

COE-CST Research Roadmapping

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Roadmapping Methodology

- Phase I - Preliminary Foundation
 - Identify Scope
 - Find leadership and acquire sponsorship
 - Demonstrate problem being solved
- Phase II - Development Phase
 - Designate “product” that is the focus
 - Identify the critical requirements and technology/research areas
 - Study research alternatives and create needs timeline
 - Write roadmap report
- Phase III - Building Consensus and Follow-up
 - Explain roadmap to larger community
 - Obtain independent critique and validation
 - Update as needed

**Current Status:
Beginning Phase III**

*Adapted from “Fundamentals of Technology Roadmapping”, Garcia and Bray, SNL, 1997



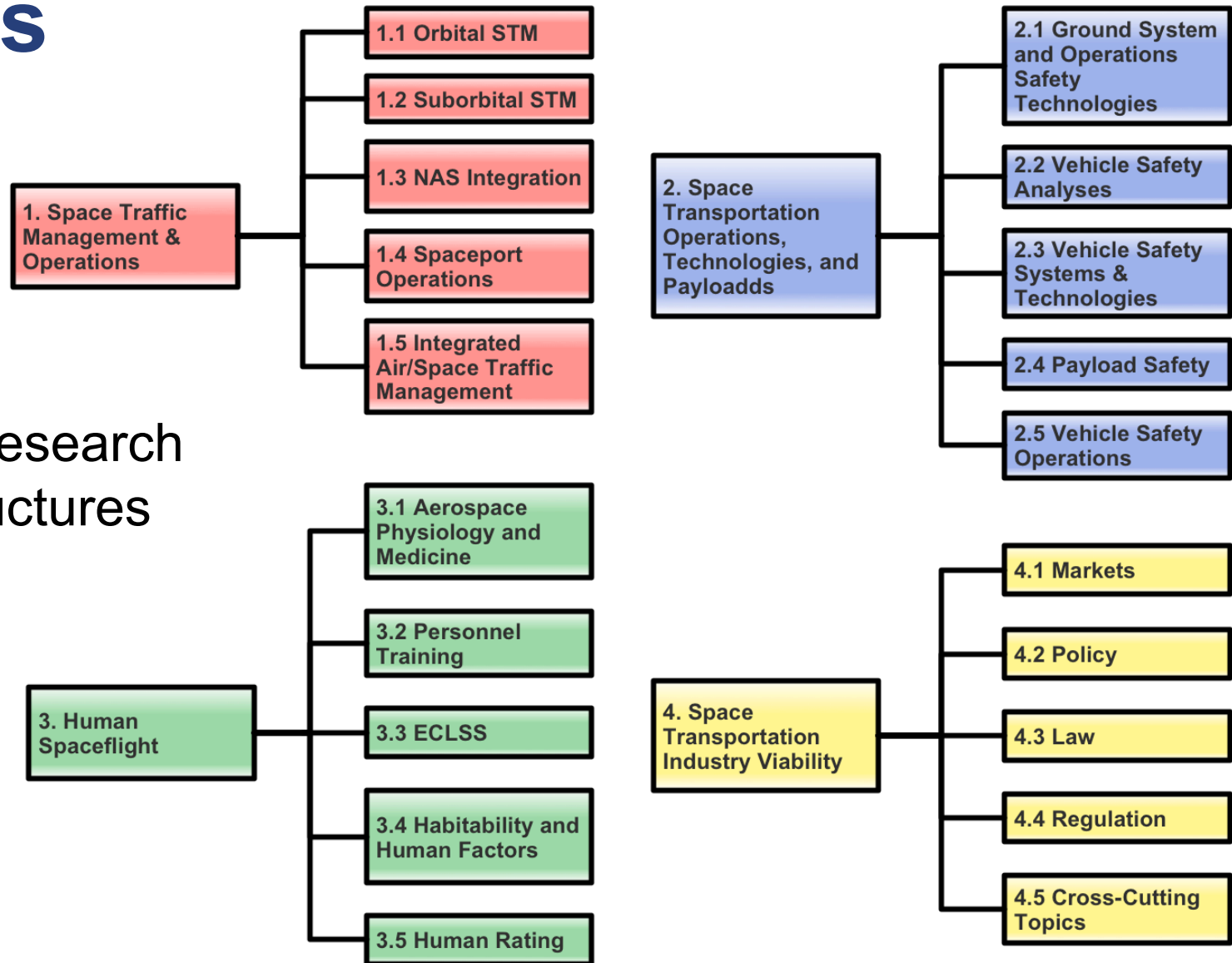
Workshops

- Stanford University
 - April 6-7, 2011
 - 51 representatives of industry, academia, government
 - Defined initial theme objectives and structure
- Washington DC
 - Lockheed Martin Global Vision Center
 - August 15-17, 2011
 - 73 representatives in attendance
 - Refined theme structure and research prioritization



Results

Finalized Research Theme Structures



Results – Research Priorities

- **Theme 1 - Space Traffic Management (STM) and Operations:**
 - **Mission Statement:** The STM task will focus on facilitating commercial utilization of orbital space resources, free from physical interference, by implementing technical and regulatory provisions. The National Airspace System (NAS) integration and spaceport operations task will focus on integrating commercial space vehicle and spaceport operations into the NAS by providing equitable sharing of NAS resources for both air and space traffic.
 - **High-Priority Research:** In order to reduce the imposition made on the National Airspace System and facilitate the integration of air and space vehicle traffic, a minimum safe corridor for launches and re-entries must be identified.



Results – Research Priorities

- **Theme 2 - Space Transportation Operations, Technologies, and Payloads:**
 - **Mission Statement:** Perform research to significantly improve reliability/safety/risk posture and availability for stakeholders in full mission cycle vehicle operations and ground operations while ensuring that proper business case closes (and no negative interactions with rest of participants).
 - **Recommendation:** Further effort is ongoing to identify top research objectives from the technological landscape. This will require iterative effort between this theme and the other three themes.



