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

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SELP 697 – Integrated Project II

Agenda

- LEfMEP 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

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
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.

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

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.
Pre-NPOESS History

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

DMSP / POES Convergence

Basis of $1.3 Billion Cost Savings
- Common spacecraft & instrument hardware
- Reduced constellation size & replenishment rate
- EUMETSAT to fly MetOp-C in mid-AM orbit
- Staff and infrastructure efficiencies (common ground, single program office)
NPOESS Organizational Relationships

**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

**NASA**
- Technology transfer
- EOS continuity (after ~1997)

**LEfMEP Challenge(s)**

**LEfMEP Enabler(s)**

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

1994 (by design): SPD ➔ (NOAA Administration) ➔ EXCOM

2009: SPD ➔ PEQ ➔ DAA NESOS ➔ AA NESOS ➔ NOAA ➔ EXCOM

LEbMEP Enabler(s)
LEbMEP #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.
LEbMEP #3.6.3: Ensure all review and approval steps are truly needed and value-adding in the program.

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

VIIRS
KINS Det an cited.
NCOI missing data
when sensor has
een problems

The sensor was
not as mature as claimed

SRTE told they
don't plan to
down the business
but later changed their
mind

LEbMEP Enabler(s)
LEbMEP Challenge 1.2.1 "Lack of leadership commitment" action; no implementation of lessons learned as new best practices throughout the program"

SBRC bought by Raytheon

Raytheon moves
operator from Santa
Barbara to EU
Segunda

Needs for major
overruns and
critical schedule
delays

LEbMEP #12.2 Upfront in the program, dedicate enough time and resources to understand what the key requirements and intended program benefits really are
LEbMEP #17: Ensure clear, program-wide understanding of agreed-upon technologies and technology standards
LEbMEP #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 (analysis vs. program failure)
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

LEJMEP Enabler(s)
LEJMEP #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
LEJMEP #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

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
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