Mission Satellite Operations

N. Malechaux/ G. Shirtliffe
Jason Ground System (Routine)

NASA Earth Terminals:
- Poker Flat NASAET-PFF
- Wallops (back up) NASAET-WFF

CNES Control Center
JCCC (Toulouse)

CNES Earth Terminal:
- Aussaguel CNESSET-AUS

JPL Control Center
JTCCS (Pasadena)

JPL Mission Center
JSDS (Pasadena)

CNES Mission Center
SSALTO (Toulouse)

 USERS
CNES/JPL Operations Organization 1/2

• Routine Fly-by activities
  • Connection to Earth Terminal to READ Satellite Mass Memory
  • Telemetry file transmission to Control Centers and Mission centers for archiving and processing
  • OSDR product generation and distribution (PODAAC/JSDS, SSALTO)

• Daily Routine activities
  • Navigation tasks: Orbit determination, maneuver determination, maneuver forecasts, Guidance TC generation and Upload to Satellite
  • Orbital products generation D-1 and distribution (MOE)
  • IGDR products generation for D-2

• Weekly Routine activities:
  • Joint Operational Coordination Group meeting every Thursday to plan the weekly activities
  • Instruments TC upload (Poseidon Calibration)
• Occasional Routine activities
  • Twice per month:
    – Thermal expertise, STR1 expertise: **no impact on science data availability**
  • Once per month:
    – GPS cyclic expertise, Power expertise for the monthly spacecraft report:
      **no impact on science data availability**
  • Every 3 months:
    – Cross maneuver for Poseidon pointing bias calibration, STR dark current
      monitoring, Second STR de-stocking to make sure it is running correctly
      **no impact on science data availability**
  • Every 6 months:
    – Gyro scale factors and gyro misalignments calibration through specific 3 axes
      maneuver **1 hour without altimeter measurements**
    – Third Gyro de-stocking to lubricate the spinning top axis
      **no impact on science data availability**
### Platform Incident Summary
Since Last SWT (October 21, 2002)

<table>
<thead>
<tr>
<th>Incident</th>
<th>Date</th>
<th>Cause</th>
<th>Mission impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRSTASURV</td>
<td>From end of October 2002</td>
<td>Suspected pollution</td>
<td>Depointing</td>
</tr>
<tr>
<td>Yellow alarm increasing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POSSADMLERR</td>
<td>2003/09/05 22:10</td>
<td>Crack on SADM sensor</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>2003/09/06 01:55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STR Status

• STR1 patch in RAM on April 9th 2003:
  – This patch changed the “a” and black & white thresholds for star detection & rejection
  – same behavior for both STR

• The dimming of the STR signal has stabilized since December 2002
  – monitored through STR1 expertise, twice per month

• MAG/GYRO/ALTI ground filter is in development
  – its integration at JCCC is in progress
SADM Status

- SADM zooms detected some errors on both sensors: the right and the left.
- To prevent a SHM due to an erroneous measurement on the right SADM sensor, it was decided to modify the right SADM filter value from 3 to 20 (a SHM will occur only if the error on right SADM position lasts longer than 10 minutes).
- Since the SADM commanding is linked to the right measurement, it is preferable not to disable completely the FDR.
- There is no risk concerning battery deficit linked to this operation.
- Analysis is in progress to change the gain of the filter of the SADM position estimation loop.
## Payload incident synthesis since last SWT

<table>
<thead>
<tr>
<th>Incident</th>
<th>Date</th>
<th>Cause</th>
<th>Mission impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRSR2 standby</td>
<td>2002/12/07 11h35, 2003/02/28 19h45, 2003/06/14 19h30, 2003/09/02 07h40, 2003/09/03 10h00</td>
<td>Software anomaly. To be modified with new s/w upload.</td>
<td>Loss of TRSR data, but no mission impact. (TRSR is not a mission critical instrument)</td>
</tr>
<tr>
<td>TRSR2 not sending PLTM packets</td>
<td>2003/05/16 03h32, 2003/07/30 05h40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRSR1 incident</td>
<td>2003/09/25</td>
<td>Under investigation. Diagnostics are being planned.</td>
<td></td>
</tr>
<tr>
<td>POSEIDON reinit</td>
<td>2003/03/01 18h23, 2003/04/09 00h19</td>
<td></td>
<td>Loss of altimeter measurements: From 18h23 to 22h39 From 00h19 to 08h29</td>
</tr>
</tbody>
</table>
DORIS Specific Operations