Results – Research Priorities

- **Theme 3 - Human Spaceflight:**
 - **Mission Statement:** It is the goal of the human spaceflight research area to optimize the human and spacecraft systems for performance, safety, and access for commercial human spaceflight.
 - **High-Priority Research:** Verifiable guidelines are needed for all spaceflight participants. To develop these, extensive data on the risks of various medications and conditions in the space environment are required.



Results – Research Priorities

- **Theme 4 - Space Transportation Industry Viability:**
 - **Mission Statements:**
 - 1) The purpose of the Industry Viability research area support effective policy decision-making and reflect the dual regulatory and promotional missions of the FAA Office of Commercial Space Transportation.
 - 2) Research addressing regulation is designed to maximize regulatory cost-effectiveness; research concerning promotion aims to maximize industry growth.
 - **High-Priority Research:** What “the market” is remains an open question to the CST industries. Identifying and verifying the suborbital and orbital microgravity commerce and research opportunities is of prime importance.



Results – Sample Research Tasks

- **Theme 1 - Space Traffic Management (STM) and Operations:**
 - De-confliction of air and space traffic
 - Required airspace for different vehicles and missions
 - Air-space transition corridors
- **Theme 2 - Space Transportation Operations, Technologies, and Payloads:**
 - Research and recommend safe, expeditious, and cost efficient processing of reusable manned or unmanned vehicles that are payloads on ELV's
 - Landing, inspection, modification if needed, transportation, and integration
- **Theme 3 - Human Spaceflight:**
 - Evaluate specific medical conditions in high-g environment utilizing centrifuge facilities
 - Support the development of medical kits for various suborbital and orbital flight scenarios
- **Theme 4 - Space Transportation Industry Viability:**
 - Retrospective analysis of:
 - Transition from government to private customers
 - Commercial failures
 - Proactive analysis of research capabilities and research requirements



Future Work

- Report status:
 - First draft completed
 - Major revisions based on Ken Davidian's comments underway
- Next steps:
 - Disseminate results to the community
 - Improve based on resulting comments and critiques
 - Update periodically
 - Implement roadmap into COE's research planning and decision making



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