Commercial Space Transportation

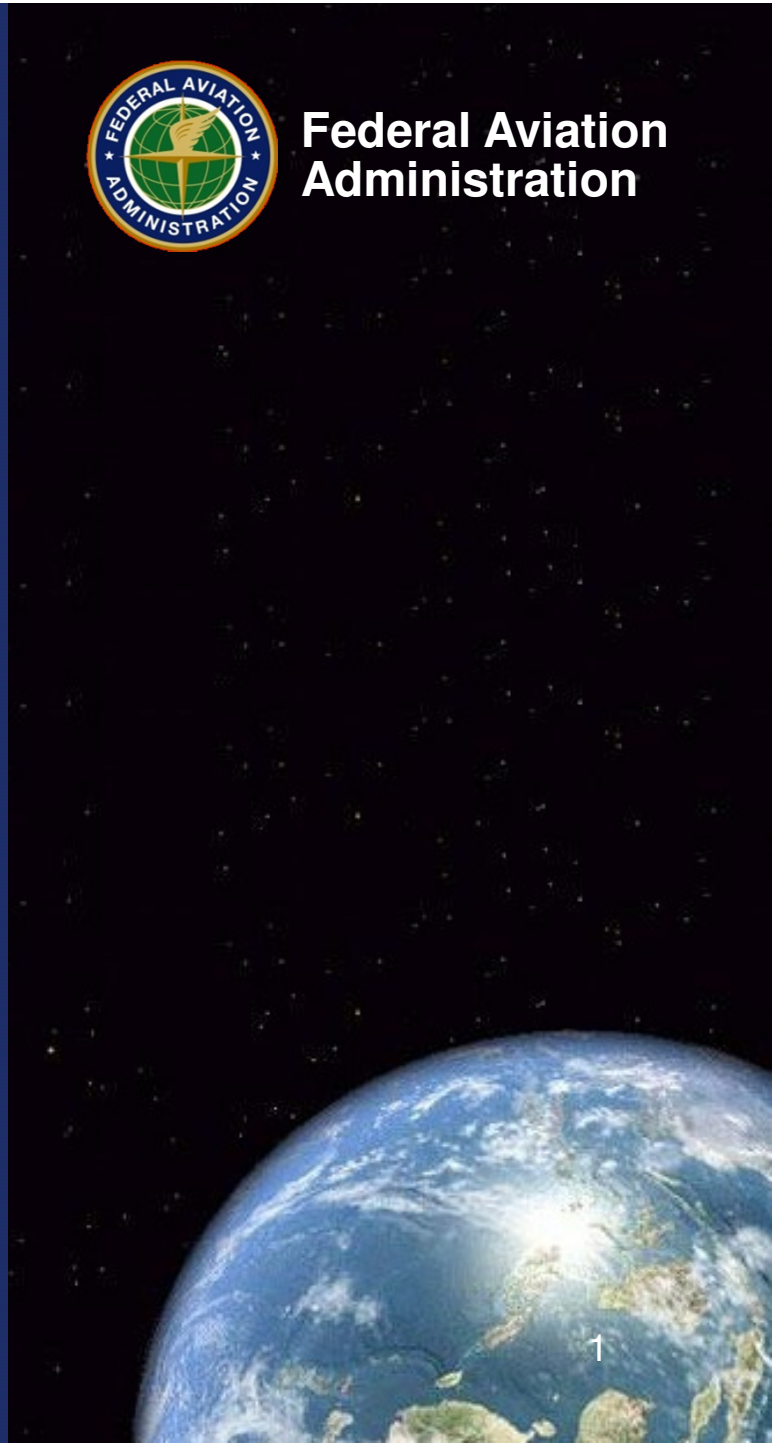
Federal Aviation Administration

COMSTAC-STANDARD WORKING GROUP (SWG)

April 27-28, 2016

OBSERVATIONS, FINDINGS AND RECOMMENDATIONS (OFR'S)

Chair: Oscar S. Garcia
Vice-Chair: Livingston Holder



SWG Formal Activities

- 2 SWG Conf calls — Dec 2016, Apr 2016
- SWG attended FAA AST Conference — Feb 2016
- SWG attended ICAO Space 2016 — Feb 2016
- 1 SWG Conf Call Briefing to CSF — Mar 2016
- SWG, CSF, ASTM Planning Meeting — Apr 2016

Agenda

1. **CSLCA Reporting Section 111 Consensus Standards**
   - 111-(5) FAA AST Briefing, Randy Repcheck
   - 111-(6) IDA-STPI Briefing, Anita Eisenstadt
2. **HSF Occupant Safety Standards Roadmap**
   - Task Group Update, Paul Damphousse
3. **Human Spaceflight Occupant Safety Standards and Recommended Practices (SARP's)**
   - New CSF/ASTM Commercial Spaceflight Committee
     - CSF Briefing, Michael Lopez-Alegria
     - ASTM Briefing, Pat Picariello
4. **Commercial Satellite On-Orbit Servicing and Construction**
   - Industry/Government consensus standards
   - DARPA Briefing-Todd Master

CSLCA SECTION 111 REPORTING

- **Finding (Draft)**

  The COMSTAC/ SWG will provide AST and IDA-STPI responses and proactive inputs on occupant* safety industry standardization areas and also “readiness metrics” to transition to an evolved oversight framework beyond the current moratorium/learning period.

