International Space Station Payload Operations Integration

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Major: Astronautical Engineering

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The Payload Operations Integrator (POINT) plays an integral part in the Certification of Flight Readiness process for the Mission Operations Laboratory and the Payload Operations Integration Function that supports International Space Station Payload operations. The POINTs operate in support of the POIF Payload Operations Manager to bring together and integrate the Certification of Flight Readiness inputs from various MOL teams through maintaining an open work tracking log. The POINTs create monthly metrics for current and future payloads that the Payload Operations Integration Function supports. With these tools, the POINTs assemble the Certification of Flight Readiness package before a given flight, stating that the Mission Operations Laboratory is prepared to support it. I have prepared metrics for Increment 29/30, maintained the Open Work Tracking Logs for Flights ULF6 (STS-134) and ULF7 (STS-135), and submitted the Mission Operations Laboratory Certification of Flight Readiness package for Flight 44P to the Mission Operations Directorate (MOD/OZ).

Nomenclature

ATV= Automated Transfer Vehicle

CEF= Change Evaluation Form

CM= Configuration Management

CoFR= Certification of Flight Readiness

COL-CC= Columbus Control Center

CSA= Canadian Space Agency

ESA= European Space Agency

FRR= Flight Readiness Review

HTML= Hyper Text Markup Language

HTV= H-II Transfer Vehicle

ISS= International Space Station

JAXA= Japanese Aerospace Exploration Agency

JSC= Johnson Space Center

MCC-H= Mission Control Center, Houston

MOD= Mission Operations Directorate

MOL= Mission Operations Laboratory

MSFC= Marshall Space Flight Center

NASA= National Aeronautics and Space Administration

NPOCB= NASA Payload Operations Control Board

Ops TIM= Operations technical interchange meeting

OWTL= Open Work Tracking Log

OZ= International Space Station Payloads Program Office

PD= Payload Developer

PL= Payload

PMIT= Payload Mission Integration Team

POD= Payload Operations Director

POIC= Payload Operations & Integration Center

POIF= Payload Operations & Integration Function

POINT= Payload Operations Integrator

PLOT= Payload Operations Techniques

POIWG= Payload Operations Integration Working Group

POM= Payload Operations Manager

RPWG= Research Planning Working Group

SSIPC= Japanese Control Center

STS= Space Transportation System

TsUP= Russian Mission Control

I. Introduction

The Payload Operations Integrator provides a great deal of support within the International Space Station Payload Operations and Integration Function Operations Directors Office at NASA's Marshall Space Flight Center for International Space Station Payload Operations. As an integration position, the POINT is involved in many different aspects of International Space Station Payload Operations, the most significant being the Certification of Flight Readiness process.

II. Background

The International Space Station (ISS) construction began in 1998 with the launch of the Russian-built, US-funded Zarya module which provided initial control for the station. ISS has been continuously crewed since 2000. It is a partnership between The National Aeronautics and Space Administration (NASA), The Russian Space Agency (Roscosmos), The European Space Agency (ESA), The Japanese Aerospace Exploration Agency (JAXA), and the Canadian Space Agency (CSA). ISS construction was completed in 2011. ISS is 109 meters long and has a pressurized volume of 837 cubic meters. Its 8 solar arrays generate 84 kilowatts of power to run the essential life support systems as well as the many experiment racks and facilities. [1]

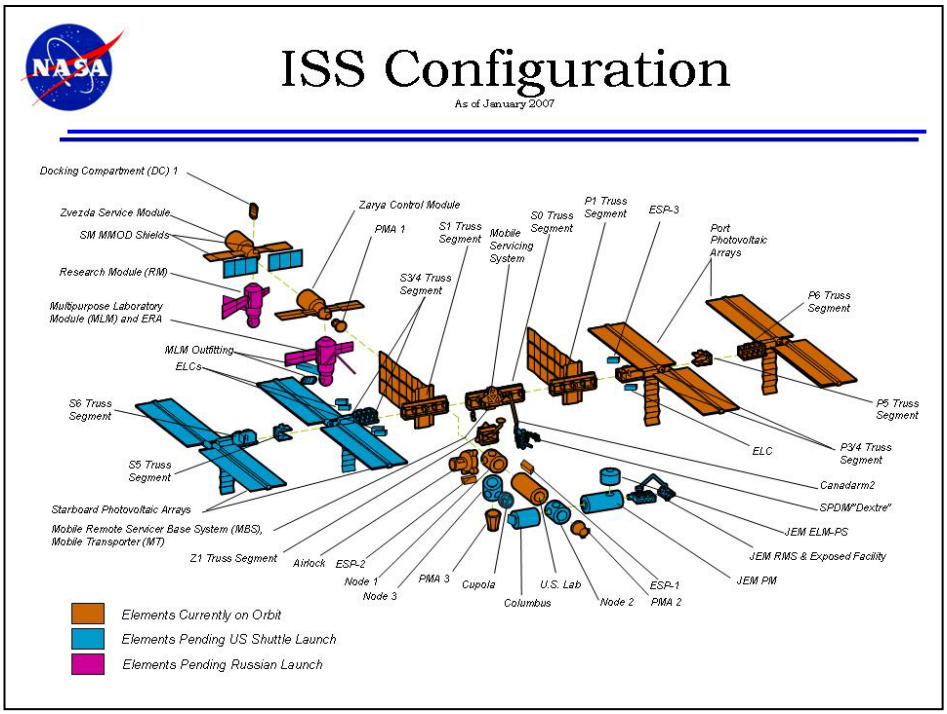


Figure 1. International Space Station Configuration. *Plan for completion of ISS as of January 2007.*

Five control centers across the globe support the International Space Station mission. The Mission Control Center in Houston (MCC-H) is the central authority for hardware and operations control for US and International Partner facilities. The Moscow Mission Control Center (TsUP) has control over the Russian portions of ISS. The Columbus Control Center (COL-CC) in Oberpfaffenhofen, Germany monitors and control ESA's Columbus module. The Space Station Integration and Promotion Center (SSIPC)

[1] http://www.nasa.gov/mission_pages/station/main/onthestation/facts_and_figures.html

in Tskuba, Japan controls the JAXA research module Kibo. The Payload Operations and Integration Center (POIC) in Huntsville, Alabama has all control over US and International Partner payloads such as facility racks and experiments onboard ISS.

