

Commercial Space Transportation



Federal Aviation
Administration

COMSTAC-STANDARDS WORKING
GROUP (SWG)

October 25-26, 2016

OBSERVATIONS, FINDINGS AND
RECOMMENDATIONS (OFR'S)

Chair: Oscar S. Garcia

Vice-Chair: Livingston Holder



Industry Standards Agenda

- **US :**

1. CSCLA Reporting Section 111 (5) and (6)
2. Consensus Standards Development
3. Industry Spaceflight Safety Roadmap

- **International :**

1. US leadership- International Standards Organization (ISO)
2. DARPA CONFERS Program- Industry Consensus Standards

SWG Q 2-3 2016 Activities

- 3 SWG Conf calls
 - July STPI Sec 111 (6) Metrics
 - Sep AST Sec 111(5) Cons Stds
 - Sep ASTM/CSF ASTM New Act
- SWG members individual input to CSCLA Reports
 - STPI Sec 111 (5) Industry Metrics for Safety Frameworks
 - AST Sec 111 (6) Industry Consensus Standards Status
- SWG/ISWG Conf Calls
 - October
 - Ad-Hoc calls ISO, DARPA
 - May-October
- SWG Chair ASTM Organizational
 - October

CSLCA SECTION 111 REPORTING

- **Observation (Draft)**

The COMSTAC/ SWG applauds AST and IDA-STPI for seeking ample industry response and 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

Industry Consensus Standards Development

ASTM Commercial Spaceflight Standards Committee F47

- Organization Status Meeting (Held 10/24, DC) Highlights
 - Pat Picariello and Christine deJong ASTM
- Sample Subcommittees under development:
 - **Human Spaceflight Occupant Safety (HSF-OS)**
 - **Standards Road Mapping**

Committee Title Scope and Structure

Title: Commercial Spaceflight (F47)

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 spaceflight. One purpose of the committee is to create human spaceflight safety standards. The work of this Committee will be coordinated with other ASTM committees and organizations having mutual interest.

Proposed Subcommittee Structures

- F47.01 Occupant Safety of Suborbital Vehicles
- F47.02 Occupant Safety of Orbital Vehicles
- F47.03 Unoccupied Launch and Reentry Vehicles
- F47.04 Spaceports
- F47.05 Cross-Cutting
- F47.90 Executive
- F47.91 Terminology
- F47.92 Standards Road mapping
- F47.93 Regulatory Liaison

Commercial Spaceflight Committee (F47)

Next Steps

- i. Website
- ii. Roster
- iii. Establish Leadership
- iv. Approve Bylaws
- v. Member Training
- vi. Standards Road mapping
- vii. COTCO / BOD Approval
- viii. Strategic Planning



ASTM Commercial Spaceflight Consensus Standards Committee

- Observation (Draft)

The COMSTAC applauds ASTM, CSF, AST and other industry participants for attending a successful organizational meeting of the new ASTM Commercial Spaceflight Committee.



ASTM Standards Road Mapping

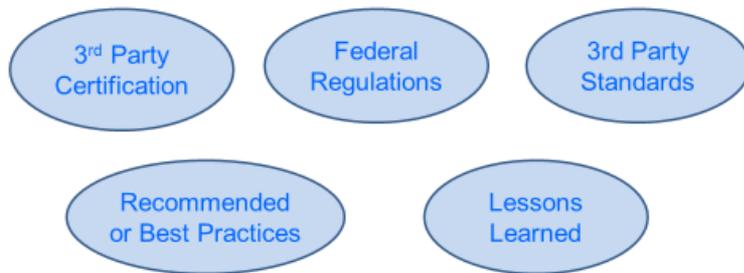
- **Finding (Draft)**

COMSTAC SWG supports and will assist in the formation of an ASTM Commercial Spaceflight **Standards** Road mapping Subcommittee in which industry and AST are encouraged to participate.

The activities would be to prioritize, develop and promote acceptance of industry consensus standards, recommended practices and other standardization tools benefitting safety. Such activities would be useful to AST, for example, in the planning and implementing of future licensing and/or regulation.

