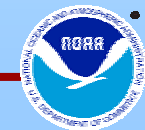

National Polar-orbiting Operational Environmental Satellite System (NPOESS)

Nunn-McCurdy Certification and Impacts on Climate Sensors

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NOAA's National Climatic Data Center



Outline

- Purpose / Issue
- NPOESS Background
- Certified Restructured NPOESS Program
- Impacts on Climate Observations



Purpose / Issue

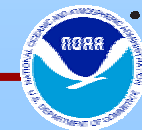
Update on the outcome of the Nunn-McCurdy Certification Process

Discuss Impacts on Climate Observations and Mitigation Strategy



Original NPOESS Program

- Presidential Decision Directive (PDD-2) of May 10, 1994, established the NPOESS program
 - Replaces independent civil and Department of Defense (DoD) polar-orbiting environmental satellites with one integrated system and incorporates aspects of NASA's Earth Observing System
- Provides environmental data to civil, military, and international users
 - Aids protection of national resources (safety, life, and property) — primary data source for forecasting
- Satellites in three distinct sun-synchronous polar orbits
 - Combination of 13 payloads (10 environmental sensors) provide 55 unique Environmental Data Records to support civil and military user needs



Nunn- McCurdy* Certification Process

- Since estimated NPOESS costs exceeded 25% of original, NPOESS (DoD) must provide to Congress a written certification of the following items:
 - 1) That this acquisition program is essential to national security
 - 2) There are no alternatives that provide equal or greater military capability at less cost
 - 3) The new estimates of the program costs are reasonable
 - 4) The management structure for the program is adequate to manage and control costs

*Title 10 USC §2433



Decision Options – The Certification Must Choose one of the Following

- Certify the original program with updated cost and schedule
- Certify a restructured program
- Terminate the program



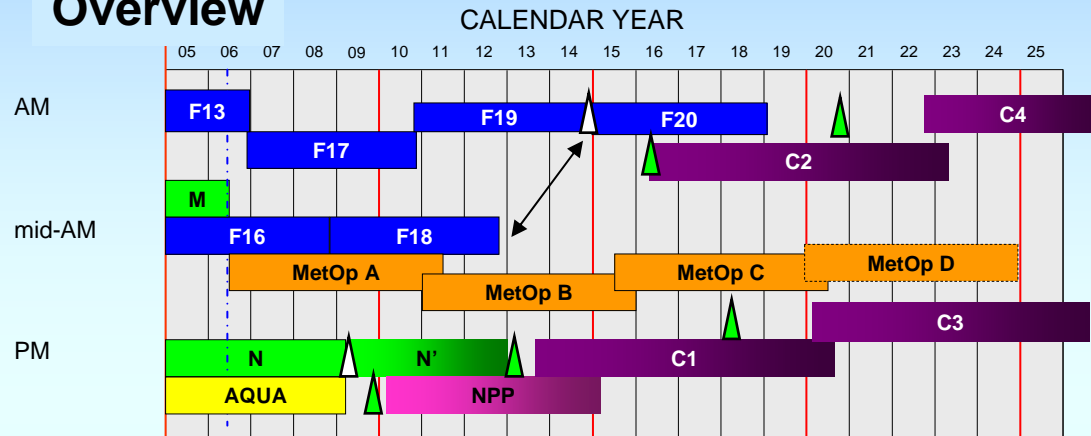
Decision Drivers

- Continuity of Polar Weather Satellite Coverage
- Risk
- Potential to Deliver Original Capability
- Affordability



Certified Restructured NPOESS Program

Overview



End of Constellation Service Life:
2026+

Sensor Configuration

Core Sensors

- AM: VIIRS, Microwave Image/Sounder, SARSAT, ADCS
- PM: VIIRS, Microwave Imager/Sounder (C3), CrIS, ATMS, CERES (C1), OMPS-Nadir, SEM, SARSAT, ADCS

Non-Manifested Sensors

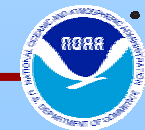
APS, TSIS, OMPS-Limb, ERBS, Full SESS, SuS, Alt



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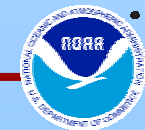
Description