The POIC is part of the Payload Operations Integration Function (POIF) at Marshall Space Flight Center (MSFC) in Huntsville, AL. POIF is responsible for the support and coordination of all International Space Station payloads and operations. POIF is a part of the overall Mission Operations Laboratory (MOL) at MSFC. MOL reports to the Mission Operations Directorate (MOD) at Johnson Space Center (JSC) in Houston, TX. MOD has the overall control over the International Space Station Payload Program Office (OZ) which MOL reports to the Mission Operations Directorate (MOD) at Johnson Space Center (JSC) in Houston, TX. MOD has the overall control over the International Space Station Payloads Program Office (OZ).

The Payload Operations and Integration Function consists of several branches including Space Systems Operations, Ground Systems Operations, Planning Operations and Analysis, Training and Crew Operations, and Facility Operations. All branches report to the Operations Directors Office, which houses the Project Manager, Branch Chief, Payload Operations Manager (POM), the Payload Operations Directors (PODs), Payload Safety, and the Payload Operations Integrators (POINTs). A POD and a POINT are assigned to each ISS operational increment to guide work through that period. It was as a Payload Operations Integrator (POINT) that I spent my summer internship at NASA.

The Payload Operations Integrator is responsible for coordinating much of the activity between branches within POIF. POINTs support the POM and POD positions in preparing for upcoming increments and operations within the current assigned increment. The pre-increment activities begin several months out with initial planning operations eventually culminating in the Certification of Flight Readiness for the increment and flights within the increment.

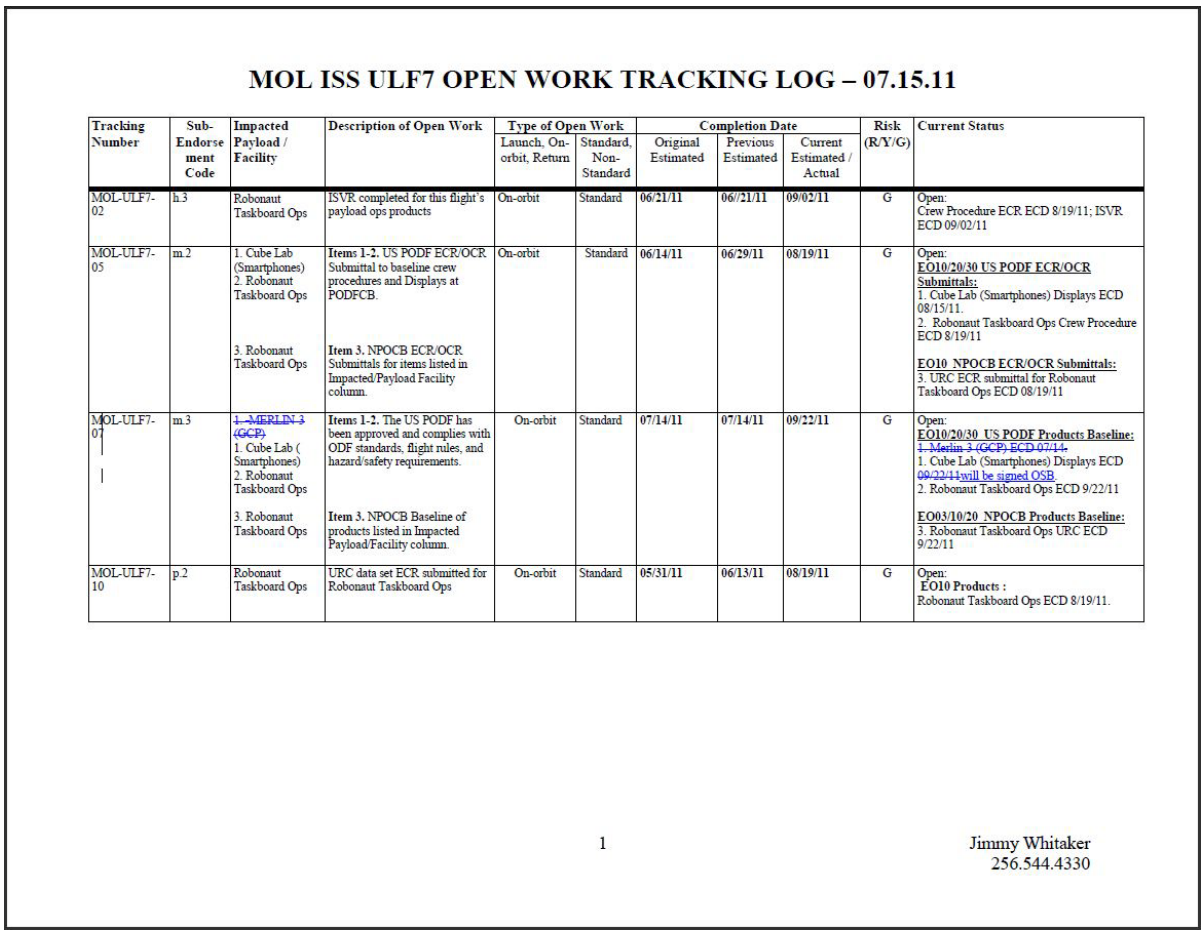
At the start of the internship, I was given five goal tasks to complete: to participate in the Certification of Flight Readiness (CoFR) process, to create Increment 29/30 Payload Tracking Metrics, to assist in tracking and updating the Mission Operations Laboratory Certification of Flight Readiness Open Work Tracking Logs, to develop a POINT webpage, and to complete records management on CoFR records in anticipation of the retirement of the Space Shuttle Program. I was also tasked with meeting support, assisting in an update of the Integrated Payload List on the POIC Payload contact webpage, assisting in updating the POIF First Contact Package, formatting and proofing the updates to the POIF CoFR document, and assisting with the POIF Payload Operations Technical Interchange Meeting (Ops TIM) for the SCAN Testbed Payload.