• DORIS OBS 2.08 upload on November 25th, 2002.
• Major improvement: the ability to track shift frequency beacons. This permits several active beacons in the same area, without interference.
• Mission Impact:
  – Loss of Doris data from 2002/11/25 12h07 to 2002/11/26 about 21h00 UTC.
  – No OSDR product from 2002/11/25 12h07 to 2002/11/26 about 23h39 UTC.
Poseidon Specific Operations

• long calibration 2 sequence (low-pass filter precise measurement), over ocean (this is suitable for optimal results)
  – First command at 2003/10/06 00:15:00 UTC
  – duration of sequence = 34 minutes and 20 seconds

• particular CAL1 CNG calibration sequence mostly over land
  – First command at 2003/10/06 01:20:00 UTC
  – duration of sequence = 38 minutes and 2 seconds
Maneuver Summary

- **Station keeping maneuvers:**
  - 2002/10/29 with Δa = 15.28m
  - 2002/12/18 with Δa = 13.83m
  - 2003/02/15 with Δa = 15.33m
  - 2003/04/16 with Δa = 17.42m
  - 2003/04/26 with Δa = -8.69m
  - 2003/06/24 with Δa = 13.57m
  - 2003/10/01 with Δa = 11.58m
  - once every 2 months

- **Cross maneuvers:**
  - 1 every 3 months in routine
    - 2003/05/02

- **Gyro calibrations:**
  - 1 every 6 months in routine
    - 02/10/08 with STR1 in ACQ
    - 2003/02/04 with STR2
    - 2003/04/01 with STR2
    - 2003/04/03 with STR2
    - 2003/04/29 with STR1
<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Transition</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002/11/04 23h28</td>
<td>Steering -&gt; Fix $-180^\circ$</td>
<td>$\sim 14.5^\circ$</td>
</tr>
<tr>
<td>2002/11/10 00h41</td>
<td>Fix $-180^\circ$ -&gt; Fix $0^\circ$</td>
<td>$\sim 1.5^\circ$</td>
</tr>
<tr>
<td>2002/11/16 04h27</td>
<td>Fix $0^\circ$ -&gt; steering</td>
<td>$\sim -14^\circ$</td>
</tr>
<tr>
<td>2002/12/25 17h14</td>
<td>Steering -&gt; Fix $0^\circ$</td>
<td>$\sim -14.5^\circ$</td>
</tr>
<tr>
<td>2002/12/31 17h52</td>
<td>Fix $0^\circ$ -&gt; Fix $-180^\circ$</td>
<td>$\sim 0.5^\circ$</td>
</tr>
<tr>
<td>2003/01/06 13h11</td>
<td>Fix $-180^\circ$ -&gt; Steering</td>
<td>$\sim 16^\circ$</td>
</tr>
<tr>
<td>2003/02/27 02h57</td>
<td>Steering -&gt; Fix $-180^\circ$</td>
<td>$\sim 14.5^\circ$</td>
</tr>
<tr>
<td>2003/03/04 04h15</td>
<td>Fix $-180^\circ$ -&gt; Fix $0^\circ$</td>
<td>$\sim -0.15^\circ$</td>
</tr>
<tr>
<td>2003/03/09 00h03</td>
<td>Fix $0^\circ$ -&gt; Steering</td>
<td>$\sim -14^\circ$</td>
</tr>
<tr>
<td>2003/04/28 15h13</td>
<td>Steering -&gt; Fix $0^\circ$</td>
<td>$\sim -15.5^\circ$</td>
</tr>
<tr>
<td>2003/05/04 13h59</td>
<td>Fix $0^\circ$ -&gt; Fix $-180^\circ$</td>
<td>$\sim 0^\circ$</td>
</tr>
<tr>
<td>2003/05/10 10h05</td>
<td>Fix $-180^\circ$ -&gt; Steering</td>
<td>$\sim 14.5^\circ$</td>
</tr>
<tr>
<td>2003/06/20 05h56</td>
<td>Steering -&gt; Fix $-180^\circ$</td>
<td>$\sim 14^\circ$</td>
</tr>
<tr>
<td>2003/06/26 05h39</td>
<td>Fix $-180^\circ$ -&gt; Fix $0^\circ$</td>
<td>$\sim -0.9^\circ$</td>
</tr>
<tr>
<td>2003/07/01 05h16</td>
<td>Fix $0^\circ$ -&gt; Steering</td>
<td>$\sim -14.5^\circ$</td>
</tr>
<tr>
<td>2003/08/23 16h02</td>
<td>Steering -&gt; Fix $0^\circ$</td>
<td>$\sim -15^\circ$</td>
</tr>
<tr>
<td>2003/08/28 14h32</td>
<td>Fix $0^\circ$ -&gt; Fix $-180^\circ$</td>
<td>$\sim -0.8^\circ$</td>
</tr>
<tr>
<td>2003/09/03 13h29</td>
<td>Fix $-180^\circ$ -&gt; Steering</td>
<td>$\sim 16.2^\circ$</td>
</tr>
</tbody>
</table>
# Yaw Transitions (2/2)