- NPOESS bus sized to carry full sensor configuration
- Constellation of 2 EMD and 2 Production satellites
- Terminate CMIS
 - Compete new Microwave Imager/Sounder starting with C2
- NOAA/NASA forecasting models and selected climate continuity preserved
- Restructuring of NGST contract required
- All Non-manifested sensor integration planned and budgeted
- Rely on MetOp for mid-morning orbit
- Contractor and government management continuity preserved



Key Management Actions

- Fully fund Certified NPOESS program
 - Based on the Office of the Secretary of Defense Cost Analysis Improvement Group's estimate
- Implement new Award Fee Plan
 - Deputy Under Secretary of Defense for Acquisition & Technology's March 29, 2006 Award Fee Memorandum
 - DOC Inspector General's recommendations
- Hold quarterly EXCOM program reviews
 - IPO and Contractor participation
- Develop a plan for a two-orbit U.S. program relying on the use of European data for a third orbit
 - Approved by the EXCOM
- Develop an improved communications and key decisions process for the tri-agency management



Preserves Weather Forecasting Capability Improvements

- Afternoon orbit contains advanced imager and advanced sounder to enhance weather forecasting
- Reliance upon MetOp in mid-morning orbit
 - AVHRR preserves imagery resolution
 - NOAA to work with EUMETSAT regarding an improved imager on MetOp follow-on (MetOp-D)
 - MetOp scatterometer and advanced atmospheric sounder enhance operational weather forecasting capability in mid-morning orbit
 - Improved data timeliness through Antarctic data acquisition station
- Re-competed microwave imager/sounder:
 - Wind speed and direction requirements preserved
- Metop scatterometer for ocean wind speed and direction becomes primary data source until new imager/sounder is available on C2



DMSP secondary source for ocean wind speed



Maximizing Continuity of NOAA Polar Satellites

- NOAA N-Prime satellite launch delayed to 2009
- Continue to rely on NOAA / EUMETSAT partnership on MetOp in mid-morning orbit
- NPP satellite launch in 2009
 - Risk reduction and back-up (imaging, sounding, and ozone capability)
- Use of still functioning instruments of older NOAA satellites

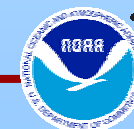


Overview of NPOESS Certification

NOAA Climate Impacts

NPOESS program certified June 5, 2006

- Certified NPOESS to focus on the continuity of operational spacecraft that favors weather measurements
- Lower or no priority for climate measurements
 - Pre Nunn-McCurdy: 3 orbits and 6 spacecraft
 - Post Nunn-McCurdy: 2 orbits and 4 spacecraft
 - Five climate oriented sensors are de-manifested
 - instruments flown only if developed outside of NPOESS program
 - Two climate oriented sensors have reduced coverage
 - one less flight per day
 - One climate oriented sensor will have reduced capability
 - build a less expensive, less capable instrument of the same type

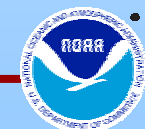


NOAA Climate Research Priorities

Collaboration with NASA

NOAA is partnering with NASA on a joint response on the climate capabilities with a certified NPOESS

- Phase 1: A NOAA-NASA team to develop a joint document on Climate Impacts and potential mitigation strategy for OSTP
- Phase 2: Follow-up with costs of various mitigation strategies



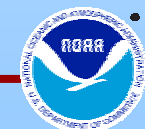
NOAA Climate Research Priorities

Response to NPOESS Certification

NOAA's Climate Goal priorities for NPOESS

- Data that allow for the understanding, monitoring, and predicting of climate variability and change that:
 - provide detection of climate change
 - place a high priority on the heritage of Climate Data Records* (CDRs) already in place compared to starting new CDRs
 - enable attribution of climate change

**A Climate Data Record is a time series of sufficient length, consistency, and continuity to determine climate variability and change (NRC, 2004)*



