ESA's first two years of ISS Operations
- Lessons Learnt -

Bob Chesson
Head Human Spaceflight Operations

ESA; 28 April 2010

S119E008595

ESA's first two years of ISS operations

- Columbus laboratory launched in February 2008 and since then operated continuously 24/7 from the COL-CC in Munich.
- Extensive utilisation programme carried out involving over 200 hours of ISS crew time. Experiment operations controlled from 9 User Support and Operations Centres.

- ATV "Jules Verne" launched 10 March 2008, docked to ISS on 2 April 2008, re-entered on 29 September 2008.

What have we learnt from 2 years of operations?

- Extensive lessons learnt exercises carried out for 7 increments of Columbus operations.
- Results fed back through continuous improvement process to take into account feedback from flight crews, flight control teams, payload operations, engineering and ground segment teams.
- Results of ATV Jules Verne lessons learnt were fed into the Post Flight Review process.
- Many of the ATV lessons learnt have led to design changes in ATV and the ATV control centre as well as procedure and process changes in operations.
- The commitment to continuous improvement in the way we do both Columbus and ATV operations is being maintained and is now closely linked to the need to reduce operations costs.
- The most significant of our “Lessons Learnt” are described in this presentation.

Columbus Lessons Learnt

- **Anomaly resolution:**
  - Very high number of payload anomalies
  - Resolution process too slow and inefficient
  - Streamlined process, clarified team roles, improved tools.
  - Appointed anomaly managers.
  - Significant improvements

Columbus Lessons Learnt

- **Proper preparation and planning of operations:**
  - ISS Operations proved to be more complex than anticipated
  - To be able to carry out an operation on the ISS, it is necessary to put together a complete package: equipment, SW, procedures, resources, configuration, safety, crew, planning.
  - If any of these elements is missing, the opportunity will be lost and precious time and resources wasted
  - We have learnt to check that everything is in place before including the operation in the timeline.

Columbus Lessons Learnt

- **Safety Process:**
  - In the early Columbus operations, some inadequate responses by the engineering and operations teams to safety critical situations.
  - Lack of awareness of safety in the various teams
  - Training programme started to generate a safety culture throughout the operations community
  - Successful but swing too far in the opposite direction resulting in complaints from flight crews and ground staff and delays in implementation.
  - Striving for more “balanced” approach.

Columbus Lessons Learnt

Motivation of Operations Teams

- At the start of Columbus operations teams were highly motivated and this motivation lasted into the first months of increment operations
- Once the reality of 24/7 shift operations became clear, coupled with a high on-console workload, attrition increased.
- Motivation became an issue as a smaller team of flight controllers were continuously working shifts.
- As a short to medium term measure, the size of the FCT was increased and this stabilised the situation.
- In the current cost saving regime, other measures are being looked at.

ATV Lessons Learnt

- **Flight segment operations products deliveries**
  - As in many missions, the operations preparation was affected by late and incomplete deliveries of mission data bases, operations manuals, procedures etc. from the flight segment.
  - Mitigated by introducing an additional platform for product integration and test.
  - Expected to improve for future ATV missions.

ATV Lessons Learnt

- **Simulations:**
  - The effort for the Joint Integrated Simulation (JIS) programme for Jules Verne mission was underestimated:
    - A limited subset of the Multi-Element Procedures (MEPs) and Operations Integrated Procedures (OIPs) were exercised in the JIS.
    - A very limited set of malfunctions/contingencies were introduced into the JIS.
  - These deficiencies corrected for ATV-2 as well as:
    - More training for the engineering teams
    - Better set-up of the ESA and Russian simulators

ATV Lessons Learnt

- **ATV Control Centre Infrastructure**
  - The layout in the Flight Control Room and the Engineering Support Rooms which was not optimised and caused overcrowding has now been improved.
  - Link to the BUCC in Huntsville has been implemented.
- **ATV-CC Operations**
  - The planning function for the Jules Verne mission was underestimated and for ATV-2 an ATV Operations Planning Team has been created.
  - The training of ATV-CC staff needs to be more robust if ATV missions will be flown every year. To this end an ATV Training Academy has been set up.
  - Use of Parking Orbit as nominal mission.

