

# Mission Assurance Applied to 7120.8 Programs

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# Introduction

- Share insights from involvement of five NPR 7120.8 projects, each currently in various stages of the project: Lunar Vertex (LVx), Polylingual Experimental Terminal (PEXT), LaForge, SunCET, miniCOR.
- Navigating expectations from NPR 7120.5 classed missions to NPR 7120.8, Research and Technology Program and Project Management Requirements, where costs are lower, risks are allowed to be higher, but assurances must be maintained so the mission produces results.
- Many aspects of such projects can be discussed in general; these slides will focus more on workmanship, supply chain, and teaming.

# NPR 7120.8 vs 7120.5

1. There is no significant MA flow down, like a SPD-39: Class D Mission Assurance Requirements document. Tailoring of NPR 7120.8 requirements is encouraged by the document itself which results in a Project Plan that is reviewed and approved by NASA.
2. Mishap reporting requirements are present, but additional requirements (like Missile System Prelaunch Safety Package) vary by contract.
3. Systems testing requirements (TVAC, EMI, Vibe) are sometimes included in the SOW; in practice the bare minimum is that the payload survives enough such that it does no harm to other payloads.
  - Project teams and NASA still work hard to maintain a scientific return.
4. Reviews are still present (Continuation Assessments and Key Decision Points), but it varies by project and program office how attuned the reviews are to requirements of NPR 7123.1.

# Workmanship

- Workmanship standards are not flowed down by SOW or contract
- JHU APL performs many processes in-house (PWB and PWA fabrication, machining, assembly, environmental testing)
  - The default was to perform the work as if a 7120.5 classed project
    - Applied *inspection criteria* from J-STD-001 w/ Space, NASA 8739.1 Polymerics, and NASA 8739.4 Cable, Crimp and Harness for **custom** assemblies.
    - Acceptance was per the concurrence of Lead Engineer and SMA
  - Brings the highest quality with the lowest risk (no retraining, no alterations in process or expectations, no risk to other programs)
    - Nonconformances are addressed only by Lead Engineer and SMA
      - Rapid response and less paper to document, evaluate, and continue hardware movement.
- Suppliers were expected to apply the same standards for custom hardware for the project
  - COTS items would be accepted per the vendor's usual acceptance criteria
  - Details of build history (anomalies, acceptance reports, requirement verification, etc) provided by End Item Data Package (EIDP) provided to APL.
- Integration and Test were implemented such that any pre-cover activity required SMA involvement.

The least risky option is to allow a process to continue performing work to traditional space level quality; the cost effective portion lies in how exceptions (non-conformances) are resolved.

# Supplier Management

- Low Cost and High Risk missions quickly drive the desire to utilize COTS items
- Suppliers used for 7120.8 projects can come in two flavors:
  - Established vendors that have a catalog item with a history of successful hardware
  - NewSpace with new capabilities and new (usually low) cost
- SMA's concern should increase when the vendor....
  - ... has not previously delivered to a government space agency...
  - ... promises at the proposal a radically better price or performance compared to competitors...
  - ... has performed environmental test to an non-flight level before delivery (i.e., no TVAC or vibration far below flight)...
  - ... claims heritage based on successful flights of subassemblies, but not the assembly being contracted...
  - ... is unfamiliar with typical safety requirements for the technology or application being contracted...
  - ... does not allow any personnel visual access to the hardware during assembly (despite NDA's being in place)...
  - ... begins using terms like “proprietary” to respond to fundamental design or process questions...

Suppliers can make or break a project, SMA should prepare accordingly as early as possible.  
7120.8 Missions do not have the budget for dual source strategies.

# Team Management

- NPR 7120.8 is a fairly recent document (2018), so many are not familiar with the working conditions
- Staff can be pulled in from grant/R&D environment or the rigor of 7120.5 projects
  - Set SMA approach clearly and early
  - Highlight differences that allow agility and efficiency
  - Highlight areas of more traditional controls (workmanship, safety, documentation)
- Team benefits the most if comprised of highly experienced individuals
  - Higher cost per person, but efficiency of work is more likely
  - Capable of performing multiple roles/functions
  - LE experience is critical as most acceptance of irregularities is between SMA & LE.
    - Experience with past projects aids in the tailoring approach with SMA.
- Early-Career staff can see immense benefits
  - Exposure to many aspects of project (Multiple roles/tasks).
  - Rapid skill progression (Small team doesn't promote redundancy).
  - Fosters creativity and innovation (Small budgets create necessity).

Small budgets on small projects encourage highly experienced teams that work efficiently, but early career can benefit from rapid increase experience.

# Final Thoughts

- NPR 7120.8 is very light on requirements, the temptation exists to run the entire project with few requirements
  - All 7120.8 programs I worked have benefited from SMA inputs
  - Communicate with team early what tailoring exists and reasoning.
  - Maintain flexibility to tailor based on the nature of the mission.
- SMA must be comfortable to evaluate risk on all flavors of non-conformances (PWA, Harness, Mechanical, suppliers, etc).
- SMA must know the “why” of requirements as well as the “what” to drive the tailoring/risk discussions/agreements.
- Utilize established process as much as possible where the budget/risk permits.
- Early involvement with suppliers is crucial
  - Expect surprises that aren’t typical on classed programs
- Small staff **will** be involved in all phases and all hardware of the program.

7120.8 program are great opportunities to experience all aspects of spaceflight mission.



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