Introduction to the FAA COE CST & NASA Participation Options

Federal Aviation Administration

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AST's Dual Mission Goals

Title 51 US Code Subtitle V, Ch. 509

- **Regulate** the commercial space transportation industry, only to the extent necessary, 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 interest of the United States.
- **Encourage, facilitate, and promote** commercial space launches and re-entries by the private sector.

Center of Excellence for Commercial Space Transportation

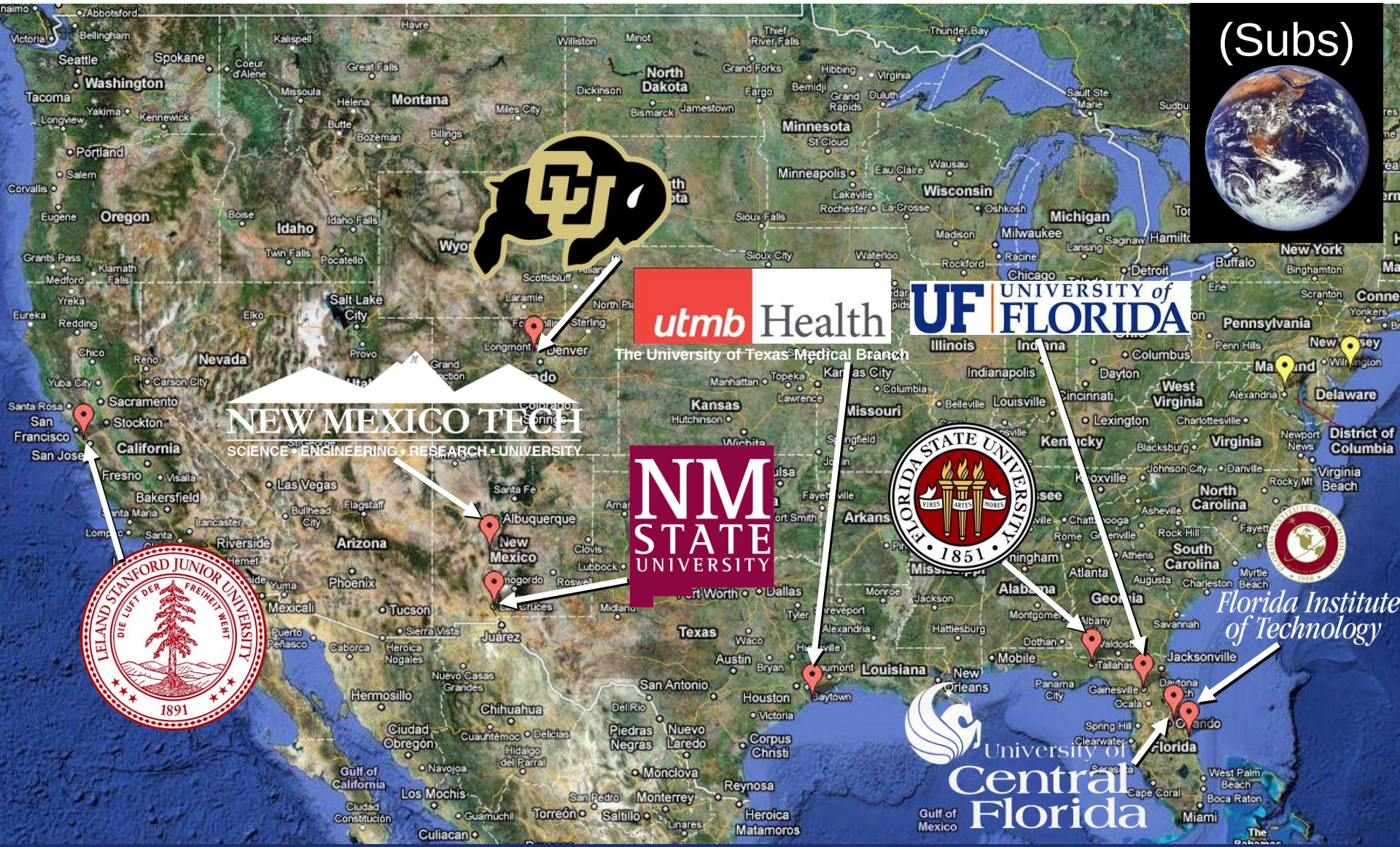
- **Origins**: Omnibus Budget Reconciliation Act of 1990, Public Law 101-508, Title IX, Aviation Safety and Capacity Expansion Act.
- **What**: A 10-year partnership of academia, industry, and government to create a world-class consortium.
- **3 COE Goals**: Research – Training – Outreach/STEM
- **Why**: Address current and future challenges for commercial space.
- **How**: Openly-competed, selected by FAA Administrator.
- **How Much (FAA Funding)**:
  - Past/Current Years (FY10-12): $2M, $500K, $1M
  - Out-Years (FY13-19): $1M (or more?)
- **1:1 Matching Requirement** For <u>All</u> USG Funds