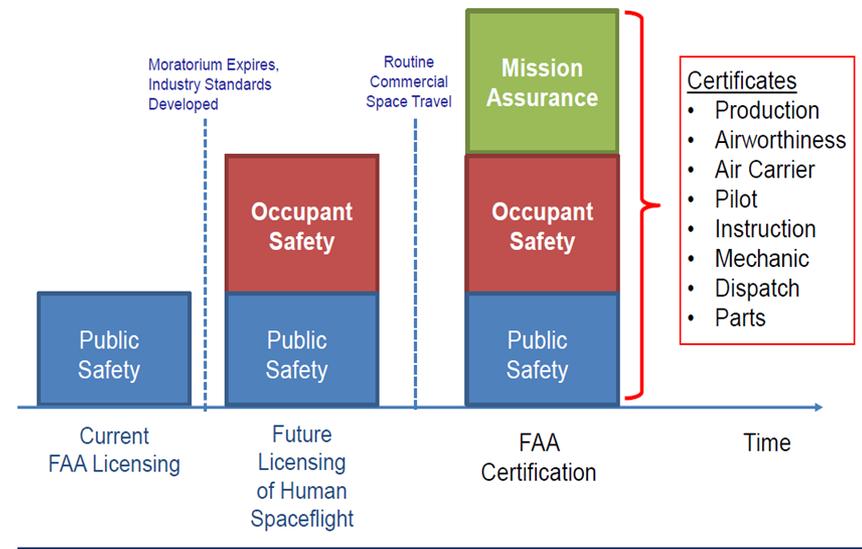
Human Spaceflight Occupant Safety COMSTAC SWG Road mapping

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

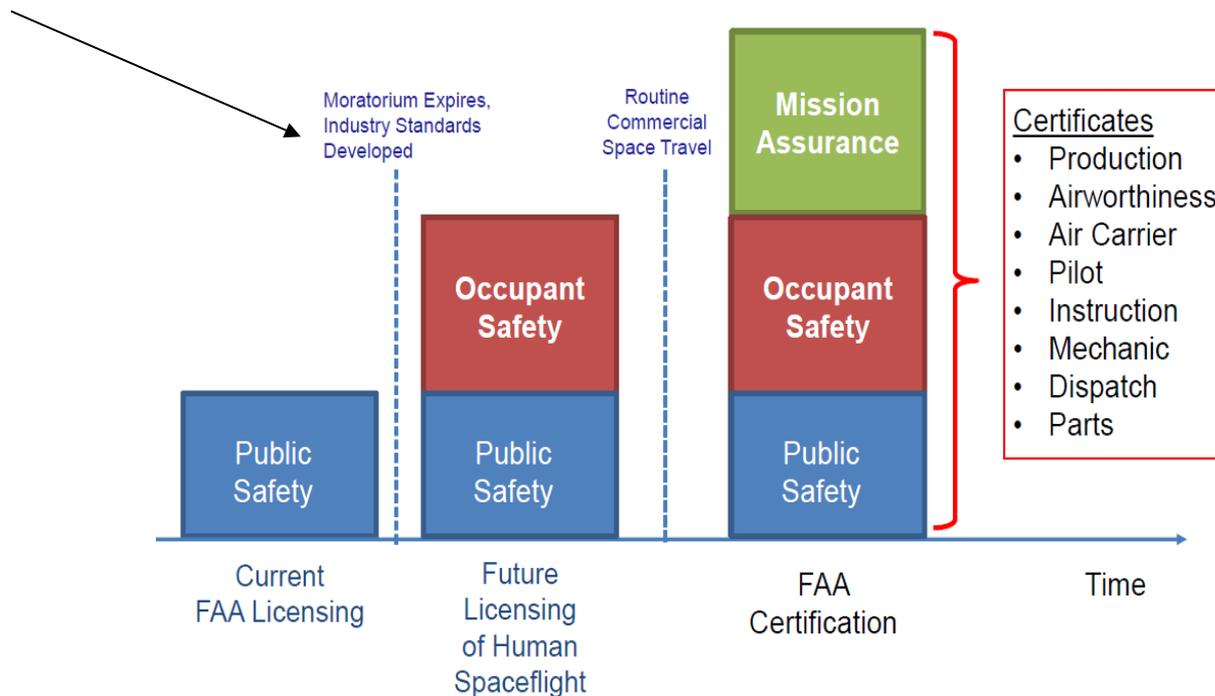
Potential Regulatory Path



HSF OS Roadmap

- Focus on next Milestone: Moratorium Expiration and possible HSF Licensing
- Roadmap requirements:
 - Voluntary consensus standards and other safety tools developed
 - HSF necessary licensing areas defined

Potential Regulatory Path



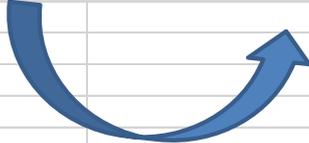
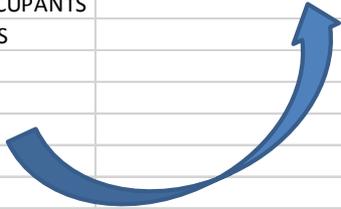
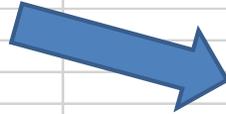
HSF OS Roadmap

