InSIM – Frankfurt, September 2014

„Munich, we’ve got a problem“

Dr.rer.nat. Thomas Uhlig, Flugdirektor Columbus
• Largest space object created by mankind
• Over 375t of mass
• Over 100 “visits” by other spacecrafts
• Almost 1000 hours of extravehicular activities
• Altitude: 330-400 km
• Inclination of 51,6°
International ISS operations network
Europe is diverse...

Rather complex setup on European side
Various USOCs (“User Support Operations Center”) operate the experiments (“payloads”) on board Columbus Control Center (Col-CC) as central node

The tasks of the Columbus Control Centers:

- Commanding and controlling of the Columbus subsystems (TCS¹, EPDS², ECLSS³, DMS⁴, COMMS⁵)
- Coordination of the scientific experiments
- Support of astronauts during their work in Columbus
  - Responsibility for the safety of the crew in Columbus
  - Planning of European ISS activities
  - Provision of the European ground network

¹ Thermal Control System
² Electrical Power Distribution Subsystem
³ Environmental Control and Life Support System
⁴ Data Management System
⁵ Communications
At Col-CC...

**COL-FLIGHT**
Overall responsibility for Columbus operations.
Coordinates the Columbus Flight control team.
Interacts with the Station Flight Director in Houston.

**COL-OC**
Interface to and coordinator of the USOCs.
Responsible for the system to payload interface.
Point of contact for all PL related questions for the FCT.

**COSMO**
Responsible for stowage on board.
Mechanical activities on board.
Is maintaining the Plug-in-plan.

**COL SYSTEMS**
Responsible for the ECLSS, EPDS and TCS system on board.
Emergency responses.

**COL DMS**
Responsible for the board Computers.
Configures the high rate data traffic with the station.
Surveys the on board video equipment and the station.

**EUROCOM**
The person who communicates with the astronauts on board.

Planning function
7.2.1 Payload Commanding

PURPOSE
To define the command policy and required coordination between Col-CC and USOCs for all command operations concerning Columbus ESA payloads, either performed from the Col-CC or from the USOCs.

PARTICIPANTS
COL FLIGHT <SITE> OPS
COL OC <SITE> GC
GSOC GC

GENERAL
The Operations Interface Procedures (OIP), §8.8.1.1, "IP Commanding via US assets", applies between MCC-H and Col-CC.

Two types of payload commands may be sent only from the Col-CC:

1) payload LAN rate control commands (used to control the packet transmission rate on the on-board LAN by the payload rack or external platform).
2) payload file transfer commands (used to transfer files between the Columbus MMU and the payloads).

Payload command activities covered by this JOIP are a set of commands corresponding to scheduled and unscheduled activities. Scheduled activities are those which are planned in the OISP. Any other activities are considered as unscheduled (e.g., execution of malfunction procedures, saving of equipment/payload in case of anomalies, etc).

PROCEDURE
A. SCHEDULED COMMAND ACTIVITIES

1) COL OC will coordinate internally the command enabling of the required USOC and will inform the dedicated <SITE> OPS that the site has been enabled for commanding.

2) Minimum 5 minutes before the start of the command activity, the FRC <SITE> OPS will contact COL OC to get a “GO” from Col-CC to begin the upcoming nominal commanding activity. When applicable, COL OC may give a “GO” for dedicated stop only, and/or request regular updates during a commanding activity.
Principal operational concept (1/3)

All activities are performed via approved and validated procedures.

Procedures enable the crew to a certain extend to work autonomously, but include ground steps/coordination.

---

**1.101 COL VIDEO CASSETTE RECORDER SERVICING**

(IFM/1E-ALL/FIN) Page 1 of 4 pages

**OBJECTIVE:**
Perform a routine servicing of a Columbus Video Cassette Recorder (VCR) by cleaning the VCR tape heads using a cleaning tape.