III. Certification of Flight Readiness Process

The most essential POINT function is the Certification of Flight Readiness process. The CoFR process ensures that all teams are prepared to support the launch and operations of an increment or flight. This process occurs before each and every flight where NASA International Space Station payloads are flown or supported. Each POIF branch must review its status, open work, and possible exceptions before it can commit to endorsing flight readiness. This process occurs over the months before projected launch.

Each week, the POIF branches track its open work for the upcoming flights and send these logs to the POINT in charge of the particular increment in which these flights occur. An action item or is considered “Open Work” when it has not been completed in its entirety. When all parts of the action item have been completed it is categorized as “Closed.” It is then the POINT’s duty to gather all the data from the submitted Open Work Tracking Logs (OWTLs) and integrate them into the overall MOL OWTL. This document is internal to MOL and is used to update the OZ CoFR database which tracks all open work for the entire ISS Program and is accessible for view by the whole program. It is from this database that OZ gathers the information needed to determine the status of increment/flight preparedness and readiness.

When the internship period began, there was MOL Open Work for Flights ULF5 (STS-133), ATV2, ULF6 (STS-134) and ULF7 (STS-135). I was tasked to assist in maintaining the Open Work Tracking Logs for these flights. Currently, there only remains open work on ULF6 and ULF7 for items that were transported to ISS via the Space Shuttle with the intention of use later in the increment. All launch constrained open work was completed on time for these flights and was documented accordingly.



MOL ISS ULF7 OPEN WORK TRACKING LOG – 07.15.11

Tracking Number	Sub-Endorsement Code	Impacted Payload / Facility	Description of Open Work	Type of Open Work		Completion Date			Risk (R/Y/G)	Current Status
				Launch, On-orbit, Return	Standard, Non-Standard	Original Estimated	Previous Estimated	Current Estimated / Actual		
MOL-ULF7-02	h.3	Robonaut Taskboard Ops	ISVR completed for this flight's payload ops products	On-orbit	Standard	06/21/11	06/21/11	09/02/11	G	Open: Crew Procedure ECR ECD 8/19/11; ISVR ECD 09/02/11
MOL-ULF7-05	m.2	1. Cube Lab (Smartphones) 2. Robonaut Taskboard Ops 3. Robonaut Taskboard Ops	**Items 1-2.** US PODF ECR/OCR Submittal to baseline crew procedures and Displays at PODFCB. **Item 3.** NPOCB ECR/OCR Submittals for items listed in Impacted/Payload Facility column.	On-orbit	Standard	06/14/11	06/29/11	08/19/11	G	Open: **EO10/20/30 US PODF ECR/OCR Submittals:** 1. Cube Lab (Smartphones) Displays ECD 08/15/11. 2. Robonaut Taskboard Ops Crew Procedure ECD 8/19/11 **EO10 NPOCB ECR/OCR Submittals:** 3. URC ECR submittal for Robonaut Taskboard Ops ECD 08/19/11
MOL-ULF7-07	m.3	~~1. MERLIN 3 (GCP).~~ 1. Cube Lab (Smartphones) 2. Robonaut Taskboard Ops 3. Robonaut Taskboard Ops	**Items 1-2.** The US PODF has been approved and complies with ODF standards, flight rules, and hazard/safety requirements. **Item 3.** NPOCB Baseline of products listed in Impacted Payload/Facility column.	On-orbit	Standard	07/14/11	07/14/11	09/22/11	G	Open: **EO10/20/30 US PODF Products Baseline:** ~~1. Merlin 3 (GCP) ECD 07/14.~~ 1. Cube Lab (Smartphones) Displays ECD ~~09/22/11~~will be signed OSB 2. Robonaut Taskboard Ops ECD 9/22/11 **EO03/10/20 NPOCB Products Baseline:** 3. Robonaut Taskboard Ops URC ECD 9/22/11
MOL-ULF7-10	p.2	Robonaut Taskboard Ops	URC data set ECR submitted for Robonaut Taskboard Ops	On-orbit	Standard	05/31/11	06/13/11	08/19/11	G	Open: **EO10 Products :** Robonaut Taskboard Ops ECD 8/19/11.

1

Jimmy Whitaker
256.544.4330

Figure 2. ULF7 MOL Open Work Tracking Log. *The OWTL for Flight ULF7 as of July 15, 2011, clearly showing the open items on which the launch date was not dependent.*

The CoFR Template (timeline) determines when each CoFR milestone must be completed based on the vehicle type (see Figure 3). The ISS Payloads Office CoFR Instruction Letter originates with OZ in Houston and is distributed to the POIF branches by the POINT supporting the Increment (See Appendix A for example). The Letter is signed by the Project Manager and asks each branch to assess its preparedness to support the given mission or increment. Each branch must then examine its open work and assess whether or not the

	COFR MILESTONE	Shuttle Flights	Russian Flights	ATV/HTV/ COTS Flights	Space X	Orbital Science
		TEMPLATE DATE	TEMPLATE DATE	TEMPLATE DATE	TEMPLATE DATE	TEMPLATE DATE
1	ISS Payload Office Pre-Coordination Review	L-13 W	L-11W	L-11W	TBS	TBS
2	Release ISS Payloads Office CoFR Instruction Letter	L-11.5 W	L-9.5W	L-9.5W	TBS	TBS
3	CoFR endorsement checklist, Open Work Tracking Log (OWTL) and LPA Inputs Due	L-9.5W	L-7.5W	L-7W	TBS	TBS
4	IPM CoFR Readiness Review	N/A	L-7W	L-5.5W	TBS	TBS
5	IP/P CoFR Readiness Reviews (with OZ Participation as necessary)	N/A	L-5W	L-5W	TBS	TBS
6	ISS Payloads Office Mission Integration LPA Review	L-9W	N/A	N/A	TBS	TBS
7	LPA (SSPCB)	L-7W	N/A	N/A	TBS	TBS
8	Multilateral ISS Payloads Office CoFR Readiness Review	L-4.5W	L-4.5W	L-4W	TBS	TBS
9	Stage Operations Readiness Review (SORR)	L-3.5W	L-2W to L-3W	L-2W to L-3W	TBS	TBS
10	Flight Readiness Review (FRR)	L-2W	L-1W to L-2W	L-2W	TBS	TBS
11	Launch	0	0	0	TBS	TBS

