-1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS 7-4
7.4.1.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURES 7-5
7.4.2-1 SCENARIO OF PAYLOAD SPECIAL PURPOSE DEXTEROUS MANIPULATOR ACTIVITIES 7-6
7.4.2.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND SPECIAL DEXTEROUS GRASP FIXTURE 7-7
7.4.3.1-1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURES 7-7
7.4.4-1 EXTRAVEHICULAR ROBOTICS MOBILE SERVICING SYSTEM SOFTWARE INTERFACE REQUIREMENTS 7-8
7.6.1-1 SCENARIO FOR PAYLOAD RETURN READINESS 7-10

7.6.2-1 PAYLOAD HARDWARE DESCRIPTION FOR DESCENT 7-11
7.7.1-1 ISS DEINTEGRATION AND RETURN OPERATIONS RESOURCE TABLE..... 7-14
8.1-1 FERRY FLIGHT OPERATIONS REQUIREMENTS 8-1
9.1.1-1 PAYLOAD DEVELOPER-PROVIDED TRAINING CLASSIFICATION AND LOCATION REQUIREMENTS 9-2
9.2.1-1 TRAINING FACILITY AND EQUIPMENT REQUIREMENTS 9-3
10.1.1-1 GROUND DATA SERVICES REQUIREMENTS SUPPORTING FLIGHT OPERATIONS 10-3
10.1.2-1 ADDITIONAL REQUIREMENTS/SERVICES SUPPORTING FLIGHT OPERATIONS 10-4
C-1 TO BE DETERMINED ITEMS..... C-2
C-2 TO BE RESOLVED ISSUES..... C-2

FIGURE

3.1.3-1 FLIGHT-SPECIFIC PAYLOAD CONFIGURATION DRAWING 3-1
4.1.2-1 PAYLOAD HARDWARE CENTER OF GRAVITY LOCATIONS FOR ASCENT 4-2
5.3.3.1-1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS, ASCENT 5-3
5.3.3.2-1 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS..... 5-4
5.3.3.3-1 DANGER AND WARNING LABEL LOCATIONS..... 5-4
5.4.1.2-1 STANDARD GRAPPLE FIXTURE LOCATIONS..... 5-6
5.4.2.2-1 STANDARD DEXTEROUS GRASP FIXTURE LOCATIONS..... 5-7
5.4.3.2-1 UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATIONS 5-8
5.5.2-1 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS 5-9
7.3.3.1-1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS, DESCENT..... 7-3
7.3.3.2-1 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS..... 7-4
7.3.3.3-1 DANGER AND WARNING LABEL LOCATIONS..... 7-4
7.4.1.2-1 STANDARD GRAPPLE FIXTURE LOCATIONS..... 7-6
7.4.2.2-1 SPECIAL DEXTEROUS GRASP FIXTURE LOCATIONS 7-7
7.4.3.2-1 UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATIONS 7-8
7.5.2-1 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS 7-9
7.6.2-1 PAYLOAD HARDWARE CENTER OF GRAVITY LOCATIONS FOR DESCENT..... 7-11

1.0 INTRODUCTION

1.1 PURPOSE

This Payload Integration Agreement (PIA) Increment Addendum will contain all the relevant data to document the International Space Station (ISS) Program Research Program Office (RPO), Payload Developer (PD), or Appropriate Office requirements and commitments for launch date readiness for the increments applicable for the flight-to-flight period. The ISS Program to Space Shuttle Program (SSP) PIA agreements will be documented in the ISS flight-unique Mission Integration Plan (MIP). This PIA Increment Addendum specifies management and technical activities required for on-orbit operation and the ISS flight-unique MIP for transportation of the payload. For purposes of this document the RPO, PD, or Appropriate Office are treated as equivalent entities.

The top-level requirements unique to the {Payload Name} for a schedule flight date on or about {launch date} and for a planned return after completion of its on-orbit mission life of {number} years are documented in this PIA Increment Addendum. The PIA Increment Addendum is not a detailed collection of integration and operations requirements and data; such detailed information will reside in the Payload Data Sets. All sections of {Payload-unique PIA document number} are applicable during this flight period except as modified by Appendix D of this PIA Increment Addendum.

A. The PD shall enter the appropriate information into each of the tables in the Increment Addendum. If the requested information in the table is Not Applicable (N/A), N/A should be entered.

B. Section 3.0 of this PIA Increment Addendum describes the overall payload configuration and any changes that may occur during the flight period. The PD shall document the purpose/objectives, a payload description, the payload category, the microgravity operating sensitivity, and the services required by the payload.

1.2 SCOPE

This document applies to full truss site unpressurized payloads, their associated ancillary stowage requirements, and to other ISS Program-approved external payloads. This PIA Increment Addendum is not applicable to European Space Agency (ESA) Columbus External Payload Facility (EPF) payloads, Russian Segment payloads, or National Space Development Agency of Japan (NASDA) Japanese Experiment Module-Exposed Facility (JEM-EF) payloads or to National Aeronautics Space Administration (NASA) payloads flying on the ESA EPF, the Russian segment or the JEM-EF.

This PIA Increment Addendum documents the ISS Program and transportation services, tactical parameters, prelaunch to ascent requirements, on-orbit requirements, return requirements, ancillary volume stowage requirements, training requirements, and the Program-provided ground support requirements, all on an increment and flight basis. These elements are necessary to accomplish the integration, launch, on-orbit operation, descent, and deintegration of the payload. The data sets document payload

configuration, training, ground data services, payload operations, planning, Kennedy Space Center (KSC) Technical and Support requirements, as well as Extravehicular Activity (EVA) and Extravehicular Robotics (EVR) requirements. A complete description of each data set is specified in SSP 52000-PDS, Payload Data Sets Blank Book.

1.2.1 APPROVAL AUTHORITY

The payload-unique PIA, PIA Increment Addendum, Payload Data Sets, Interface Control Documents (ICDs), and associated changes are to be approved jointly by the ISS Payloads Office and the RPO, PD, or Appropriate Office. Level III Control Boards control the unique data sets.

1.2.2 CONFIGURATION MANAGEMENT

Configuration control for this PIA Increment Addendum commences upon the last required signature of this document. The ISS Program will maintain configuration control of this document in accordance with SSP 41170, Configuration Management Requirements.

1.3 PRECEDENCE

In the event of inconsistency among payload integration documentation contained within the applicable documents, resolution will be achieved by observing the following order of precedence:

A. Safety documents

B. Payload-unique PIA

C. SSP 57061, Standard Payload Integration Agreement for Unpressurized Payloads

D. PIA Increment Addendum

E. Payload ICDs referenced within SSP 57061 or PIA Increment Addendum

F. Payload Data Sets

G. SSP 57061 applicable documents other than A, B, C, D, E, and F

2.0 DOCUMENTS

2.1 APPLICABLE DOCUMENTS

The following documents include specifications, models, standards, guidelines, handbooks, and other special publications. The current issue of the following documents is identified in the Program Automated Library System (PALS) (http://iss-www.jsc.nasa.gov/ss/issapt/pals) or Payload Integrated Library System (PILS) (http://sspweb.jsc.nasa.gov/pils/payload.cfm). The documents listed in this paragraph are applicable to the extent specified herein. Inclusion of applicable documents herein does not in any way supersede the order of precedence identified in Paragraph 1.3 of this document.

SSP 30219	Space Station Reference Coordinate Systems
SSP 30256	Extravehicular Activity (EVA) Standard Interface Control Document
SSP 30550	Space Station Program Robotic Systems Integration Standards Volume 1: Robotic Accommodation Requirements
SSP 41170	Configuration Management Requirements
SSP 42004	Mobile Servicing System (MSS) to User (Generic) Interface Control Document Part I
SSP 42004, Part 2	Mobile Servicing System (MSS) to User (Generic) Interface Control Document Part 2
SSP 50005	International Space Station Flight Crew Integration Standard (NASA-STD-3000/T)
SSP 50006	International Space Station Internal & External Decals & Placards Specification
SSP 50304	POIC Capabilities Document
SSP 50313	Integrated Display and Graphics Standard
SSP 50323	Payload User Development Guide (PUDG) for the Space Station Training Facility (SSTF) Payload Training Capability (PTC)
SSP 50503	International Space Station Onboard Training Media Requirements

SSP 52000-IDD-ERP	Expedite the Processing of Experiments to Space Station (EXPRESS) Rack Payloads Interface Definition Document
SSP 52000-PDS	Payload Data Sets Blank Book
SSP 52005	Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures
SSP 52052	Portable Computer System (PCS) Interface Definition Document
SSP 57000	Pressurized Payloads Interface Requirements Document
SSP 57003	Attached Payload Interface Requirements Document
SSP 57004	Attached Payload Hardware Interface Control Document Template
SSP 57061	Standard Payload Integration Agreement for Unpressurized Payloads
SSP 57236	Laboratory Support Equipment (LSE) Hardware Interface Control Document
SSP 58026-01	Generic Payload Simulator Requirements Document, Volume I
SSP 58309	Payload Training Implementation Plan
NSTS 07700, Volume XIV, Appendix 5	Space Shuttle System Payload Accommodations, System Description and Design Data - Ground Operations
NSTS 07700, Volume XIV, Appendix 7	Space Shuttle System Payload Accommodations, System Description and Design Data - Extravehicular Activities
NSTS/ISS 13830	Payload Safety Review and Data Submittal Requirements for Payloads using the: - Space Shuttle - International Space Station
NSTS 1700.7B	Safety Policy and Requirements for Payloads Using the Space Transportation System

NSTS 1700.7B ISS Addendum	Safety Policy and Requirements for Payloads Using the International Space Station
NSTS 21000-IDD-ISS	Shuttle/Orbiter International Space Station Interface Definition Document
NSTS 21000-IDD-MDK	Shuttle/Payload Interface Definition Document for Middeck Accommodations
NSTS 21000-IDD-486	Shuttle/Payload Interface Definition Document for the Payload and General Support Computer (PGSC)
JSC 28533	International Space Station (ISS) Catalog of IVA Government Furnished Equipment (GFE) Flight Crew Equipment
JSC 36307	NASA Training Implementation Plan (TIP)
JSC-48024-XXX	Extravehicular Activity (EVA) Checklist-STS-XXX Flight Supplement - Basic
JSC-48540-XX	International Space Station (ISS) Robotics Group ISS-XX
KHB 1700.7	Space Shuttle Payload Ground Safety Handbook
SMD-91-2104	Ferry Flight Loads Environment for Returnable Payloads

2.2 REFERENCE DOCUMENTS

The following documents contain supplemental information to guide the user in the application of this document. These reference documents may or may not be specifically cited within the text of this document.

SSP 50200-01	Station Program Implementation Plan, Volume 1: Station Program Management Plan
SSP 50200-02	Station Program Implementation Plan, Volume 2: Program Planning and Manifesting
SSP 50200-03	Station Program Implementation Plan, Volume 3: Cargo Analytical Integration
SSP 50200-04	Station Program Implementation Plan, Volume 4: Payload Engineering Integration
SSP 50200-05 Part 1	Station Program Implementation Plan, Volume 5: Logistics and Maintenance, Part 1: Maintenance

SSP 50200-05 Part 2	Station Program Implementation Plan, Volume 5: Logistics and Maintenance, Part 2: Logistics
SSP 50200-06	Station Program Implementation Plan, Volume 6: Cargo Physical Processing
SSP 50200-07	Station Program Implementation Plan, Volume 7: Training
SSP 50200-08	Station Program Implementation Plan, Volume 8: Increment Execution Preparation
SSP 50200-09	Station Program Implementation Plan, Volume 9: Real-Time Operations
SSP 50200-10	Station Program Implementation Plan, Volume 10: Sustaining Engineering
SSP 50477	Joint Crew Provisioning Catalog
SSP 57002	Payload Software Interface Control Document Template
SSP 57013	Generic Attached Payloads Verification Plan
ARC-BRP-40086	User Operations Facility Capabilities Document
LS 70053-2	JSC Telescience Support Center Capabilities Document
TSC-DOC-006	GRC Telescience Support Center User Guide
TSC-HDBK-001	MSFC Telescience Support Center Capabilities Document

3.0 PAYLOAD INFORMATION

3.1 PAYLOAD OBJECTIVES/DESCRIPTION

This section documents the flight-specific objectives and description of the payload, what type of payload hardware will be flown, and the operation requirements for operating the payload during the increments contained in the flight period. If the payload description or operation is expected to change during the course of the flight period, these operational scenarios will be described.

3.1.1 PAYLOAD/OBJECTIVES STATEMENT

{Purpose/Objectives - A statement of the primary purpose and objectives of the payload. This description should be specific to this flight period.}

3.1.2 PAYLOAD DESCRIPTION STATEMENT

{Payload Description - A descriptive overview of the payload flight hardware that includes a summary transportation and on-orbit scenario, as well as a summary of the on-orbit hardware configuration. Identify any other payloads that need to be co-manifested, co-located, and/or operated concurrently for use by this payload during this flight period}

3.1.3 FLIGHT-SPECIFIC PAYLOAD DRAWING

The PD shall provide a drawing(s) that depict(s) the payload in its on-orbit operational configuration in Figure 3.1.3-1, Flight-Specific Payload Drawing, per SSP 52000-PDS, Section 9.3.2.

{PD Insert drawing(s) here}

FIGURE 3.1.3-1 FLIGHT-SPECIFIC PAYLOAD CONFIGURATION DRAWING

3.2 ISS PAYLOAD/CARGO CARRIER COMPATIBILITY

The PD shall design the attached payload or payload element to be capable of being flight-certified and compatible with the transportation vehicle, logistics carrier or sub-carrier, that carrier's integration into the transportation vehicle, and the transportation services as identified in Table 3.2.1-1, ISS Payload Cargo Carriers.

3.2.1 ISS ATTACHED PAYLOAD CARGO CARRIER COMPATIBILITY

The PD shall design the payload and payload equipment to be compatible with the selected cargo carrier in Table 3.2.1-1. This design shall be in accordance with NSTS-21000-IDD-ISS, Shuttle/Orbiter International Space Station Interface Definition Document and the safety requirements of NSTS 1700.7B, Safety Policy and Requirements for Payloads Using the Space Transportation System; NSTS 1700.7B, ISS Addendum, Safety Policy Requirements for Payloads Using the International Space

Station; and KHB 1700.7, Space Shuttle Payload Ground Safety Handbook, in accordance with NSTS/ISS 13830, Payload Safety Review and Data Submittal Requirements for Payloads using the Space Shuttle/International Space Station.

A. ISS Payload Cargo Carriers - The PD shall identify the transportation vehicle and cargo carrier, and design for integrating/deintegrating the payload being transported to or from orbit.

TABLE 3.2.1-1 ISS PAYLOAD CARGO CARRIERS

Cargo Carrier	Yes/No
Transportation Vehicle	
-Orbiter Payload Cargo Bay	
-Orbiter Middeck	
Cargo Carrier/Logistics Carrier	
-Express Pallet	
-Spacelab Logistics Pallet	
-Pressurized Module (Passive Stowage)	
-Other	

3.2.2 ISS ATTACHED PAYLOAD INTERFACES

The ISS attach sites from which a payload is capable of operating on are listed in Table 3.2.2.1-1, ISS Payload Attach Sites. The PD shall design to be compatible with the ISS Payload Attach System (PAS)/Unpressurized Cargo Carrier Attach System (UCCAS)/Mobile Remote Servicer (MRS) Base System (MBS) Common Attach System (MCAS) sites.

3.2.2.1 ISS ATTACH SITES/PAYLOAD COMPATIBILITY

The PD shall design the payload and payload equipment to be compatible/interchangeable with all S3 PAS, P3 UCCAS, and MCAS attach sites in accordance with SSP 57003, Attached Payload Interface Requirements Document and SSP 57004, Attached Payload Hardware Interface Control Document Template. The selected compatible attach site shall be designated in Table 3.2.2.1-1.

A. ISS Payload Attach Sites - ISS sites, which are configured for remotely, actuated connection and disconnection of attached payloads to and from ISS resources and services.

B. Other (Non-Standard) - Payload’s unique ISS installation/location to support data collection.

TABLE 3.2.2.1-1 ISS PAYLOAD ATTACH SITES

Truss Location	PAS/UCCAS/MCAS Compatible (Yes/No)
U.S. Truss (S3)	
-S3UI (Ram, Wake, Zenith)	
-S3UO (Ram, Wake, Zenith)	
-S3LI (Ram, Wake, Nadir)	
-S3LO (Ram, Wake, Nadir)	
U.S. Truss (P3)	
-P3UO (Ram, Wake, Zenith)	
-P3LO (Ram, Wake, Nadir)	
Other (Non-Standard)	

3.2.3 PAYLOAD CATEGORY TYPE SELECTION

The PD shall provide the following information in Table 3.2.3-1, Payload Category Type Selection/Specification.

A. Payload Type - The payload science discipline or technology that best characterizes the payload. The PD shall indicate the category of the payload by placing an X in the appropriate cell in the right column.

B. Other payload type - If payload type “Other” is selected, describe the payload type.

TABLE 3.2.3-1 PAYLOAD CATEGORY TYPE SELECTION/SPECIFICATION

Payload Type	Category
Carrier Type	
- EXPRESS Pallet	
- Full Attach Site	
- Partial Attach Site	
Sponsor Type	
- Government/Academic	
- Industrial (Commercial)	
Research Type	
- Space Systems	
- Space Science	
- Earth Science	
- Materials Research	
- Fluid Physics	
Technology	
- Other (describe)	

3.3 PAYLOAD MICROGRAVITY CHARACTERISTICS

The PD shall provide the following information in Table 3.3-1, Payload Operating Mode Microgravity Characteristics. If no data is available, indicate by leaving the appropriate microgravity category(s) in Table 3.3-1 blank.

