Standards and Interoperability

Interoperability and Space Exploration Seminar

Panel 5: Space Industry Perspectives on Interoperability

7 September 2006

AIAA 75 Years
American Institute of Aeronautics and Astronautics

Discussion Topics

- About AIAA
- AIAA Standards Program
- The Space Standardization Landscape
- Standards and Interoperability
- Example 1: Mars Exploration
- Example 2: Modernization of Gov't Ground Control Networks

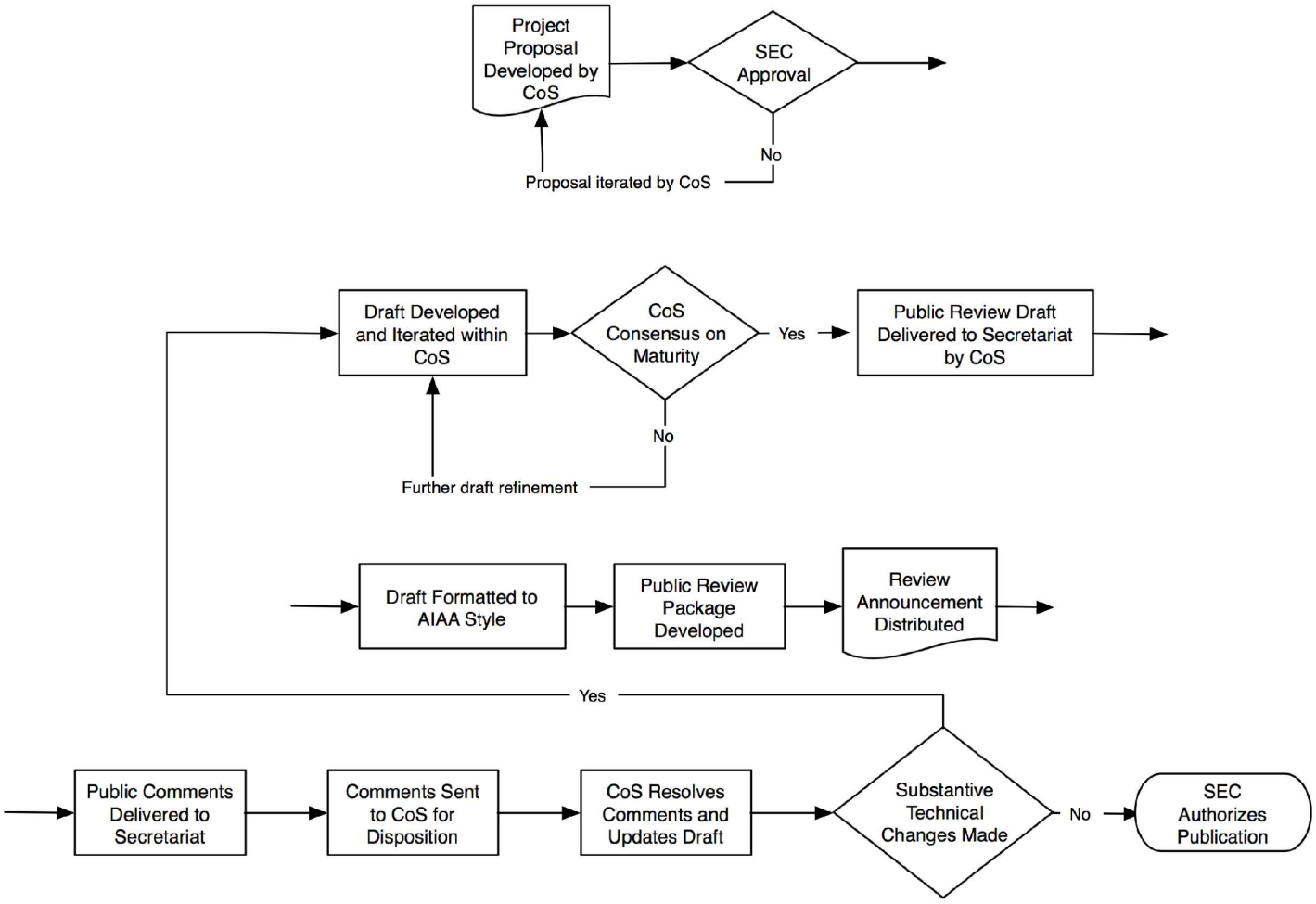
About AIAA

- Mission
  - *AIAA advances the state of aerospace science, engineering, and technological leadership.*
- Vision
  - *AIAA is the shaping, dynamic force in aerospace - THE forum for innovation, excellence, and global leadership.*
- Membership of ~ 36,000 aerospace professionals
- 62 corporate members
- Supported by professional staff of ~ 100
- Core products & services: standards, conferences, publications, public policy, workforce and professional development, technical information repository

AIAA Standards Program

- Openness
- Balance
- Due-process
- Public review and comment
- Iterative
- Consensus-based
- ANSI-accredited

Iterative Consensus Development



Space Standardization Landscape

- AIAA Committees on Standards
  - *Governed by AIAA Standards Executive Council*
  - *Topics include: aerospace pressure vessels, solar cells and panels, space system structural design, etc.*
  - *Fairly U.S.-centric*
- ISO TC20/SC14
  - *Governed by the International Organization for Standardization (ISO)*
  - *Focused on standardization for space systems and operations at the international level*
  - *AIAA provides SC Secretary*

Space Standardization Landscape

- CCSDS - Consultative Committee for Space Data Systems
  - *Governed by the CCSDS Management Council*
  - *Focused on standardization for space data and information transfer at the international agency level*
  - *NASA funds AIAA to provide process management support*

- Together these groups develop consensus standards for the entire life-cycle of space mission
  - *Design and production*
  - *Launch*
  - *On-orbit ops*
  - *Disposal*

Standards and Interoperability

- Standardization promotes interoperability by:
  - *Providing a forum for technical information exchange*
  - *Codifying industry best practices*
  - *Creating a robust "network" layer*
  - *Defining information exchange models*
  - *Defining physical interface models*
- Leading to:
  - *Greater understanding of exchanged information*
  - *Reduced non-recurring and recurring costs*
  - *Reduced mission risk*
  - *Increased situational awareness*

Mars Exploration Example

- Problem:
  - *Early missions relied on data transferred directly from Mars surface to Earth ground stations*
  - *Very limited transmission rates*
  - *Data reliability constrained*

- Solution:
  - *Relay data from Martian surface to Mars orbiting spacecraft and then on to Earth*
  - *Standardize communication protocols to allow surface missions and orbiters to share data transmission duties reliably and efficiently*

Mars Exploration Example

- Results:
  - *Consensus data relay protocol developed at international level within CCSDS*
  - *Protocols successfully implemented on Spirit and Odyssey Rovers*
  - *Rover to orbiter transmission rates twice as fast as predicted*
  - *Scientists receiving three times more data than originally expected*
  - *Demonstrated first working international comm network around another planet (Spirit & Mars Express)*

Modernization of Air Force Ground Control Networks Example

- Problem:
  - *Desire to share resources among NASA, NOAA, DoD networks*
  - *Desire to modernize AF ground control network despite legacy systems on orbit*
- Solution:
  - *Adopt open, TCP/IP based standards for TT&C functions*
  - *Develop adaptations and conversions of open standards to support legacy systems*

Modernization of Air Force Ground Control Networks Example

- Results:
  - *Upgrades to AF networks to provide TCP/IP capability underway*
  - *New AIAA CoS formed to develop adaptations and conversions based on proven CCSDS standards*
  - *CoS made up of representatives of gov't and commercial network user community, hardware vendor community, support community*
  - *Standards publication within six-months likely (work started in Spring 2005)*
  - *Prototype implementations are in development and testing*

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