*Occupants include spaceflight participants, government astronauts and crew

CSLCA SECTION 111 REPORTING

- **Recommendation (Draft)**

  The COMSTAC/SWG recommends that the FAA/AST enable effective channels to receive timely industry inputs for required HR 2262 Section 111 Congressional Reports.

  For instance, industry website dedicated sections, feedback forms, relevant AST and/or its consultants' email addresses.

HSF Occupant Safety Standards Development Roadmap

- AST and the COMSTAC and SWG collaborate to develop a Human Space Flight Occupant Safety Standards Development Roadmap.
- The COMSTAC and SWG take important industry inputs from the SWG's Roadmap to Voluntary Industry Consensus Standards Task Group to:
  - Develop and Cluster industry voluntary consensus SARP's into areas for possible future licensing of human spaceflight.
  - Identify and manage "metrics" and "indicators" for industry preparedness for safety framework evolutions.
- SWG RoadmapTask Group first update.
  - Paul Damphousse and Brian Gulliver

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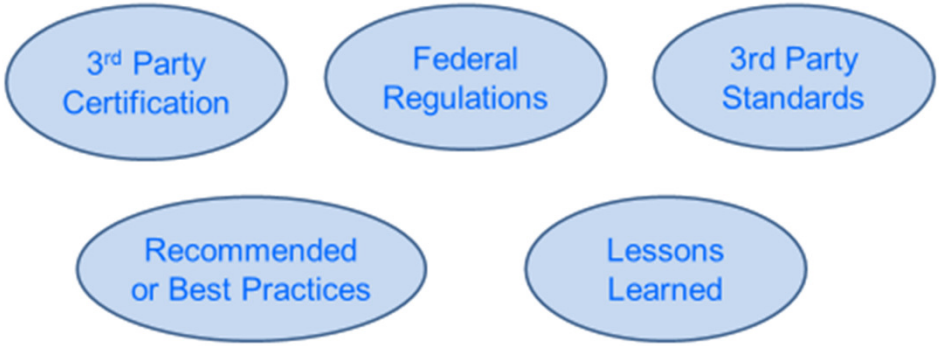
HSF Occupant Safety Standards Development

Potential Roadmap Subject Areas



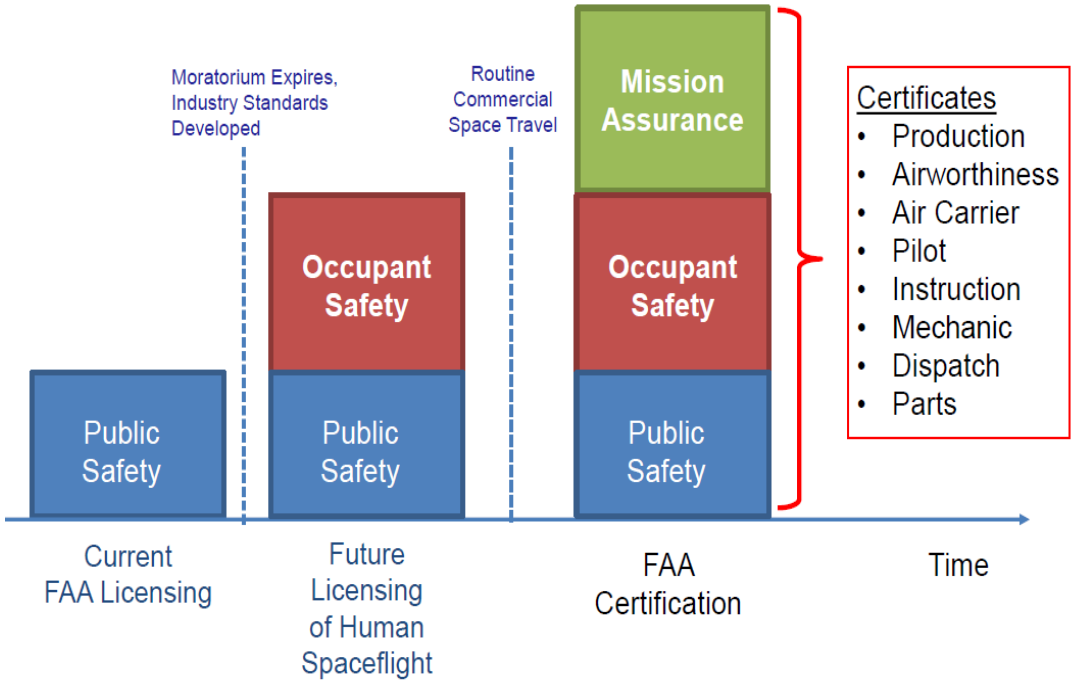
TIMELINE	2015	20XX	20YY	20ZZ
STAGE	LEARNING PERIOD	PRE-REGULATON	REGULATIONS	CERTIFICATIONS
MILESTONE	INITIAL OPERATIONS	ROUTINE OPS	COMMON CARRIAGE	
METHOD	INFORMED CONSENT	NPRM	REGS 14CFR 400.XX	FAA FORMS XXXX-X
INDUSTRY/AST COLAB	SARP	ARC	ARC	FAA=POLICY/VERIF/INSPECT
			INDUSTRY= SARP'S AS MOC	INDUSTRY= SARP'S AS MOC
SAFETY AREAS	DESIGN	DESIGN&PERF	VEHICLES	AIR/SPACE WORTHINESS CERT
	MANUFACTURING	REQD EQUIP	AIR/SPACE CARRIER	COMMON CARRIAGE CERT
	OPERATIONS	QLTYASSURANCE	PILOT/ASTRONAUT	LICENSE
		PRODUCTION	INSTRUCTION	PROGRAM CERT
		OPS MANUALS	MECHANIC	LICENSE
		MAINT&INSP	DISPATCH	LICENSE
		AIRWORTHINESS	PARTS	PMA
	ETC	ETC	ETC	ETC