COE CST & the National Space Policy

INTERSECTOR GUIDELINE: FOUNDATIONAL ACTIVITIES AND CAPABILITIES

- **Strengthen U.S. Leadership In Space-Related Science, Technology, and Industrial Bases.**
  - "Departments and agencies shall: conduct basic and applied research that increases capabilities and decreases costs, where this research is best supported by the government; encourage an innovative and entrepreneurial commercial space sector; and help ensure the availability of space-related industrial capabilities in support of critical government functions."
- Enhance Capabilities for Assured Access To Space.
- Maintain and Enhance Space-based Positioning, Navigation, and Timing Systems.
- **Develop and Retain Space Professionals.**
  - Departments and agencies also shall promote and expand public-private partnerships to foster educational achievement in Science, Technology, Engineering, and Mathematics (STEM) programs, supported by targeted investments in such initiatives.
- Improve Space System Development and Procurement.
- **Strengthen Interagency Partnerships.**
  - "Departments and agencies shall improve their partnerships through cooperation, collaboration, information sharing, and/or alignment of common pursuits. Departments and agencies shall make their capabilities and expertise available to each other to strengthen our ability to achieve national goals, identify desired outcomes, leverage U.S. capabilities, and develop implementation and response strategies."

9 COE CST Member Universities (Primes)



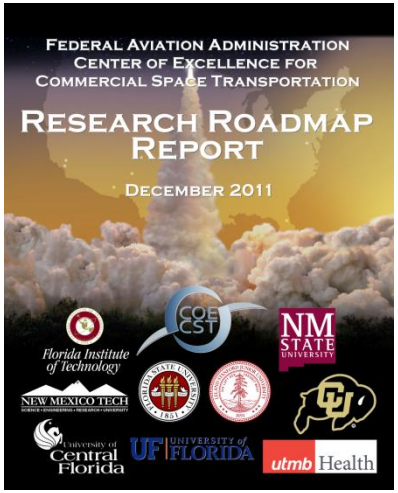
COE CST Research Areas

1. Space Traffic Management & Operations

- 1.1 Orbital
- 1.2 Suborbital
- 1.3 NAS Integration
- 1.4 Spaceport Operations
- 1.5 Integrated Air/Space Traffic Management

3. Human Spaceflight

- 3.1 Aerospace Phys & Medicine
- 3.2 Personnel Training
- 3.3 ECLSS
- 3.4 Habitability & Human Factors
- 3.5 Human Rating