NPOESS and Nunn-McCurdy

Reductions for Climate-Relevant Sensors

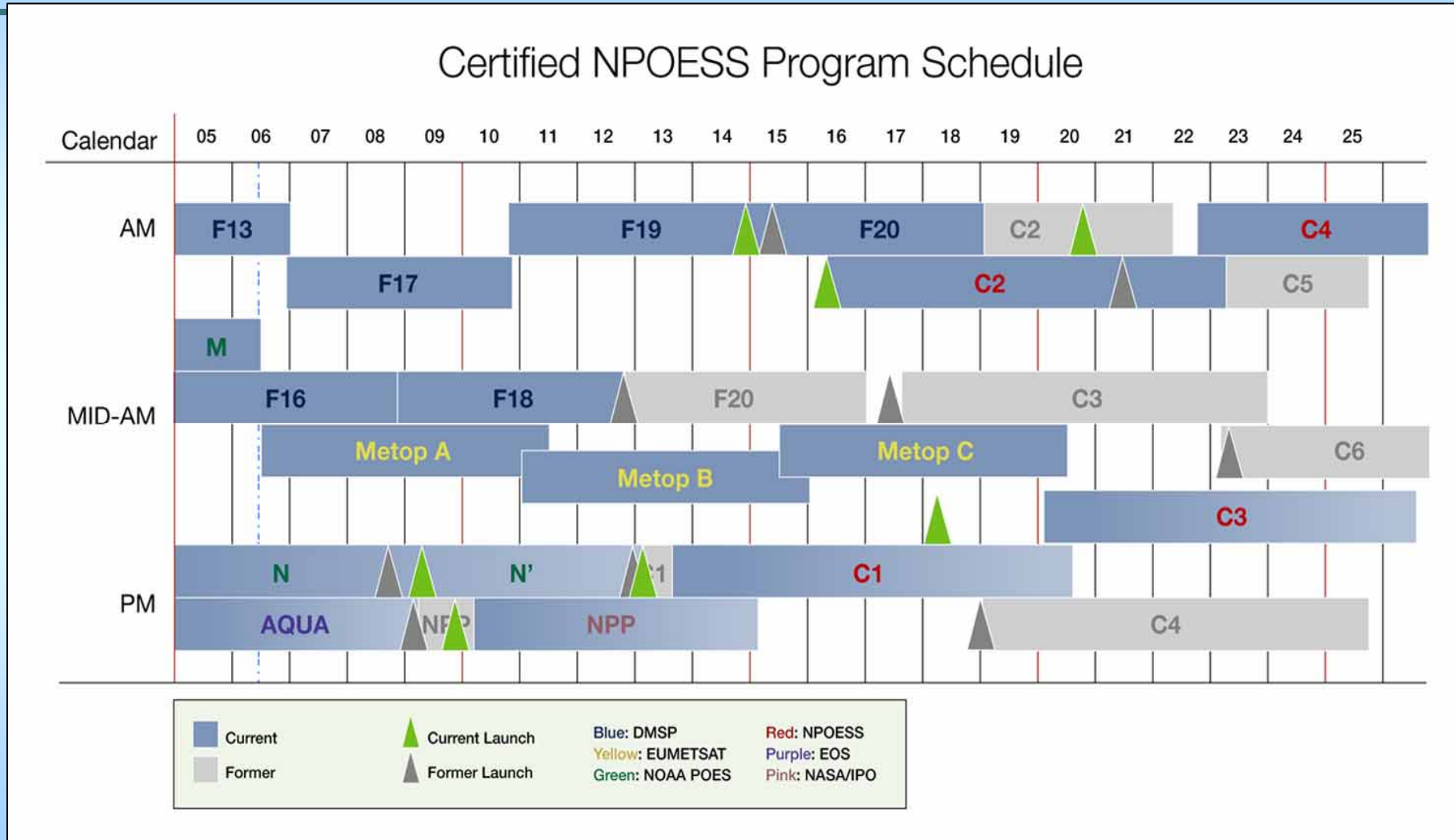
| NPOESS Instruments | NPP | EARLY-AM | | MID-AM | | | PM | |
|--|-----|----------|----------|----------|-----------|----------|----------|----------|
| | | New C2 | New C4 | Old (C3) | METOP | Old (C6) | New C1 | New C3 |
| | | Old (C2) | Old (C5) | | | | Old (C1) | Old (C4) |
| <i>Reduced Capability Sensors</i> | | | | | | | | |
| CMIS* | | ✓ | ✓ | | (ASCAT) | | | ✓ |
| <i>Reduced Coverage Sensors (in NOAA priority order of importance)</i> | | | | | | | | |
| CrIS/ATMS | ✓ | | | | IASI/ATMS | | ✓ | ✓ |
| VIIRS | ✓ | ✓ | ✓ | | AVHRR | | ✓ | ✓ |
| ADCS | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| <i>Demanifested Sensors (in NOAA priority order of importance)</i> | | | | | | | | |
| TSIS | | | | | | | | |
| CERES/ERBS | | | | | | | ✓ CERES | |
| ALT | | | | | | | | |
| OMPS* | ✓ | | | | | | ✓ | ✓ |
| APS | | | | | | | | |

