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CONTOUR Science Ops Update

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CONTOUR Science Ops - Who's doing what?

Ann Harch - (Cornell)

- CONTOUR Science Operations Coordinator
  - Coordinate schedule for 'seq-gen' inputs
  - Sequence integration, conflict resolution
  - Coordinate reviews
- CRISP/CFI sequencing
  - CAS/FRAG Development and Review
  - Build detailed sequences

Alice Bowman (APL)

- Mission Operations Science Instrument Lead
  - Coordinate real-time command generation for all instruments, maintain RTC library
  - Point of Contact for RT instrument activities
  - Develop instrument telemetry pages
- NGIMS/CIDA sequencing
  - CAS/FRAG Development and Review
  - Build detailed sequences (NGIMS process under development)

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Science Sequence Generation Software

INSTRUMENT SEQUENCE GENERATION S/W:

- Instrument-specific software, assists with 'opportunity analysis' and generation of command sequences
- Must address whether the activity makes 'sense' and will return data that is scientifically meaningful (SEQGEN will not do this)
- Ultimately must convert command sequences into standard SEQGEN sasf input file based on approved CAS/Fragment definitions, and be able to review the output of SEQGEN (SSF files)

SEQGEN

- Project-maintained s/w, based on reusable command macros, final validation of sequences, models s/c resource usage, instrument health and safety
- Graphical representation of instrument and engineering activities, DSN contacts, etc.
- May run with individual instrument input, all science instruments merged, and/or with engineering activities merged

Science Sequence Generation *PROCESS*

- Science teams define high-level activity desires and objectives at home institutions
- After approval by PI, science coordinator and MOps work together to schedule activities
- MOps delivers ops initial files to science coordinator and instrument teams
- Activity requests for science observations created by science teams using standard SEQGEN request file (approved CAS and Fragment blocks).
- Final merge of all science instrument files and constraint check in SEQGEN occurs at Cornell
- Instrument engineers review, validate sequences at instrument institutions
- Science coordinator delivers a set of files that is conflict free and will not violate health and safety of s/c or any instrument.

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SCIENCE
SEQUENCE DEVELOPMENT MATRIX

	High Level Activity Design	*Detailed Design*	*Instrument SEQGEN*	*SEQGEN Merge*	*Engineer Review*
CFI	**Murchie*/Taylor**	**Harch**	**Harch**	**Harch**	**Conard/Warren**
CRISP	**Murchie*/Bell**	**Harch**	**Harch**	**Harch**	**Heffernan/Warren**
CIDA	**Kissel `**	**Schneider**	**Bowman**	**Harch**	**Schneider/Ryno**
NGIMS	**Mahaffy**	**Tan**	**Tan/Bowman**	**Harch**	**Tan/??**

*** with Robinson, Thomas, Cochran**

CONTOUR Science Ops - Progress Report

Process Definition and S/W Development:

- SEQGEN adaptation - Nov 2001 - May 2002
  - concurrent development of CAS/Fragments, implementation of instrument flight rule modeling, practice building actual sequences
  - work began when command dictionaries became available in November
  - first goal was to support Mission Sim I (encounter sequencing)
  - current goal - support Mission Sims II & III (encounter, post-launch cals)
  - late spring/summer - will build actual post-launch activities

- Review Process and S/W
  - Roles defined (who does what)
  - Instrument engineer review s/w requirements defined
    - Different process and s/w for each instrument

CONTOUR Science Ops - RTC Process

PRE-LAUNCH -

- CIDA lead engineers will request STOL sequences through Alice Bowman
  - Alice will coordinate STOL sequence build, and reviews
  - No activities will be performed with CIDA by I&T or Mission Ops without first notifying Alice
- Development of CFI/CRISP/NGIMS/CIDA activities for the Mission Ops Simulations requiring real-time STOL scripts will be coordinated through Alice

POST-LAUNCH -

- All RTC activities for NGIMS, CIDA, CFI, and CRISP will be coordinated through Alice
  - This includes software uploads, real-time activation and checkouts, emergency commanding, or any other sequences that cannot be built using stored commands
  - Instrument teams deliver high-level desires for real-time-commands to Alice
  - Alice works DSN scheduling issues to select timing of the event
  - She will bring proper teams together to build and review the sequences, and will maintain cognizance over RTC execution, and follow up.