Microgravity Characterization - Select the microgravity characteristics by entering the appropriate information in the table. Descriptions of ISS characteristics are as follows:

1. Sensitive to Quasi-steady Acceleration - The contents of this payload are sensitive to accelerations below a frequency of 0.01 Hertz (Hz) (magnitudes, directions, and duration).
2. Sensitive to Vibratory Acceleration - The contents of this payload are sensitive to steady-state vibratory accelerations between the frequency range of 0.01-300 Hz (magnitudes, frequency bands, directions, and duration).
3. Sensitive to Transient Accelerations - The contents of this payload are sensitive to brief acceleration impulses (magnitudes, frequency bands, directions, and duration).
4. Non-Sensitive to Acceleration - The contents of this payload are not sensitive to quasi-steady or vibratory accelerations.
5. Disturber-Quasi-steady Acceleration - The contents of this payload may produce accelerations below a frequency of 0.01 Hz (magnitudes, directions, and duration).
6. Disturber-Vibratory Acceleration - The contents of this payload may produce steady-state vibratory accelerations between the frequency range of 0.01-300 Hz (magnitudes, frequency bands, directions, and duration).
7. Disturber-Transient Accelerations - The contents of this payload may produce brief acceleration impulses (magnitudes, frequency bands, directions, and duration).
8. Acceleration Passive - The contents of this payload will not produce accelerations of any type.

TABLE 3.3-1 PAYLOAD OPERATING MODE MICROGRAVITY CHARACTERISTICS

Check Category	Characteristic	Magnitude (μg)			Frequency (Hz)*			Duration		
		X	Y	Z	X	Y	Z	X	Y	Z
	Sensitive-quasi-steady									
	Sensitive-virbratory									
	Sensitive-transient									
	Non-sensitive									
	Disturber-quasi-steady									
	Disturber-vibratory									
	Disturber-transient									
	Acceleration passive									

*Provide frequency spectrum for non-monochromatic sensitivity.

3.4 VIEWING REQUIREMENTS/LOCATION

The PD shall provide the following information in Table 3.4-1, ISS Viewing Locations for Attached Payloads.

TABLE 3.4-1 ISS VIEWING LOCATIONS FOR ATTACHED PAYLOADS

Attach Site	Viewing Directions	Selected Site
S3UI	Ram, Wake, Zenith	
S3UO	Ram, Wake, Zenith	
S3LI	Ram, Wake, Nadir, Earth Limb	
S3LO	Ram, Wake, Nadir, Earth Limb	
P3UO	Ram, Wake, Zenith	
P3LO	Ram, Wake, Nadir, Earth Limb	
Other*		

*Provide viewing direction in ISS coordinate system; reference SSP 30219.

3.5 PAYLOAD ATTITUDE AND POINTING REQUIREMENTS

The PD shall provide the following information in Table 3.5-1, Payload Attitude and Pointing Requirements, for the payload. These requirements will be described in terms of Orbiter orientation, line-of-site vectors of the payload-to-ISS elements (vice versa), and ISS operations.

A. Orbiter Orientation - Describe these requirements in terms of Orbiter orientation (e.g., Orbiter position and velocity in J2000 Cartesian coordinate system, Orbiter position and velocity in Earth-fixed coordinate system, Euler angles to body-fixed coordinate system from Local Vertical/Local Horizontal (LVLH), etc.).

B. ISS Orientation - Describe these requirements in terms of the ISS vehicle orientation (e.g., ISS position and velocity in J2000 Cartesian coordinate system, ISS position and velocity in Earth-fixed coordinate system, Euler angles to body-fixed coordinate system from LVLH, etc).

C. Line-of-Site Vectors - Describe these requirements in terms of payload pointing (e.g., Wake, Ram, Zenith, Nadir, exposure to the solar vector, etc.).

D. ISS Operations - Describe these requirements in terms of ISS operations on the payload (e.g., alpha joint or beta joint photovoltaic array rotational angle and latch times, attitude and attitude stability during EVA activity, ISS reboost or Orbiter mating operations, etc.).

TABLE 3.5-1 PAYLOAD ATTITUDE AND POINTING REQUIREMENTS

Source	Attitude and Pointing Requirement
Orbiter Orientation	
ISS Orientation	
Line-of-Site Vectors	
ISS Operations	

[Expand table as required to document additional content.]

3.6 ISS LAPTOP COMPUTERS

The Payload Software Control Panel will act as the focal point for discussion and resolution of PD ISS laptop computer issues.

The Shuttle in-flight laptop computer requirements shall be specified in the ISS flight-unique MIP.

3.6.1 PORTABLE COMPUTER SYSTEM LAPTOP COMPUTERS

The Portable Computer System (PCS) is the shared ISS resource available on-orbit for payload use. The PCS computer requirements shall be in accordance with SSP 57000, Pressurized Payloads Interface Requirements Document, and SSP 52052, Portable Computer System (PCS) Interface Definition Document.

The ISS Program will provide a flight-like unit to be used for hardware/software verification test purposes during Payload Test and Checkout System (PTCS) testing at KSC.

3.6.2 SPACE STATION COMPUTER LAPTOP COMPUTERS

The PD shall place any requests to utilize the ISS Manual Procedure Viewer (MPV) during any payload tasking in this section of the payload-unique PIA Increment Addendum.

3.7 PAYLOAD-PROVIDED LAPTOP COMPUTER REQUIREMENTS

Payload-provided laptops shall conform to the requirements of SSP 57000 and utilize the standard ISS laptop. All payload software shall be certified and provided by the PD. Laptop displays used on-orbit shall conform with the SSP 50313, Integrated Display and Graphics Standard. Displays intended for use on-orbit shall be approved by the Payload Display and Review Panel (PDRP) and shall be delivered to Online Project Management System (OPMS) at Marshall Space Flight Center (MSFC) for PDRP review. Success of the payload software is the responsibility of the PD. The PD will also provide the laptop and all equipment necessary to support the laptop unless negotiated and documented in the payload-unique PIA and the ISS flight-unique MIP.

If the payload will be using interchangeable hard drives or removable media, the PD shall be responsible for providing that equipment to support the payload unless negotiated and documented in the payload-unique PIA and the ISS flight-unique MIP.

The PD shall be responsible for providing similar commercial computers and cable for ground development and PD-provided training. If the PD requires the use of ISS Program facilities for the testing of payload laptop computer software, it shall be negotiated and documented in the payload-unique PIA and the ISS flight-unique MIP.

Payload on-orbit operations requesting the services of the Shuttle Payload and General Support Computer (PGSC) shall be in accordance with NSTS 21000-IDD-486, Shuttle/Payload Interface Definition Document for the Payload and General Support Computer (PGSC). Use of the PGSC equipment to support the payload shall be negotiated and documented in the payload-unique PIA and the ISS flight-unique MIP.

3.7.1 LAPTOP COMPUTER REQUIREMENTS DESCRIPTION

The PD shall provide the following information in Table 3.7.1-1, Payload Laptop Computer Requirements Description.

A. Laptop Computer Item - Laptop computer item description, part number, quantity required, duration of on-orbit use, PD or ISS Program provided.

B. Laptop Computer Requirements Description - Describe the payload laptop computer requirements in terms of laptop run requirements, laptop stowage requirements, file transfer for data downlink, and on-board data stowage requirements, etc.

TABLE 3.7.1-1 PAYLOAD LAPTOP COMPUTER REQUIREMENTS DESCRIPTION

Item	Laptop Computer Requirements Description	
	Payload-Provided	ISS Shared
Laptop Software		
Laptop Cables		
Laptop Power Converter		
Laptop PCMCIA Cards		
Laptop Removable Media		
Laptop Hard Drives		

[Expand table as required to document additional content.]

3.8 PAYLOAD PHOTO/TELEVISION REQUIREMENTS

The PD shall provide the following information in Table 3.8-1, Payload Photo/Television Requirements, for the payload. This table identifies the ISS payload photo/television requirements to acquire imagery that will be used to support payload historical documentation, onboard training, operations, procedure development, and sustaining engineering.

A. Flight Phase - Describe these requirements in terms of payload activity during each flight phase (e.g., payload deploy sequence while Shuttle is docked to station, etc.).

B. Photography - Describe these requirements of EVA crew tasking in terms of activities with the payload (e.g., installation at ISS attach site, etc.).

C. Television (TV) - Describe these requirements of EVA crew tasking in terms of activities with the payload (e.g., installation at ISS attach site, etc.).

D. Remarks - Describe these requirements in terms of payload views (e.g., TV and photos providing wide angle and zoom views of payload at ISS payload attach site, etc.).

E. Specific Viewing Requirements - Describe these requirements in terms of payload view (e.g., view of payload post-removal from the Orbiter's crossbay carrier, etc.).

TABLE 3.8-1 PAYLOAD PHOTO/TELEVISION REQUIREMENTS

Flight Phase	Photography	Television	Remarks	Specific Viewing Requirements

[Expand table as required to document additional content.]

3.9 PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENT REQUIREMENTS

This section addresses special considerations that should be taken into account during payload tactical planning and manifesting associated with payload-unique environmental elements and their compatibility with the ISS Program and the SSP.

3.9.1 PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENTS OF COMPATIBILITY REQUIREMENTS

This section is not requesting a payload safety data package or a payload verification data package. This section is to document the payload-unique induced environmental elements in terms of their compatibility with the ground processing, Shuttle, ISS, and other co-manifested payloads to ensure Program awareness.

The payload shall meet the standard ISS Program/SSP/payload natural and induced environmental interfaces contained in SSP 57003 and NSTS 21000-IDD-ISS.

The payload shall be in compliance with Program safety requirements in accordance with NSTS 1700.7B and NSTS 1700.7B, ISS Addendum.

The PD shall conduct environmental interface analyses to determine physical and functional interface compatibility of the payload with the Orbiter, the Station, and neighboring ISS payloads as defined in the payload-unique PIA.

3.9.2 PAYLOAD-UNIQUE ENVIRONMENTAL ELEMENTS COMPATIBILITY DESCRIPTION

The PD shall provide the following information in Table 3.9.2-1, Environmental Compatibility Description.

A. Payload Environmental Characteristic - Describe the payloads-induced environmental characteristics, interfaces, and/or hazardous materials, including structural loads, thermal, contamination, venting, cryogenics/fluid/gas leakage, magnetic fringe field, Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC), etc.

B. Induced Environment Description/Measurement - Describe the payloads-induced environment in terms of an engineering measurement, size, area, or volume (e.g., controllable temperature range in degrees, magnetic fringe field in terms of gauss, etc.).

TABLE 3.9.2-1 ENVIRONMENTAL COMPATIBILITY DESCRIPTION

Payload Environmental Characteristic	Induced Environment Description/Measurement

[Expand table as required to document additional content.]

3.10 SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES

This section documents the SSP Services and ISS Program-funded SSP Services a flight-by-flight basis, which are being requested by the PD. The SSP Services are described in NSTS 07700, Volume XIV, Appendix 5, Space Shuttle System Payload Accommodations, System Description Design Data - Ground Operations. ISS Program standard pre-launch and post-landing services are described in SSP 52000-PDS, Section 7 KSC Support Requirements Data Set. ISS Program-funded SSP Services are to be negotiated and documented in the payload's flight-unique MIP.

The PD will provide in the subsequent Table 3.10.1-1, SSP Services and ISS Program-Funded SSP Services Requirements, by flight: identification of hardware requiring the service, the service required, additional information, and a technical rationale for the service based on that specific hardware.

3.10.1 SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES REQUIREMENTS

The PD shall provide the following information in Table 3.10.1-1.

A. Location - Where the requested service is located.

B. Hardware - Identify the hardware that requires the service.

C. Services - Choose from the following list of SSP Services and ISS Program-funded SSP Services, and enter data in table. Reference SSP 57061, Section 7.0 for a description of these services.

   1. Late access for installation of payload bay payloads.

   2. Middeck late access for payload equipment turnover/servicing requirements. Category 1 - The payload requires late turnover/servicing within Launch minus (L-)76 hours, but prior to L-28 hours. The payload will be turned over from the PD to NASA KSC to allow installation in accordance with launch countdown and crew compartment stowage activities.

   3. Middeck late access for payload equipment turnover/servicing requirements. Category 2 - The payload requires late turnover/servicing (non-time specific) between L-28 hours and L-19.5 hours. The payload will be turned over from the PD to NASA KSC to allow installation in accordance with a mission-unique stowage schedule.

   4. Middeck late access for payload equipment turnover/servicing requirements. Category 3 - The payload requires late turnover/servicing within a specific time between L-28 hours and L-19.5 hours. The payload will be turned over from the PD to NASA KSC to allow installation in accordance with a mission-unique stowage schedule.

   5. Prelaunch Orbiter power/cooling/data monitoring for payload bay payloads.

6. Prelaunch Orbiter power/cooling/data monitoring for middeck payload equipment.

7. Middeck payload servicing for planned launch delay margins less than or equal to 30 days:

   Enter payload expiration time in column for Additional Data as follows: The payload contains time critical science that expires within *[Insert number]* hours/days after payload hardware turnover to KSC. At this time, the payload is no longer viable for a successful launch and mission.

   For payloads requiring offline refurbishment, enter specific time in column for Additional Data: The PD requires *[Insert number]* hours in an assigned offline processing facility to perform payload refurbishment.

8. Payload servicing for a launch delay less than or equal to 30-days (payload bay) [Enter specific time in column for additional data].

9. Post-landing Orbiter power/cooling/data monitoring for payload bay payloads.

10. Post-landing Orbiter power/cooling/data monitoring for middeck payload equipment.

11. Payload bay access in the Orbiter Processing Facility (OPF) for payload servicing.

12. Nominal End of Mission (EOM) middeck early turnover by either Return plus (R+)5.5 hours, R+8.5 hours, or R+25 hours. (Enter one of these choices in the column for Additional Data.)

13. Early End of Mission (EEOM) middeck early turnover by either R+5.5 hours, R+8.5 hours, or R+25 hours. (Enter one of these choices in the column for Additional Data.)

    NOTE: This is an ISS Program-funded SSP Service.

14. Early return of data products such as film or data diskettes to Johnson Space Center (JSC) via T-38 aircraft.

15. Payload-unique Orbiter ferry flight requirements.

16. Other.

D. Additional Data - Enter any additional data necessary to describe the service required.

E. Technical Rationale - Provide a specific justification for the service such as the specific potential research/science loss. Describe what would happen and how the safety, science, or schedule would be affected if the service were not provided. Category 3 middeck turnover requirements (late turnover/servicing within a specific time between L-28 hours and L-19.5 hours) are to have a more detailed justification.

TABLE 3.10.1-1 SSP SERVICES AND ISS PROGRAM-FUNDED SSP SERVICES REQUIREMENTS

Location	Hardware Item	Services	Additional Data	Technical Rationale

[Expand table as required to document additional content.]

3.11 PAYLOAD OPTIONAL SERVICES

This section documents the ISS Program Payload Flight Equipment Optional Services on a flight-by-flight basis, which are being requested by the PD.

ISS Program Payload Flight Equipment shall be either procured by the PD from NASA/Government Furnished Equipment (GFE) or furnished as NASA/GFE. In either case, NASA shall certify the Payload Flight Equipment. This includes the use of a laptop computer to support in-flight payload operations or on-orbit payload operations on an as-available basis.

The PD will provide in the subsequent tables, Payload Optional Services Requirements, by flight: identification of hardware requiring the service, the service required, additional information, and a technical rationale for the service based on that specific hardware.

3.11.1 EXTRAVEHICULAR ROBOTICS EQUIPMENT REQUIREMENTS

The PD shall provide the following information in Table 3.11.1-1, Extravehicular Robotics Equipment Requirements.

A. EVR Equipment Requirements - List the program EVR flight equipment required (e.g., specific type of grapple fixture, etc.).

B. Procured or Loaned - Statement of whether the EVR flight equipment is to be procured or loaned.

C. Need Date - The date by which the EVR flight equipment is needed (e.g., L-20 months).

D. Duration - The length of time the program-loaned EVR equipment is needed (e.g., 3 years, etc.). Applicable only to program-loaned equipment.

TABLE 3.11.1-1 EXTRAVEHICULAR ROBOTICS EQUIPMENT REQUIREMENTS

EVR Equipment Requirements	Procured or Loaned	Need Date	Duration

NOTE: One item per line.

[Expand table as required to document additional content.]

3.11.2 FLIGHT EQUIPMENT - PROCURED OR PROGRAM-FURNISHED

ISS Program Payload Flight Equipment shall be either procured by the PD from NASA/GFE or furnished as NASA/GFE. In either case, NASA shall certify the Payload Flight Equipment.

3.11.2.1 PROCURED EQUIPMENT - UMBILICAL MECHANISM ASSEMBLY

The Umbilical Mechanism Assembly (UMA) passive half shall be procured by the PD from NASA/GFE and certified by NASA.

3.11.2.2 PROGRAM-FURNISHED EQUIPMENT - FLIGHT REQUIREMENTS

The PD requirements for Program-Furnished Equipment for payload flight hardware for prelaunch activities and flight activities are documented in Table 3.11.2.3-1, Payload Flight Equipment Requirements. The ISS Program Payload Label Approval Team will review, approve, and provide fabricated decals and labels required by the payload in accordance with SSP 57003.

3.11.2.3 PAYLOAD FLIGHT EQUIPMENT REQUIREMENTS

The PD shall provide the following information in Table 3.11.2.3-1.

A. Flight Equipment Requirements - List the procured (e.g., UMA passive half, grapple fixture, etc.) or Program-furnished flight equipment to be provided (e.g., EVA handrails, flight decals and labels, etc.).

B. Procured or Program-Furnished - Statement of whether the payload flight equipment is to be procured or Program-furnished.

C. Location - The location where the procured or Program-furnished flight equipment is to be provided (e.g., JSC, KSC, PD site, etc.).

D. Need Date - The date by which the flight equipment is needed (e.g., L-20 months).

E. Duration - The length of time the Program-furnished equipment is needed (e.g., 3 years, etc.). Applicable only to Program-furnished equipment that is reusable.

