CONTOUR Science Sequencing Update

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Mission Operations Simulations - Completed

Mission Simulation 2 'Day 4' Encounter Dry Run - March 13 , 2002

- Dry run of 'Day 4' encounter test - CA -6 hours to CA+ 30min
    - 6.5 hour realistic encounter sequence for all instruments (NGIMS, CIDA, CRISP, CFI)
    - *Results* - Successful except that CRISP did not track; problem later understood to be due to bug in cmd data base relating to use of 3-span ephemerides, plus incorrect UTC of zero MET assumed (launch time).

Mission Simulation 2 'Day 3' - April 3, 2002

- 'Day 3' - Post-launch Real-Time Activations and Checkouts
    - NGIMS Functional (pressure check), Calibration Valve Rupture Test, Calibration Checkout (Baseline Performance Test)
    - *Results* - All objectives met.
- 'Day 3' - CRISP Tracking Test:
    - Reduced encounter test (40 min., tracking only with simplified imaging, closed loop with test movie)
    - *Results* - 3 runs not successful due to 3-span Chebychev problem, 2 runs succesful using single-span Cheby

Mission Simulation 2 'Day 4' Encounter Test - April 4 , 2002

- 'Day 4' Encounter Test -

    - Realistic encounter sequence for all instruments (NGIMS, CIDA, CRISP, CFI)

    - CA - 6 to CA + 30min, recorded about 4.5 Gbit, CRISP closed loop with 'movie'

    - *Results* - Successful except that CRISP inbound encounter macro kicked off early (due to buffered CA_START command from previous tracking test re-runs). New command created to allow manual reset of closest approach mode to idle. NGIMS reset (500 sec gap, otherwise good results). CIDA - 1% duplicate packets.

Off Nominal Tracking Tests - April 5, 2002

- Performed a series of nine 15-minute CRISP tracking tests by loading off-nominal trajectories to CRISP TPU

    - CRISP tracked open loop on ephemeris

    - 7 'Good Targeting' trajectories (including one 2-span and one 3-span Cheby), and 1 'Bad Targeting' trajectory);

    - *Results* - Six executed nominally and each properly kicked off the appropriate encounter macros. The non-single span Cheby's did not work (as expected, bug not fixed yet) and one other did not because CA_START command was not sent (as expected). G&C roll control not enabled.

Science Sequencing -Status

Process

- Sequencing procedures have been refined during testing; excellent progress been made

- RTC command procedures working well

Sequencing Software

- Seq_Gen reusable macros (CASs and Fragments) have been developed for all instruments and are capable of building full encounter sequences and calibrations

- First generation of tested CASs and Fragments will be delivered to MOps in June for use during Post Injection Checkouts

Validation Software

- Instrument team sequence validation software has been developed for CIDA and NGIMS and used during testing (s/w was developed to interface with instrument GSEs)

- CFI and CRISP rely more heavily on manual review and state simulator modeling

Mission Operations Simulations - Future

Mission Simulation 3 'Day 1' 3-Axis Test - May 13 , 2002

- 'Day 1' 3-Axis Test -
    - 3 hours starting about CA -10 hours
    - Opnav testing, practice Coalign Cal test

Off Nominal Tracking Tests - 'Day1' Evening - May 13, 2002

- Redo subset of the 10-minute CRISP tracking tests by loading off-nominal ephemerides to CRISP TPU
    - Enable G&C roll control
    - Test 2 and 3 span Chebychev trajectories with fixed s/w

Mission Operations Simulations - Future

Real-time Activation Scripts for CRISP/CFI- 'Day2' Evening - May 14, 2002

- Perform initial turn-on STOL scripts for CRISP and CFI
- 2.5 hours each

Mission Simulation 3 'Day 3' 3-Axis Test - May 13 , 2002

- 'Day 1' 3-Axis Test - Encounter Test Dry Run
    - 3 hours shortened encounter test
    - CRISP and CFI only

