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# Validating Selected Lean Enablers for Managing Engineering Programs using the NPOESS Program

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## **Validating Selected Lean Enablers for Managing Engineering Programs using the NPOESS Program**

**Matt Ward**

*Candidate for the Master of Science in Systems Engineering  
SELP 697 – Integrated Project II*

## **Agenda**

- LfMEP Background
- Case Study Plan
- NPOESS History
- NPOESS Issues and Enablers
- Conclusions

## My Background

- Project Manager over Supply Chain on various EHF Communications programs at Northrop Grumman – Space Park

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## Project Background

- LAI MIT / INCOSE / PMI conducting project on “Lean Enablers for Managing Engineering Programs (LEfMEP)”
- This project analyzed the challenges the NPOESS program faced and how LEfMEP would have likely mitigated those issues

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## Primary Sources

1. General Accountability Office reports analyzed the challenges and issues the program faced during the execution phase.
2. A detailed report from Aerospace Corporation commissioned by Executive Program Office for Environmental Satellites, examined the program issues and challenges by means of 75 interviews, 29 surveys, and 4000 documents
3. The author attended a seminar on "NPOESS Failures" by Lt Col Shannon Begeman, NPOESS Air-Staff Program Element Monitor from 2004-2006 (during Nunn McCurdy)
4. Personal interaction by the author with two retired senior program executives

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## Case Study Reviewers

- Josef Oehmen, PhD, M.I.T., LEfMEP Academic Chair
- Bohdan "Bo" Oppenheim, PhD, INCOSE rep and co-author
- Fred Brown, PhD, retired TRW executive
- Arnold Galloway, PhD, retired TRW executive
- Eric Olsen, PhD, Lean Professor, Cal Poly San Luis Obispo

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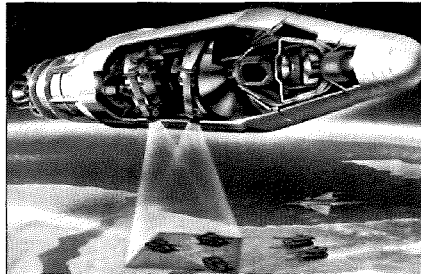
## Pre-NPOESS History

- A period of phenomenal discovery and development in remote sensing characteristics ensued in the late 1960s and early 1970s as **the three agencies (NASA, DoD, and NOAA)** developed a **symbiotic and productive relationship**.
- NOAA was heir to the environmental satellite technology developed by NASA and DoD received from NOAA insights concerning the conduct of daily satellite operations, data processing, and timely delivery of products, as well as application of these data.
- **General and specific agreements between NOAA and NASA and DoD governed the relationship, responsibilities, and costs of the support** provided to NOAA. A tri-agency group, with the coordinated activities among the three agencies. NOAA was charged with the responsibility for determining the requirements of the (civilian) users of its satellite services, specifying the performance of the systems needed to satisfy these requirements and obtaining the funds needed to build and launch the satellites and build and operate the ground segments of the systems."

[Davis 2011]

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## Pre-NPOESS History



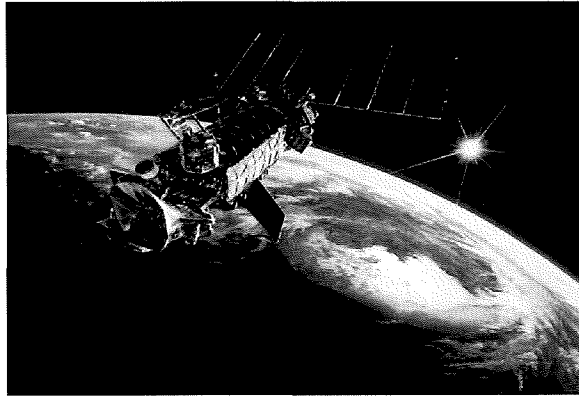
The Corona satellites used 31,500 feet (9,600 meters) of special 70 millimeter film



[Begeman 2012]

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## Pre-NPOESS History



DMSP was inserted into Corona's orbit and commissioned with mapping the cloud cover over target areas so film was not wasted

[Begeman 2012]

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## Pre-NPOESS History

- Meanwhile NOAA and NASA were doing something very similar.....