- Remains Intact No Change/Not Relevant
- Reduced Capability Related Missions
- Deleted ✓ Implies Sensor Present

*CMIS to be redefined as a less capable, less expensive sensor
 *OMPS Limb Subsystem is cancelled and the Nadir Subsystem is maintained



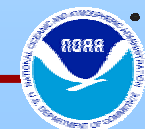
New NPOESS Schedule



Demanifested Climate Sensors

Sensors flown only if developed outside of NPOESS program

1. Total Solar Irradiance Sensor (TSIS)
2. Earth Radiation Budget Sensor (ERBS)
3. Ocean Altimeter (ALT)
4. Ozone Mapping and Profiler Suite (OMPS Limb)
5. Aerosol Polarimeter Sensor (APS)



Reduced Coverage Climate Sensors

One less flight per day

1. Visible Infrared Imaging Radiometer Suite (VIIRS): from 3 Satellites / day to 2
2. Cross-track Infrared Sounder (CrIS/ATMS): from 2 Satellites/day to 1
3. Argos Data Collection System (ADCS): no impact



Reduced Capability Climate Sensor

Build a less expensive, less capable instrument of the same type

- Conical Scanning Microwave Imager (CMIS)



Summary

- New certified NPOESS Program has major impacts on climate observations:
 - 5 sensors demanifested
 - 2 sensors with reduced coverage
 - 1 sensor with reduced capability
- Impacts and mitigation assessments are ongoing by NOAA and NASA
- A joint NOAA-NASA white paper on mitigation is being prepared for the White House Office of Science and Technology Policy (OSTP)



Acronym List

| | | | |
|--------|--|--------|---|
| ADCS | Advanced Data Collection System | IPA | Independent Program Assessment |
| ALT | Altimeter | JARC | Joint Agency Requirements Council |
| APS | Aerosol Polarimetry Sensor | JARG | Joint Agency Requirements Group |
| ATMS | Advanced Technology Microwave Sounder | NASA | National Aeronautics and Space Administration |
| AVHRR | Advanced Very High Resolution Radiometer | NGST | Northrop Grumman Space Technology |
| C1, C2 | First NPOESS spacecraft, second NPOESS spacecraft | NOAA | National Oceanic and Atmospheric Administration |
| CAIG | Cost Analysis Improvement Group | NPP | NPOESS Preparatory Project |
| CERES | Clouds and the Earth's Radiant Energy System | NPOESS | National Polar-orbiting Operational Environmental Satellite System |
| CMIS | Conical-scanning Microwave Imager/Sounder | OMB | Office of Management and Budget |
| CrIS | Cross-track Infrared Sounder | OMPS | Ozone Mapping and Profiler Suite |
| DMSP | Defense Meteorological Satellite Program | PDRR | Program Definition and Risk Reduction |
| DOC | Department of Commerce | SBRS | Santa Barbara Remote Sensing |
| DoD | Department of Defense | SEM | Space Environment Monitor |
| DUS | Deputy Under Secretary | SESS | Space Environment Sensor Suite |
| EDR | Environmental Data Record | SSPR | Shared System Performance Responsibility |
| EDU | Engineering Development Unit | SUAG | Senior Users Advisory Group |
| ERBS | Earth Radiation Budget Sensor | SuS | Survivability Sensor |
| EXCOM | Executive Committee | TSC | Tri-Agency Steering Committee |
| IPG | Integrated Program Office | TSIS | Total Solar Irradiance Sensor |
| IRT | Independent Review Team | VIIRS | Visible/Infrared Imager/Radiometer Suite |