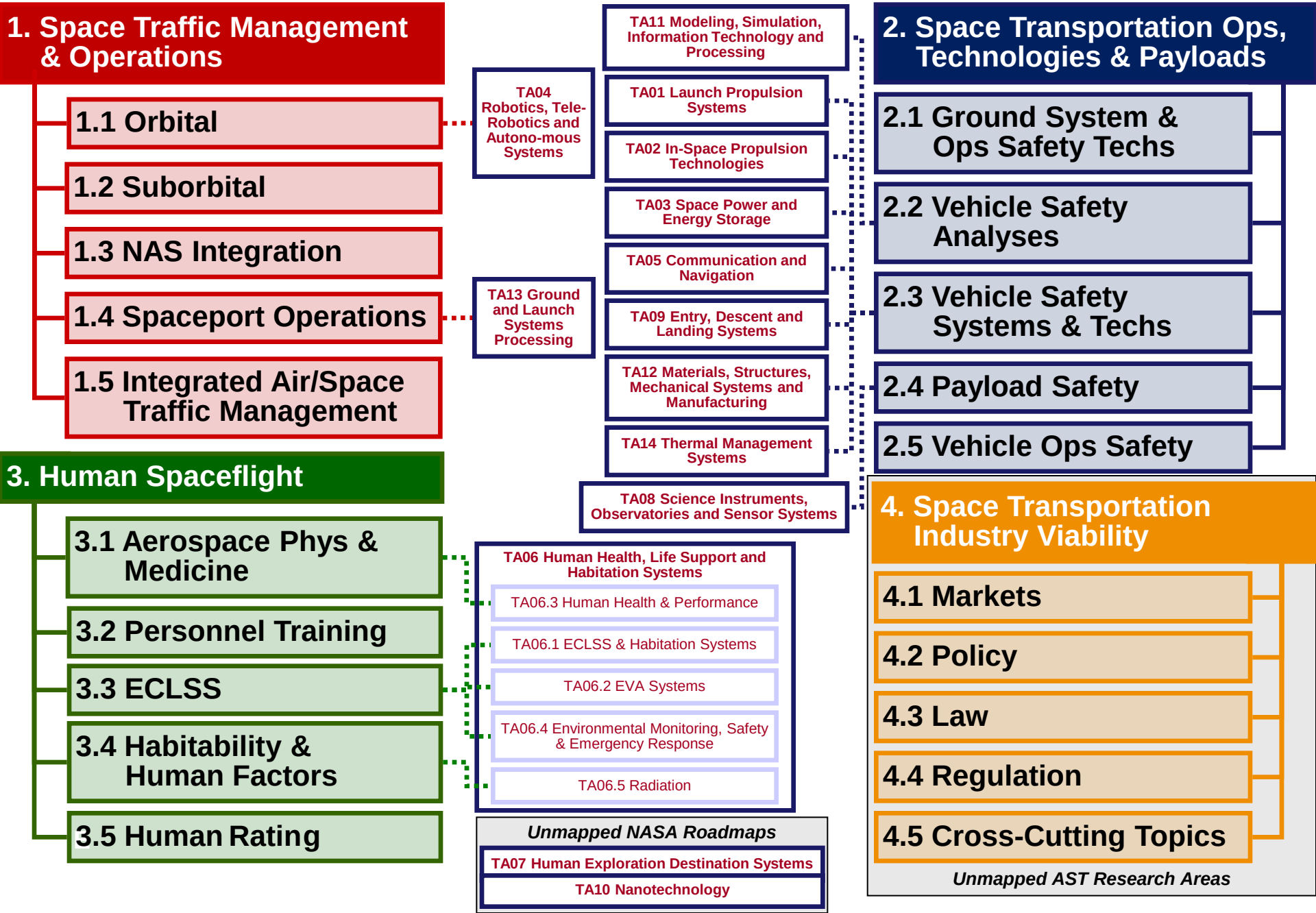
2. Space Transportation Ops, Technologies & Payloads

- 2.1 Ground System & Ops Safety Techs
- 2.2 Vehicle Safety Analyses
- 2.3 Vehicle Safety Systems & Techs
- 2.4 Payload Safety
- 2.5 Vehicle Ops Safety