**LOCATION:**
Installed: COL1SCAO.

**DURATION:**
10 minutes

**CREW:**
One

**MATERIALS:**
VTR Cleaning Tape
Marking Pen

1. CHECKING VCR STATUS

Local / Remote Switch

Status LED NOMINAL

Door Knob

Status LED REMOTE

Front Door
Flight rules define the “operational envelope”
Off-nominal situations

- Automatic FDIR (Failure Detection, Isolation and Recovery) implemented in the vehicle
- Station-wide alarm system (3 levels: Cautions, Warnings and Emergencies) alerts crew and ground

- For each alarm a defined response procedure is available for crew and ground to react to the malfunction
- Goal: Bring the vehicle into a safe configuration (Priority: Crew – vehicle - mission) and hand over the detailed investigations to the Engineering community
Emergency operations (1/2)

• Three emergency scenarios are defined:
  • Fire
  • Rapid Depress
  • Toxic Atmosphere

• Common crew response (warn, gather, fight)
• Special crew response dependent on emergency
• Responses are already designed for independency
• „Excape to earth“ option available any time
• ISS CDR is leading the emergency response
• Challenging operations due to heavy communications, not possible to pause for S/G calls, English and Russian
• Regularly practiced, also while crew on board
Emergency operations (2/2)

- Medical Emergencies are handled differently
  - Dedicated treatment procedures/equipment on board
  - Crew medical officers
  - Flight Surgeons available on ground
  - Privatized conferences, only ops impacts are communicated
Ways of Communications

• Verbal communication (EUROCOM!)
  • 4 „space to ground“ voice channels
  • Voice-over-IP capabilities

• Visual communications
  • 6 (+1) video channels (one-way)
  • Still photographs, which are downlinked (latency of 2-3 days)

• Written communications
  • Procedures, timeline, stowage note
  • „Daily Summary“ and other documents
  • Email (private and operationally)
  • „crew notes“
Es ist genau festgelegt, welche Position welche Voice Loops mithören muss, wie jemand erreicht werden kann, welche Funktionen die Loops haben.

Kommunikationsmittel
### Communications protocol

<table>
<thead>
<tr>
<th>Role</th>
<th>“S/G 1” voice loop</th>
<th>“COL FD 1” voice loop</th>
<th>“COL OC 1” voice loop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew</td>
<td>Munich, Station on S/G1 for BLB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUSC Ops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL OC</td>
<td>Go ahead, Alex!</td>
<td>COL OC here</td>
<td></td>
</tr>
<tr>
<td>EUROCOM</td>
<td>Which user name am I supposed to use?</td>
<td>COL FD, the user name is “Astro123”!</td>
<td>The user “Astro123”</td>
</tr>
<tr>
<td>MUSC Ops</td>
<td>Alex, please use “Astro 123”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL OC</td>
<td></td>
<td>Good words</td>
<td>Good words</td>
</tr>
<tr>
<td>Crew</td>
<td>Copy, thanks!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flight Notes

CFN13623: GMT 079 Daily Summary Inputs Collection

To: COL-FD
From: COL-FD / Libby Jackson
Revisor: COL-FD / Libby Jackson
Activity: Real-Time Operations

Please provide here your inputs for tomorrow's GMT 079 Daily Summary. Thanks!

Cadmos Ops:
Tom, in preparation of your ENERGY session starting on GMT085, we have uplinked message 34-0013 "ENERGY Big Picture Words", which we will be discussing with you on GMT081 during the ENERGY Big Picture Conference.

COL FD proposed wording:
Tom, in preparation for your upcoming ENERGY session, starting on GMT085, we have uplinked message 34-0013 "ENERGY Big Picture Words", which we will be discussing with you on GMT081 during the ENERGY Big Picture Words Conference.

COL-FLIGHT DISPOSITION

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Position</th>
<th>Individual</th>
<th>Disposition</th>
<th>Attach</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013/07/8 18:10</td>
<td>COL-FD</td>
<td>Jackson</td>
<td>Approved</td>
<td></td>
</tr>
</tbody>
</table>

Comment: CADMOS has confirmed they are happy with the proposed wording.