Figure 3. ISS Payloads Office CoFR Readiness Review Schedule for Flight X. *Shuttle Flights, Russian Flights, ATV/HTV/COTS, Space X, and Orbital Science.*

launch-constrained items will be closed on time. Exceptions are issued when an open work item cannot meet the expected requirements. Some exceptions are acceptable such as for items that will not be completed by launch but that can be completed afterwards such as crew training on orbit or ground training after the payload is delivered. Other exceptions that cannot be closed before launch may be issued a waiver. If there is no waiver, an assessment must occur to decide if the item will have modified operations, removed from the manifest, or if the flight will be delayed. The ISS Payload Program Manager makes the final decision on MOL exceptions.

Once each branch has found it can support the flight, the CoFR point of contact sends the approval and Certification of Flight Readiness package to the increment's POINT. The POINT then ensures that each branch has sent their input and that all the necessary documentation is present. The CoFR package should include the Open Work Tracking Logs, an Endorsement Checklist that verifies certain requirements have been met, a list of any exceptions, and a plan to close the exceptions if they cannot be completed on time. The POINT then evaluates and integrates each branch's input and verifies it with the existing MOL Open Work Tracking Log. The Increment Lead POD then receives each branches input as well as the integrated package put together by the POINT. It is the Increment Lead POD's duty to endorse flight readiness for MOL as a whole. The CoFR formal endorsement for flight and mission operations readiness is then sent to OZ at JSC in hard copy and electronic form. The POINT retains a copy of this as well for records.

After each ISS branch reports back to the ISS Program Office endorsing flight readiness, a series of flight readiness reviews are held at L-4.5 Weeks and L-2 Weeks. This meeting addresses any open work items that had not been closed at the time of CoFR package submittal. It is at the L-2 Weeks Flight Readiness Review (FRR) that final certification is given to fly the mission and the launch date is officially set. In the event the flight is delayed, there may be another FRR scheduled prior to the new launch date.

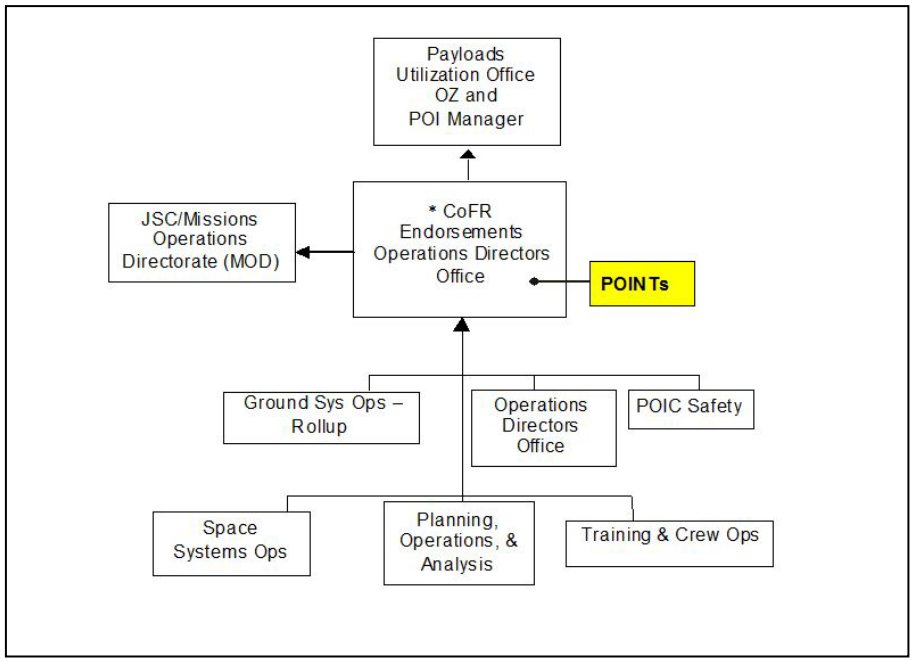


Figure 4. Certification of Flight Readiness Reporting Flow Chart. *Depicts the chain of command for reporting CoFR inputs within MOL, culminating in the submission to MOD and OZ.*

The MOL CoFR Process applies for Space Shuttle flights, Russian Soyuz flights, Russian Progress flights, ESA Automated Transfer Vehicle (ATV) flights, and JAXA H-II Transfer Vehicle (HTV) flights. With the advent of US cargo and payload transfer to ISS through commercial providers, it is assumed that the same CoFR process will apply for NASA payloads. However, it is impossible to say how the process may change when these commercial flights, namely through Space-X and Orbital Science, come into fruition.

During the internship, I participated in the end of the CoFR process for ULF7, the final space shuttle mission. Therefore I helped track MOL Open Work for the flight as well as support the multi-lateral readiness review via teleconference with OZ. Here, the head of the ISS Payloads Program Office determined that all branches within OZ, including MOL, were prepared to support the shuttle flight. I was tasked with completing an entire CoFR process for Flight 44P, a Russian Progress Flight. OZ sent the template for the CoFR Instruction Letter, which I edited for this flight and distributed to the Project Manager for her signature. The letter was then distributed to each CoFR point of contact within MOL for their approval. Once I received each branch's input, I checked their endorsements to ensure that each had the necessary approvals and documentation and passed them on to the

Increment Lead POD. The Increment Lead POD then signed off on the endorsement and sent approval and the Certification of Flight Readiness package to OZ.