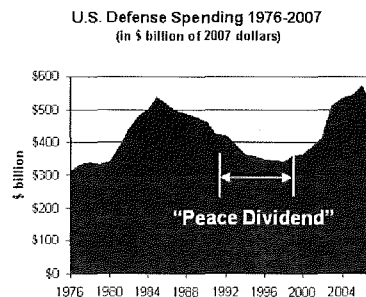
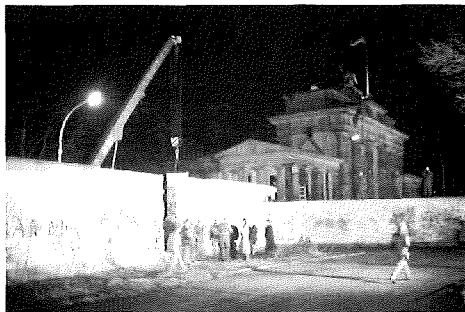


POES supports a broad range of environmental monitoring applications including weather analysis and forecasting, climate research, global sea surface temperature measurements, atmospheric soundings of temperature and humidity, etc

[Hall 2010]

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# Pre-NPOESS History

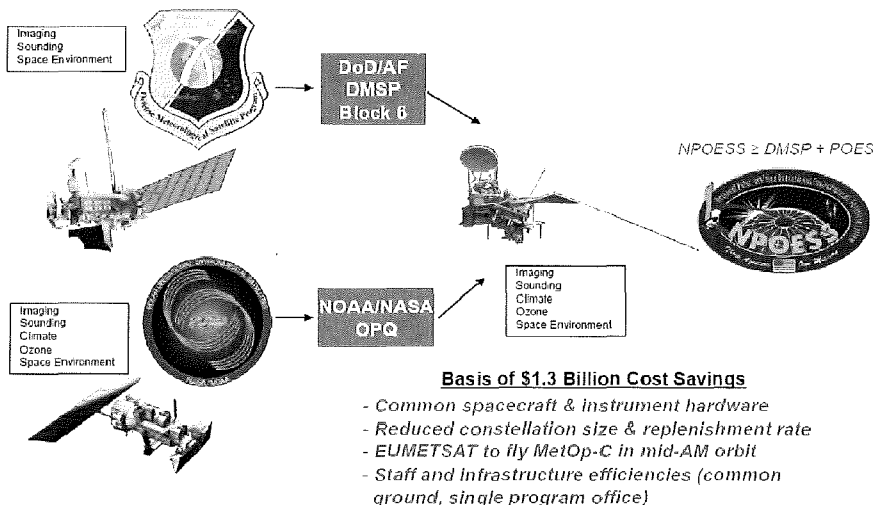


The collapse of the Berlin Wall in 1989 created a "Peace Dividend" to help fund civil programs

[Hall 2010]

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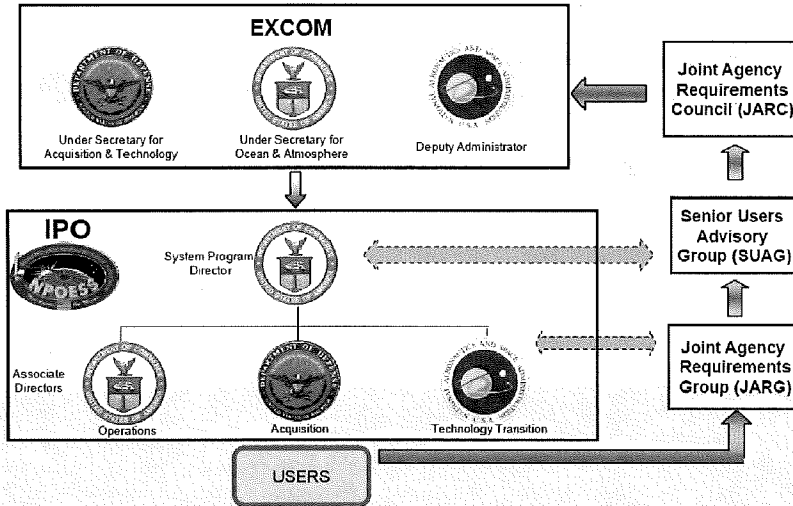
# DMSP / POES Convergence



[Hall 2010]

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# NPOESS Organizational Relationships



[GAO 2009]

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## Issue #1: The priorities of NASA, NOAA and DoD were not aligned.

### DoD



- DMSP continuity (early-AM)
- Cost savings within the FYDP
- KPPs satisfied – other requirements if possible



### Clinton Administration

- Short-term cost avoidance
- Long-term cost savings
- Increased civil-military cooperation
- Program execution within budget

### DOC



- POES follow-on program funded
- POES continuity (PM & mid-AM)
- All requirements satisfied
- Performance advances if possible



### NASA

- Technology transfer
- EOS continuity (after ~1997)

### LfMEP Challenge(s)

#### LfMEP Enabler(s)

*LfMEP #20.1: Nominate a permanent, experienced program manager fully responsible and accountable for success of the entire program lifecycle, with complete authority over all aspects of the program*

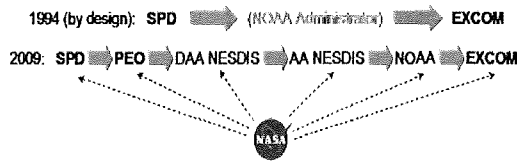
*{leading to increased workload, mismatch between requirements, prevents efficient fulfillment of similar requirements”*

[Hall 2010]

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### Issue #2: The Executive Committee's bureaucratic approval process delayed major elements and decisions of the program.