TABLE 3.11.2.3-1 PAYLOAD FLIGHT EQUIPMENT REQUIREMENTS

Flight Equipment Requirements	Procured or Program-Furnished	Location	Need Date	Duration

[Expand table as required to document additional content.]

3.12 LAPTOP COMPUTER EQUIPMENT

The ISS Program will provide, if requested, the use of a laptop computer to support in-flight payload operations or on-orbit payload operations on an as-available basis. This request will be documented in the payload-unique PIA and the ISS flight-unique MIP.

4.0 PAYLOAD PRELAUNCH TO DOCKED REQUIREMENTS

This section documents the payload prelaunch through docked mission phase requirements for transportation to the ISS. Criteria for developing payload constraints for shuttle launches are identified in NSTS 07700, Volume XIV. Pre-launch to ascent requirements for SSP are documented in NSTS 21000-IDD-ISS, NSTS 21000-IDD-MDK, Shuttle/Payload Interface Definition Document for Middeck Accommodations, and in the ISS flight-unique MIP. Non-compliance for payloads interfacing with the Shuttle will be coordinated with the Shuttle Program Office.

The PD will identify in the subsequent subsections per flight: the payload requirements for program-furnished ground equipment, payload Launch Commit Criteria (LCC), maximum launch configuration, and the ascent to on-orbit requirements. Details of these requirements will be further documented in the various payload-specific data sets as defined in SSP 52000-PDS.

4.1 PAYLOAD HARDWARE

This section describes the payload transportation scenario to the ISS.

The PD in this paragraph will provide a brief description of the payload's Orbiter transportation carrier management and technical integration agreements (e.g., Integrated Cargo Carrier Interface Control Agreement, etc.).

4.1.1 PRELAUNCH PROCESSING AND PAYLOAD TRANSPORTATION TO ISS ACTIVITIES

The PD shall provide the following information in Table 4.1.1-1, Scenario of Prelaunch Processing and Payload Transportation to Docked Activities.

A. Prelaunch to Docked Activities - Define the scenario describing the prelaunch processing and the transportation of the payload hardware to the ISS. Include a summary or brief description of the prelaunch through docked activities with the ISS. Include reactivation of time-sensitive hardware.

TABLE 4.1.1-1 SCENARIO OF PRELAUNCH PROCESSING AND PAYLOAD TRANSPORTATION TO DOCKED ACTIVITIES

Prelaunch to Docked Activities

[Expand table as required to document additional content.]

4.1.2 PAYLOAD HARDWARE DESCRIPTION FOR ASCENT

The PD shall provide the following information in Table 4.1.2-1, Payload Hardware Description.

A. Payload Item - An individual payload item or groupings of payload-related items manifested (e.g., pallet assembly, avionics box, aft flight deck panel, venting adapter kit, removable computer media, dewar, etc.).

B. Payload Item Location - Location of the payload item (e.g., Orbiter payload bay, Multi-Purpose Logistics Module (MPLM), middeck locker, aft flight deck, etc.).

C. Volume - The volume of the payload item (i.e., the dimensional envelope).

D. Mass - The mass of the payload item listed in the table.

E. Additional Information - Provide the payload item or groupings final assembled or installed flight configuration drawing number. Provide for the payload item listed in the table, any unique shapes and sizes, hazardous materials or gases, etc., that might be pertinent to the Orbiter and/or ISS.

F. Physical External Dimensions - The physical external dimensions of the payload item listed in the table.

G. Center of Gravity (CG) - The CG point of the payload item listed in the table. The CGx, CGy, CGz values are in inches (centimeters (cm)). The CG point of origin is to be defined by the payload in Figure 4.1.2-1, Payload Hardware Center of Gravity Locations for Ascent.

H. Total Mass/Flight - The total mass of the payload item(s) by flight.

TABLE 4.1.2-1 PAYLOAD HARDWARE DESCRIPTION FOR ASCENT

Payload Item	Payload Item Location	Volume ft^3 (m^3)	Mass lbm (kg)	Additional Information - Drawing Number	Physical External Dimension in (cm)	Center of Gravity		
						CGx in (cm)	CGy in (cm)	CGz in (cm)
		Total Mass/Flight lbm (kg):						

[Expand table as required to document additional content.]

Payload hardware CG locations for ascent are identified in Figure 4.1.2-1.

NOTE: The PD shall provide drawings to show the payload CG component locations in Figure 4.1.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 4.1.2-1 PAYLOAD HARDWARE CENTER OF GRAVITY LOCATIONS FOR ASCENT

4.2 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS

This section of the PIA Increment Addendum documents the PD requirements for Program-Furnished Equipment for payload ground hardware for prelaunch activities and flight activities.

4.2.1 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS

The PD shall provide the following information in Table 4.2.1-1, Program-Furnished Equipment - Ground Requirements.

A. Location - The location where the program-furnished ground equipment is to be provided (e.g., KSC, PD site, etc.).

B. Ground Equipment - List the program-furnished ground equipment required by the PD for his use (e.g., payload or pallet shipping container, station-to-payload suitcase simulator, lifting sling, spreader beams, etc.). Ground equipment to be listed in this table includes ISS Program fleet resources and other ISS Program-provided hardware and/or software, but does not include KSC-provided equipment to be used by the PD at KSC. KSC-provided equipment and facilities to be used at the launch base shall be entered in SSP 52000-PDS, Section 7.

C. Need Date - The date by which the program-furnished ground equipment is needed (e.g., L-20 months to L-12 months).

D. Duration - The length of time prior to launch the program-furnished ground equipment is needed (e.g., L-18 months to L-12 months).

TABLE 4.2.1-1 PROGRAM-FURNISHED EQUIPMENT - GROUND REQUIREMENTS

Location	Equipment - Ground Requirements	Need Date	Duration

[Expand table as required to document additional content.]

4.3 LAUNCH COMMIT CRITERIA

This section contains the payload LCC. Criteria for developing payload constraints for Shuttle launches are identified in NSTS 07700, Volume XIV, Appendix 5, Section 6.

4.3.1 LAUNCH COMMIT CRITERIA REQUIREMENTS

The PD shall provide the following LCC requirements in Table 4.3.1-1, Payload Launch Commit Criteria. Detailed LCC information shall be provided by the PD in accordance with SSP 52000-PDS, Section 6.

A. Payload Item - An individual payload item or groupings of payload-related items manifested requiring replacement or replenishment (e.g., battery, dewar, etc.) requiring LCC.

B. Payload LCC - The requirements as specified in the ISS flight-unique MIP and negotiated by the ISS Program and the PD that could cause launch holds.

C. Technical Rationale - A justification for the need of the LCC. Provide a specific justification for the LCC such as the specific potential research/science loss. Quantify the rationale by describing what would happen and how the science, safety, or schedule would be affected if the LCC were not provided.

TABLE 4.3.1-1 PAYLOAD LAUNCH COMMIT CRITERIA

Payload Item	Payload Launch Commit Criteria	Technical Rationale

[Expand table as required to document additional content.]

4.4 PAYLOAD MAXIMUM LAUNCH CONFIGURATION

The maximum launch configuration duration is the amount of time the payload can sustain its launch configuration from turnover/last servicing without physical access. For an attached payload with late access requirements, the payload launch configuration duration is based on the completion of payload activities in the payload bay at L-88 hours. All other attached payloads have a launch configuration duration based on completion of payload closeouts in the Space Station Processing Facility (SSPF) at approximately L-1.5 months (PD's last opportunity to access an attached payload in the SSPF).

Payload items requiring middeck access have a launch configuration duration based on turnover/last servicing beginning at approximately L-2 weeks for standard bag stow, beginning approximately L-8 days for Standard Locker Stow and beginning L-76 hours for Late Stow.

Table 4.4.1-1, Payload Maximum Launch Configuration Duration, provides the technical rationale and the requirement for the maximum amount of days (or indicate indefinitely) from the completion of payload prelaunch operations until the payload requires access after an extended launch delay.

NOTE: Payload bay and middeck payload planned launch delay margins less than or equal to 30 days (e.g., 24 hours (hr), 48 hr, 72 hr, 96 hr, and 120 hr) are to be negotiated, technically justified, and documented in Section 3.10 of this Addendum.

4.4.1 PAYLOAD MAXIMUM LAUNCH CONFIGURATION DURATION

The PD shall provide the following Maximum Launch Configuration Duration information in Table 4.4.1-1 for each payload item.

A. Flight Number - The requested flight identification number (e.g., UF-3, UF-4, etc.).

B. Payload Item - An individual payload item or groupings of payload-related items manifested requiring replacement or replenishment (e.g., battery, dewar, etc.).

C. Estimated Turnover/Last Servicing Timeframe (L-XX) - The estimated turnover or last servicing of the payload item, which starts the launch configuration duration timeframe. Identify this L-XX timeframe in months, days, or hours.

D. Maximum Launch Configuration Duration (Months/Days/Hours) - The maximum time the payload can sustain launch configuration from the Estimated Turnover/Last Servicing Timeframe without physical access. Identify this duration by indicating the number of months, days, hours, or by indicating “Indefinitely”.

E. Planned Launch Delay Margin - Identify the amount of planned launch delay margin by subtracting C from D or by indicating “Indefinitely.”

F. Technical Rationale - A justification for the Maximum Launch Configuration Duration limitation. Provide a specific justification for the duration such as the specific potential research/science loss. Quantify the rationale by describing what would happen and how the science, safety, or schedule would be affected if the limitation were exceeded. Identify the specific payload hardware that is causing the limitation.

TABLE 4.4.1-1 PAYLOAD MAXIMUM LAUNCH CONFIGURATION DURATION

Flight Number	Payload Item	Estimated Turnover/Last Servicing Timeframe (L-XX)	Maximum Launch Configuration Duration (Months/Days/Hours)	Planned Launch Delay Margin	Technical Rationale

[Expand table as required to document additional content.]

4.5 PRELAUNCH TO DOCKED PAYLOAD RESOURCE REQUIREMENTS

This section documents resource requirements by mission phase that will be utilized while the payload is on the transport vehicle. It addresses the prelaunch through completion of early on-orbit payload preparation for transfer and/or operations. The information is listed on a per-flight basis. The PD shall specify requirements, in the subsequent table, for pre-launch, ascent, early on-orbit operations and/or transport, and flight crew time resources.

4.5.1 PRELAUNCH TO DOCKED PAYLOAD RESOURCE TABLE

The PD shall provide the following information in Table 4.5.1-1, Prelaunch to Docked Payload Resource Table.

Column Header Definitions:

1. Resource Required - The power, command, telemetry, or flight crew time needed to support the payload during each transportation phase.
2. Pre-payload Bay Door (PLBD) Closure - The resource needed during the period of time from payload insertion into the Orbiter payload bay to PLBD closure for flight.
3. Post-PLBD Closure - The resource needed during the period of time from PLBD closure for flight to Solid Rocket Booster (SRB) ignition.
4. Launch - The resource needed during the period of time from SRB ignition through the establishment of a stable orbit (typically post-Orbital Maneuvering System (OMS) second burn).
5. PLBD Open to Pre-Dock - The resource needed during the period of time from just after the establishment of a stable orbit until final the Orbiter/ISS common berthing mechanism capture latches have fully closed and successfully reached the completion of the acquire bolt phase.
6. Docked - The resource needed during the period of time from the start of Orbiter docked at a pressurized mating adapter (Orbiter mated to the ISS) until the mission timeline allocates execution of payload robotics transfer operations and/or transferring of the payload middeck lockers to the ISS.
7. Quantity - Amount of the resource required in the units specified.
8. Duration - The length of time that the resource is needed to operate the payload in the defined period of time.

Resources Required:

A. Continuous Power - The maximum steady state electrical power condition required for nominal payload operations, in watts (W) and hr.

B. Peak Power - The highest electrical power requirement lasting longer than 10 milliseconds required for payload-unique system operations or subsystem start up/down operations, in W and hr.

C. Minimum Continuous Power - Minimum continuous power (“keep alive/survival”) is the lowest uninterrupted electrical power required by the payload to avoid payload damage or failure, in W and hr.

D. Unpowered Payload Survival - The maximum amount of time that the payload can survive without power, in minutes (min).

E. Orbiter Command Interface - payload command data rate uplinked to, processed by, and routed to the payload via the Orbiter payload Command and Data Handling (C&DH) System in kilobits-per-second (kbps) and seconds (sec).

F. Orbiter Low Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

G. Orbiter High Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

H. External Imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., Shuttle Remote Manipulator System (SRMS) operations, etc.).

I. Internal Imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., pre-egress operations prior to payload deploy, etc.).

J. Crew Support - The number of Orbiter and/or ISS crewmembers and time (min/hrs) required to simultaneously support payload operations. Include a description of the crew activities being performed in support of the payload operations, including any overhead time required, during the identified mission phase.

K. Other Requirements - List other Orbiter support equipment to be used and the duration of use (min/hr/days).

TABLE 4.5.1-1 PRELAUNCH TO DOCKED PAYLOAD RESOURCE TABLE

Resource Required	Pre-PLBD Closure		Post-PLBD Closure		Launch		PLBD Open to Pre-Dock		Docked	
	Quantity	Duration	Quantity	Duration	Quantity	Duration	Quantity	Duration	Quantity	Duration
Continuous power (W and hr)										
Peak power (W and hr)										
Minimum continuous power ("keep alive/survival") (W and hr)										
Unpowered payload survival (min)										
Orbiter command interface (kbps and sec)										
Orbiter low rate data downlink (kbps and sec)										
Orbiter high rate data downlink (kbps and sec)										
External imagery										
Internal imagery										
Crew support (# of crew and time)										
Other requirements										

[Expand table as required to document additional content.]

4.6 PRELAUNCH TO DOCKED CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME

Payload contingency operational requirements or contingency flight crew time in support of the payload are not addressed in this PIA Increment Addendum.

Payload contingency procedures requiring Orbiter flight crew action (aft flight deck switch, commanding, etc.) are collected via the OPMS/Payload Information Management System (PIMS) software tool. Payload planning for contingency operations (e.g., flight rules, timeline, etc.) are collected via the Payload Data Library (PDL) and the interim User Requirements Collection (iURC)/User Requirements Collection (URC) as defined in SSP 52000-PDS (i.e., Section 6 Payload Operations Data Set, and Section 10, Payload Planning Data Set).

5.0 TRANSFER AND INTEGRATION ONTO ISS REQUIREMENTS

This section documents the joint on-orbit requirements to perform payload transfer from the Orbiter payload bay to berth of the payload on the ISS. The PD will identify the payload Orbiter unberth, translation, and station berthing requirements, in addition to addressing EVA and EVR requirements for transfer and installation services and placement on the ISS. Criteria for developing payload constraints for Shuttle are identified in NSTS 07700, Volume XIV, and NSTS 21000-IDD-ISS, and SSP 52000-PDS further details payload-specific requirements. Payload-specific operational details are to be documented in the NASA Mission Operations Directorate (MOD) Flight Data File (FDF) EVA Checklist and the Robotics Systems Operations Data File (SODF) Flight Specific Robotics Book.

5.1 SHUTTLE REMOTE MANIPULATOR SYSTEM HANDOFF AND TRANSFER REQUIREMENTS FROM THE ORBITER TO THE ISS

This section contains the transfer scenario from payload unberth from the Orbiter payload bay to handoff to the ISS Space Station Remote Manipulator System (SSRMS).

The PD shall provide the following information in Table 5.1-1, Scenario of Payload Shuttle Remote Manipulator System Unberth to Space Station Remote Manipulator System Handoff Activities.

A. Payload SRMS Unberth to SSRMS Handoff Activities - Define the scenario describing the payload unberth from Orbiter and SRMS capture/handoff to the SSRMS. Include reactivation of time-sensitive hardware.

TABLE 5.1-1 SCENARIO OF PAYLOAD SHUTTLE REMOTE MANIPULATOR SYSTEM UNBERTH TO SPACE STATION REMOTE MANIPULATOR SYSTEM HANDOFF ACTIVITIES

Payload SRMS Unberth to SSRMS Handoff Activities

[Expand table as required to document additional content.]

5.2 SPACE STATION REMOTE MANIPULATOR SYSTEM HANDOFF AND TRANSFER REQUIREMENTS FOR PLACEMENT ON THE ISS ATTACH SITE

This section contains the transfer scenario from payload handoff to the SSRMS to placement on the ISS. Once at the payload attach site, the hardware will be installed into the active PAS and the UMA connection mated. The PAS site will then be powered, and delivery of ISS-to-payload power and data will be supplied.

The PD shall provide the following information in Table 5.2-1, Scenario of Space Station Remote Manipulator System Payload Activities to Payload Attach Site Activities.

A. SSRMS Payload Activities to Payload Attach Site Activities - Define the scenario describing the SSRMS payload activities to payload berth on the payload attach site. Include reactivation of time-sensitive hardware.

TABLE 5.2-1 SCENARIO OF SPACE STATION REMOTE MANIPULATOR SYSTEM PAYLOAD ACTIVITIES TO PAYLOAD ATTACH SITE ACTIVITIES

Payload SSRMS to Attach Site Activities

[Expand table as required to document additional content.]

5.3 EXTRAVEHICULAR ACTIVITY REQUIREMENTS

This section of the document contains the EVA requirements for transfer and installation services required delivering the payload to the ISS. The PD will identify in the subsequent tables the payload hardware and the ancillary EVA generic tools and crew aids requirements. Details of these requirements will also be further documented in SSP 52000-PDS, Section 11, and the NASA JSC MOD FDF EVA Checklist. Payload nominal EVA tasks shall be approved by the EVA Analysis Integration Team (AIT).

5.3.1 STANDARD EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS

The PD shall provide the following information in Table 5.3.1-1, Extravehicular Activity Standard Tools and Crew Aids Requirements, as defined in NSTS 07700, Volume XIV, Appendix 7, Space Shuttle System Payload Accommodations, System Description and Design Data - Extravehicular Activities.

A. Standard Tools and Crew Aids - Describe the standard tools and/or crew aids required for facilitating and supporting crew EVA tasks for the payload.