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Transition</th>
<th>ß</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003/10/23 02h23</td>
<td>Steering -&gt; Fix –180°</td>
<td>~ 14°</td>
</tr>
<tr>
<td>2003/10/28 03h42</td>
<td>Fix –180° -&gt; Fix 0°</td>
<td>~ 1°</td>
</tr>
<tr>
<td>2003/11/03 20h29</td>
<td>Fix 0° -&gt; Steering</td>
<td>~ -16°</td>
</tr>
</tbody>
</table>
Jason Ground System Status

- Current Jason Ground System configuration and Earth Terminal performance is adequate to meet mission requirements. (Total recovery rate > 99.95%)
  - No system anomalies have led to the loss of any mission or science data
- Jason Telemetry, command and health/safety monitoring is very good
  - Operations Staff is fully trained and constantly recertified in routine operations and contingency procedures
  - Since handover to JPL, there have been 3 command related errors resulting in the loss of 10 minutes of science data.
- Sequencing
  - Hardware/software and the sequencing team are operating well
  - All products and services are meeting requirements
    - Earth terminal scheduling
    - Generation of routine flight time-tagged sequence
    - Generation of all routine flight operations support data products
- The use of task automation is increasing at both the JPL and CNES control centers
CNES/JPL Operations Status

• Mission operations at JPL entered routine phase on 16 April 2002, after a successful handover from CNES to JPL

• Very good performance for both CNES and JPL Control Centers:
  – 99.954% of HKTMR Telemetry archived since Jan 15
  – 99.953% of PLTM1 and 99.940% of PLTM2 Telemetry archived since Jan 15
  – since last SWT less than 0.002% of TM was lost (HKTM & PLTM)
  – Ground system: ROBUST

• Operations Status: GREEN
  – Since mid-January, all the JGS elements are performing well
  – All documentation and personnel training is complete and up to date
  – Doris OBS 2.08 successfully uploaded on November 25th, 2002

• CNES/JPL operational coordination is well defined and working smoothly
JPL Mission Operations
Foreseen Activities for 2003 & 2004

JPL Mission Operations activities during the remainder of 2003 and 2004 will include:

- Continued proficiency testing, retraining and recertification of the Jason-1 Mission Operations Teams at JPL
- Low bit rate testing at NASA & CNES Earth Terminals
- Support of exceptional STR, SADM and TRSR onboard software patches and upload activities
- Testing of increased automation-related activities at JPL