IMPLEMENTATION

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Position</th>
<th>Individual</th>
<th>Implement Status</th>
<th>Attach</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013/07/8 18:12</td>
<td>COL-FD</td>
<td>Jackson</td>
<td>Implemented</td>
<td></td>
</tr>
</tbody>
</table>

Comment: Comment provided in EFN 055918.

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Position</th>
<th>Individual</th>
<th>Attach</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013/07/8 18:10</td>
<td>EUROCOM</td>
<td></td>
<td>Pending</td>
</tr>
</tbody>
</table>

Comment:
**Documentation: Clog**

### Columbus Control Center

#### Operations Support Tools

**Columbus : Col-FD : uhlig**

<table>
<thead>
<tr>
<th>Event Time</th>
<th>Log List</th>
<th>Search</th>
<th>Reports</th>
<th>Handover</th>
<th>Close Log</th>
<th>Logout</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-07-28 16:01:14</td>
<td>Closed CFN2456</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:52:10</td>
<td>COL OC issued PPC144 to add the 5mins crew activity on GMT280.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:51:38</td>
<td>MUSC came up with an 5mins crew activity in E 3 to remove the test cartridges from the TCUs before the PDA.VAC samples are inserted. On GMT281 we only trained crew member is already overbooked, thus OC is now investigating what to do.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:47:45</td>
<td>WPA2 checkout completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:39:37</td>
<td>Asked ISS FD for the go for the WPA2 s/o haz command. We are go for it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:29:32</td>
<td>Go given for WPA checkout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016-07-28 15:28:21</td>
<td>SD sync done. SYSTEMS did not see the peak, but the other phases of the test. Thus we consider it as successful.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Kandidaten: Absolventen mit Ingenieurs- oder naturwissenschaftlichen Abschluss
- Dauer der Ausbildung: Etwa 1 Jahr

Simulationen and training material

- Lowest two levels can be covered by classroom lessons and theoretical testing
- Application level requires practical training and testing

Lessons:
- Lesson Certification
- DonnaRumma, Anna Rita
- Uhlig, Thomas

Certifications:
- Lesson Certification
  - Certified [23-Jul-2013]
  - Trg. Record (Completed) [11-Feb-2014]
  - View Changes
- DonnaRumma, Anna Rita
  - Certified [23-Jul-2013]
  - Trg. Record (Completed) [11-Feb-2014]
  - View Changes
- Uhlig, Thomas
  - Certified [26-Mar-2014]
  - Trg. Record (Completed) [Not defined]
  - View Changes
<table>
<thead>
<tr>
<th>FD</th>
<th>STRATOS</th>
<th>USOC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO1-6</strong> Show leadership skills</td>
<td>All EOs need to be handled successfully</td>
<td>EO is not defined for STRATOS</td>
</tr>
<tr>
<td>[COL FD] EO1-5.2</td>
<td>Actively generate team awareness</td>
<td>Matrix</td>
</tr>
<tr>
<td><strong>2</strong> Execute scheduled activities under own responsibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PO2-1</strong> Perform regular EMS activities</td>
<td>EO is not defined for COL FD</td>
<td>Two of the EOs need to be successfully handled</td>
</tr>
<tr>
<td>Linked to [COL FD] EO3-1</td>
<td>Coordinate nominal commanding activities of STRATOS</td>
<td></td>
</tr>
<tr>
<td>Linked to [COL FD] EO3-1</td>
<td>Coordinate nominal commanding activities of STRATOS</td>
<td></td>
</tr>
<tr>
<td>Linked to [COL FD] EO3-1</td>
<td>Coordinate nominal commanding activities of STRATOS</td>
<td></td>
</tr>
</tbody>
</table>
Vielen Dank für Ihre Aufmerksamkeit

ISS selber sehen:  http://www.heavens-above.com
Unser Blog:  www.dlr.de/blogs/
Unsere Homepage:  www.col-cc.de/
Unser Tag d. offenen Türe:  12. Okt 2014