- Focus on next Milestone: Moratorium Expiration and possible HSF Licensing
- Roadmap Evolution to Date
- Thanks to SWG Task Group Co-Leaders Paul Dampousse and Brian Gulliver, and Jim Duffy, et al for a first roadmap draft 2015-2016
- **Safety Roadmap Process:**
 - **Roadmap initial standard areas based on AST HSF OS Recommended Practices**
 - **As flight data from experience is gained with test crew, government astronauts and with participants for hire, standards will cluster in relevant areas for acceptance**
 - **Accepted standards and areas will lead to areas for potential licensing of launch operations**
 - **i.e. Operators license with a Human Rating or Human OpsSpecs**
 - **There might be different timelines and human rating or OpsSpecs levels for different CONOPS**
 - **i.e. Tourism, Scientific, Point to Point, NGO's, etc**

HSF OS Roadmap

Current Industry Input-Draft

2016	2016-20XX	2016-20XX	20XX
MORATORIUM	MORATORIUM	MORATORIUM	LICENSING
INITIAL OPERATIONS	ACTUAL FLIGHTS LAUNCHES	ACTUAL FLIGHTS LAUNCHES	STANDARDS DEVELOPED AND ACCEPTED
INFORMED CONSENT	INFORMED CONSENT	INFORMED CONSENT	HUMAN RATING
	CREW TEST/GOVERNMENT ASTRO/PUBLIC	CREW TEST/GOVERNMENT ASTRO/PUBLIC	CREW TEST/GOVERNMENT ASTRO/PUBLIC
SELF-REGULATION	SELF-REGULATION	SELF-REGULATION	SA'S, DIRECTIVES, BULLETINS, ETC
STANDARDIZATION KICK OFF AREAS	FOR HIRE HSF EXPERIENCE GAINED	APPLICABLE STANDARDS DEVELOPED	HUMAN RATING LICENSING AREAS
DESIGN & ENGINEERING	SAFETY DATABASES		VEHICLE AIRS/SPACEWORTHINESS
MANUFACTURING & ASSEMBLY	REPORTING SYSTEMS		FLIGHT/RANGE, GROUND/ CREW
MAINTENANCE AND REPAIR	KNOWLEDGE SHARING		PRODUCTION
QUALITY ASSURANCE AND TESTING	SAFETY STATS		OPS MANUALS
TRAINING AND TESTING, CREW	INSURANCE REQUIREMENTS		MAINT&INSP CREW
MEDICAL AND FITNESS, CREW	ETC	OPS SPECS	AIRWORTHINESS
MEDICAL AND FITNESS, OCCUPANTS		GROUND	ETC
FLIGHTWORTHINESS		RANGE	
ETC		FLIGHT ATMOSPHERE	
		FLIGHT EX-ATMOSPHERE	
		ETC	



HSF Occupant Safety (HSF-OS) Roadmap-Next Steps

- Industry input via COMSTAC/AST telecoms and surveys
- HSF Safety Roadmap REAL drivers:
 - **Reality-** Operational experience gained (metrics and milestones)
 - **Effectiveness-** practical Industry licensing areas
 - **Accord-** consensus industry standards, practices, safety data reporting, sharing and management (safety culture)
 - **Logic-** Licensing levels and timings suitable to type of operation (i.e. flex moratorium periods for adventure, scientific, P2P HSF licensed operations)

On Orbit Commercial Satellite Construction and Servicing

- Newly Formed Consortium CONFERS
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?



International Standards Organization ISO

Issue- US industry will benefit from enhanced leadership in ISO TC20/SC* 14 new standards development working groups

- US industry is not limited by ITAR to lead in the development new ISO standards
- Other countries are filling gaps, i.e. China's expert are leading most new standards initiative and development in the area of automation of launch processes

* SC14-Space Systems and Operators

International Standards Organization ISO

Finding:

It is beneficial for US industry to increase its efforts and participation in ISO's SC 14 to develop new international Space Systems and Operators standards. Such participation is not prevented by export controls.

Next Steps

Q4 2016 Q1 2017

- SWG further inputs to AST for Section 111 (5) (6) reporting
- SWG HSF OS focused **Safety Roadmap** collaboration with AST
- SWG participation and input to the development of the new ASTM Commercial Spaceflight Committee and its sub-committees
 - Focus on a Consensus **Standards Roadmap**