NPOESS Preparatory Project (NPP) Status

Jim Gleason
NPP Project Scientist
Nunn-McCurdy Certification of NPOESS

NPOESS Program was certified by DoD

- Number of spacecraft reduced from 6 to 2+2
- EUMETSAT will provide mid-morning coverage
- Operational Data Continuity was Primary Requirement
- Instruments cancelled and de-scoped
- Instruments removed from program “De-manifested”
  - Spacecraft resources maintained should instruments be provided
- Launch schedules shifted
  - NPP September 30, 2009
  - C1 January 2013
  - C2 January 2016
## Orbit Configuration Changes

### Crossing Time

<table>
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<tr>
<th>Old NPOESS</th>
<th>0530</th>
<th>2 satellites</th>
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<td>2130</td>
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<th>New NPOESS</th>
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<th>1 satellite + 1 option</th>
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NPOESS Schedule
Instruments Changes

Instrument Descopes

• CMIS  Conical-scanning Microwave Imaging/Sounding
  Imaging: SST, Soil Moisture, Ice/Snow Cover
  Polarimetric Ocean Wind speed
  Atmospheric Temperature/Moisture Sounding

• SESS  Space Environment: Electron/Particle energy spectrometers, UV imagery, Fly SEM

De-Manifested Instruments, could be provided GFE

• TSIS  - Total and Spectral Solar Irradiance
• ERBS  - Earth Radiation Budget
• Alt   - Sea Surface Altimetry
• APS   - Aerosol Polarimetry Sensor
• Full SESS  - Descoped SESS
• OMPS Limb  - Ozone Profile
# Sensors and Platforms

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<tr>
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<th>NPP</th>
<th>2013</th>
<th>2016</th>
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MODIS Science Team Meeting  October 31,2006
Advanced Technology Microwave Sounder (NASA / Northrop Grumman Electronic Systems)

Description
- **Purpose:** In conjunction with CrIS, global observations of temperature and moisture profiles at high temporal resolution (~ daily).
- **Predecessor Instruments:** AMSU A1 / A2, MHS
- **Approach:** Scanning passive microwave radiometer (22 channels (23GHz - 183GHz))
- **Swath width:** 2300 km
- **Co-registration:** with CrIS

Status
- Engineering Unit on Spacecraft
- Flight Model calibration complete
### Description

- **Purpose:** Monitors the total column and vertical profile of ozone
- **Predecessor Instruments:** TOMS, SBUV, GOME, OSIRIS, SCIAMACHY
- **Approach:** Nadir and limb push broom CCD spectrometers
- **Swath width:** 2600 km

### Status

- Brass Board Main Electronics Box complete
- Flight Unit #1 Assembly underway
- Boresight shifts observed after vibration test
- Mechanical studies ongoing
- **Limb removed**

**Algorithm Status:** Using TOMS/SBUV heritage approaches for Nadir Instruments. Limb profile still in development using new space-based limb observation data.
Cross-Track Infrared Sounder
IPO / NGST / ITT Industries

Description

• **Purpose:** In conjunction with ATMS, global observations of temperature and moisture profiles at high temporal resolution (~ daily)

• **Predecessor Instruments:** HIRS, AIRS, IASI

• **Approach:** Michelson Interferometer (1142 channels in 3 bands (3.5 μm - 16 μm))

• **Swath width:** 2300 km

• **Co-registration:** with ATMS

Status

• EDU qualification complete and has been delivered to Ball

• Flight Unit #1 Assembly underway

• Flight Unit #1 failed during vibe test

• Braze joints in instrument frame cracked

• Assessment is ongoing
Visible Infrared Imaging Radiometer Suite
IPO /NGST/ Raytheon Santa Barbara Remote Sensing

Description

• **Purpose:** Global observations of land, ocean, & atmosphere parameters at high temporal resolution (~ daily)
• **Predecessor Instruments:** AVHRR, OLS, MODIS, SeaWiFS
• **Approach:** Multi-spectral scanning radiometer (22 bands between 0.4 µm and 12 µm) 12-bit quantization
• **Swath width:** 3000 km

Status

• EDU Finished T/Vac testing
• Flight Unit #1 Development continues
VIIRS Status

- Top Three issues from EDU T/Vac testing
  - Band-to-Band registration
    - Band registration shifts with temperature
  - Line-spread function
    - Instrument focus changes with temperature
  - Detector Cross-talk
  - Special testing is still on-going. Working to separate optical from electrical crosstalk.

Raytheon is closing Santa Barbara facility.

  NPP VIIRS will be the last instrument assembled in Santa Barbara.
  FM-2 will be assembled in El Segundo

Wayne Esaias presenting VIIRS details in 4 pm Ocean Color Splinter
Questions?

NPP Science Team Meeting
March 13-15, 2007
Annapolis, MD
If unit costs of a Major Defense Acquisition Program increase >25%, then DoD (as delegated to USD(AT&L)) must certify that all of the following four criteria are met, or no further appropriated funding can be obligated on major contracts:

- Such acquisition program is essential to national security
- There are no alternatives to such acquisition program which will provide equal or greater military capability at less cost
- The new estimates of the program acquisition unit cost or procurement unit costs are reasonable
- The management structure for the acquisition program is adequate to manage and control program acquisition unit cost or procurement unit cost

Certificate must apply to whatever program goes forward, which is not necessarily the program of record.

If program going forward differs too much from program of record, then cannot certify; such a program must instead be proposed as a “new start.”

Even if a program is certifiable, USD(AT&L) can choose not to certify.
CMIS Overview

CMIS contributes to all KPP EDRs
- Primary: Soil Moisture, SSW
- Supports: AVMP, AVTP, SST, Imagery

CMIS flies on all NPOESS Configurations
- Produces 16 EDRs total
- Spins at 31.6 RPM
- 83 primary channels, plus redundancy
- Surface measurements at 6, 10, 18, 36, 89, 166 GHz
- Profiling at 23, 50/60, 183 GHz
- Polarimetry at 10, 18, 36 GHz
- Two main parabolic reflectors:
  > Low Freq.: 2.2 m (12-horn feed farm)
  > High Freq: 0.7 m (4-horn feed farm)
- Passive 2-point calibration every scan:
  > Warm Load, Cold Space Reflector

Supplier: Boeing Satellite Systems, El Segundo, CA
- Key Subcontractors:
  > Atmospheric Environmental Research (AER), algorithms
  > Remote Sensing Systems (RSS), ocean algorithms
  > Millitech, High Frequency receivers

<table>
<thead>
<tr>
<th>Sensor Description</th>
<th>TMI</th>
<th>CMIS</th>
<th>SSM/I</th>
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<tr>
<td>CMIS has heritage to TMI and SSM/I</td>
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<tr>
<td>Mass, kg</td>
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<td>Momentum, N-m-s</td>
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<td>Average power, W</td>
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<tr>
<td>Average data rate, kbps</td>
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OMPS Scanning Track

RDR Generation
Satellite Velocity Vector

Spacecraft Downlink

Nadir Path

2.23 deg FOV

110 deg FOV

16.6 deg FOV

250 km x 130 km (Limb Profiler)

250 km x 250 km HCS (nadir NP)

50 km x 2800 km (Nadir TC)