4. Space Transportation Industry Viability

- 4.1 Markets
- 4.2 Policy
- 4.3 Law
- 4.4 Regulation
- 4.5 Cross-Cutting Topics

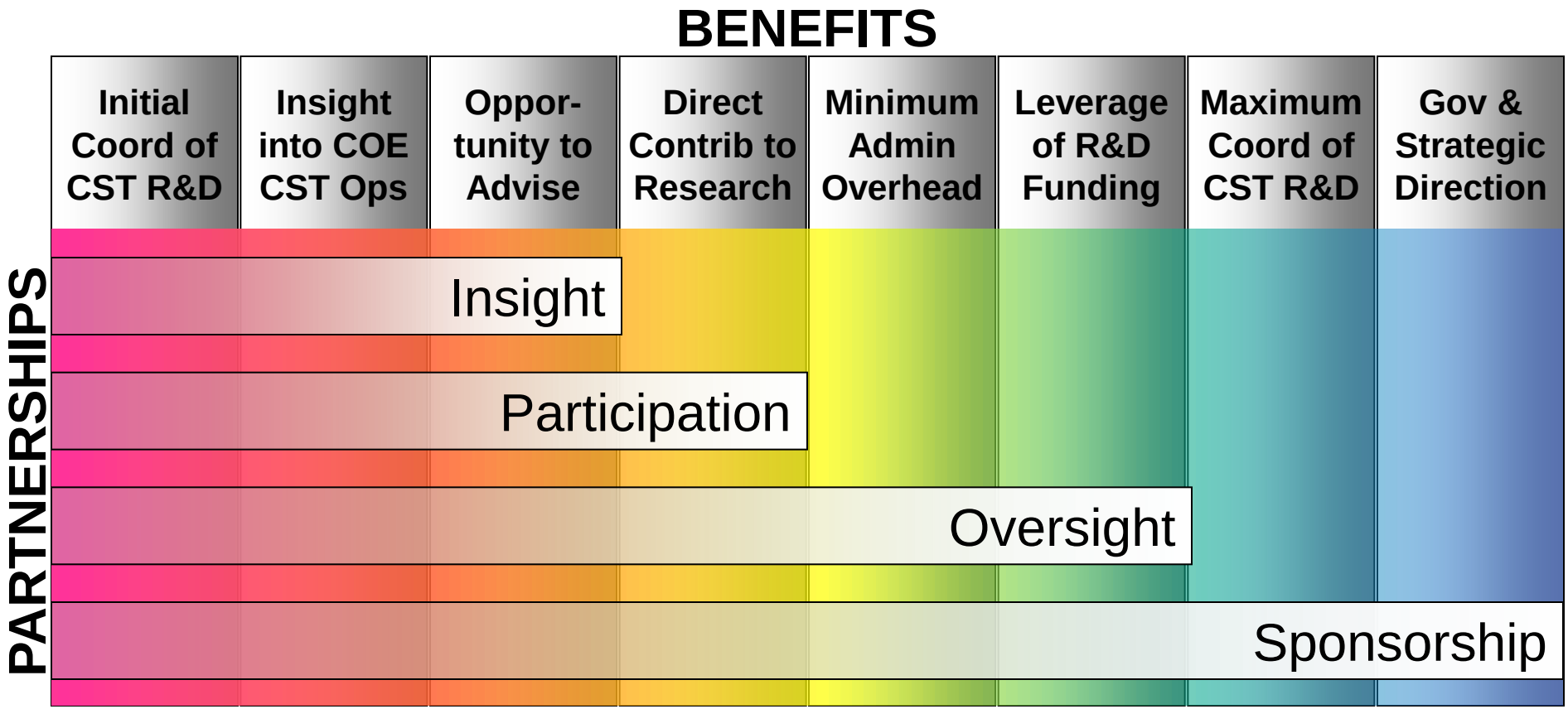
AST Research Areas & NASA Space Technology Road Maps