MEMORANDUM OF AGREEMENT (MOA)  
 BETWEEN THE  
 NATIONAL SCIENCE FOUNDATION (NSF)  
 AND THE  
 NATIONAL POLAR ORBITING OPERATIONAL  
 ENVIRONMENTAL  
 SATELLITE SYSTEM ACCESS  
 INTEGRATED PROGRAM OFFICE (IPO) OF THE  
 NATIONAL OCEANIC AND ATMOSPHERIC  
 ADMINISTRATION, DEPARTMENT OF COMMERCE  
 (NOAA/POO)  
 REGARDING THE USE OF MICRONS STATION,  
 ANTARCTICA

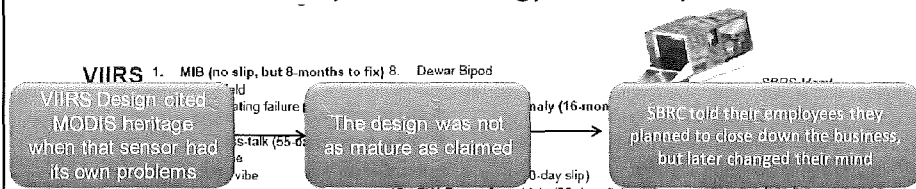
#### LEfMEP Enabler(s)

LEfMEP #2.6.2: Minimize and streamline the program-internal reporting for program activities and sub-projects by optimizing the internal reporting requirements. Only require reports that are clearly necessary, and align reporting requirements to reduce redundant reporting.  
 LEfMEP #2.6.3: Ensure all review and approval steps are truly needed and value-adding in the program.

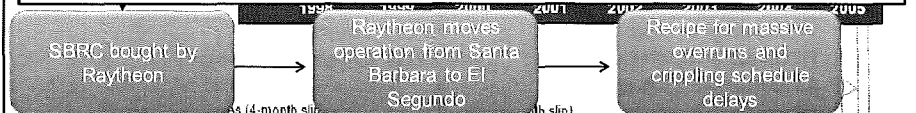
[Hall 2010]

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### Issue #3: The sensor acquisition strategy for the key sensors was flawed



LEfMEP Challenge 1.2.1 "Lack of leadership commitment"  
 action; no implementation of lessons learned as new best practices throughout the program"



#### LEfMEP Enabler(s)

LEfMEP #12.2 Up-front in the program, dedicate enough time and resources to understand what the key requirements and intended program benefits really are  
 LEfMEP 17: Ensure clear, program-wide understanding of agreed-upon technologies and technology standards  
 LEfMEP #17.2: Institute clear guidelines for technology maturation and insertion process in your program. Clearly define what type and level of technology, cost and schedule risk is acceptable under what circumstances [paralysis by analysis vs. program failure].)

[Hall 2010]

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#### Issue #4: Unrealistic cost estimating and funding instability plagued the program execution

- The sensor subcontracts were given unachievable cost targets and told to “make or beat”
- Program estimate assumed development costs would be less than DMSP or POES despite greater mass, power and twice as many sensors
- NOAA matched DOD funding, when DOD cut, NPOESS cut.
- “Stop and Go” development due to funding constraints impacted sensor deliveries

##### LefMEP Enabler(s)

*LefMEP #17.7: Provide stable funding for technology development and maturation. This will support a steady, plannable pipeline of new technologies to be inserted into the program*

*LefMEP #11.1: Ensure strong corporate, institutional and personal accountability and personal penalties for “low-balling” of the budget, schedule, and risk and overestimating capabilities in order to win the contract.*

[Hall 2010]

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## What Happened?

- Management issues caused grave impacts:
  - \$14B program estimate vs. \$6.5B baseline
  - Over 2 year gap in weather coverage due to launch delays due to 3-5 year launch delay
  - Nunn McCurdy
  - NPOESS program terminated, split military and civil needs into two programs (DWSS and JPSS)
  - DWSS cancelled

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## Conclusions

- LEfMEP implementation could have enabled successful NPOESS launch, on-time, on-budget, providing....
  - Life-saving data to the “boots on the ground”
  - Time-critical weather data for NOAA weather reporting
  - Advanced telemetry for NASA research that will help address climate change
- Instead we got very limited benefit for our money