B. Description of EVA Requirements - Describe the payload operations and time that would require crew EVA support and tasking.

TABLE 5.3.1-1 EXTRAVEHICULAR ACTIVITY STANDARD TOOLS AND CREW AIDS REQUIREMENTS

Standard Tools and Crew Aids	Description of EVA Requirements

[Expand table as required to document additional content.]

5.3.2 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS

The PD shall provide a description of the unique or special EVA services or equipment for transferring the hardware from the Orbiter-to-ISS in Table 5.3.2-1, Unique Extravehicular Activity Tools and Crew Aids Requirements.

A. Unique EVA Tools and Crew Aids - Describe the unique or special tools and/or crew aids required for facilitating and supporting crew EVA tasks for the payload.

B. Description of Unique EVA Requirements - Describe the payload operations and time that would require crew EVA support and tasking with unique or special EVA tools.

TABLE 5.3.2-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS

Unique EVA Tools and Crew Aids	Description of Unique EVA Requirements

[Expand table as required to document additional content.]

5.3.3 EXTRAVEHICULAR ACTIVITY INTERFACES

The PD shall provide hardware, translation paths, and appropriate labeling to affect EVA access in accordance with SSP 30256, Extravehicular Activity (EVA) Standard Interface Control Document; SSP 50005, International Space Station Flight Crew Integration Standard (NASA-STD-3000/T); and SSP 50006, ISS Internal & External Decals & Placards Specification.

5.3.3.1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS

The Payload aids for EVA nominal operations and contingency operations are shown in Figure 5.3.3.1-1, Extravehicular Activity Aids Locations, Ascent.

NOTE: The PD shall provide drawings to show the payload locations of EVA aids (i.e., handrails, tether attachment points, caution and warning labels, targets, etc.) for nominal operations and contingency capability in this Figure 5.3.3.1-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.3.3.1-1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS, ASCENT

5.3.3.2 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS

Payload EVA translation paths with gaps ≤ 24 inches are shown to connect to existing ISS translation paths in Figure 5.3.3.2-1, Extravehicular Activity Translation Paths.

NOTE: The PD shall provide drawings to showing the EVA translation paths in the payload in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.3.3.2-1 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS

5.3.3.3 EXTRAVEHICULAR ACTIVITY DANGER AND WARNING LABEL LOCATIONS

Payload EVA translation or mobility handholds located on payload hardware, which pose a critical or catastrophic hazard to the crewmember or to the equipment shall be labeled and identified in Figure 5.3.3.3-1, Danger and Warning Label Locations.

NOTE: The PD shall provide drawings to showing the payload equipment danger and warning label locations in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.3.3.3-1 DANGER AND WARNING LABEL LOCATIONS

5.3.4 EXTRAVEHICULAR ACTIVITY TASK HAZARDS

The PD shall provide a description of all payload hardware, software, or material hazards unique to EVA services or task workarounds. The operation of any covers, enclosures, appendages, fasteners, valves, and tooling that are required for the EVA tasks shall be included. The PD shall ensure the payload design, interfaces, and operations comply with the requirements of NSTS 1700.7B and NSTS 1700.7B, ISS Addendum.

5.3.4.1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS

The PD shall provide a description of the unique or special EVA task hazards in Table 5.3.4.1-1, Unique Extravehicular Activity Tools and Crew Aids Requirements.

A. Unique EVA Task Hazards - Describe the unique or special EVA task hazards required for facilitating and supporting crew EVA tasks for the payload.

B. Description of Unique EVA Task Hazards - Describe the payload operations that would require the EVA crew to be exposed to any unique EVA task hazards.

TABLE 5.3.4.1-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS

Payload-Unique Hazard	Description of Unique EVA Hazards

[Expand table as required to document additional content.]

5.4 EXTRAVEHICULAR ROBOTICS REQUIREMENTS

This section of the document contains the EVR requirements for transfer and installation services required delivering the payload to the ISS. The PD will identify in the subsequent tables the Mobile Servicing System (MSS) services required to transport the payload about the station and support EVR operations. Details of these requirements will also be further documented in the various SSP 52000-PDS, Section 12.

EVR activities for the payload characteristics and interfaces pertaining to MSS services, grapple fixture location and orientation, and power and data requirements of a particular station robotic system are documented in the following paragraphs. These requirements shall be documented in accordance with SSP 30550, Space Station Program Robotic Systems Integration Standards Volume 1: Robotic Accommodation Requirements; SSP 42004, Mobile Servicing System (MSS) to User (Generic) Interface Control Document, Part I; SSP 42004, Mobile Servicing System (MSS) to User (Generic) Interface Control Document Part 2; and NSTS-21000-IDD-ISS.

5.4.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS

5.4.1.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS IDENTIFIED

The PD shall provide the following requirements for use of the standard MSS services in Table 5.4.1.1-1, Extravehicular Robotics Standard Mobile Servicing System Services and Grapple Fixtures. This table shall include the standard MSS robotic system required and the grapple fixture required.

A. MSS System Services or Grapple Fixture Type - Describe the services or grapple fixture required for facilitating and supporting EVR tasks for the payload.

TABLE 5.4.1.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURES

MSS System Services or Grapple Fixture Type

[Expand table as required to document additional comment.]

5.4.1.2 EXTRAVEHICULAR ROBOTICS STANDARD GRAPPLE FIXTURE LOCATION

Payload grapple fixture(s) locations are identified in Figure 5.4.1.2-1, Standard Grapple Fixture Locations in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the payload grapple fixture locations in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.4.1.2-1 STANDARD GRAPPLE FIXTURE LOCATIONS

5.4.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS

This section contains requirements for the Special Purpose Dexterous Manipulator (SPDM), which allows servicing and maintenance of the payload when provided with an Special Dexterous Grasp Fixture (SDGF) as defined in SSP 42004. The PD shall provide a scenario for SPDM payload activities.

The PD shall provide the following information in Table 5.4.2-1, Scenario of Payload Special Purpose Dexterous Manipulator Activities.

A. Scenario of Payload SPDM Activities - Define the scenario describing the payload SPDM activities. Include reactivation of time-sensitive hardware.

TABLE 5.4.2-1 SCENARIO OF PAYLOAD SPECIAL PURPOSE DEXTEROUS MANIPULATOR ACTIVITIES

Payload SPDM Activities

[Expand as required to document additional comment.]

5.4.2.1 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS IDENTIFIED

The SDGF is Program-provided in accordance with SSP 42004 and SSP 30550 to allow servicing and maintenance of payloads.

The PD shall provide the following requirements for use of the standard MSS services in Table 5.4.2.1-1, Extravehicular Robotics Standard Mobile Servicing System Services and Standard Dexterous Grasp Fixture. This table shall include the standard MSS robotic system and Standard Dexterous Grasp Fixture requirement.

A. MSS System Services or SDGF - Describe the services and SDGF required for facilitating and supporting EVR tasks for the payload.

TABLE 5.4.2.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND STANDARD DEXTEROUS GRASP FIXTURE

MSS System Services or SDGF

[Expand as required to document additional comment.]

5.4.2.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE LOCATIONS

The payload SDGF locations are identified in Figure 5.4.2.2-1, Standard Dexterous Grasp Fixture Locations, in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the payload SDGF locations in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.4.2.2-1 STANDARD DEXTEROUS GRASP FIXTURE LOCATIONS

5.4.3 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS

5.4.3.1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS IDENTIFIED

The PD shall provide any unique requirements or non-standard hardware for use with the standard MSS services in Table 5.4.3.1-1, Extravehicular Robotics Unique or Non-Standard Mobile Servicing System Services or Grapple Fixtures. This table shall include any unique or non-standard robotic system services, grapple fixture, or end effector hardware or equipment required and supplied by the payload.

A. Non-Standard MSS System Services or Grapple Fixture - Describe the unique or non-standard MSS system services or grapple fixture for facilitating and supporting EVR tasks for the payload.

TABLE 5.4.3.1-1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURES

Non-Standard MSS System Services or Grapple Fixture

[Expand as required to document additional comment.]

5.4.3.2 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATION

The PD-provided unique or non-standard grapple fixture locations are identified in Figure 5.4.3.2-1, Unique or Non-Standard Grapple Fixture Locations, in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the payload-unique or non-standard grapple fixture locations in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.4.3.2-1 UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATIONS

5.4.4 EXTRAVEHICULAR ROBOTICS SOFTWARE INTERFACE REQUIREMENTS

The PD shall provide a definition of the C&DH software interface requirements between the MSS and Payload in Table 5.4.4-1, Extravehicular Robotics Mobile Servicing System Software Interface Requirements. C&DH example, PD provide ready-to-latch indication between the payload and the MSS equipment when the two pieces of equipment are placed within the berthing mechanism's capture envelope.

A. Payload-to-MSS Element - Describe the payload-to-MSS system element required for facilitating and supporting the payload.

B. Description of Payload-to-MSS Software Requirement - Describe the MSS robotic system software interfaces required for payload operations.

TABLE 5.4.4-1 EXTRAVEHICULAR ROBOTICS MOBILE SERVICING SYSTEM SOFTWARE INTERFACE REQUIREMENTS

Payload-to-MSS Element	Description of Payload-to-MSS Software Requirements

[Expand as required to document additional comment.]

5.4.5 PAYLOAD ROBOTIC PROPERTIES

The PD shall comply with the ISS Program and SSP robotic properties as defined in SSP 57003, NSTS-21000-IDD-ISS, and SSP 42004.

5.5 COMMON ATTACH SYSTEM EXTERNAL BERTHING CAMERA SYSTEM OPERATIONS

Documented within this section are the PD requirements and interfaces for utilizing the ISS Common Attach System (CAS) External Berthing Camera System (EBCS).

5.5.1 EXTERNAL BERTHING CAMERA SYSTEM REQUIREMENTS

A. Camera Package Location - The PD shall include EBCS avionics package mounting provisions such that, when the payload is berthed, the EBCS avionics package is located at active PAS coordinates in accordance with SSP 30219, Space Station Reference Coordinate Systems, and aligned with the active PAS frame. The EBCS avionics shall be mounted in accordance with SSP 57003.

B. Operating Resources - During ISS berthing operations, the payload shall route ISS video and electrical power to the EBCS as defined in SSP 57003.

C. Minimum Continuous Power ("keep alive/survival") - Once berthed, the payload shall route minimum continuous ISS power to the EBCS. The EBCS electrical interface and wiring harness is defined in SSP 57003.

5.5.2 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS

The payload EBCS locations are defined in Figure 5.5.2-1, External Berthing Camera System Locations, in accordance with SSP 57004.

NOTE: The PD shall provide drawings to show the payload EBCS component locations in Figure 5.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 5.5.2-1 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS

5.6 TRANSFER FROM ORBITER AND INTEGRATION ONTO ISS RESOURCE REQUIREMENTS

This section documents, on a flight basis, the joint operations resource requirements for payload transfer from the Orbiter payload bay with the SRMS to berth of the payload on the ISS. The PD shall specify in the subsequent table, payload unberthing from the Orbiter payload bay, SRMS handoff/transfer, SSRMS handoff/transfer, ISS payload berth, and flight crew time resource requirements.

5.6.1 TRANSFER AND INTEGRATION ONTO ISS RESOURCE TABLE

The PD shall provide the following information in Table 5.6.1-1, Transfer and Integration onto ISS Resource Table.

Column Header Definitions:

1. Resource Required - The power, command, telemetry, or flight crew time needed to support the payload during removal of the payload from the Orbiter's payload bay, each translation phase, and ISS berthing.
2. SRMS Operations - The resource needed during the period of time from Payload Latch Retention Assembly (PLRA) actuator release of the payload longeron trunnions, SRMS full end effector capture of the payload's grapple fixture, and translation for handoff to the SSRMS.
3. SSRMS Operations - The resource needed during the period of time from SSRMS full end effector capture of the payload's grapple fixture, SRMS end effector payload grapple fixture release, and SSRMS direct translation of the payload to the ISS payload attach site.
4. Or the resource needed during the period of time from SSRMS full end effector capture of the payload's grapple fixture while berthed on the CAS and release of the MCAS ready-to-latch indicators of the guide vanes, capture bar, or electrical UMA to end this time period.
5. MSS Operations - The resource needed for SSRMS operations where the payload will be first berthed to the MCAS for translation on the Mobile Transporter (MT) to the desired location for subsequent placement on an ISS PAS location. Use the MCAS ready-to-latch indicators of the guide vanes, capture bar, or electrical UMA to end this time period.
6. Payload ISS Berth - The resource needed during the period of time from payload physical contact with active PAS guide vanes until the PAS Capture Latch Assembly (CLA) claws are driven closed on the payload capture bar by the Integrated Motor Control Assembly (IMCA); this will be subsequently followed by CLA positive lockdown indication (payload-berthed) and SSRMS release.
7. Quantity - Amount of the resource required in the units specified.
8. Duration - The length of time that the resource is needed to operate the payload in the defined period of time.

Resources Required:

A. Continuous Power - The maximum steady state electrical power condition required for nominal payload operations, in W and hr.

B. Peak Power - The highest electrical power requirement lasting longer than 10 milliseconds required for payload-unique system operations or subsystem start up/down operations, in W and hr.

C. Minimum Continuous Power - Minimum continuous power ("keep alive/survival") is the lowest uninterrupted electrical power required by the payload to avoid payload damage or failure, in W and hr.

D. Unpowered Payload Survival - The maximum amount of time that the payload can survive without power, in min.

E. Orbiter Command Interface - Payload command data rate uplinked to, processed by, and routed to the payload via the Orbiter payload C&DH System in kbps and sec.

F. Orbiter Low Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

G. Orbiter High Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

H. ISS Command Interface - Payload command data rate uplinked to, processed by, and routed to the payload via the ISS payload C&DH System in kbps and sec.

I. ISS Low Rate Data Link - The rate and duration of data transmitted from the payload to the ground via the ISS 1553B Payload Bus/C&DH System for both Health and Status and Low Rate Telemetry in kbps and sec.

J. ISS High Rate Data Link - The rate of data transmitted from the payload to the ground via the ISS Automated Payload Switch/C&DH System for both Health and Status and High Rate Telemetry in megabits-per-second (Mbps) and sec.

K. External imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., SRMS operations, SSRMS operations etc.).

L. Internal imagery - Video/photographic coverage requirements of the payload during specific mission activities.

M. Crew Support - The number of Orbiter and/or ISS crew members and time (min/hr) required to simultaneously support payload operations. Include a description of the crew activities being performed in support of the payload operations, including any overhead time required, during the identified mission phase.

N. Other requirements - List other Orbiter and/or ISS support equipment to be used and the duration of use (min/hr/days).

TABLE 5.6.1-1 TRANSFER AND INTEGRATION ONTO ISS RESOURCE TABLE

Resource Required	SRMS Operations		SSRMS Operations		MSS Operations		Payload ISS Berth	
	Quantity	Duration	Quantity	Duration	Quantity	Duration	Quantity	Duration
Continuous power (W and hr)								
Peak power (W and hr)								
Minimum continuous power ("keep alive/survival") (W and hr)								
Unpowered payload survival (min)								
Orbiter command interface (kbps and sec)								
Orbiter low rate data downlink (kbps and sec)								
Orbiter high rate data downlink (kbps and sec)								
ISS command interface (kbps and sec)								
ISS-low rate data link (kbps and sec)								
- Health/status								
- Low rate data								
ISS high rate data link (Mbps and sec)								
- Health/status								
- High rate data								
External imagery								
Internal imagery								
Crew support (# of crew and time)								
Other requirements								

[Expand table as required to document additional content.]

5.7 TRANSFER AND INTEGRATION ONTO ISS CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME

Payload contingency operational requirements or contingency flight crew time in support of the payload are not addressed in this PIA Increment Addendum.

Payload contingency procedures requiring Orbiter or ISS flight crew action (aft flight deck switch, commanding, etc.) are collected via the OPMS/PIMS software tool. Payload planning for contingency operations (e.g., flight rules, timeline, etc.) are collected via the PDL and the iURC/URC as defined in SSP 52000-PDS (i.e., Section 6, Payload Operations Data Set, and Section 10, Payload Planning Data Set).

6.0 ON-ORBIT RESOURCE REQUIREMENTS

The PD will define in the subsequent sections, the payload's on-orbit joint mission phase operations/performance requirements; i.e., the nominal on-orbit operating requirements, and the on-orbit resource requirements for power, data, imagery, crew, support equipment, and ancillary stowage. Details of these requirements will be further documented in the various payload specific data sets as defined in SSP 52000-PDS.

6.1 ON-ORBIT OPERATING REQUIREMENTS

The PD will specify in this section ISS Program on-orbit resource requirements for nominal payload operations, external-induced environment operations, mated vehicle operations, ISS reboost operations, and planned ISS Program EVA operations.

The PD shall provide the following payload on-orbit operating requirements in Table 6.1-1, On-Orbit Operating Requirements.

A. Description of On-Orbit Operating Requirements - Describe the payload on-orbit operations. Include reactivation of power/time-sensitive hardware; contamination-sensitive avoidance operations; and any payload items requiring replacement, replenishment, or service by ISS Program or SSP crew.

TABLE 6.1-1 ON-ORBIT OPERATING REQUIREMENTS

Description of On-Orbit Operating Requirements

[Expand as required to document additional comment.]

6.2 ON-ORBIT RESOURCE REQUIREMENTS

This section documents, on a flight basis, the resource requirements for on-orbit payload operations on the ISS during this joint operations mission phase. The PD shall specify, in the subsequent table, ISS payload-berthed operations and flight crew time resource requirements.

In addition, as input to mission planning (i.e., payload timelines), detailed resource requirements, including sequencing of payload activities, shall be provided by the PD via the iURC/URC requirements tool.

6.2.1 ON-ORBIT OPERATIONS ISS RESOURCE TABLE

The PD shall provide the following information in Table 6.2.1-1, On-Orbit Operations ISS Resource Table.