The details of the CoFR process is defined and dictated in *POIF-1006 PL Ops Certification of Flight Readiness (CoFR)*, commonly known as the CoFR book. This document provides step by step direction for how to create and distribute a CoFR submittal package. Part of the POINTs' work this summer was participating in a Tiger Team to revise this document. Though I was not a content expert, I participated in Tiger Team meetings, which helped me to further understand the CoFR process. When the content was set by the Tiger Team, I formatted the book to the set specifications. Through this process I utilized my knowledge of Microsoft Office but also learned a great deal more about the inner workings of the CoFR process and each team's participation. The revised document was submitted to the NASA Payload Operations Control Board (NPOCB) for further comments and approvals in July 2011.

IV. Nominal POINT Duties

A. Metrics

The POIF Increment Payload Metrics are a tool used to compare the number of onboard payloads POIF is working to the contract task order and to baselined manifests. The metric tracks the number of payloads currently on orbit that will be in operation during the given increment as well as the number of new payloads planning to be flown during that increment. Payloads are classified as reflights, legacy or new depending if they have been flown in a previous increment but did not remain onboard, if they are continuing operation from the previous increment, or if they are brand new and being operated for the first time in that increment. A payload is not included on the metric if it is pre-positioned, meaning it was brought up on a flight during the increment but not being used until later, or if the hardware remained on ISS from operation in a previous increment but is not being utilized during the increment for which the metric applies.

Increment Payload Metrics must generated using several documents as reference: the Increment Payload Status Matrix, approved Change Evaluation Forms (CEFs) and the Integrated Payload List are a few. The Increment Payload Status Matrix provides a list of the legacy payloads which are planned to be operated during the given increment. It also provides a list of new payloads and the flights on which they should be delivered to ISS. This list is generated by the POINTs based on lists of on-orbit payloads as well as flight manifests. However, the Increment Payload Status Matrix is not updated as frequently as other documents therefore CEFs must be monitored as well. CEFs are used to change the manifest, flight, or operation of a payload that has been previously baselined. Once a CEF is approved, the payload is changed accordingly and the Payload Metric must reflect this change. When a new payload is added via CEF after the Payload Status Matrix has been formulated, it is added to the Payload Metric during the monthly update. It is therefore important for the POINT in charge of that increment's Payload Status Matrix to closely monitor the status of pending CEFs that pertain to their increment.

When the data is gathered, it is entered into a Microsoft Excel template, derived from previous increments' metrics. Generally, the legacy payload list remains the same, although there are payloads which remain on-orbit but are not utilized during the increment and are thus not on this list. This list is sorted by payload type and location such as its rack location or if it is a deployed payload. The new payload section is divided into generic and sortie payloads. The generic new payloads will be transferred to ISS and used onboard, the sortie payloads will fly up and down on the same vehicle, only spending as much time at ISS as the vehicle that carried it. Sortie payloads are generally a space shuttle function but even with the retirement of the shuttle fleet, the term is still being used for next generation vehicles. This spreadsheet is used to generate a graph of the Payload Status Matrix. The graph is distributed to POIF as a visual for the number of payloads to expect to work.

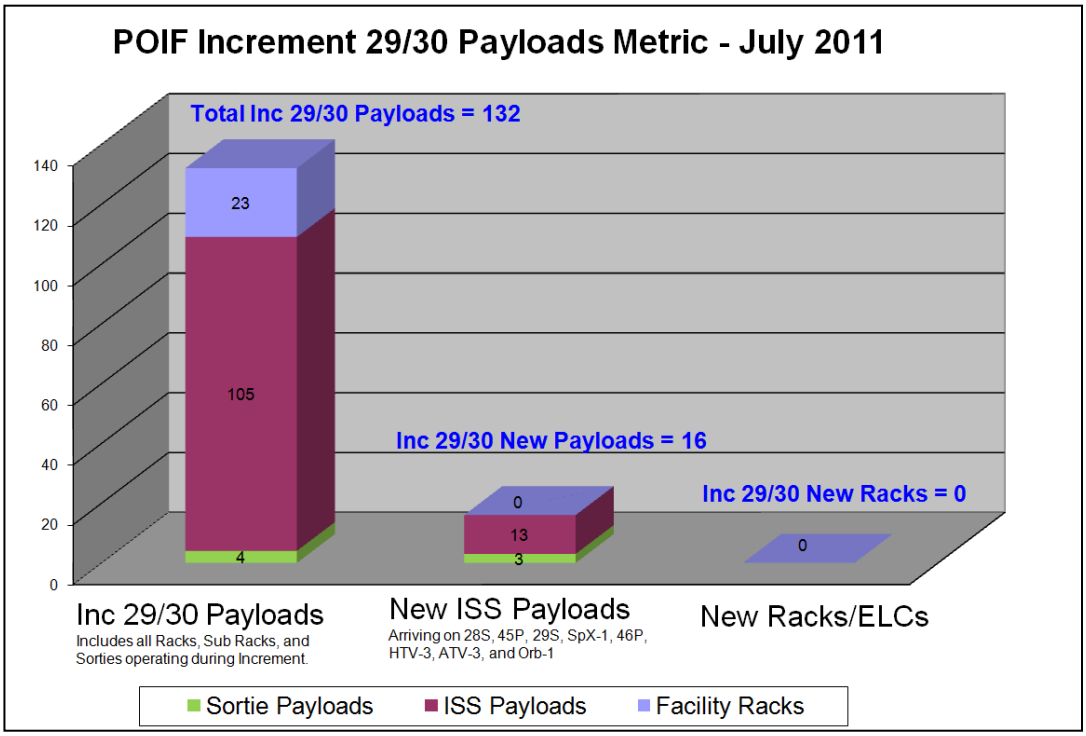


Figure 5. Increment 29/30 Payloads Status Matrix. *Sample Metrics graph from July 2011 for POIF payloads.*

