



AST Commercial Space
Transportation

Commercial Space Innovation Institute (CSII) Overview

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Federal Aviation
Administration

Self-Introduction

Education

- BS Aero/Astro Eng, Ohio State University (78-83)
- MS Mech Eng, Case Western Reserve Univ (83-87)
- ISU SSP 1989 - Strasbourg
- PhD, Graduate School of Business, University of Cape Town (15-18)

Professional Experience (Past)

- NASA Headquarters (04-08)
- Paragon Space Development Corp (01-02, 03-04)
- X PRIZE Foundation (02-03)
- NASA Lewis/Glenn Research Center (83-01)
- International Space University/SSP (97-99)

Professional Experience (Current)

- Director of Research, FAA Office of Commercial Space Transportation (08-now)
- Editor-in-Chief, New Space Journal (13-now)
- Adjunct Instructor, Virginia Tech Pamplin College of Business (20-now)

Photo: Ken with the full-length aerospike nozzle designed for the Nuclear Thermal Rocket program at the NASA Lewis Research Center, c. 1992.



AGENDA

- AST RESEARCH
 - Scope
 - Goals
- CSII ORGANIZATION
 - Scope
 - Goals & Approaches

FAA AST DUAL MISSION GOALS

(TITLE 51 US CODE SUBTITLE V, CH 509)

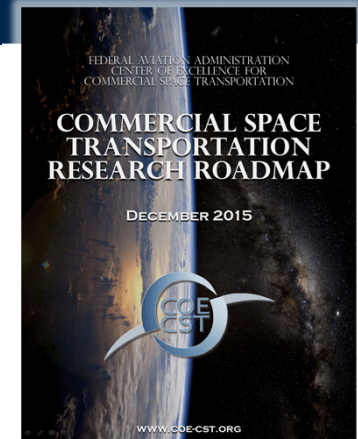
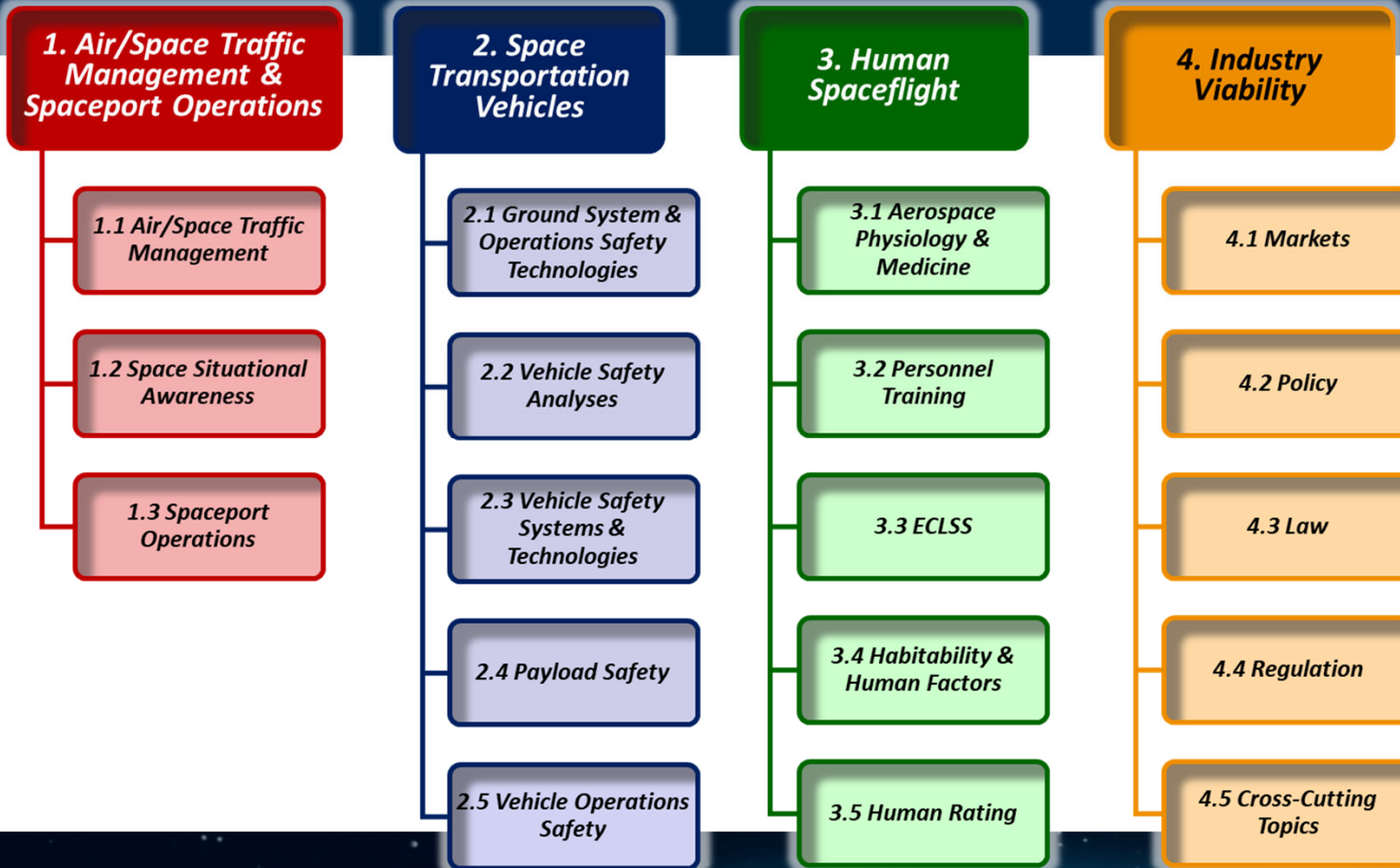
PUBLIC SAFETY MISSION [§50901(a)(7)]

“encourage private sector launches, reentries, and associated services and, only to the extent necessary, regulate those launches, reentries, and services to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States”

INDUSTRY PROMOTION MISSION [§50903(b)(2)]

“Encourage, facilitate, and promote commercial space launches and re-entries by the private sector, including those involving space flight participants”

RESEARCH AREAS OF INTEREST TO AST



- This shows the entire scope of all possible research topics.
- Tasks are funded in some of these programs at any given time.
- Originally developed in 2011, updated in 2015, ready for another update.