Column Header Definitions:

1. Resource Required - The power, command, telemetry, or flight crew time needed to support the payload during on-orbit operations while berthed to ISS PAS.
2. Payload Operations - The resource needed during the period of time that the payload is in an operations cycle (e.g., science collection, calibration mode, etc.) or protecting against an external induced environment (e.g., off gassing from nearby external payloads, ISS venting or fluid dumps, Orbiter vehicle dumps, propellants transfer, etc.). Other induced operations, which may affect the payload, are ISS thermal conditions where the station places the payload in prolonged sunlight or prolonged shade and ISS microgravity operations, which may be affected by payload operations or vice versa.
3. Mated Vehicle Operations - The resource needed during the period of time that the payload is in an operations cycle in which mating operations with the Orbiter or a Russian vehicle is occurring.
4. ISS Reboost Operations - The resource needed during the period of time that the payload is in an operations cycle in which ISS reboost operations are required per the altitude strategy plan.
5. EVA Operations - The resource needed during the period of time that the payload is in an operations cycle in which ISS-planned EVA operations are required for logistics or maintenance tasks.
6. Quantity - Amount of the resource required in the units specified.
7. Duration - The length of time that the resource is needed to operate the payload in the defined period of time.

Resources Required:

A. Continuous Power - The maximum steady state electrical power condition required for nominal payload operations, in W and hr.

B. Peak Power - The highest electrical power requirement lasting longer than 10 milliseconds required for payload-unique system operations or subsystem start up/down operations, in W and hr.

C. Minimum Continuous Power - Minimum continuous power (“keep alive/survival”) is the lowest uninterrupted electrical power required by the payload to avoid payload damage or failure, in W and hr.

D. Unpowered Payload Survival - The maximum amount of time that the payload can survive without power, in min.

E. ISS Command Interface - Payload command data rate uplinked to, processed by, and routed to the payload via the ISS payload C&DH System in kbps and sec.

F. ISS Low Rate Data Link - The rate and duration of data transmitted from the payload to the ground via the ISS 1553B Payload Bus/C&DH System for both Health and Status and Low Rate Telemetry in kbps and sec.

G. ISS High Rate Data Link - The rate of data transmitted from the payload to the ground via the ISS Automated Payload Switch/C&DH System for both Health and Status and High Rate Telemetry in Mbps and sec.

H. External Imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., payload scenes in conjunction with other ISS EVA activities after the payload has been on-orbit for an extended period of time, etc.).

I. Internal Imagery - Video/photographic coverage requirements of the payload during specific mission activities.

J. Crew Support - The number of Orbiter and/or ISS crewmembers and time (min/hr) required to simultaneously support payload operations. Include a description of the crew activities being performed in support of the payload operations, including any overhead time required, during the identified mission phase.

K. Other Requirements - List other Orbiter and/or ISS support equipment to be used and the duration of use (min/hr/days).

TABLE 6.2.1-1 ON-ORBIT OPERATIONS ISS RESOURCE TABLE

Resource Required	Payload Nominal Operations		Mated Vehicle Operations		ISS Reboost Operations		EVA Operations	
	Quantity	Duration	Quantity	Duration	Quantity	Duration	Quantity	Duration
Continuous power (W and hr)								
Peak power (W and hr)								
Minimum continuous power ("keep alive/survival") (W and hr)								
Unpowered payload survival (min)								
ISS command interface (kbps and sec)								
ISS low rate data link (kbps and sec)								
- Health/status								
- Low rate data								
ISS high rate data link (Mbps and sec)								
- Health/status								
- High rate data								
External imagery								
Internal imagery								
Crew support (# of crew and time)								
Other requirements								

[Expand table as required to document additional content.]

6.2.2 ON-ORBIT INTRAVEHICULAR ACTIVITY PAYLOAD OPERATIONS AND PERFORMANCE REQUIREMENTS

The PD in this section will document nominal payload Intravehicular Activity (IVA) operations and performance, as required. Table 6.2.2.1-1, Payload Operation Performance Description describes the payload performance.

6.2.2.1 INTRAVEHICULAR ACTIVITY PAYLOAD OPERATION PERFORMANCE DESCRIPTION

The PD will define the sequence of payload IVA activities expected to result in the completion of the operation performance for the payload (e.g., crew unpack payload hardware and assemble, etc.).

A. Event identifier (ID) - Event ID is a short title or description for each IVA payload operation.

B. Payload Operation Performance Description - Describes the IVA operation performance including critical performance requirement such as event dependence, continuous operation, or operation when resources are available.

TABLE 6.2.2.1-1 PAYLOAD OPERATION PERFORMANCE DESCRIPTION

Event ID	Payload Operation Performance Description

[Expand as required to document additional comment.]

6.3 ON-ORBIT STOWAGE

This section documents any unique on-orbit stowage requirements going to and from the ISS in support of the payload. The PD will define in Table 6.3.1-1, On-Orbit Volume Stowage Requirements, the payload equipment, requested storage location, up mass and volume, and down mass and volume.

6.3.1 ON-ORBIT STOWAGE VOLUME REQUIREMENTS

The PD shall provide the on-orbit stowage volume requirements in Table 6.3.1-1.

A. Equipment Item - Equipment required to support payload operations (e.g., removable computer media, training material, etc.). Indicate any stowage constraints or orientation requirements when stowed.

B. Up Mass/Volume and Frequency - Specify the up mass/volume and frequency for each payload equipment item required.

C. Down Mass/Volume and Frequency - Specify the down mass/volume and frequency for each payload equipment item required.

D. Description of Stowage Requirements - Any special requirements for stowage or information such as unique shapes and sizes, hazardous materials, etc., that might be pertinent to the ISS. Indicate stowage requirements, pressurized or unpressurized.

TABLE 6.3.1-1 ON-ORBIT STOWAGE VOLUME REQUIREMENTS

Equipment Item	Up Mass/Volume				Down Mass/Volume				Description of Stowage Requirements	
	lbm (kg)	ft^3 (m^3)	Physical External Dimension in (cm)	Frequency	lbm (kg)	ft^3 (m^3)	Physical External Dimension in (cm)	Frequency	Pressurized	Unpressurized

[Expand table as required to document additional content.]

NOTE: Do not include the volume or mass of any padding materials unless this value is provided by the Payloads Office.

6.4 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT/LABORATORY SUPPORT EQUIPMENT AND ACCOMMODATIONS FOR PAYLOAD OPERATION

The PD shall specify pressurized volume Station Support Equipment (SSE) or Laboratory Support Equipment (LSE) that is required to support operations of the payload. The PD will define these scheduled resources in Table 6.4.1-1, On-Orbit ISS Pressurized Volume Station Support Equipment Parts Table, and in Table 6.4.2-1, On-Orbit ISS Pressurized Volume Laboratory Support Equipment Parts.

6.4.1 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT AND ACCOMMODATIONS ITEMS REQUIREMENTS

The PD may request use of SSE prior to launch of the payload in accordance with JSC 28533, International Space Station (ISS) Catalog of IVA Government Furnished Equipment (GFE) Flight Crew Equipment, which provides information regarding IVA equipment details. All of the SSE items are ISS-scheduled resources.

The PD shall provide any unique on-orbit pressurized SSE requirements in Table 6.4.1-1.

A. SSE Accommodation Equipment Item - Specify which of the provided SSE is required to support operations of the payload (e.g., name, part number, etc.).

B. Usage Description - Enter any notes pertaining to the use of the SSE item, especially if the item is required during a majority of the time that the payload will be operating. Indicate the length of time the item will be required, quantity required, and usage rationale.

TABLE 6.4.1-1 ON-ORBIT ISS PRESSURIZED VOLUME STATION SUPPORT EQUIPMENT PARTS TABLE

SSE Accommodation Equipment Item	Usage Description

[Expand table as required to document additional content.]

NOTE: The use of SSE will be negotiated through the LSE PIM.

6.4.2 ON-ORBIT ISS PRESSURIZED VOLUME LABORATORY SUPPORT EQUIPMENT AND ACCOMMODATIONS ITEMS REQUIREMENTS

The PD may request use of LSE prior to launch of the payload in accordance with SSP 57236, Laboratory Support Equipment (LSE) Hardware Interface Control Document which provides information regarding IVA equipment details. All of the LSE items are ISS-scheduled resources.

The PD shall provide any unique on-orbit pressurized LSE requirements in Table 6.4.2-1, On-Orbit ISS Pressurized Volume Laboratory Support Equipment Parts Table.

A. LSE Accommodation Equipment Item - Specify which of the provided LSE is required to support operations of the payload (e.g., name, part number, etc.).

B. Usage Description - Enter any notes pertaining to the use of the SSE item, especially if the item is required during a majority of the time that the payload will be operating. Indicate the length of time the item will be required, quantity required, and usage rationale.

TABLE 6.4.2-1 ON-ORBIT ISS PRESSURIZED VOLUME LABORATORY SUPPORT EQUIPMENT PARTS TABLE

LSE Accommodation Equipment Item	Usage Description

[Expand table as required to document additional content.]

NOTE: The use of SSE will be negotiated through the LSE PIM.

6.5 PRESSURIZED ACCOMMODATIONS - OTHER

The PD shall provide on-orbit details of payload accommodation requirements in the International Partner (IP) pressurized volume (i.e., the Columbus Module (COL), the Japanese Experiment Module (JEM), or any other bartered payload volume available) that would be accomplished between the appropriate PIA documents.

Payloads that go into another pressurized volume, other than the United States Laboratory (US Lab), will be accommodated in the appropriate PIA and ICD of those modules.

Basic design loads and requirements for pressurized payloads transported to ISS are documented in SSP 57000, SSP 52005, Payload Flight Equipment Requirements and Guidelines for Safety-Critical Structures; and, SSP 52000-IDD-ERP, EXpedite the PRocessing of Experiments to Space Station (EXPRESS) Rack Payloads Interface Definition Document.

The PD shall provide other pressurized accommodation requirements in Table 6.5.1-1, Pressurized Accommodations - Other Requirements.

A. IP Pressurized Volume/Module - Specify which IP pressurized volume/module is required to support operations of the payload.

B. Usage Description - Enter any notes pertaining to the use of the payload item, especially if the item is required during a majority of the time that the payload will be operating. Indicate the length of time the item will be required.

TABLE 6.5.1-1 PRESSURIZED ACCOMMODATIONS - OTHER REQUIREMENTS

IP Pressurized Volume/Module	Usage Description

[Expand table as required to document additional content.]

6.6 ON-ORBIT CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME

Payload contingency operational requirements or contingency flight crew time in support of the payload are not addressed in this PIA Increment Addendum.

Payload contingency procedures requiring ISS flight crew action (commanding, etc.) are collected via the OPMS/PIMS software tool. Payload planning for contingency operations (e.g., flight rules, timeline, etc.) are collected via the PDL and the iURC/URC as defined in SSP 52000-PDS (i.e., PDS Section: Section 6, Payload Operations Data Set, and Section 10, Payload Planning Data Set).

7.0 ISS DEINTEGRATION AND POST-LANDING REQUIREMENTS

This section documents the joint on-orbit requirements to perform payload unberth and transfer from the ISS to the Orbiter for return from the ISS. The PD will identify the payload unberth, translation, transport berthing, descent, and return landing requirements. Criteria for developing payload constraints for Shuttle return are identified in NSTS 07700, Volume XIV, and NSTS 21000-IDD-ISS.

The PD will also address EVA and EVR requirements for transfer and installation services and placement of the payload in the Orbiter payload bay. Payload-specific return requirements are further detailed in SSP 52000-PDS. Payload-specific operational details are documented in JSC-48024-XXX, Extravehicular Activity (EVA) Checklist-STS-XXX Flight Supplement - Basic, and JSC-48540-XX, International Space Station (ISS) Robotics Group ISS-XX.

7.1 SPACE STATION REMOTE MANIPULATOR SYSTEM CAPTURE AND TRANSFER REQUIREMENTS FOR REMOVAL FROM THE ISS ATTACH SITE

This section contains the scenario for payload SSRMS capture and unberth from the ISS PAS site to ready for transfer to the Shuttle SRMS. Describe the payload hardware disconnect from the active CLA and UMA, after SSRMS full end effector capture of the payload's grapple fixture. Describe power down of the payload at the PAS site and during arm-to-arm handoff, which includes the EBCS equipment.

The PD shall provide the following information in Table 7.1-1, ISS Unberth and Readiness for Shuttle Remote Manipulator System Capture Activities.

A. ISS Payload Unberth Activities to Readiness for Shuttle SRMS Capture - Define the requirements describing the SSRMS full end effector capture of the payload, disconnect from the active PAS CLA and UMA, removal of the payload from the attach site, arm translation, and readiness for capture by the SRMS. Include reactivation of time-sensitive hardware.

TABLE 7.1-1 ISS UNBERTH AND READINESS FOR SHUTTLE REMOTE MANIPULATOR SYSTEM CAPTURE ACTIVITIES

Payload Unberth Activities from ISS by the SSRMS-to-SRMS Handoff

[Expand table as required to document additional content.]

7.2 SHUTTLE REMOTE MANIPULATOR SYSTEM HAND-OFF AND TRANSFER REQUIREMENTS TO THE SHUTTLE REMOTE MANIPULATOR SYSTEM TO THE ORBITER

This section contains the capture/transfer scenario from SSRMS payload handoff to the SRMS to placement in the Orbiter. Once in the Orbiter payload bay, the payload longeron trunnions and keel will be reinstalled into the Orbiter's PLRAs and the SRMS

will release the payload. Delivery of Orbiter-to-payload power and data may be supplied during payload return and will be assessed on a case-by-case basis.

The PD shall provide the following information in Table 7.2-1, Shuttle Remote Manipulator System Transfer to Orbiter Payload Bay.

A. Payload Unberth to Orbiter Transfer Activities - Define the scenario describing the payload SSRMS-to-SRMS handoff to Orbiter payload bay installation for descent. Include reactivation of time-sensitive hardware.

TABLE 7.2-1 SHUTTLE REMOTE MANIPULATOR SYSTEM TRANSFER TO ORBITER PAYLOAD BAY

Payload SRMS Transfer to Orbiter Payload Bay Activities

[Expand table as required to document additional content.]

7.3 EXTRAVEHICULAR ACTIVITY REQUIREMENTS

This section of the document contains the EVA requirements for transfer and installation services required returning the payload from the ISS. The PD will identify in the subsequent tables the payload hardware and the ancillary EVA generic tools and crew aids requirements. Details of these requirements will also be further documented in SSP 52000-PDS, Section 11 and JSC-48024-XXX. Payload nominal EVA tasks shall be approved by the EVA AIT.

7.3.1 STANDARD EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS

The PD shall provide the following information in Table 7.3.1-1, Extravehicular Activity Standard Tools and Crew Aids Requirements, as defined in NSTS 07700, Volume XIV, Appendix 7.

A. Standard Tools and Crew Aids - Describe the standard tools and/or crew aids required for facilitating and supporting crew EVA tasks for the payload.

B. Description of EVA Requirements - Describe the payload operations and time that would require crew EVA support and tasking.

TABLE 7.3.1-1 EXTRAVEHICULAR ACTIVITY STANDARD TOOLS AND CREW AIDS REQUIREMENTS

Standard Tools and Crew Aids	Description of EVA Requirements

[Expand table as required to document additional content.]

7.3.2 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS

The PD shall provide a description of the unique or special EVA services or equipment for transferring the hardware from the ISS-to-Orbiter in Table 7.3.2-1, Unique Extravehicular Activity Tools and Crew Aids Requirements.

A. Unique EVA Tools and Crew Aids - Describe the unique or special tools and/or crew aids required for facilitating and supporting crew EVA tasks for the payload.

B. Description of Unique EVA Requirements - Describe the payload operations and time that would require crew EVA support and tasking with unique or special EVA tools.

TABLE 7.3.2-1 UNIQUE EXTRAVEHICULAR ACTIVITY TOOLS AND CREW AIDS REQUIREMENTS

Unique EVA Tools and Crew Aids	Description of Unique EVA Requirements

[Expand table as required to document additional content.]

7.3.3 EXTRAVEHICULAR ACTIVITY INTERFACES

The PD shall provide hardware, translation paths, and appropriate labeling to affect EVA access in accordance with by SSP 30256, SSP 50005, and SSP 50006.

7.3.3.1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS

The Payload aids for EVA nominal operations and contingency operations are shown in Figure 7.3.3.1-1, Extravehicular Activity Aids Locations, Descent.

NOTE: The PD shall provide drawings to show the locations of EVA aids (i.e., handrails, tether attachment points, caution and warning labels, targets, etc.) for nominal operations and contingency capability in this Figure 7.3.3.1-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.3.3.1-1 EXTRAVEHICULAR ACTIVITY AIDS LOCATIONS, DESCENT

7.3.3.2 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS

Payload EVA translation paths with gaps ≤ 24 inches are shown to connect to existing ISS translation paths in Figure 7.3.3.2-1, Extravehicular Activity Translation Paths.

NOTE: The PD shall provide drawings to show the EVA translation paths for the payload in Figure 7.3.3.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.3.3.2-1 EXTRAVEHICULAR ACTIVITY TRANSLATION PATHS

7.3.3.3 EXTRAVEHICULAR ACTIVITY DANGER AND WARNING LABEL LOCATIONS

Payload EVA translation or mobility handholds located on payload hardware, which pose a critical or catastrophic hazard to the crewmember or to the equipment, shall be labeled and identified in Figure 7.3.3.3-1, Danger and Warning Label Locations.

NOTE: The PD shall provide drawings to show the equipment danger and warning label locations in Figure 7.3.3.3-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.3.3.3-1 DANGER AND WARNING LABEL LOCATIONS

7.3.4 EXTRAVEHICULAR ACTIVITY TASK HAZARDS

The PD shall provide a description of all payload hardware, software, or material hazards unique to EVA services or task workarounds. The operation of any covers, enclosures, appendages, fasteners, valves, and tooling that are required for the EVA tasks shall be included. The PD shall ensure the payload design, interfaces, and operations comply with the requirements of NSTS 1700.7B and NSTS 1700.7B, ISS Addendum.

