(Russian) Joint Research OASIS Lessons Learned and Operations Improvements

POIWG Main Forum

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Background – Ops Challenges

- The purpose of this presentation is to highlight both general and specific Joint Research lessons learned, and the mitigation initiatives in work
- Specific examples included in this presentation are from the OASIS payload which was installed and operated in MSG
- Original ISSP direction was to train, plan, and operate Joint Research payloads comparable to nominal USOS ops
- Since the original several JR payloads were operated in mid-2014, it became clear that we had a number of challenges to overcome in order to be successful
- Difficulties encountered with JR payloads can be categorized into the following major areas:
  - Language
  - USOS Familiarity
  - Crew Training
  - Planning

OASIS Lessons Learned – Background

- OASIS was one of the first payloads to utilize Russians for crew operations.
- Increment 43/44 cosmonaut Oleg Kononenko was trained at JSC on 03/19/2015.
- Due to the Progress loss and resulting Soyuz delay, Kononenko was not on-orbit to support the start of OASIS operations.
- Cosmonaut Gennady Padalka (not ground trained) performed many of the first OASIS crew operations, including the OASIS installation into MSG.

OASIS Lessons Learned – Language

- **Driving Event:** The Russian version of the OASIS installation procedure was linked to the crew activity. Once beginning the activity, Padalka requested the procedure in English.
- **Lessons Learned:**
  - Procedure language preference can be crew member dependent.
  - If a procedure *is* translated, keep label names in English to match the hardware. OASIS labels were translated as well as the main text of the procedure

OASIS Lessons Learned – Language

- **Driving Event**: During the initial OASIS crew activity, Padalka requested an interpreter to assist the S/G enabled PD.
- **Lessons Learned**:
  - An interpreter was extremely helpful for crew clarification, efficiency, and operational success on crew activities.
  - Recommend that the interpreter have hands-on familiarity with the payload hardware and attend ground training with the cosmonaut.
  - If not able to use an interpreter, describing the item can aid in understanding what hardware is being referenced rather than simply referencing OpNom.
  - “Counterclockwise” and “heads up” are specific terms that do not translate into Russian. Refrain from slang English terms. It would be beneficial to get Russian assessment of what English words literally do not translate.
  - Even with a cosmonaut with “excellent English skills”, a language barrier was evident and a challenge for OASIS operational success. Multiple performances of the same activity did improve efficiency, however the language barrier was still evident.

Lessons Learned – Language

- **Challenge**: Cosmonauts not used to operating and communicating in English using English language products
- **Mitigations**:
  - JR crew procedures and other operations products are now generally translated into Russian, however both versions will be on-board and available if a crewmember decides to switch
  - Labels and OpNom are not to be translated into Russian; the English names will remain English in the Russian procedure
  - Tech Trans International (TTI) setting up training for PD teams and POIC to help with terminology nuances – see POIWG splinter “RJR Interpreter Splinter”
  - Interpreters are being trained to talk to the cosmonauts on space-to-ground. This capability is in work is expected to be available in 1-2 months
    - Includes training on ground hardware and observing some crew training sessions

OASIS Lessons Learned – USOS Familiarity

- **Driving Event:** US procedure standards were assumed to be consistent and understood by cosmonauts. OASIS crew activities demonstrated that assumptions cannot be made for consistent knowledge on PODF procedure standards.
- **Lessons Learned:**
  - Cosmonauts did not have a strong familiarity with Stowage and Execution Notes.
  - If an action was not explicitly stated in the procedure, it was not performed. This is important for steps such as connector cap mating.
  - Check POIC – Recommend the procedure state “Call Huntsville”. Cosmonauts would also call down after each step and have to be instructed to continue through the procedure without reporting after each step.

Lessons Learned – USOS Familiarity

- **Challenge**: Cosmonauts not used to working in the USOS
  - NASA payload hardware is less familiar to them because they don't see/use it every day
  - USOS ops tools (OPTIMIS Viewer, IPV, Stowage Notes) are not their primary tools and PODF standards and implicit instructions are not well understood
  - Stowage locations are not frequently accessed by cosmonauts
- **Mitigations**:
  - Additional crew time may be scheduled to account for the learning curve
  - In some cases the USOS crew may assist with retrieval and stowage of hardware items
  - Forward work: Providing additional ground training, particularly facility and USOS Daily Ops training to cosmonauts
  - Forward work: Build a knowledge base of procedural instructions that should be explicitly stated instead of implicitly assumed

Lessons Learned – Crew Training

- **Challenge**: Scheduling training for cosmonauts
  - Typically a cosmonaut will have three or four ~2 week long trips to the US for training in their last year before flight
  - Most JR protocols have been signed well after the point at which training schedules have been negotiated among Partners
  - Normally while in Houston, cosmonaut schedules are full and JR training can be difficult to add
  - GCTC approval is required to train cosmonauts; approval is contingent on signed protocols and formal direction from the Russian management chain
- **Mitigations**:
  - Protocols signed early in the training flow would allow the scheduling coordination process to better take JR requirements into account
  - Recently Russian management representatives in the JR discussions have agreed to short extensions of cosmonaut trips to Houston, for JR payload training; however, extending trips still requires GCTC training management approval

OASIS Lessons Learned – Planning

- **Driving Event:** Russian planners expected OASIS to meet a pre-determined operational schedule. During the course of operations, science changes require real-time planning changes for different crew activity dates/times or additions.
- **Lessons Learned:**
  - Time difference when working with Russian planning teams – they do not support 24x7
  - Russian processes do not readily accommodate the fluid, dynamic nature of USOS payload operations
  - Russian planners seem less receptive to re-planning requirements
  - Difficulty for the OASIS team given no direct contact between the PD team and Russian planners

OASIS Lessons Learned – Planning

- **Driving Event:** OASIS crew activities when performed by a trained cosmonaut took typically 1.5x the amount of time that would have been scheduled for a USOS crew member
- **Lessons Learned:**
  - Efficiencies are gained by Russian or USOS crew over time/repeated execution, but Russian execution does require more time
  - Utilizing the Russian crew for on-orbit operations is not a one-to-one trade off

Lessons Learned – Planning

- **Challenge**: Planning and Replanning Processes
  - RSC-E approval is required to schedule cosmonauts for JR activities; approval is contingent on signed protocols and paperwork
  - Once OOS is built it becomes more difficult to add new activities or time to already-planned activities
  - Late changes close to execution are very difficult to get through the Russian planning processes
- **Mitigations**:
  - Protocols signed prior to OOS development allows the planning process to work
  - Forward work: Enhance interfaces and replanning processes with Russian ops/planning personnel to better accommodate late change
  - Forward work: Better characterize the efficiency difference between USOS crew and cosmonauts conducting JR

Conclusions

- The Joint Research program is designed to augment international utilization onboard ISS
- Operations processes, products, and interfaces are different than standard USOS processes, and we expect this to always be the case
- We have had some challenges and some successes and are learning as we go
- We plan to continue to develop mitigations to enhance success, though much forward work remains ahead

Joint Research puts the "International" in ISS!