B. Records Management

The CoFR process involves creating and collecting several documents. Once a flight is complete, everything from the CoFR process is filed with the Configuration Management (CM) Office. With the end of the space shuttle program, POIF was ordered into compliance with iso 9000 which required records management. For compliance, only the final CoFR endorsement from the Increment Lead POD to OZ was required to be kept for records traceability. All other documents were to be discarded. Every CoFR document from the beginning of the ISS Program had been saved and filed with CM. This included original CoFR packages and pitches that used a different CoFR process involving a lot more paperwork. After locating the CoFR submittal document for each flight, I pulled them into chronological order by flight and re-filed them. There were not documents for every flight to ISS during its 10 year operation, mainly because some earlier and international flights had no NASA payload support, thus no need for MOL's input. The CoFR documents for the space shuttle flights are now all in one file and all other flights in a second file with room allotted for future documents.

C. Meeting Support

The POINTs are responsible for supporting several meetings throughout POIF. Because of the nature of the POINT job is integration, having a broad perspective of the goings on of POIF is essential. The POINT attendance of meetings is intended to accomplish this. The POD staff meeting, the POIF management meeting, the Payload Mission Integration Team (PMIT) teleconference, the POIF Payload Operations Techniques (PLOT) meeting, and the Research Planning Working Group (RPWG) teleconference are the weekly meetings that POINTs support. Each POINT supports different meetings and brings the important information to share at the weekly POINT meeting. While operating as a POINT, I supported all of these meetings in order to learn more and gain a more broad perspective on ISS payload operations. In addition, I took the minutes for the POINT meetings. In addition there are two Payload Operations and Integration Working Group (POIWG) face-to-face meetings a year held in Huntsville, AL which all of POIF supports.

Additionally, there are planning meetings that occur before an increment that the POINT assigned to that increment is expected to support. These meetings help to generate planning for upcoming increments, the Payload Status Matrix, and other prep-coordination items.

D. POINT Website

The International Space Station Payloads Program Office (OZ), as well as each of its branches, has a website which house many tools, databases, as well as branch information for employees. In turn, POIF, as well as many of its branches, has a website as well. The POINT team did not have a website, and I was tasked with creating one as part of my internship participation. Using HTML and the formats of the other POIF websites, I created a POINT website from scratch. Using content input from the POINT team, I included many of the tools and databases used on a daily basis as well as biographical and contact information for each POINT and descriptions of the POINT job. The POINT website went through a few phases and revisions before it went live and has been subsequently updated again. It now includes access to the POINT Handbook, minutes from the POINT meetings, the POINT calendar, links to the CoFR database tool and the CEF/CETI database tool, and a description of POINT tasks.

The new POINT website gives other POIF teams the opportunity to learn more about the work of the POINT team. It is also a useful tool for the POINT team that now has a one-stop tool for their most frequently used and accessed documents and websites. The website is meant to be a work in progress and through further use, it can be updated to include new tools, documents, or items the team finds useful. It was designed in a manner that the code is user friendly and easily edited without the use of expensive web-design tools to which there is limited access within the office. Therefore, it can be easily edited by others in the future.

E. Operations Technical Interchange Meeting

Payload Developers (PDs) often request an Operations Technical Interchange Meeting (Ops TIM) with the POIF team for both sides to learn about the new payload and operations with POIF. This meeting is organized by the POINTs, must be requested, and is specific to one certain payload. The Ops TIM provides an opportunity for the PDs to ask questions about their place in POIF operations. It also provides POIF a chance to question the PDs on the planned operations and regulations for the payload and its integration with ISS operations. POIF gives presentations to the PDs so each branch has an opportunity to show what they do and how they are involved with the payload. These presentations are given by the POD Team, the Astronaut Office, Crew Training, Ground Data Systems, Ground Training, Safety, Payload Systems, and an overview of several of the Front Room Console Positions that are involved in planning operations. These presentations are generally given in person at the Ops TIM, however, a book exists with each First Contact Presentation included in it.

I participated in the update of this presentation book in preparation for the Ops TIM for the SCAN Testbed Payload. This task involved working with a POINT to contact all involved parties to update the presentations, such as new contact information and to remove references to the Space Shuttle, which would be retired and not used at the time of flight for this payload. My particular assignment was to contact and update the Astronaut Office presentation, for which only the contact information changed.

V. Conclusion

As a direct result of my work, numerous products were generated. The Increment Payload Status Matrix for Increment 29/30 was generated as a completely new product which will be updated and used throughout Increment 29/30. The POIF 1006 CoFR Book Document for which I participated in the Tiger Team and did the formatting will be used until another update is deemed necessary as the singular guideline for completing the CoFR process. The POINT website has created a place for other POIF teams to learn about the POINT job as well as given easy access for the POINT team to their most frequently accessed items. The POINT Handbook was also updated by the POINT Team, me included, to reflect the team's current activities and support. The CoFR records no longer needed after the retirement of the Space Shuttle Program were purged and the remainder of CoFR records was organized by flight number and flight date. Finally, the Certification of Flight Readiness Process was competed for Flight 44P, which anticipates launch in August 2011.

Being trusted to do "real work" on tasks that were essential to POIF operations and to see many different aspects of ISS Payload Operations work was an extremely rewarding experience. Working as a POINT offered

many more experiences than I had expected, including being involved in work on the final Space Shuttle flight, an experience that was truly once in a lifetime.

Appendix A

Flight 44P Certification of Flight Readiness Package

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
2101 NASA Parkway
Houston, Texas 77058-3696

June 28, 2011

Reply to Attn of: OZ-04-0078

TO: Distribution

FROM: OZ/Manager, Payloads Office

SUBJECT: Certification of Flight Readiness (CoFR) Instruction Letter for Flight 44P and the remainder of ULF7 Stage (44P Launch to 26S Undock).