7.3.4.1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS

The PD shall provide a description of the unique or special EVA task hazards in Table 7.3.4.1-1, Unique Extravehicular Activity Task Hazards.

A. Unique EVA Task Hazards - Describe the unique or special EVA task hazards required for facilitating and supporting crew EVA tasks for the payload.

B. Description of Unique EVA Task Hazards - Describe the payload operations that would require the EVA crew to be exposed to any unique EVA task hazards.

TABLE 7.3.4.1-1 UNIQUE EXTRAVEHICULAR ACTIVITY TASK HAZARDS

Payload-Unique Hazard	Description of Unique EVA Hazards

[Expand as required to document additional comment.]

7.4 EXTRAVEHICULAR ROBOTICS REQUIREMENTS

This section of the document contains the EVR requirements for transfer and installation services required returning the payload from the ISS. The PD will identify in the subsequent tables the MSS services required to transport the payload about the station and support EVR operations. Details of these requirements will also be further documented in the various SSP 52000-PDS, Section 12.

EVR activities for the payload characteristics and interfaces pertaining to MSS services, grapple fixture location and orientation, and power and data requirements of a particular station robotic system are documented in the following paragraphs. These requirements shall be documented in accordance with SSP 30550, 42004, and NSTS-21000-IDD-ISS.

7.4.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS

7.4.1.1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURE REQUIREMENTS IDENTIFIED

The PD shall provide the following requirements for use of the standard MSS services in Table 7.4.1.1-1, Extravehicular Robotics Standard Mobile Servicing System Services and Grapple Fixtures. This table shall include the standard MSS robotic system required and the grapple fixture required.

A. MSS System Services or Grapple Fixture Type - Describe the services or grapple fixture required for facilitating and supporting EVR tasks for the payload.

TABLE 7.4.1.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND GRAPPLE FIXTURES

MSS System Services or Grapple Fixture Type

[Expand as required to document additional comment.]

7.4.1.2 EXTRAVEHICULAR ROBOTICS STANDARD GRAPPLE FIXTURE LOCATION

Payload grapple fixture(s) locations are identified in Figure 7.4.1.2-1, Standard Grapple Fixture Locations in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the grapple fixture locations in Figure 7.4.1.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.4.1.2-1 STANDARD GRAPPLE FIXTURE LOCATIONS

7.4.2 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS

This section contains requirements for the SPDM, which support deintegration of the payload when provided with an SDGF as defined in SSP 42004. The PD shall provide a scenario for SPDM payload activities.

The PD shall provide the following information in Table 7.4.2-1, Scenario of Payload Special Purpose Dexterous Manipulator Activities.

A. Scenario of Payload SPDM Activities - Define the scenario describing the payload SPDM activities. Include reactivation of time-sensitive hardware.

TABLE 7.4.2-1 SCENARIO OF PAYLOAD SPECIAL PURPOSE DEXTEROUS MANIPULATOR ACTIVITIES

Payload SPDM Activities

[Expand as required to document additional comment.]

7.4.2.1 EXTRAVEHICULAR ROBOTICS STANDARD DEXTEROUS GRASP FIXTURE REQUIREMENTS IDENTIFIED

The SDGF is Program-provided in accordance with SSP 42004 and SSP 30550 to support deintegration of the payload.

The PD shall provide the following requirements for use of the standard MSS services in Table 7.4.2.1-1, Extravehicular Robotics Standard Mobile Servicing System Services and Special Dexterous Grasp Fixture. This table shall include the standard MSS robotic system and SDGF requirement.

A. MSS System Services or SDGF - Describe the services and SDGF required for facilitating and supporting EVR tasks for the payload.

TABLE 7.4.2.1-1 EXTRAVEHICULAR ROBOTICS STANDARD MOBILE SERVICING SYSTEM SERVICES AND SPECIAL DEXTEROUS GRASP FIXTURE

MSS System Services or SDGF

[Expand as required to document additional comment.]

7.4.2.2 EXTRAVEHICULAR ROBOTICS SPECIAL DEXTEROUS GRASP FIXTURE LOCATIONS

The payload SDGF locations are identified in Figure 7.4.2.2-1, Special Dexterous Grasp Fixture Locations, in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the SDGF locations in Figure 7.4.2.1-2. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.4.2.2-1 SPECIAL DEXTEROUS GRASP FIXTURE LOCATIONS

7.4.3 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS

7.4.3.1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURE HARDWARE REQUIREMENTS IDENTIFIED

The PD shall provide any unique requirements or non-standard hardware for use with the standard MSS services in Table 7.4.3.1-1, Extravehicular Robotics Unique or Non-Standard Mobile Servicing System Services or Grapple Fixtures. This table shall include any unique or non-standard robotic system services, grapple fixture, or end effector hardware or equipment required and supplied by the payload.

A. Non-Standard MSS System Services or Grapple Fixture - Describe the unique or non-standard MSS system services or grapple fixture for facilitating and supporting EVR tasks for the payload.

TABLE 7.4.3.1-1 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD MOBILE SERVICING SYSTEM SERVICES OR GRAPPLE FIXTURES

Non-Standard MSS System Services or Grapple Fixture

[Expand as required to document additional comment.]

7.4.3.2 EXTRAVEHICULAR ROBOTICS UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATION

The PD-provided unique or non-standard grapple fixture locations are identified in Figure 7.4.3.2-1, Unique or Non-Standard Grapple Fixture Locations in accordance with SSP 30550 and SSP 42004.

NOTE: The PD shall provide drawings to show the unique or non-standard grapple fixture locations in Figure 7.4.3.2-2. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.4.3.2-1 UNIQUE OR NON-STANDARD GRAPPLE FIXTURE LOCATIONS

7.4.4 EXTRAVEHICULAR ROBOTICS SOFTWARE INTERFACE REQUIREMENTS

The PD shall provide a definition of the C&DH software interface requirements between the MSS and payload in Table 7.4.4-1, Extravehicular Robotics Mobile Servicing System Software Interface Requirements. C&DH example, PD provide ready-to-latch indication between the payload and the MSS equipment when the two pieces of equipment are placed within the berthing mechanism's capture envelope.

A. Payload-to-MSS Element - Describe the payload-to-MSS system element required for facilitating and supporting the payload.

B. Description of Payload-to-MSS Software Requirement - Describe the MSS robotic system software interfaces required for payload operations.

TABLE 7.4.4-1 EXTRAVEHICULAR ROBOTICS MOBILE SERVICING SYSTEM SOFTWARE INTERFACE REQUIREMENTS

Payload-to-MSS Element	Description of Payload-to-MSS Software Requirements

[Expand as required to document additional comment.]

7.4.5 PAYLOAD ROBOTIC PROPERTIES

The PD shall comply with the ISS Program and SSP robotic properties as defined in SSP 57003, NSTS-21000-IDD-ISS, and SSP 42004.

7.5 COMMON ATTACH SYSTEM EXTERNAL BERTHING CAMERA SYSTEM OPERATIONS

Documented within this section are the PD requirements and interfaces for utilizing the ISS CAS EBCS.

7.5.1 EXTERNAL BERTHING CAMERA SYSTEM REQUIREMENTS

A. Camera Package Location - The PD shall include EBCS avionics package mounting provisions such that, when the payload is berthed, the EBCS avionics package is located at active PAS coordinates in accordance with SSP 30219 and aligned with the active PAS frame. The EBCS avionics shall be mounted in accordance with SSP 57003.

B. Operating Resources - During ISS berthing operations, the payload shall route ISS video and electrical power to the EBCS as defined in SSP 57003.

C. Minimum Continuous Power ("keep alive/survival") - Once berthed, the payload shall route minimum continuous ISS power to the EBCS. The EBCS electrical interface and wiring harness defined in SSP 57003.

7.5.2 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS

The payload EBCS locations are identified in Figure 7.5.2-1, External Berthing Camera System Locations, in accordance with SSP 57004.

NOTE: The PD shall provide drawings to show the payload External Berthing Camera System component locations in Figure 7.5.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.5.2-1 EXTERNAL BERTHING CAMERA SYSTEM LOCATIONS

7.6 RETURN REQUIREMENTS

This section documents the descent and landing requirements following transfer of the payload from the ISS to the Orbiter. The PD will identify the scenario describing the payload return readiness activities on a flight-by-flight basis of the payload hardware being transported from the ISS.

Criteria for developing payload constraints for Shuttle return are identified in NSTS 07700, Volume XIV, Appendix 5. Orbiter-to-payload on-orbit retrieval and payload bay installation requirements for SSP descent are documented in NSTS 21000-IDD-ISS. The payload descent and landing requirements shall be documented in the ISS flight-unique MIP.

Additional information may need to be provided to SSP based on the difference of the payload from the launch configuration, including power requirements and whether or not the payload is returning in the same configuration as it was launched. If it is an across-the-bay payload, other requirements, such as location or power requirements, will also need to be provided to the SSP for manifesting the return payload. Details of these requirements will be further documented in the various payload-specific data sets as defined in SSP 52000-PDS.

7.6.1 HARDWARE RETURN READINESS

After payload placement in the Orbiter payload bay, the PD shall describe any return readiness requirements of the payload during descent or after landing (i.e., does the payload require any Shuttle services, etc.).

The PD shall provide the following information in Table 7.6.1-1, Scenario for Payload Return Readiness.

A. Payload Retrieval to Return Readiness - Define the scenario describing the return readiness of the payload after installing the payload on-orbit in the Orbiter payload bay.

TABLE 7.6.1-1 SCENARIO FOR PAYLOAD RETURN READINESS

Payload Retrieval to Return Readiness

[Expand as required to document additional comment.]

7.6.2 PAYLOAD HARDWARE DESCRIPTION FOR DESCENT

The PD shall provide the following information in Table 7.6.2-1, Payload Hardware Description for Descent.

A. Payload Item - An individual payload item or groupings of payload-related items manifested (e.g., pallet assembly, avionics box, aft flight deck panel, venting adapter kit, removable computer media, dewar, etc.).

B. Payload Item Location - Location of the payload item (e.g., Orbiter payload bay, MPLM, middeck locker, aft flight deck, etc.).

C. Volume - The volume of the payload item (i.e., the dimensional envelope).

D. Mass - The mass of the payload item listed in the table.

E. Additional Information - Provide the payload item or groupings final assembled or installed flight configuration drawing number. Provide for the hardware item listed in the table, any unique shapes and sizes, hazardous materials or gases, etc., that might be pertinent to the Orbiter and/or ISS.

F. Physical External Dimensions - The physical external dimensions of the payload item listed in the table.

G. CG - The CG point of the payload item listed in the table. The CGx, CGy, CGz values are in inches (cm). The CG point of origin is to be defined by the payload in Figure 7.6.2-1, Payload Hardware Center of Gravity Locations for Descent.

H. Total Mass/Flight - The total mass of the payload item(s) by flight.

TABLE 7.6.2-1 PAYLOAD HARDWARE DESCRIPTION FOR DESCENT

Payload Item	Payload Item Location	Volume ft^3 (m^3)	Mass lbm (kg)	Additional Information - Drawing Number	Physical External Dimension in (cm)	Center of Gravity		
						CGx in (cm)	Cgy in (cm)	CGz in (cm)
		Total Mass/Flight lbm (kg):						

[Expand as required to document additional comment.]

Payload hardware CG locations for ascent are identified in Figure 7.6.2-1.

NOTE: The PD shall provide drawings to show the payload CG component locations in Figure 7.6.2-1. Drawing formats are defined in SSP 52000-PDS, Section 9.3.2.

[Expand as required to document additional comment.]

FIGURE 7.6.2-1 PAYLOAD HARDWARE CENTER OF GRAVITY LOCATIONS FOR DESCENT

7.7 RETURN RESOURCE REQUIREMENTS

This section documents, on a flight basis, the joint mission resource requirements for readying the payload for return from the ISS and its entry phase. The PD shall specify, in the subsequent table, ISS payload return operations and flight crew time resource requirements.

7.7.1 ISS DEINTEGRATION AND RETURN OPERATIONS RESOURCE TABLE

The PD shall provide the following information in Table 7.7.1-1, ISS Deintegration and Return Operations Resource Table.

Column Header Definition:

1. Resource Required - The power, command, telemetry, or flight crew time needed to support the payload during removal of the payload from the ISS PAS, each translation phase, and reinstallation of the payload in the Orbiter's payload bay.
2. Payload Unberth/SSRMS Operations - The resource needed during the period of time from payload physical contact with active PAS guide vanes ready-to-latch indicators is broken, SSRMS full end effector capture of the payload's grapple fixture, and translation for handoff to the SRMS.

   Or the resource needed during the period of time from SSRMS full end effector capture of the payload's grapple fixture while berthed on the CAS and release of the MCAS ready-to-latch indicators of the guide vanes, capture bar, or electrical UMA to end this time period.

3. SRMS Operations - The resource needed during the period of time from SSRMS full end effector release of the payload grapple fixture, SRMS end effector payload grapple fixture capture, and SRMS translation of the payload into the Orbiter's payload bay.
4. MSS Transport - The resource needed for SSRMS operations where the payload will be first berthed to the MCAS for translation on the MT to the desired location for subsequent capture and handoff to the SRMS. Use the MCAS ready-to-latch indicators of the guide vanes, capture bar, or electrical UMA to end this time period.
5. Payload Orbiter Install - The resource needed during the period of time from PLRA actuator capture of the payload longeron trunnions, and SRMS full end effector release of the payload's grapple fixture after payload install in the Orbiter's payload bay.
6. Quantity - Amount of the resource required in the units specified.
7. Duration - The length of time that the resource is needed to operate the payload in the defined period of time.

Resources Required:

A. Continuous power - The maximum steady-state electrical power condition required for nominal payload operations, in W and hr.

B. Peak power - The highest electrical power requirement lasting longer than 10 milliseconds required for payload-unique system operations or subsystem start up/down operations, in W and hr.

C. Minimum continuous power - Minimum continuous power ("keep alive/survival") is the lowest uninterrupted electrical power required by the payload to avoid payload damage or failure, in W and hr.

D. Unpowered payload survival - The maximum amount of time that the payload can survive without power, in min.

E. ISS command interface - Payload command data rate uplinked to, processed by, and routed to the payload via the ISS payload C&DH System in kbps and sec.

F. ISS Low Rate data link - The rate and duration of data transmitted from the payload to the ground via the ISS 1553B Payload Bus/C&DH System for both Health and Status and Low Rate Telemetry in kbps and sec.

G. ISS High Rate Data Link - The rate of data transmitted from the payload to the ground via the ISS Automated Payload Switch/C&DH System for both Health and Status and High Rate Telemetry in Mbps and sec.

H. Orbiter Command Interface - Payload command data rate uplinked to, processed by, and routed to the payload via the Orbiter payload C&DH System in kbps and sec.

I. Orbiter Low Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

J. Orbiter High Rate Data Downlink - The rate of data transmitted from the payload to the ground via the Orbiter C&DH System in kbps and sec.

K. External Imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., SRMS operations, SSRMS operations etc.).

L. Internal Imagery - Video/photographic coverage requirements of the payload during specific mission activities (e.g., pre-egress operations prior to payload PAS removal, etc.).

M. Crew Support - The number of Orbiter and/or ISS crewmembers and time (min/hr) required to simultaneously support payload operations. Include a description of the crew activities being performed in support of the payload operations, including any overhead time required, during the identified mission phase.

N. Other Requirements - List other Orbiter and/or ISS support equipment to be used and the duration of use (min/hr/days).

TABLE 7.7.1-1 ISS DEINTEGRATION AND RETURN OPERATIONS RESOURCE TABLE

Resource Required	Payload Unberth/SSRMS Operations		SRMS Operations		MSS Transport		Payload Orbiter Install	
	Quantity	Duration	Quantity	Duration	Quantity	Duration	Quantity	Duration
Continuous power (W and hr)								
Peak power (W and hr)								
Minimum continuous power ("keep alive/survival") (W and hr)								
Unpowered payload survival (min)								
ISS command interface (kbps and sec)								
ISS low rate data link (kbps and sec)								
- Health/status								
- Low rate data								
ISS high rate data link (Mbps and sec)								
- Health/status								
- High rate data								
Orbiter command interface (kbps and sec)								
Orbiter low rate data downlink (kbps and sec)								
Orbiter high rate data downlink (kbps and sec)								
External imagery								
Internal imagery								
Crew support (# of crew and time)								
Other requirements								

[Expand table as required to document additional content.]

7.8 RETURN CONTINGENCY REQUIREMENTS FOR PAYLOAD OPERATIONS OR FLIGHT CREW TIME

Payload contingency operational requirements or contingency flight crew time in support of the payload are not addressed in this PIA Increment Addendum.

Payload contingency procedures requiring ISS or Orbiter flight crew action (commanding, aft flight deck switch, etc.) are collected via the OPMS/PIMS software tool. Payload planning for contingency operations (e.g., flight rules, timeline, etc.) are collected via the PDL and the iURC/URC as defined in SSP 52000-PDS (i.e., Section 6, Payload Operations Data Set, and Section 10, Payload Data Set).

8.0 FERRY FLIGHT REQUIREMENTS

This section documents the payload ferry flight requirements associated with the transport and return of the payload after landing.

Reference SMD-91-2104, Ferry Flight Loads Environment for Returnable Payloads, for the Orbiter, for payload bay ferry flight environment, and NSTS 21000-IDD and NSTS 07700, Volume XIV, for the Orbiter post-flight operations. Payload post-flight turnover to the PD and return shipping are documented in SSP 52000-PDS, KSC Support Requirements, Section 7.

8.1 FERRY FLIGHT OPERATIONS REQUIREMENTS

The PD will identify the payload ferry flight transport requirements from the ISS Program after landing in Table 8.1-1, Ferry Flight Operations Requirements.