Mission Simulation 3 'Day 5' Encounter Test - May 20, 2002

- 'Day 5' full encounter test
    - 6.5 hour test, all instruments, (with playback test runs 24 hours)
    - Changes from before - NGIMS baseline test performed prior to encounter instead of the encounter functional, mods for all instruments per lessons learned from previous tests

Post Injection Checkout -CIDA

5 weeks after SRM burn (week of 9/14 - 9/21)

- Assess instrument state after launch and SRM burn.
    - Need 4 DSNs ~120 mins each.
    - Separated by ~ 2 days to allow for data analysis.
    - Constraint: The target must not be exposed to direct sunlight. (The spacecraft must not point Z-axis to the sun, ~ 6 degree min. angle between Z-axis, spacecraft, and sun.)

Post Injection Checkout -NGIMS

Following SRM burn (week of 8/17 - 8/22)

- Assess instrument state after launch and SRM burn.
  - Need 1st DSN ~190 mins.
  - Need 2nd DSN ~170 mins - contingency only
  - Need 3rd DSN ~170 mins - contingency only

5 weeks following SRM burn (week of 9/14 - 9/21)

- Perform Pyro Breakoff, Rupture Valve and Calibration Value Check.
  - Need 1st DSN ~170 mins.
  - Need 2nd DSN 30 hrs later for ~110 mins

Post Injection Checkout -CRISP/CFI

Day 1 - Spinning (8 hr pass during week of 8/17 - 8/22)

- Initial power up of CRISP and CFI
- Basic limited functional for both (no moving parts)
- Interactive STOL sequences with playback

Day 2 - 3-Axis (8 hr pass during week of 9/8 - 9/15)

- Power up CRISP and CFI
- Pre-cover blow functionals for both instrument
- Interactive STOL sequences with playback

Day 3 - 3-Axis (8 hr pass during week of 9/8 - 9/15)

- Power up CRISP and CFI
- Covers off both instrument
- Full functionals both instruments
- Interactive STOL sequences with playback

Post Injection Checkout -CRISP/CFI

Day 4 - 3-Axis (8 hr pass or performed in blind on or about 9/17)

- Coalignment Cal / Encke simulation (6 hour test)
- Needs to occur near 1.07 AU, with all instruments involved to simulate thermal conditions at Encke

Day 5 - 3-Axis (8 hr pass)

- Playback of Coalignment Cal / Encke Simulation

Day 6 - 3-Axis (8 hr pass or performed in blind on or about 9/19)

- Repeat Coalignment Cal (still close to 1.07 AU)

Day 7 - 3-Axis (8 hr pass)

- Playback of Coalignment Cal 2

Post Injection Checkout -CRISP/CFI

Day 8 - 3-Axis (8 hr pass or performed in blind after covers off, 9/11 - 9/21)

- General alignment and pointing cal
- Image quality, pointing star cals, star tracker coalignment with various s/c conditions, field-of-view and field of regard alignment., OPNAV calibration of CFI (distortion/responsivity/exposures & rates).

Day 9 - 3-Axis (8 hr pass)

- Playback of General alignment and pointing cals

Day 10 - 3-Axis (8 hr pass after covers off, 9/11 - 9/21)

- Open and closed loop tracking tests
- Test the functionality of the tracking system in a variety of modes and scenarios.

Day 11 - 3-Axis (8 hr pass or performed in blind after covers off, 9/11 - 9/21)

- Initial science cals

Day 12 - 3-Axis (8 hr pass)

- Playback of initial science cals

Post Injection Checkout -Development Schedule

May 29, 2002 -

- Planning meeting with MOps to lay out Post Injection science activities
- Bowman, Tan, Harch, Whittenburg, Holdridge required
- **Instrument Teams must finalize requirements prior to this and deliver to appropriate representative**

June 1, 2002 -

- Tested STOL scripts for instrument activations due to Alice
- CASs and Fragments submitted by instrument teams to Mops for CM

July 15, 2002 -

- Initial science inputs due to Ann for command loads for merge and conflict resolution

July 23, 2002 -

- Final science inputs due to Ann for command loads

July 30, 2002 -

- Delivery of validated, error-free, conflict-free command loads to MOps