COE CST Research Tasks

Research Task Name	RA	PI Name (University)
Space Environment MMOD Modeling and Prediction	1.1	Close (SU), Fuller-Rowell (CU)
Space Situational Awareness	1.1	Scheeres (CU)
Unified 4-Dimensional Trajectory Analysis	1.3	Alonso (SU)
Space Operational Framework	1.4	Hynes (NMSU)
Air and Space Traffic Considerations for CST	1.5	Villaire (FIT)
Master's Launch and On-Orbit Operations Laboratory	2.1	Born (CU)
Multi-Disciplinary Analysis of Safety Metrics	2.2	Alonso (SU)
Flight Software Validation & Verification for Safety	2.2	Alonso (SU)
Magneto-Elastic Sensing for Struct Health Monitoring	2.3	Zagrai & Ostergren (NMT)
High Temperature Pressure Transducers	2.3	Sheplak (UF), Oats (FSU)
Autonomous Rendezvous and Docking	2.3	Fitz-Coy (UF), Collins (FSU), Rock (SU), Axelrad (CU)
Ultra High Temperature Composites	2.3	Gou & Kapat (UCF)
Wearable Biomedical Monitoring Equipment	3.1	Jennings (UTMB)
Physiological DB Definition and Design	3.1	Vanderploeg (UTMB)
Comm'l Suborbital & Orbital Design Ref Missions	3.1	Vanderploeg (UTMB)
Additional NASTAR Centrifuge Testing	3.3	Vanderploeg (UTMB)
Human Rating of Commercial Spacecraft	3.4	Klaus (CU)
Crew and HSP Medical Stds	3.5	Jennings (UTMB)
Role of COE CST in EFP	4.5	Hubbard (SU), Born (CU)

Spectrum of Partnerships & Benefits



Summary of Partnership Roles & Benefits

Role	Responsibilities	Benefits
Insight	• Attendance at COE CST Reviews, Meetings	• Initial Coordination of USG R&D Efforts • Provides Insight into COE CST Operations • Opportunities to Advise As Appropriate
Partici-pation	• Contribution of General Support to COE CST [see Note 1] • Event Attendance [see Note 2]	All Previous Benefits, Plus… • Direct Contribution to COE CST Research
Over-sight	• Sponsored Participation in Specific Research Activities, Meetings • Management Responsibilities of Research Task	All Previous Benefits, Plus… • Minimizes Administrative Overhead • Leverage of USG R&D Funding
Sponsor-ship	• Sustained Funding of Research Tasks in Multiple Research Areas • Management Responsibilities of Research Tasks	All Previous Benefits, Plus… • Maximum Coordination of USG R&D Efforts • COE CST Governance and Strategic Direction • (Maximum Alignment with National Space Policy)

Note 1: NASA Use of Extant NASA Resources* for COE CST Needs (e.g., Literature Searches of Prior Research). Granting COE CST Principal Investigators Controlled Access to NASA Facilities*, Resources*. IPAs, Innovation Ambassadors at Member Universities.
Note 2: Personnel Time for Participation, Consultation in Task Meetings, Reviews, Workshops. May Include Travel, Per Diem Support, etc.
** Non-Sensitive, Publicly Available GFE & Services Only. Some Restriction Apply, Void Where Prohibited…*

Summary

- COE is a unique R&D “acquisition instrument” with broad scope, global reach, and 1:1 matching requirement for all USG funds.
- Maximize Common Interests of Overlapping Mission Areas
  - AST’s R&D Research Areas - Safety & Promotion Goals
  - NASA’s Space Transportation Roadmap – R&D & Mission Goals
- Multiple FAA-USG Partnering Options
- Full Spectrum of Benefits/NSP Alignment

Backup Charts

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Member University Strengths

FIT	aerospace & space-related engineering, science, space traffic management & launch operations, vehicle & payload analysis and design, thermal systems & propulsion.
FSU	thermal management, vehicle aerodynamics & controls, sensors, actuators, system health monitoring, high performance simulations.
NMT	structural health management, rocket engine test facility, explosives, induced lightning, fast tracking telescope.
NMSU	suborbital investigations, scientific ballooning, nano-satellite development.
SU	optimization & autonomous operation of complex systems, strategic research planning.
UCF	thermal protection system, cryogenic systems & materials, composites, sensors, actuators, GNC.
CU	spacecraft life support & habitat design, human factors engineering analysis, payload experiment integration, space environment, orbital mechanics.
UF	research in space systems, MEMS, computational sciences, structural dynamics, controls, gas dynamics, propulsion.
UTMB	medical support & human spaceflight physiological research, preparation of passengers & crew for suborbital space flights.

The COE CST is made possible with generous support from…

For More Information…

www.coe-cst.org

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Contact Info