A. Payload Item - A description of the payload hardware that constituents the payload's return complement for a ferry flight (e.g., integrated assembly, payload-to-pallet adapter, payload-to-MPLM element, or a payload-to-integrated Unpressurized Logistics Carrier interface, etc.).

B. Ferry Flight Requirements - A description of payload-unique requirements for payload bay environment for an SSP ferry flight (e.g., purge of payload bay at stopover points).

TABLE 8.1-1 FERRY FLIGHT OPERATIONS REQUIREMENTS

Payload Item

[Expand as required to document additional comment.]

9.0 PAYLOAD DEVELOPER-PROVIDED CREW TRAINING, GROUND SUPPORT TRAINING, AND TRAINER MOCKUP REQUIREMENTS

This section describes the PD requirements for crew training, ground support personnel training, and trainer mockups for the payload.

The PD shall provide payload training and resource requirements to the Training Strategy Team (TST) process as required by SSP 58309, Payload Training Implementation Plan; JSC 36307 NASA Training Implementation Plan (TIP); SSP 58026-01, Generic Payload Simulator Requirements Document, Volume I; SSP 50503, International Space Station Onboard Training Media Requirements; and SSP 52000-PDS, Section 4. The PD shall document the payload training and resource requirements agreed to at the TST in the PDL.

9.1 CREW AND GROUND SUPPORT PERSONNEL TRAINING REQUIREMENTS

The PD shall support the development of training plans, lesson plans, courseware, or other materials for all training related to their payload. The provided training materials shall support flight crew onboard training, increment-based training, and ground support personnel training. This also includes the development of flight products such as crew procedures and displays delivered in time to support training verification activities. Detailed training requirements will be further documented in the SSP 52000-PDS, Section 4.

Detailed crew training requirements provided by the PD shall supply training lessons for the crews and ground operations cadre/support personnel who will operate the payload on-orbit. This payload training shall speak to two specific lesson areas:

A. Training for payload installation and removal to-and-from the ISS attach site location.

B. On-orbit payload mission life training for extended/continuous operations.

The PD shall participate in the required ISS Program and/or SSP internal training certification process to support payload operations in accordance with SSP 52000-PDS, Section 4.

The PD shall define Telescience Support Center (TSC)-specific training requirements in SSP 52000-PDS, Section 4. This section does not include requirements for training that will be provided to the PD by the Payload Operations Integration Function (POIF). These requirements will be determined by the TST.

9.1.1 TRAINING CLASSIFICATION AND LOCATION REQUIREMENTS

The PD-provided training requirements that define the trainees involved and the training location shall be provided in Table 9.1.1-1, Payload Developer-Provided Training Classification and Location Requirements.

A. Flight Number - The first flight or the flight increments affected by the training requirements.

B. Trainee Classification Description - The individuals requiring training in support of payload operations (e.g., crew instructors, flight crew, launch/landing site personnel, Payload Operations Integration Center (POIC) cadre, TSC personnel, etc.).

C. Training Hours - Estimate of number of hours required for this training.

D. Time Frame - The time frame during which the training needs to occur (e.g., Increment minus (I-)18, L-12, etc.).

E. Training Location - The location where the training is to occur. If training is to occur at a site other than JSC, a rationale shall be provided here and a waiver obtained from the Payload Training Panel.

TABLE 9.1.1-1 PAYLOAD DEVELOPER-PROVIDED TRAINING CLASSIFICATION AND LOCATION REQUIREMENTS

Trainee Classification Description	Training Hours	Time Frame	Training Location

[Expand as required to document additional comment.]

9.2 TRAINER/SIMULATOR REQUIREMENTS

To support payload training, the PD shall provide usage requirements for Space Station Training Facility (SSTF) and Non-SSTF Payload Training Facilities to the TST.

SSTF facilities include the Payload Training Complex in JSC Building 5, the Neutral Buoyancy Laboratory (NBL) in the JSC Sonny Carter Training Facility, the Multi-Use Remote Manipulator Development Facility (MRMDF) in JSC Building 9, the Virtual Reality Laboratory in JSC Building 9, and the Space Station Mockup and Training Facility (SSMTF) in JSC Building 9. The training material library/storage areas in JSC Building 4 South and the Payload Training Simulator may be available to supplement SSTF storage space in support of PD training. The Non-SSTF facilities are not part of the SSTF, but support payload training.

The PD shall develop a technical description or memo of understanding for each trainer/simulator that provides detailed information for the trainer to be supplied.

The PD shall supply trainer/simulator supporting data (simulator fidelity, training materials, procedures, drawings, etc.) using SSP 58026-01, and SSP 52000-PDS, Section 4, in conjunction with SSP 50323, Payload User Development Guide (PUDG) for the Space Station Training Facility (SSTF) Payload Training Capability (PTC). This trainer/simulator configuration data is the basis to develop agreements and define ICD interfaces with the designated training facilities.

To support payload training, the PD shall develop and deliver a payload trainer that will support crew training for nominal, maintenance, safety-related, and malfunction operations.

Special training equipment (e.g., robotics lab, NBL mockups, videos, etc.) may also be required to support specific payload training objectives. The PD shall also provide the PD's requirements for the use of training facilities and supporting services, such as data links or telecommunications.

9.2.1 TRAINING FACILITY AND EQUIPMENT REQUIREMENTS

The PD-provided training facility requirements that define the facility involved and the training equipment needed shall be provided in Table 9.2.1-1, Training Facility and Equipment Requirements.

A. SSTF - Define the SSTF required to support payload training (e.g., Sonny Carter Facility NBL, Multiplexer/Demultiplexer (MDM) Software Development Facility, etc.).

B. Non-SSTF Payload Training Facilities - Define the Non-SSTF Payload Training Facilities required to support payload training (e.g., Building 37 lab space, etc.).

C. Training Equipment Required/Setup - Describe the required equipment and/or equipment setup, duration of the training session for support of payload training, or special training equipment (e.g., payload dry runs (certifying procedures, techniques, hardware, etc.), NBL tank setup, robotics training setup, number of training sessions required, host computer, etc.).

D. PD-Provided Training Equipment/Setup - Describe the PD-provided payload mockup or equipment to support training (e.g., low-fidelity pallet assembly with high-fidelity payload adapter, number of mockups to be delivered, time frame for delivery, etc.).

TABLE 9.2.1-1 TRAINING FACILITY AND EQUIPMENT REQUIREMENTS

Space Station Training Facilities (SSTF)	Non-SSTF Payload Training Facilities	Training Equipment Required/Setup	PD-Provided Training Equipment/Setup

[Expand as required to document additional comment.]

10.0 GROUND DATA SERVICES REQUIREMENTS - FLIGHT OPERATIONS

This section documents the top-level Ground Data Services Requirements in support of payload flight operations from launch of the payload for its on-orbit life. These requirements also refer to the ground support requirements needed during simulations and real-time on-orbit operations at the payload's ground operating location(s).

The PD shall provide ground data services requirements for payload-unique services required if in the United States Operations Center (USOC), a TSC, or at any other operating location. This includes network and/or hardware connectivity and ground control facility services for the payload operating location in accordance with SSP 52000-PDS, Section 5. TSC user manuals define all the services available to the PD at the various operated NASA TSCs. Requested TSC requirements will have to be assessed for cost and schedule impacts prior to approval by the TSC Facility Representative.

This section does not include requirements for KSC ground support.

10.1 GROUND DATA SERVICES OPERATIONAL REQUIREMENTS

The PD shall identify in Table 10.1.1-1, Ground Data Services Requirements Supporting Flight Operations. These requirements shall address the pre-mission planning and coordination for network connectivity, operating location, and facility definition in support of the payload.

Payload non-standard ground data services or operations locations shall be the exclusive responsibility of the PD.

10.1.1 GROUND DATA SERVICES REQUIREMENTS SUPPORTING FLIGHT OPERATIONS

The PD shall provide the following information in Table 10.1.1-1 for supporting the payload:

A. Ground Data Services Requirement - Select multiple services as required for each payload operating location. Choose from the following types of services:

   1. Experiment Science/Engineering Data - Any data used to support science and/or engineering objectives such as Custom Data Package Services, Ground Support Equipment Packet Services, Payload MDM Health and Status, Payload Ancillary, Broadcast Ancillary, or Ground Ancillary data.

   2. Voice - Includes voice loops for ground-to-ground and ground-to-space communications in support of Orbiter and on-orbit ISS operations.

   3. ISS Downlink Video - A PD with a requirement for downlink video at an operating location other than the USOC or a TSC will be responsible for acquiring the Video Ground Terminal Equipment required to receive this video.

   4. Ground Commanding - Ability to issue uplink commands to a payload.

5. POIC Services - Reference SSP 50304, POIC Capabilities Document, for a description of standard POIC-provided services, interfaces, and methods required for supporting the payload.
6. ISS Command/Data Uplink - Command services for the payload that can be provided by the ISS, the POIC ground data systems, or the payload operation control center.
7. ISS Downlink Data - ISS system core telemetry and/or payload telemetry data (command, housekeeping, health and status) available onboard the ISS, at the POIC, or the payload operation control center.
8. Orbiter Command/Data Uplink - Command services for the payload that can be provided by the Orbiter, the Mission Control Center-Houston (MCC-H), or the payload operation control center.
9. Orbiter Downlink Data - Orbiter system core telemetry and/or payload telemetry data (command, housekeeping, health and status) available onboard the Orbiter, at MCC-H, or the payload operation control center.

B. Indicate All Locations - From - Indicate the From (e.g., POIC, ISS, a TSC, etc.) locations where the ground data services requirement is needed.

C. Indicate All Locations - To - Indicate the To (e.g., USOC, a TSC, other operating location, etc.) locations where the ground data services requirement is needed.

D. Data Rate for Each Location (kbps) - Approximate total data rate for all payload-generated data streams in kbps for each location.

E. POIC Processing Payload Science/Engineering Data - Indicate a request for the POIC to process the payload's science/engineering data. This request will have to be assessed prior to approval.

F. Voice Distribution System - Indicate each operating location that has a voice distribution system requirement.

G. Internet Voice Distribution System (IVoDS) - For each operating location that does not have a voice distribution system, indicated the number of IVoDS interfaces required.

TABLE 10.1.1-1 GROUND DATA SERVICES REQUIREMENTS SUPPORTING FLIGHT OPERATIONS

Ground Data Services Requirement	Indicate All Locations – From	Indicate All Locations – To	Data Rate for Each Location (kbps)	POIC Processing Payload Science/ Engineering Data	Voice Distribution System	IVoDS
Payload Science /Engineering Data				Yes or No		
Voice					Yes or No	
Video						
Ground Commanding	Yes or No					
POIC Services						
ISS Command/ Data Uplink						
ISS Downlink Data						
Orbiter Command/ Data Uplink						
Orbiter Downlink Data						

[Expand as required to document additional comment.]

10.1.2 ADDITIONAL REQUIREMENTS/SERVICES SUPPORTING FLIGHT OPERATIONS

Additional Requirements/Services identifies any additional requirements/services for an operating location here. These requirements will have to be assessed for cost and schedule impacts prior to approval (e.g., Telescience Resource Kit (TReK) workstation, etc.). The PD shall provide the information in Table 10.1.2-1, Additional Requirements/Services Supporting Flight Operations; the following is a description of the columns.

A. Operating Location Point of Contact (POC) - Provide the name and telephone number of the operating location POC responsible for configuring ground support hardware for interfacing to external services such as POIC Services and network communications services. If there are multiple requirements for an operating location, the POC information only needs to be entered once for each location.

B. Operating Location POC - Indication of any operating location listed in Table 10.1.2-1, which supports only launch transportation services operations.

C. Other.

TABLE 10.1.2-1 ADDITIONAL REQUIREMENTS/SERVICES SUPPORTING FLIGHT OPERATIONS

Operating Location POC for External Configuration	Operating Location POC for Launch	Other

[Expand as required to document additional comment.]

APPENDIX A

ACRONYMS AND ABBREVIATIONS

APPENDIX A – ACRONYMS AND ABBREVIATIONS

µg	Microgravity
AIT	Analysis Integration Team
ATV	Autonomous Transfer Vehicle
C&DH	Command and Data Handling
CAS	Common Attach System
CG	Center of Gravity
CLA	Capture Latch Assembly
CM	Configuration Management
cm	centimeter
COL	Columbus Module
EBCS	External Berthing Camera System
EEOM	Early End of Mission
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
EOM	End of Mission
EPF	External Payload Facility
ESA	European Space Agency
ETOV	Earth-to-Orbit Vehicle
EVA	Extravehicular Activity
EVR	Extravehicular Robotics
EXPRESS	Expedite the Processing of Experiments to the Space Station
FDF	Flight Data File
ft^3	cubic feet
GFE	Government Furnished Equipment
GSE	Ground Support Equipment
hr	Hour
Hz	Hertz
I-	Increment minus
ICD	Interface Control Document
ID	Identifier
IMCA	Integrated Motor Control Assembly
in	inch
IP	International Partner
ISPR	International Standard Payload Rack
ISS	International Space Station
iURC	interim User Requirements Collection
IVA	Intravehicular Activity
IVoDS	Internet Voice Distribution System

JEM	Japanese Experiment Model
JEM-EF	Japanese Experiment Model – Exposed Facility
JSC	Johnson Space Center
kbps	kilobits-per-second
kg	kilogram
KSC	Kennedy Space Center
L-	Launch minus
lbm	pounds mass
LCC	Launch Commit Criteria
LI	Lower Inboard
LO	Lower Outboard
LSE	Laboratory Support Equipment
LVLH	Local Vertical/Local Horizontal
m^3	cubic meters
Mbps	Megabits-per-second
MBS	MRS Base System
MCAS	MBS Common Attach System
MCC-H	Mission Control Center-Houston
MDM	Multiplexer/Demultiplexer
min	minute
MIP	Mission Integration Plan
MOD	Mission Operations Directorate
MPLM	Multi-Purpose Logistics Module
MPV	Manual Procedure Viewer
MRMDF	Multi-Use Remote Manipulator Development Facility
MRS	Mobile Remote Servicer
MSS	Mobile Servicing System
MSFC	Marshall Space Flight Center
MT	Mobile Transporter
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NBL	Neutral Buoyancy Laboratory
OMS	Orbital Maneuvering System
OPMS	Online Project Management System
OPF	Orbiter Processing Facility
Ops	Operations
PAS	Payload Attach System
PCB	Payload Control Board
PCMCIA	Personal Computer Memory Card Internal Association
PCS	Portable Computer System
PD	Payload Developer

PDL	Payload Data Library
PDRP	Payload Display and Review Panel
PGSC	Payload and General Support Computer
PIA	Payload Integration Agreement
PIM	Payload Integration Manager
PIMS	Payload Information Management System
PLBD	Payload Bay Door
PLRA	Payload Latch Retention Assembly
POC	Point of Contact
POIC	Payload Operations Integration Center
POIF	Payload Operations Integration Function
PSE	Payload Support Equipment
PTC	Payload Training Capability
PTCS	Payload Test and Checkout System
PUDG	Payload User Development Guide
R+	Return Plus
RPO	Research Program Office
S	Starboard
SDGF	Standard Dexterous Grasp Fixture
sec	second
SODF	Systems Operations Data File
SPDM	Special Purpose Dexterous Manipulator
SPIA	Standard Payload Integration Agreement
SRB	Solid Rocket Booster
SRMS	Shuttle Remote Manipulator System
SSE	Station Support Equipment
SSMTF	Space Station Mockup and Training Facility
SSP	Space Shuttle Program
SSPF	Space Station Processing Facility
SSRMS	Space Station Remote Manipulator System
SSTF	Space Station Training Facility
TBD	To Be Determined
TBR	To Be Resolved
TIP	Training Implementation Plan
TReK	Telescience Resource Kit
TSC	Telescience Support Center
TST	Training Strategy Team
TV	Television
UCCAS	Unpressurized Cargo Carrier Attach System
UI	Upper Inboard
ULC	Unpressurized Logistics Carrier
UMA	Umbilical Mechanism Assembly
UO	Upper Outboard

URC	User Requirements Collection
U.S.	United States
US Lab	United States Laboratory
USOC	United States Operations Center
W	Watts

APPENDIX B

GLOSSARY OF TERMS

APPENDIX B - GLOSSARY OF TERMS

ACCOMMODATIONS

Applies to Shuttle or ISS physical locations where utilization or system items are stowed or installed.

ADDENDUM

ISS to payload integration details are documented in SSP 57062, Payload Integration Agreement Increment Addendum Blank Book for Unpressurized Payloads. PIA Increment Addendum to a {Payload-unique PIA Document Number} for separate increments will be published as separate documents.

ALLOCATION

The portioning of resources and accommodations between the ISS payload/experiment users and ISS systems.

ASCENT

The period of time from Space Shuttle SRB ignition through the establishment of a stable orbit (typically post-OMS second burn).

CARRIER

An item that delivers to orbit and returns from orbit launch package/cargo items in an MPLM or in an unpressurized atmospheric environment on an Unpressurized Logistics Carrier (ULC), Spacelab Logistics Pallet.

DATA SETS

Data sets contain the engineering, integration, and operational details required and agreed upon by the implementing organizations. Data sets define, on an increment and flight-specific basis, the engineering, integration, and operational details of the requirements in the Addendum. Data sets will be updated as agreed to by the implementing organizations to meet increment and flight-specific needs.

DESCENT

The period of time from start of crew preparation for entry through wheels stop at the landing site.

EARLY ON-ORBIT

The time from ascent complete (stable orbit) to Space Shuttle Orbiter dock/mate to the ISS.

ENTRY

The time from Space Shuttle deorbit burn to wheels stop at the landing site.

EXPRESS PALLET

A pallet system assembly of up to six payload adapters for payloads plus an EXpedite the PRocessing of Experiments to the Space Station (EXPRESS) Pallet Controller Assembly. For the purposes of this document, the EXPRESS Pallet is considered as one payload when integrating and operating on ISS.