ATV Lessons Learnt

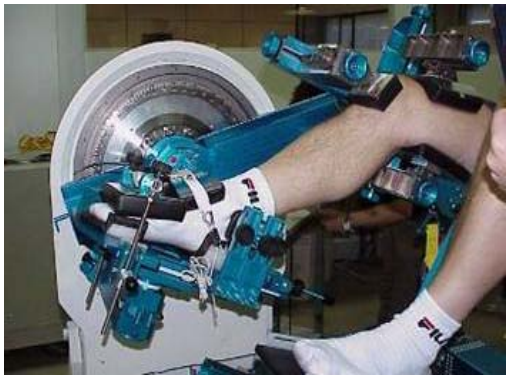
Attached Phase Operations

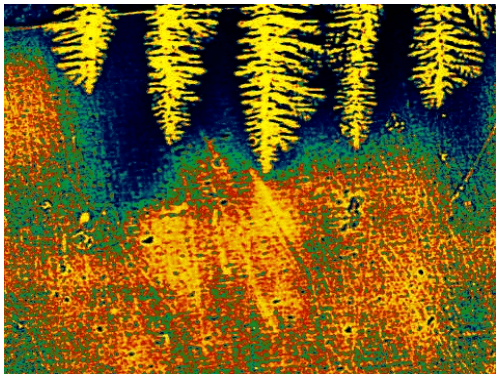
- The attached phase operations proved to be much busier than predicted pre-mission due to:
  - Underestimation of Cargo and ECLSS operations.
  - Support to ISS level operations required from ATV-CC.
- Consequently it was difficult to work off-line actions in response to IMMT etc. because all staff were on shift.
- For ATV-2, adequate staffing of the various functions will be ensured.

ESA plans for using the ISS

2010 Utilisation Perspectives

- Recovery of transportation shortfall for utilisation cargo in 2009
- Launch of HRF-MARES for Columbus & MELFI-3
- Pre-positioning of experiments & consumables for post-STS period
- Resumption of biology programme
- Completion of 1st generation physiology experiments
- Expansion of physical science experimentation (materials, fluids)
- Increase of applied/industrial research activities

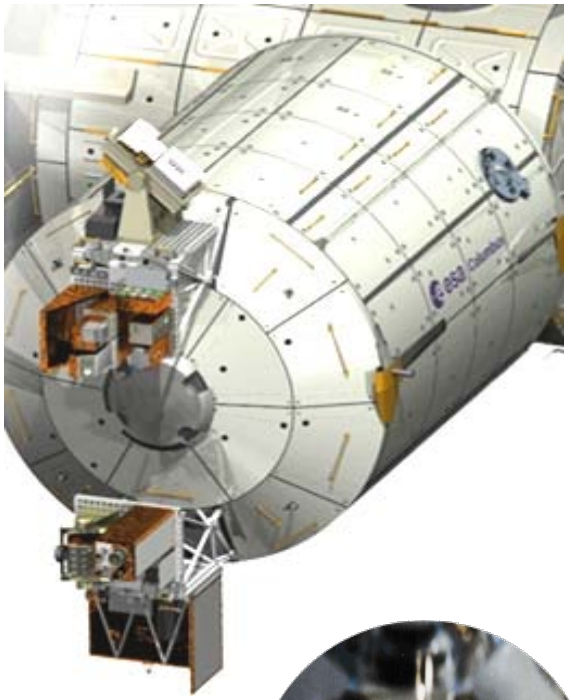




ESA plans for using the ISS

2011-2015 Utilisation Outlook

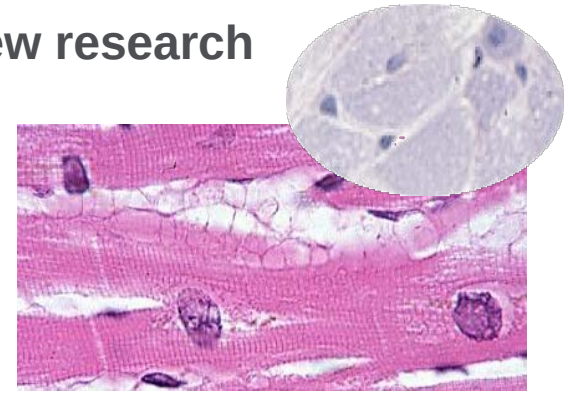
- Adaptation to new ISS cargo carriers
- Launch of major ESA payloads
  (EML, PK-4, ACES/ASIM)
- Functional evolution of on-orbit payloads
- Start of advanced on-orbit analysis tools for
  Life Sciences
- Continuation of advanced biology programme
- Start of 2nd generation physiology experiments
- Execution of Human Exploration preparation research
- Advanced physical science experimentation
  (complex plasma, colloids, emulsions, heat & mass transfer.)
- Enhancement of applied research and industrial R&D activities



ESA plans for using the ISS

2015+ Utilisation Plans & Ambitions

- Use of new ISS crew vehicles (also for science logistics)
- Launch of new COL P/L facilities (2nd generation, new research themes)
- Functional evolution of on-orbit payloads
- Full implementation of advanced on-orbit analysis tools
- Biotechnology and rodent research programme
- Enhancement of biomedical and physical research for Human Exploration
- Deployment of EuTEF-2 platform for technology testing and other Ext. P/L
- Advanced physics experimentation (complex plasma, atomic clocks)
- Full deployment of applied research and industrial R&D activities



Conclusions


ISS017E015413


S119E008595