Mission Ops Simulation Tests

Mission Simulation I was Dec 4 - 7, 2001

- Overall objective - simulate encounter commanding and procedures
- Instruments participating - CFI and NGIMS (brassboard only on s/c)
  - (CIDA review process not ready. CRISP not available.)
- Sequences built with fledgling scheduling system
- Test consisted of :
  - CFI imaging - representative approach sequences
  - NGIMS - partial baseline performance test on brassboard (separate from encounter load)
- Results -
  - *Great* number of problems uncovered in the scheduling software (fixed r/t)
  - CFI powered up nominally, commands (including an infinite duration imaging command) executed nominally
  - NGIMS brassboard - verified with quick check that commands were issued

Mission Operations Simulations

Mission Simulation II March/April, 2002- 'DAY 3'

- 'Day 3' - Post-launch Real-Time Activations and Checkouts
  - CIDA
    - Functionality Tests
  - NGIMS
    - Functional - pressure check
    - Breakoff - subset of actual commands
    - Checkout (Baseline Performance Test?)
  - CFI and CRISP - real-time-command start-up procedures?, cover blow?
    - (checkouts will occur on day 4)

- RTC (STOL) Build:
  - ALL INSTRUMENTS - High level desires due Jan 18 to Alice
    - need estimated duration of activities for each instrument
    - Alice will coordinate activities to occur on Day 3, feed-back to instrument teams how much time is available for tests by Jan 21.

Mission Operations Simulations

Mission Simulation II March/April, 2002 - DAY 3 (continued)

- RTC (STOL) Build (cont'):
  - CIDA
    - Jan 25 - Initial detailed (descriptive) INPUTS due to Alice
    - Jan 25 - Feb 8 STOL generation
    - Feb 8 - Mar 1 Review cycle with CIDA team
    - March 1- Final STOL procs delivered to MOPS
  - NGIMS
    - Feb 11 - Initial STOL INPUTS due to Alice
    - Feb 11 to Mar 1 - Review cycle with MOPS
    - Mar 1 - Final STOL procs delivered to MOPS
  - CRISP/CFI (non-stored command sequences??)
    - Feb 11 - Initial STOL INPUTS due to Alice
    - Feb 11 to Mar 1- Review cycle with MOPS
    - Mar 1 - Final STOL procs delivered to MOPS

Mission Operations Simulations

Mission Simulation II March/April, 2002- 'DAY 4'

- Day 4 - Post-launch Scheduled Activations and Checkouts
  - CRISP - functionality tests, image quality and pointing cals
    - including coalignment tests, tracking tests
  - CFI - functionality tests, image quality and pointing cals

- Sequence Build:
  - Jan 16 - Meet with CFI/CRISP engineers to decide what subset of actual post-lauch tests should be performed during Mission Sim II
  - Jan 16 to Feb 8 - Sequence generation
  - Feb 8 - Science sequence merge, produce instrument review files (ssf)
  - Feb 8 to Feb 22 - Review cycle with instrument lead engineers
  - Feb 22 - Final Sequence files delivered to MOPS

Mission Operations Simulations

Mission Simulation II March/April, 2002

- Day 4 - Encounter Simulation
  - Groundrules
    - All instruments participating, realistic encounter simulation
    - Time period for simulation … -12 hours to +30 min?
    - Data volume - 4 Gbits max for all science instruments
    - CRISP will track closed loop on simulated images
    - Attempt to schedule during cold thermal vac cycle
- Sequence Build:
  - Jan 22 - Memo detailing groundrules for test delivered to teams from Ann
  - Feb 1, 2002 - Detailed INPUTS due to Ann for CFI/CRISP
  - Feb 1, 2002 - Detailed INPUTS due to Alice for CIDA/NGIMS
  - Feb 1 to Feb 15 - Sequence generation by Ann and Alice
  - Feb 15 - Initial instrument sasf files due to Ann
  - Feb 15 - Mar 1 - review cycle with MOPS
  - Mar 1 - Final instrument sasf files delivered to Ann
  - Mar 5 - Final sequences delivered to MOPS

Spacecraft Performance Tests

Baseline Test was Dec 17-21, 2001

- Overall objective - to stress spacecraft functioning during environmental testing
  - baseline will be repeated 4 times
- Instruments participating in initial baseline test were- CIDA, NGIMS, CFI, CRISP DPU
- Sequencing - used combination of STOL and scheduling system in non-routine mode
- Tests performed that involved instruments:
  - *Functional and performance tests for each instrument*
  - *CD&H Performance (sending data to recorder)*
  - *Encounter Test (CA - 2.5 hours to +30 min):*
    - flow data to recorder from all 4 instruments (> 4Gb)
    - exceed CFI data allocation to test flow cut off
    - test CFI/CRISP data flow handoff
    - test CRISP encounter macro selection, tracking on ephemeris

Spacecraft Performance Tests

Repeat of Baseline Encounter Test on 1/9/02 with CRISP instrument and many fixes:

Encounter Test - Design Detail

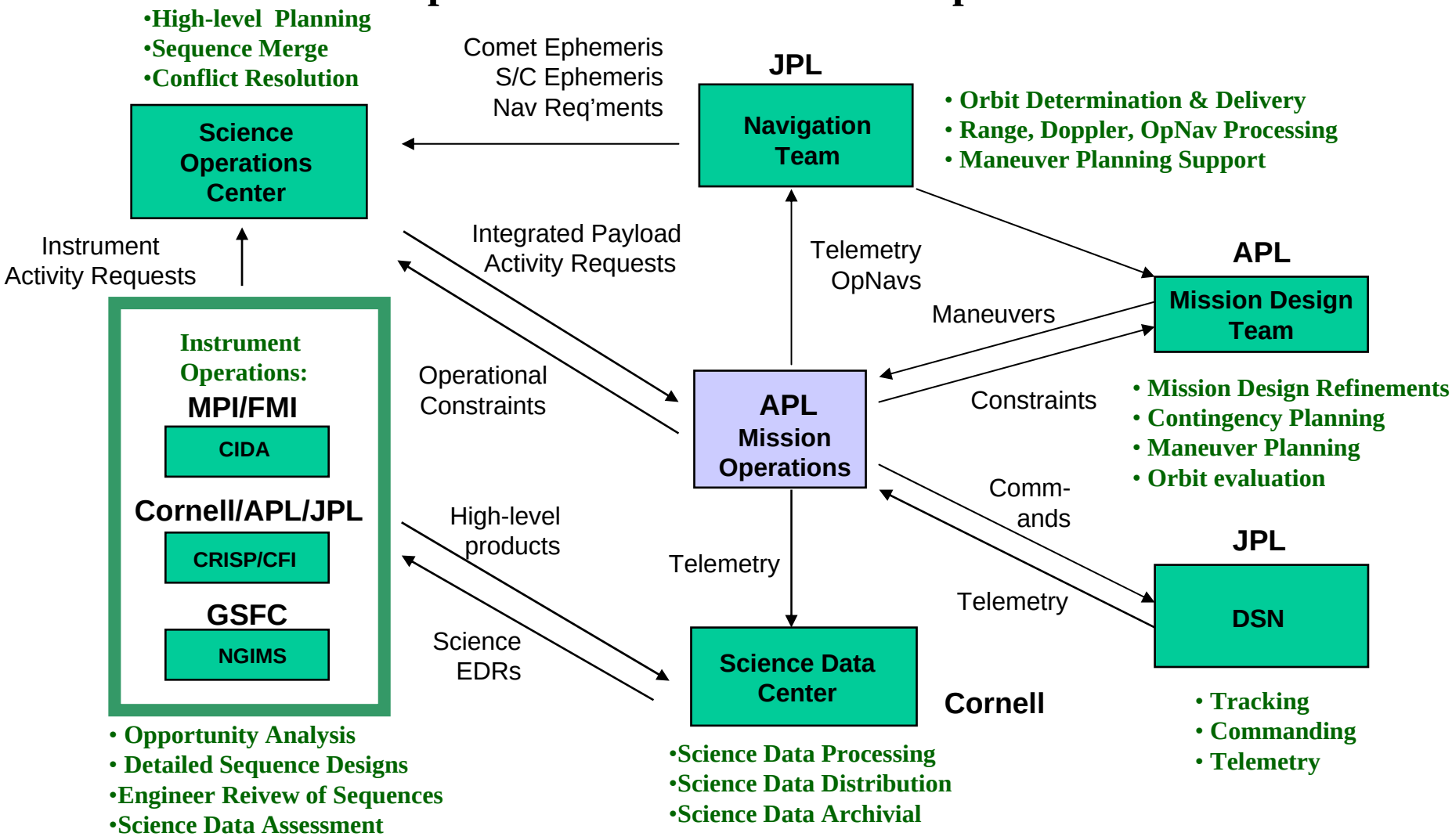
- *CIDA* - produced test spectra, flowed data to mimick volume
- *NGIMS* - representative encounter sequence without filaments
- *CFI* - representative basic approach imaging sequences, full res images
- *CRISP* - approach imaging sequences, 5 encounter macros, post-enc macro

Spacecraft Performance Tests

Additional Performance Testing:

- NGIMS - will run STOL 'Baseline Test' 2 hours following each SPT
- CIDA - need flight s/w upload (will be beginning of Feb).
- CRISP - command check test once, additional performance test after each SPT
- CFI - command check test once, additional performance test after each SPT

Operational Interfaces and Responsibilities



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CRISP/CFI Sequence Generation

APL, JPL		Cornell
CRISP/CFI leads		**SC**
• Create high-level observation plans, requirements	Observation plans → ← Ops G/L and Schedules	• Work high-level scheduling issues with MOC, schedule observations
• Iterate with SC on design details	plots, data files, analysis → ←	• Design detailed observations using Cornell op analysis s/w, iterate with science lead
• Review SEQGEN sasf file	SEQGEN sasf file for review ← → Review Comments	• Create SEQGEN file, run SEQGEN, constraint check and model
• Engineer review, approve final SEQGEN file	SEQGEN review files ← → Final Approval - email	• Run final individual CRISP/CFI file in SEQGEN with all instrument files, deliver to MOC following engr. approval