SETTING THE STAGE – “COMMERCIAL SPACE”

- Commercial Space Transportation (CST) includes many industries and segments
- Multiple industries form the CST ecosystems
- CS and space exploration research: similar, but different



CSII STRATEGIC RESEARCH GOAL ALIGNMENT

- AST research goals align with...
 - Both FAA AST missions (i.e., public safety and industry promotion)
 - Four research areas

RESEARCH AREA	PUBLIC SAFETY MISSION	INDUSTRY PROMOTION MISSION	RESEARCH AREA	PUBLIC SAFETY MISSION	INDUSTRY PROMOTION MISSION
1. AEROSPACE ACCESS & OPERATIONS	1. Improved analytical and computational methods to evaluate safety of uninjured public and property. 2. Situational awareness and understanding of risk posed by resident space objects.	1. Safe and equitable sharing of the NAS by air and space transportation operators, with minimal disruption caused by commercial space traffic (outbound and inbound). 2. Improved spaceport interoperability and development of necessary spaceport industry infrastructure resources.	4. INDUSTRY INNOVATION	1. Develop improved criteria for evaluating public safety, such as performance-based requirements for the protection of public property and critical assets.	1. Encourage the growth of evolving space industry sectors through relevant economic, legal, legislative, regulatory, and market analyses & modeling. 2. Support effective policy decision-making in the accomplishment of the dual regulatory and promotional missions of FAA AST. 3. Provide a better understanding of the relationship of governmental policy, innovation adoption, and industry growth.
3. HUMAN OPERATIONS & SPACEFLIGHT	1. Identification and reduction of avoidable risks of human spaceflight.	1. Facilitate the continuous improvement of the operational safety of human-carrying vehicles (during both launch and reentry) and spaceports.	5. COORDINATION AND DIFFUSION	1. Facilitate the transmission, translation, and transfer of research results to FAA AST regulatory analyses and decision-making processes.	1. Facilitate the transmission, translation, and transfer of research results for use by industry and standards-setting organizations.

TRANSITIONING FROM COE CST TO CSII



- COE CST was a 10-year commitment.
- Began in August 2010. Ending in August 2022.
- 10 universities, dozens of tasks, PIs, students, supporting organizations.

- CSII “under construction” since 2017.
- Fundamental ideas are the same.
- Implementation details are “in process.”
- This presentation provides the foundational details.



WHAT IS MOTIVATING THE MOVE FROM COE CST TO CSII?

Challenge #1 - Agility

- Description: In 2018, new policies increased grant award process duration from three weeks to six months
- Solution: Other Transactions decrease time from approval to award

Challenge #2 – Relevance

- Description: Level of industry involvement through COE CST was less than hoped
- Solution: Collaborative setting of requirements increases relevance of research tasks

Challenge #3 - Growth

- Description: High administrative overhead associated with many small awards is not scalable with growing budgets
- Solution: Funding projects (multiple tasks) minimizes fraction of administrative cost

CSII ORGANIZATIONAL SCOPE

The CSII ...

... Is one or more innovation alliances (R&D PPPs)

... Encourages the participation of multiple parties

- *Federal, state, and local government agencies*
- *Academic institutions*
- *Commercial actors*
- *Non-profit organizations, FFRDCs*

... Encompasses four major research areas (from the current road map)

- *Aerospace Access & Operations*
- *Aerospace Vehicles*
- *Human Operations & Spaceflight*
- *Industry Innovation*

... Achieves multiple government and commercial space transportation industry objectives

CSII ORGANIZATIONAL STRATEGY – PART 1

GOAL	APPROACH OPTIONS
Expedite the successful emergence of specific commercial space industry segments	<u>BUILDING INDUSTRY RELATIONSHIPS</u> <ul style="list-style-type: none">• Accelerated development of supply and distribution networks of commercial space operators• Innovation alliances include multiple research partners• Collective identification of research topics
Ensure government investment serves target industry segments	<u>COLLABORATIVE FUNDING</u> <ul style="list-style-type: none">• Innovation alliance members contribute resources to research activities• Government funding supplements industry commitments

CSII ORGANIZATIONAL STRATEGY – PART 2

GOAL	APPROACH OPTIONS
<ul style="list-style-type: none">• Maximize industry-university connections	<p><u>MANDATE INCLUSION OF UNIVERSITIES</u></p> <ul style="list-style-type: none">• Increase universities' awareness of industry• Increase industry's awareness of university capabilities• Reinforce workforce development benefits
<ul style="list-style-type: none">• Maximize collaboration by all research entities	<p><u>MEMBERSHIP INCENTIVES</u></p> <ul style="list-style-type: none">• Attract industry, government agencies, FFRDCs, other orgs• Access to relevant data repositories• Favorable intellectual property terms

Questions?

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