Ground Systems Standardization and Commonality: Benefits, Risks and Obstacles

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The Formal Questions

- Are there ground system functions which are particularly suitable or unsuitable for standardization?
- What are the implications of trying to achieve commonality at different stages of development maturity? Does commonality always have to be planned for in the initial development or are there ways to leverage reuse for systems that are further along?
- Does planning for commonality and reuse require different systems engineering processes?
- Are there regulatory or policy obstacles towards achieving greater commonality? Are there policy changes that could help enable standardization and reuse?
- How can costs and schedules for projects involving commonality and reuse be estimated accurately?
- What are the implications of commonality and standardization for human factors and training of operators?
- Are there management best practices that allow for successful use of commonality, standardization, and reuse in ground system projects? Are there specific pitfalls associated with management of vendors and subcontractors?

SPACE MISSION AREAS

- Communications
- Navigation
- Weather Monitoring
- Imagery
  - Electro-optical, hyperspectal, SAR
- Surveillance / Reconnaissance
  - Signals collection, tracking, space surveillance
- Other Science
- Space Control

Ground System Functions

Spacecraft / Payload Support

- Maintain RF communication links
- Provide spacecraft and payload control
  - Issue commands
  - Determine orbital parameters
- Process telemetry
  - Monitor spacecraft and payload health
  - Determine Spacecraft Attitude

Mission Data Relay

- Transport mission data
- Transport spacecraft and payload telemetry as required
- Provide data handling
- Distribute to data user community

Other

- Support mission operations
- Maintain facility and equipment

From Wertz, et. al., *Space Mission Analysis and Design*

Life Cycle

- Pre-launch
- Launch and ascent
- Early on-orbit test
- Normal Operations
  - Includes sustainment, upgrades
- Disposal

The Real Questions

- What works well?
- What’s broken?
- What do you wish you had known?
- What’s in the way?

Consensus: Benefits

- Cost control
- Technology insertion
- Interoperability
- Reliability
- Ease of use
- Facilitating competition
- Knowledge management
- Don’t need to spend time on the trivial

Consensus: Risks

- Picking wrong standard (immature, obsolescence)
- Outliving their useful life, staleness
- Standardizing things that don’t need to be

Consensus: Obstacles

- Need for continued support of legacy systems
- Who pays for it?
- Need for buy-in from both sides of interface (e.g. space segment as well as ground)
- Resistance to not being in charge
- Time to get consensus
- May not get optimum capability (best is enemy of good enough)
- Competing standards

Observations

- Standards should not be for their own sake; need to solve an actual problem
- Standardize interfaces, not applications
- Start small
- Need advocate – leadership with $
- Need business case
- Should not require extensive tailoring – standards need to be directly applicable to business agreements