To support the International Space Station (ISS) Payloads Office CoFR for Flight 44P and remainder of the ULF7 Stage (44P launch to 26S Undock), please provide your CoFR products and endorsement of readiness to the Flight Payload Manager, Sheik Alli at sheik.alli@nasa.gov and/or fax to 281-226-6582, in accordance with the schedule defined below:

CoFR Milestone		Date
1	CoFR Checklist and Open Work Tracking Log Inputs Due	7/8/11
2	OZ2 CoFR OWTL Review	7/14/11
3	CoFR Letter Due	7/14/11
4	OZ Multilateral CoFR Readiness Review	8/9/11
5	Stage Operations Readiness Review	8/18/11
6	44P Launch	8/30/11

All NASA CoFR products and the endorsement of flight readiness shall be developed in accordance with SSP 52054, ISSP Payloads CoFR Implementation Plan, Generic, Revision F, utilizing the CoFR endorsement and sub-endorsement codes posted to the ISS Payloads Office CoFR Web page at http://iss-www.jsc.nasa.gov/nwo/payload/oz2/web/cofr.shtml.

All certifying organizations and International Partners/Participants (IP/Ps) with launch hardware identified in Enclosure 1 are required to provide an endorsement package (letter and checklist) to OZ. If there is open work associated to Flight 44P, then an Open Work Tracking Log is also required.

All standard launch related open paper that has a due date past the OZ Multilateral Review milestone date listed above must provide justification in their status and could be required to present their estimated completion schedule at the Payload Control Board (PCB).

All certifying organizations and IP/Ps with active or reserve on-orbit hardware identified in Enclosure 2 are required to provide an endorsement package (letter, checklist, and Open Work Tracking Log) if there are any deltas to the ULF7 stage submittal or new open work.

Payload hardware must be certified to be in compliance with the following documents and associated changes. These are the Payload to ISS interface requirements that must be addressed by the applicable Payload organizations. The individual Payload Interface Control Documents (ICD), Payload Verification Plans (PVP), and applicable verification data submittals must either be updated to reflect this set of stage-specific requirements defined or a Requirements Change Assessment Report (RCAR) must be provided that addresses those requirements not incorporated into the Payload ICD and PVP.

The individual EXPRESS Payload ICD and PVP must either be updated to reflect the requirements defined in the cited documents or an EXPRESS RCAR must be provided that addresses those requirements not incorporated into the ICD or PVP. Payload Developers choosing to provide an EXPRESS RCAR should contact their assigned Payload Integration Manager for assistance in submitting the report.

Document	Title	Rev	Date	PIRN's
SSP 57000	Pressurized Payloads Interface Requirements Document	K	June 2010	57000-NA-0330A[1], 0349[1], 0350B, 0351A[1], and 0353A[1].
SSP 52050	International Standard Payload Rack to International Space Station, Software Interface Control Document Part 1	H	September 2009	None.
SSP 57003	Attached Payload Interface Requirements Document	F	June 2010	57003-NA-0092B[1], 0093A, 0094C, 0095A, 0097A, 0099[1], 0100[1], 0101[1], 0098B, and 57003-ELC-0028[1].
SSP 57008	Unique Pressurized Payload Non–Rack Interface Control Document Template	C	October 2010	57008-NA-0031A, 0032B[2], 0033[1] and 0034[1].

Note 1: Change is editorial or no impact to existing verification. No further assessment required.

Note 2: Applicable only for payloads using the simplified payload process. ESA and JAXA payloads are exempt from addressing this change.

Expedite the Processing of Experiments to the Space Station (EXPRESS) Rack Payload hardware should be certified to be in compliance with the requirements defined in the following table:

Document	Title	Rev	Date	PIRN's
SSP 52000-IDD-ERP	EXPRESS Rack Payloads Interface Definition Document	J	August 2010	52000-IDD-0079, 0080, 0081[1] and 0082.
SSP 52000-PVP-ERP	Generic Payload Verification Plan for EXPRESS Rack Payloads	J	August 2010	52000-IDD-0079, 0080, 0081[1] and 0082.

Note 1: Change is editorial or no impact to existing verification. No further assessment required.

Cold Stowage hardware should be certified to be in compliance with the requirements defined in the following table:

Document	Title	Rev	Date	PIRN's
SSP 57070	Cold Stowage Interface Requirements Document	B	April 2010	57070-NA-0009 and 0010[1].

Note 1: Change is editorial or no impact to existing verification. No further assessment required.

EXPRESS Logistics Carrier (ELC) hardware should be certified to be in compliance with the requirements defined in the following table:

Document	Title	Rev	Date	PIRN's
SSP 57003-ELC	Attached Payload Interface Requirements Document - EXpedite the PRocessing of Experiments to Space Station (EXPRESS) Logistics Carrier (ELC) Cargo Interface Requirements Document	B	June 2010	57003-ELC-0012D, 0013F, 0018C, 0023, 0024, 0025, 0026[1], 0027[1], 0028[1], 57003-NA-0093A, 0094C, 0097A, and 0098B.

Note 1: Change is editorial or no impact to existing verification. No further assessment required.

Payloads using the Common Transportation Matrix in SSP 57008, Appendix P should be certified to be in compliance with the requirements defined in the following table:

Document	Title	Rev	Date	PIRN's
SSP 50835 (as tailored for payloads in SSP 57008, Appendix P)	ISS Pressurized Volume Hardware Common Interface Requirements Document	A	August 2009	50835-NA-0002 and 0005C.

The Flight CoFR Schedule, Flight CoFR Letters and Enclosures are also available on the following CoFR Web page, http://iss-www.jsc.nasa.gov/nwo/payload/oz2/web/cofr.shtml, which is also available via a link on the Payload Mission Integration Team Web page. Any deltas to the letter and enclosures (per approved OZ2 Change Evaluation Forms) will be posted to the CoFR Web page for the rest of the community to use.