HSF Occupant Safety Standards Development
Roadmap

Finding (Draft)

The COMSTAC/SWG agrees with the FAA/AST's two potential regulatory roadmap milestones. Milestone 1. Industry Standards Developed as a precursor to Human Spaceflight Occupant Safety licensing. Milestone 2. Routine Commercial Space Travel activity as a precursor to potential new safety frameworks, for example, certification of vehicles and operators or others.

Potential Regulatory Path



HSF Occupant Safety Standards and Recommended Practices (SARP's)

- Industry deems important to develop and maintain a wide breadth of voluntary consensus SARP's.
  - Safety, scalability, inter-operability
- CSF has requested that ASTM completes planning and organization of a new Commercial Spaceflight Committee activity.

  - CSF Briefing, Michael Lopez-Alegria

  - ASTM Briefing, Pat Picariello

Industry Voluntary Consensus Standards and Recommended Practices (SARP'S)

Commercial Spaceflight Planning / Proposal

Request:
Proposal from CSF in April 2016 to Form a new Technical Committee

Scope: The scope of the Committee shall be the development and maintenance of voluntary consensus standards and recommended practices for the commercial spaceflight industry. Areas to address in standards include, but are not limited to, design, manufacturing and operational use of vehicles used for human and unmanned spaceflight. A principal objective of the committee is to improve the safety of crew, government astronauts, and spaceflight participants.

Subcommittee Structure:
F##.01 Manned Suborbital Vehicles
F##.02 Manned Orbital Vehicles
F##.03 Unmanned Vehicles
F##.04 Spaceports
F##.05 Cross-Cutting (TBD)
F##.90 Executive
F##.91 Terminology
F##.92 Standards Road mapping

HSF Occupant Safety Standards and Recommended Practices (SARP's)

- **Finding (Draft)**

  The COMSTAC supports industry's efforts through the Commercial Spaceflight Federation (CSF) leadership role in the formation and structuring of a new Commercial Spaceflight Committee.

  The new Committee will develop, amongst others, voluntary consensus Standards and Recommended Practices (SARPs) under the auspices of ASTM.

HSF Occupant Safety Standards and Recommended Practices (SARP's)

- **Recommendation (Draft)**

  The COMSTAC and the SWG recommend that the FAA/AST join the new industry-led ASTM Commercial Spaceflight Committee

On Orbit Commercial Satellite Construction and Servicing

- DARPA Briefing- Todd Master

Satellite Construction, Assembly, and Servicing Policy Implications

- No "on-orbit authority" to oversee activities
  - Is this compliant with Outer Space Treat Article VI "continuing supervision?"
- Similar to launch, liability regime for space is a central challenge
- Currently technical expertise for space robotic operations resides mostly at NASA (with pockets in U.S. Air Force and industry)
  - What is the best way to transfer that knowledge base to commercial entities?
- Potential for heightened international tension if purpose of robotic servicer is not understood or verifiable

Can we work to develop industry/government consensus standards for technical and operational safety to encourage commercial servicing and on-orbit construction capability?

On Orbit Commercial Satellite Construction and Servicing

- **Finding (Draft)**

  The COMSTAC SWG and the ISPWG support DARPA's interest in working with industry to develop voluntary industry-driven consensus standards for technical and operational safety to encourage commercial servicing and on-orbit construction capabilities.

  Such voluntary, industry-driven, consensus standards could benefit industry by avoiding incidents, accidents, and misunderstandings arising from a lack of knowledge of such activities.

Next Steps
Q3-4 2016

- SWG HSF occupant safety standards development roadmap collaboration with AST
- SWG input to Section 111 AST, GAO and STPI reports
- SWG participation and input to final planning and organizing of new ASTM Commercial Spaceflight Committee and its proposed road mapping sub-committee