EXPRESS PALLET PAYLOAD ADAPTER

The EXPRESS Pallet Adapter accommodates up to 500 pounds of payload equipment with volumetric constraints of 34.00 inches x 46.00 inches x 49.00 inches during launch/landing and ground handling. EXPRESS Pallet Adapters may be installed on ISS as part of a pallet complement or on an individual pallet adapter basis.

FLIGHT

The time phase and the sequence of events that take place between liftoff and entry/landing of an Earth-to-Orbit Vehicle (ETOV).

FLIGHT SUPPORT EQUIPMENT

That equipment, both hardware and associated software, that is used to provide support to flight hardware from the time of flight hardware insertion into the launch vehicle (e.g., Space Shuttle Orbiter cargo bay) until removal for on-orbit installation or assembly.

FLIGHT-TO-FLIGHT

On-orbit configuration of the ISS after each flight that adds a major capability to the ISS through assembly complete. An assembly element is a station configuration change, whereas flying up a logistics carrier is not a major ISS capability change.

GOVERNMENT FURNISHED EQUIPMENT

Equipment acquired by the Government and delivered or otherwise made available to a non-Government organization.

GROUND SUPPORT EQUIPMENT

Deliverable equipment, both hardware and associated software, that is used on the ground to provide some means of support to flight systems or equipment. Ground Support Equipment (GSE) includes test and checkout equipment, handling and transporting equipment, access equipment, and servicing equipment.

INCREMENT

A specific time period into which various assembly, discipline research, testing, logistics, maintenance, and other ISS system operations and utilization activities are grouped. Increment boundaries are established to coincide with, and are defined by, crew rotations.

ISS PROGRAM-FUNDED SSP SERVICES

Those services or tasks outside the scope of the standard SSP services but that NASA performs for a customer. These services are commonly performed for individual

payloads to accomplish complex or unique mission requirements. Funding sources/costs of these services are to be negotiated by the ISS Program, agreed to by the SSP, and documented as required in the flight-unique MIP.

ISS PROGRAM NON-STANDARD SERVICES

All ISS Program non-standard services are negotiated outside the Payload Integration Agreement on a payload-unique basis with the ISS Payloads Office/Code OZ.

IURC/URC

The current mission-planning tool is the iURC tool. The URC tool will subsequently replace this tool.

JOINT OPERATIONS

The time from Space Shuttle Orbiter dock/mate to station to Orbiter undock from the station.

LAUNCH VEHICLE

The term “launch vehicle” means an object (or any part thereof) intended for launch, launched from Earth, or returning to Earth that carries payloads, persons, or both.

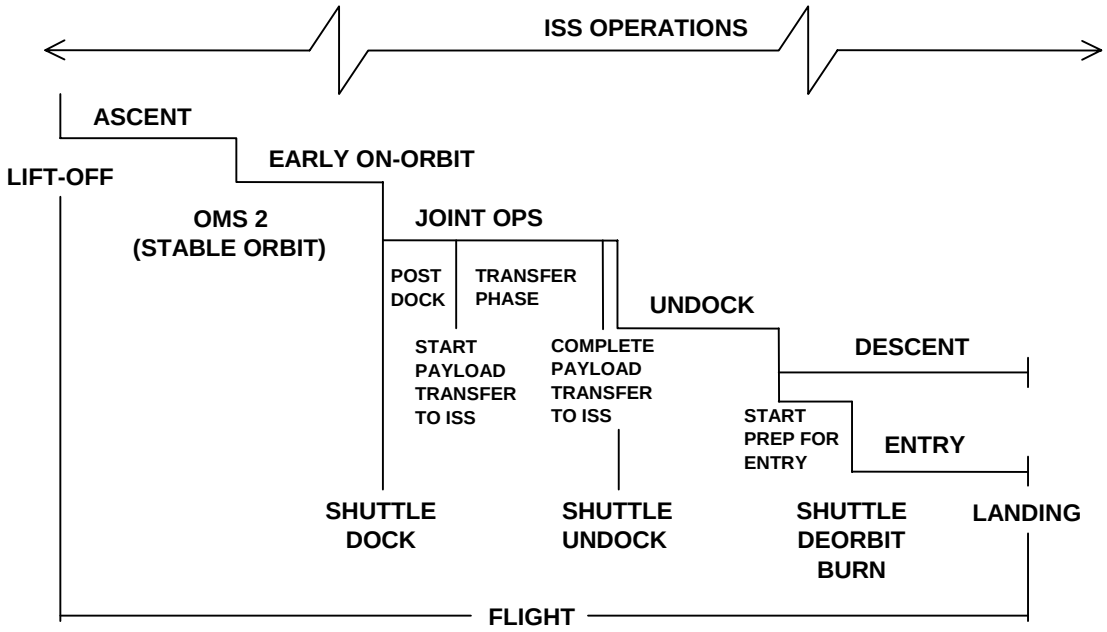
MAY

The word “may” is used for expressing purpose or an expectation to be fulfilled by the PD of a non-mandatory requirement.

MISSION

The performance of a coherent set of investigations or operations in space to achieve ISS Program goals.

MISSION PHASE DEFINITION



MULTI-PURPOSE LOGISTICS MODULE

MPLM is a pressurized carrier for transfer of cargo/payload elements to the Station that is launched in the Shuttle's payload bay. The Shuttle is the only means for returning items in the MPLM from ISS. The MPLM provides structural, mechanical, electrical, data, and robotic interfaces between it and Station facilities. Payload equipment may be transported on an MPLM resupply stowage element or in an International Standard Payload Rack (ISPR) in the MPLM.

ON-ORBIT CONFIGURATION

The hardware/software configuration that occurs during assembly operations, including stage configuration.

OPMS/PIMS

The current crew procedures planning tool is the OPMS tool. The PIMS tool will subsequently replace this tool.

ORBITAL TRANSPORT VEHICLE

A space vehicle that docks and departs from the ISS (e.g., Space Shuttle Orbiter, Progress, Soyuz, Autonomous Transfer Vehicle (ATV), and others).

PAYLOAD DEVELOPER

The engineering team/principal investigator or organization responsible for the development and management of the payload.

PAYLOAD SUPPORT EQUIPMENT

Payload Support Equipment (PSE) is equipment that is to be used for a specific payload. It is provided by the specific payload and is not available for multi-use.

POST-DOCK

The time from Space Shuttle Orbiter dock/mate to station and until the start of payload transfer onto the ISS.

PREFLIGHT IMAGERY MATRIX

Preflight Imagery Matrix is defined as photographs or video taken during payload development and up to, but not beyond, payload on-dock at KSC. Documenting imagery, payload photographs, or video is to primarily support on-orbit payload maintenance. This imagery also supports launch site ground operations, flight crew training, flight controller training, the FDF, EVA/EVR tasks, and in-flight or on-orbit payload contingencies that are payload-unique.

RESOURCES

This is the term used to identify a particular subset of ISS on-orbit capabilities used in support of system and payload operations. Resources include, but are not limited to, power, crew time, etc.

SHALL

Statements containing the word “shall” are mandatory requirements that the PD shall meet. In addition, “shall” statements are verifiable requirements in which the PD will be responsible for providing proof, as defined in the generic payload verification plan, that the requirements have been satisfied or addressed in the appropriate manner.

SHOULD

Statements containing the word “should” are used for goals that the PD should try to meet, but are not mandatory requirements.

SHUTTLE MIDDECK ACCOMMODATIONS

Modular lockers are available on the Space Shuttle to accommodate PD equipment or payload equipment hardware.

SPACELAB LOGISTICS PALLET

The Spacelab Logistics Pallet will be launched and returned on a shuttle launch vehicle. Its purpose is to carry unpressurized cargo/payloads only. The Spacelab Logistics Pallet provides structural and mechanical interfaces for cargo/payloads. Required robotic interfaces (e.g., grapple fixtures) to the Station are to provided by the cargo/payload elements.

SSP SERVICES

Those services provided to all customers for transportation of payloads to and from ISS.

STATION SUPPORT EQUIPMENT

Station Support Equipment (SSE) are devices/equipment, that are owned by the Station. Payloads may request use of devices/equipment prior to launch of the payload. The use of the SSE will be negotiated through the LSE PIM.

TRANSFER PHASE

The time from Space Shuttle Orbiter post-dock through completion of payload transfer onto ISS.

UNPRESSURIZED LOGISTICS CARRIER

An unpressurized carrier for transfer of cargo/payload elements to the ISS launched on the Shuttle. The Shuttle is the Earth-to-Orbit return vehicle for the ULC. The ULC provides structural and mechanical interfaces for cargo/payloads. Required robotic interface (e.g., grapple fixtures) to the Station are to be provided by the cargo/payload elements.

VERIFICATION

Ensures that facilities, system and payload hardware/software products, and operational procedures comply with the specification requirements imposed on them.

WILL

The word “will” is used for stating facts, information, and/or capability that are important to the PD.

APPENDIX C

OPEN WORK

APPENDIX C - OPEN WORK

Table C-1 lists the specific To Be Determined (TBD) items in the document that are not yet known. The TBD is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBD item is numbered based on the section where the first occurrence of the item is located as the first digit and a consecutive number as the second digit (i.e., **<TBD 4-1>** is the first undetermined item assigned in Section 4 of the document). As each TBD is solved, the updated text is inserted in each place that the TBD appears in the document and the item is removed from this table. As new TBD items are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBDs will not be renumbered.

TABLE C-1 TO BE DETERMINED ITEMS

TBD	Section	Description

Table C-2 lists the specific To Be Resolved (TBR) issues in the document that are not yet known. The TBR is inserted as a placeholder wherever the required data is needed and is formatted in bold type within brackets. The TBR issue is numbered based on the section where the first occurrence of the issue is located as the first digit and a consecutive number as the second digit (i.e., **<TBR 4-1>** is the first unresolved issue assigned in Section 4 of the document). As each TBR is resolved, the updated text is inserted in each place that the TBR appears in the document and the issue is removed from this table. As new TBR issues are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBRs will not be renumbered.

TABLE C-2 TO BE RESOLVED ISSUES

TBR	Section	Description

APPENDIX D

FLIGHT-BASED ADDENDUM

TABLE OF CONTENTS

PARAGRAPH **PAGE**

D.1 PIA INCREMENT ADDENDUM UPDATE FOR CONTINUED PAYLOAD ON-ORBIT OPERATIONS D-4

D.2 PIA INCREMENT ADDENDUM UPDATE FOR PALLET REPLACEMENT PAYLOAD OR PAYLOAD EQUIPMENT REFURBISHMENT OPERATIONS..... D-4

D.3 PIA INCREMENT ADDENDUM UPDATE FOR PAYLOAD RETURN OPERATIONS D-4

D.4 APPENDIX D FORMAT D-4

D.5 APPENDIX D PROCESS..... D-5

FIGURE

D.1-1 APPENDIX D PROCESS..... D-6

APPENDIX D - FLIGHT-BASED ADDENDUM

The original payload-unique PIA specified for the explicit up transportation flight within an ISS Increment is active and inclusive of remaining flights within that increment, until one of the following occurs.

1. The ISS Increment ends.
2. A flight within that increment changes the payload steady-state resource requirements or the payload configuration changes.

At this point, the PIA Increment Addendum requirements are to be re-established. The method by which this will be accomplished is the addition of an Appendix D to the PIA Increment Addendum. This new Appendix D is active and inclusive of the remaining flights within that increment, until one of the following occurs.

1. The ISS Increment ends.
2. A flight within that increment changes the payload steady-state resource requirements or the payload configuration changes.

The format of each Appendix D will be essentially a duplicate of the entire PIA Increment Addendum. However, only those sections requesting changed or new ISS resources will require updating. The remaining sections will be stated as non-applicable or referred back to a prior PIA Increment Addendum or Appendix D. Each successive Appendix D update takes precedence.

No update of the payload-unique PIA developed on a flight and increment-specific basis is planned for subsequent flights. If the payload PIA steady-state resources vary, a change request against the payload-unique PIA Increment Addendum will be initiated.

The sections below address the Appendix D data requirements as they vary depending on the operational phase of the payload.

Addressed herein are the operational phases of continued payload on-orbit operations for follow-on increments and flights, pallet replacement payload or payload equipment refurbishment, and payload deintegration and return after completion of the payload's on-orbit mission life.

D.1 PIA INCREMENT ADDENDUM UPDATE FOR CONTINUED PAYLOAD ON-ORBIT OPERATIONS

Updating the PIA Increment Addendum for continued payload on-orbit operations for follow-on increments and flights will require that Section 6, On-Orbit Resource Requirements, be brought up-to-date.

In addition, Section 9, Payload Developer-Provided Crew Training, Ground Support Tracking, and Trainer Mockup Requirements, updates will be required. This is a function of whether the payload was berthed at an ISS attach site location on the preceding ISS flight or the payload is continuing extended on-orbit operations.

D.2 PIA INCREMENT ADDENDUM UPDATE FOR PALLET REPLACEMENT PAYLOAD OR PAYLOAD EQUIPMENT REFURBISHMENT OPERATIONS

Pallet replacement payloads or payload equipment refurbishment will require the completion of the payload-unique PIA Increment Addendum Sections. These are Section 4, Payload Prelaunch to Docked Requirements; Section 5, Transfer and Integration Onto ISS Requirements; Section 6, On-Orbit Resource Requirements; and Section 9, Payload Developer-Provided Crew Training, Ground Support Tracking, and Trainer Mockup Requirements.

D.3 PIA INCREMENT ADDENDUM UPDATE FOR PAYLOAD RETURN OPERATIONS

Payload deintegration and return after accomplishment of the payload's on-orbit mission life will require initial definition of the payload-unique PIA Increment Addendum Section 7, ISS Deintegration and Post-Landing Requirements, and Section 8, Ferry Flight Requirements. This payload return phase will require bringing up-to-date Section 9, Payload Developer-Provided Crew Training, Ground Support Tracking, and Trainer Mockup Requirements.

D.4 APPENDIX D FORMAT

The Flight-Based PIA Increment Addendum title page will contain the following information:

APPENDIX: D - {###}

PAYLOAD INTEGRATION AGREEMENT INCREMENT ADDENDUM

{PAYLOAD-UNIQUE PIA DOCUMENT NUMBER} FOR INCREMENT {INCREMENT NUMBER} INCLUSIVE OF FLIGHTS {FLIGHT #, FLIGHT #, FLIGHT #}

FLIGHT-BASED PIA INCREMENT ADDENDUM

The introduction to each section within Appendix D will use the following header:

APPENDIX: D - {###}

Payload-Unique PIA Document Number			
Increment Number	**Flight Number**	**Addendum Section**	**Payload Operational Phase Description**

The applicable payload-unique PIA Increment Addendum Section(s) would subsequently follow.

D.5 APPENDIX D PROCESS

The process for developing the Appendix D, from the explicit up flight to changes associated with continuing payload on-orbit/replacement operations, is documented in Figure D.1-1, Appendix D Process.

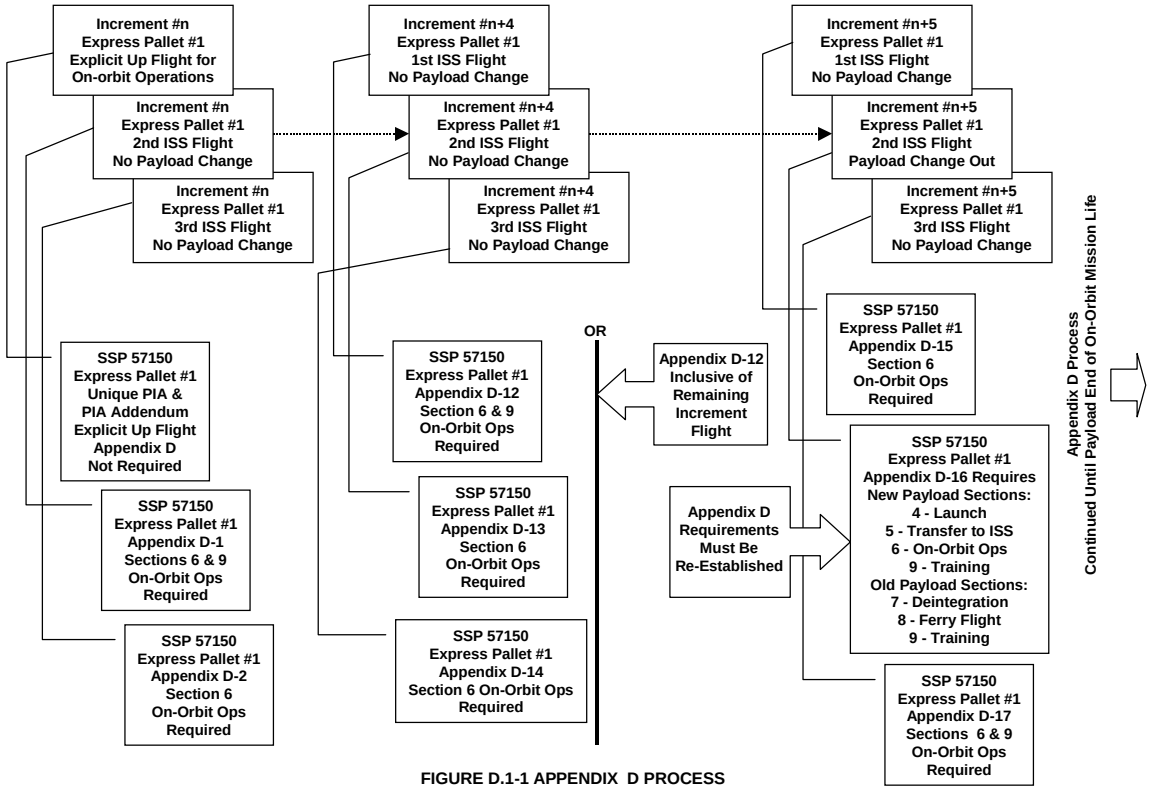


FIGURE D.1-1 APPENDIX D PROCESS