If you have any questions or comments, please contact Sheik Alli at 281-226-4295 or Stephanne Ploeger, Increment Payload Manager for Increment 27/28, at 281-244-8847 or Jeff Crislip at 291-244-7741

William R. Jones
Manager, Payloads Office

2 Enclosures:
1. 44P Launch Manifest
2. ULF7 Stage Payload On-Orbit Complement

National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

June 22, 2011

Reply to Attn of: EO03 (18-11)

TO: Distribution

FROM: EO03/ISS Payload Operations Integration Manager

SUBJECT: Request for CoFR Endorsement for Flight 44P/Increment 27/28

Please provide your endorsement of readiness as required by the MSFC MOL Payload Operations Certification of Flight Readiness Implementation Plan (POIF-1006 Rev A, dated July 2008). Your endorsements should be provided in the checklist format as defined in POIF-1006.

Payloads to be endorsed are identified in the OZ CoFR memo OZ-04-0## (see attachment included in this memo).

For the Integrated CoFR submittal you should submit:

1. CoFR Endorsement checklist.
2. Completed exception form and action plan if any exceptions identified.
3. For open work:
   a. Open item tracking log with planned completion dates.
   b. Summary action plans if the open work is the result of an unplanned event or anomalous condition.
4. A statement of readiness for launch and operations.

Your CoFR submittal is required by Friday, 7/01/11, to meet the ISS Program Payloads Office delivery.

Any comments or questions should be submitted to the Increment Lead POD for Flight 44P/Increment 27/28, Patricia Patterson, 544-2046, patricia.patterson@nasa.gov. The format required is Microsoft Word.

Lybrease F. Woodard
ISS Payload Operations Integration Manager

Mission Success Starts with Safety

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

July 12, 2011

Reply to Attn of: EO03 (19-11)

TO: Johnson Space Center
Attn: OZ/William Jones

FROM: EO03/Increment 27/28 Lead Payload Operations Director

SUBJECT: Mission Operations Laboratory Endorsement for Flight 44P, Certification of Flight Readiness (CoFR)

I certify that the endorsements have been met as reflected in the attached ISS Program Payloads CoFR checklist.

There are no Summary of Exceptions and MOL Exception Forms included with this endorsement.

Included with this letter are:

- CoFR MSFC MOL Payload Operations Endorsement checklist (Enclosure 1)

The Mission Operations Laboratory is only supplying an endorsement for the payloads and Payload Operations as defined in OZ-04-078.

If you have any questions please contact Increment 27/28 Lead POD, Patricia Patterson at 256-544-2046 or Lybrease Woodard at 256-544-2195.

Patricia M. Patterson
Increment 27/28 Lead POD
Operations Directors Office
Mission Operations Laboratory

Enc. a/s

Enclosure 1 - MOL ISS Increment 27/28 Flight 44P Endorsement Checklist – 07.08.11

TABLE G-1 MISSION OPERATIONS LABORATORY COFR ENDORSEMENT AND SUB-ENDORSEMENT CHECKLIST (5 PAGES)

App. (Y/N)	Sub-End #	Sub-End Statement	Satisfied (Y.N)	OWTL Tracking # (or N/A)	CoFR Exception # (or N/A)	Basis of Endorsement Documents (Number, Rev./Date)	Remarks (including rationale if not applicable)
	c	**All ground processing required for the integration of payload/experiment hardware/software into the ISS cargo complement, module, and/or visiting vehicle has been completed.**					
	c.2	Launch site online processing (integration, test, and servicing).					
Y	c.2.d	All required repair, rework or nonconformances have been documented and dispositioned. Operational constraints required have been defined. Note: The MOL endorsement is limited to assurance that the appropriate flight and operational products have been established/updated, as appropriate, in response to the PRs. Basis of Endorsement: PR Analysis Table	Y	N/A	N/A		
	f	**All open items and actions from design, integration, and operations reviews have been dispositioned or is standard open work.**					
Y	f.2	The IOR/FOR have been conducted and associated DNs have been dispositioned. (Operations) Basis of Endorsement: Discrepancy Notices on Flight Products	Y	N/A	N/A		
	g	**All reported hardware/software anomalies (including problems and nonconformances) have been dispositioned and do not pose a constraint to flight and on orbit operations.**					

I would like to thank the Undergraduate Student Research Program and the Universities Space Research Association for providing funding for this wonderful internship opportunity. Many thanks to the National Aeronautics and Space Administration for welcoming students and encouraging them to pursue their dreams, especially at the Marshall Space Flight Center Mission Operations Laboratory. I would like to specially thank my fantastic mentors Sam Digesu and Bobby Money who were always there to answer questions, encourage me to try new things, and for taking time out of your day, every day, to give me such a wonderful opportunity. I would also like to thank Cristy Presson, Leigh Weston, Carmen Price, Nelda Allen, and Sheila Mcdonald for their constant support and encouragement.

References:

"ISS Configuration as of January 2007," NASA Images, National Aeronautics and Space Administration, 2007. URL: http://www.nasa.gov/images/content/166624main_iss_config_012007.jpg

"International Space Station Facts and Figures," NASA Missions, National Aeronautics and Space Administration, 2011. URL: http://www.nasa.gov/mission_pages/station/main/onthestation/facts_and_figures.html

POIF-1006 PL Ops Certification of Flight Readiness (CoFR), Payload Operations and Integration Function, Mission Operations Laboratory, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, 2011.

POIF-1004 POIC Payload Operations Handbook, Vol.1: Pre/Post Increment Operations, Payload Operations and Integration Function, Mission Operations Laboratory, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, 2011.

POIF-1005 POIC Payload Operations Handbook, Vol. 2: Increment Operations, Payload Operations and Integration Function, Mission Operations Laboratory, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, 2010.

EO03-004 Payload Operations Integrator Handbook, Payload Operations and Integration Function, Mission Operations Laboratory, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, 2011.