GSAW 2007
Addressing Complexity Through Simplicity
Plenary Sessions Summary

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Summary Topics

- Keynote Themes
- Recurring Themes
- Quotable

Keynote Themes

- Complexity through simplicity seems like an oxymoron
  - But that's what we ask our ground systems to do
  - Simple for the user, but complex to implement
  - Simplicity to enhance reliability
- Space is central to U.S. ability to defend itself
  - Chinese ASAT test shows our vulnerability
  - But ground stations are more vulnerable than satellites
- Space should be a utility (like the telephone)
  - If we do our job, the war fighter shouldn't have to know about the satellites and ground systems that support them
    - Quote from a soldier to CNN: "I don't need space; I just need my rifle and my GPS"

Keynote Themes (continued)

- A properly designed ground system is critical to mission success
- Can't modify satellites quickly, must make changes on the ground to accomplish rapid transformation
  - Implementation will be filled with challenges
  - Make sure the little decisions along the way contribute to the end goals
- Ground systems: the center of the architecture
  - From integration to operations

Keynote Themes (concluded)

- Average NASA mission spends ~3.8 yrs in development but ~10.1 yrs in operation
  - Costs of ground system operations are critical to controlling total program costs
- The problem with “faster, better, cheaper” is that it turned into “cheaper, cheaper, cheaper”

Recurring Themes

- The roles and goals of ground stations
  - It falls to the ground system to make it happen
  - Lights-out operations
  - Better utilization of ground station resources and more flexibility through automated planning and scheduling
  - Lower cost, more reliability, and faster developments through commonality, reuse, and standards
- Common ground stations and ground station designs
  - AFSCN and NASA have demonstrated ground station interoperability

Recurring Themes (continued)

- To reduce ground station complexity, we need:
  - Common systems (reuse)
  - Common standards
  - Vendor independence
  - Automation: simplify architecture by making components more automated and simpler to use
- Standards
  - Adopt-adapt-develop priority for using standards
  - Only essential specs and standards (dozens, not hundreds)

Recurring Themes (continued)

- XML
  - Flexibility if used properly
  - Does not do away with the need for ICDs
  - Can lead to high overhead in operations
- SOA and net-centricity
  - All DOD programs are going to implement a net-centric, SOA architecture

Recurring Themes (continued)

- **Reuse/COTS**
  - **Reuse—we want it, but where does it come from?**
    - **"Reuse is not a requirement"**
    - **Where's the budget and schedule to achieve it?**
  - **COTS—still a love/hate relationship**
    - **It's obsolete before we can even deploy it**
    - **Vendor keeps changing its features and interfaces**
    - **How do you plan for long term maintenance?**
      - **DOD is not a major customer; where's the motivation?**
    - **Licensing costs will bite you**

Recurring Themes (concluded)

- **Controlling Cost and Schedule**
  - **"We've got to do it within budget and on time"**
    - **This was one of the top 10 independent program assessment issues**
  - **How do we keep operations and sustainment costs under control?**
  - **Exclude "[I can] name that tune in three notes" contractors**
  - **We have to rebuild our Systems Engineering and Test knowledge/skills base**

Cautionary Quotes

- "A key design issue is what should be common and what shouldn't"
- Typical mission duration is 15 years: "Anybody ordering their operational hardware through eBay?"
  - "Not the supplier of choice"
- "The complexity of the protocol should not outweigh the complexity of the device"
- "A man has got to know his (COTS) limitations"
- "We've got to get it right the first time"
- "SOAP is a lie—it's not simple, there are no objects, and it's not a protocol"

Encouraging Quotes

- **“It’s an exciting time to be in space”**
- **“Right data in the right place at the right time”**
- **“It’s time to make some bold moves”**
- **“It’s not easy, but it’s important”**
- **“We’re beginning to move from complexity to predictability”**
- **“Things should be made as simple as possible, but not any simpler.” Albert Einstein**