Progress with Commercial Space Safety Institute

ICAO/UNOOSA Symposium
Vienna 29-31 August 2017

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The Skills Gap

Licensing of commercial safety-risky activities is traditionally performed by a government regulatory body that has the responsibility for:

- levying safety requirements
- performing surveillance activities, and
- certifying compliance

However, considering the **ever-widening technical skill gap between high-tech industry and traditional government regulatory organizations**, such way of operations is becoming impractical in many advanced technological fields.

Space has some additional peculiarities: 1) skills gap between countries with long tradition of government space programs, and countries which are newcomers in the space arena; 2) skills gap within a country with specialized knowledge residing in a different government organization (e.g. national space agency, e.g. NASA vs FAA).

Bridging the skills gap within a country (Human Spaceflight)

The Case of Commercial Human Spaceflight in US

Current U.S. commercial space legislation limits FAA licensing to the protection of public safety during launch and re-entry operations.

However, there is one remarkable exception that applies to operators providing commercial transportation services to the International Space Station under the terms of NASA's Commercial Crew Program (CCP). They are required to obtain a NASA safety certificate for the safety of humans on board, as foreseen by the original agreements signed by governments participating to the ISS program (NASA OIG, 2016).

The Case of Commercial Human Spaceflight in US

The safety policy document ESMD-CCTSCR-12.10 “Commercial Crew Transportation System Certification Requirements for NASA Low Earth Orbit Missions” includes four parts:

a) **Certification Process**: outlining scope and elements of the certification process: validation of the technical and performance requirements/standards; verification of compliance with requirements/standards; consideration of operational experience; and acceptance of residual technical risk due to hazards, waivers, non-compliances, etc.

b) **Documentation**: compilation of plans and documents required for submittal at project milestones to collectively prove that the system meets technical requirements and is safe.

c) **Safety Requirements**: system capabilities in three primary categories of system safety, crew/human control of the system, and crew survival/aborts.

d) **Standards**: in the fields of engineering, safety, and medical/health, subdivided in those that must either be met as written, or equivalent alternate proposed to NASA Technical Authority for approval, or representing recommended best practices.

Verifying compliance with performance requirements is not easy task

Because it is simply impossible to formulate prescriptive requirements (i.e. detailed safety design solutions) for something that never existed before, space agencies use to issue safety and technical requirements that are goal/performance oriented.

Being performance requirements generic, verification of compliance is a crucial task demanding highly-skilled interdisciplinary competences.

During safety reviews of a CCP spacecraft, a NASA multidisciplinary panel of experts will identify issues and make recommendations, but cannot impose design or operational solutions. However, NASA Technical Authority can refuse to accept a risk.

Even if FAA would have the responsibility to regulate human spaceflight in US, it would not have the skills.

Third party certification: the example of Classification Societies

In the second half of the 18th century, marine insurers based at Lloyd's coffee house in London, developed a system for the independent inspection of ships presented to them for insurance coverage. In 1760, a committee was formed for with the express purpose of classifying the condition of each ship on an annual basis. In 1834, the Lloyd's Register of British and Foreign Shipping was reconstituted as a self-standing 'classification society'. Following the example, a number of Classification Societies were established worldwide.

Nowadays, Classification Societies act as a “Recognized Organizations” carrying out statutory surveys and certification as delegated by national maritime administrations (flag administrations).

Building a Commercial Space Safety Institute

No matter how much the cost of spaceflight will be slashed, without advancing the safety of space vehicles there will be no growth, no expansion and perhaps no future at all for the commercial human spaceflight industry.

Advancing space safety engineering applications, research, and education should be a primary strategic business goal of industry as a whole. **Industry should build on the experience accumulated in more than 50 years of government space programs, and cooperate within industry and with regulatory bodies to advance safety as common strategic goal.** For such purpose, the human spaceflight community should consider establishing a Commercial Space Safety Institute (CSSI) as a non-for-profit, independent company separated from trade organizations.

The CSSI would provide standardization and safety certification services commercial human spaceflight industry. The SSI should be a “recognized organization” approved by and operating under oversight of a national regulatory entity. The Commercial Space Safety Institute would also coordinate, support and promote research in the field of space safety engineering, support educational programs, and provide professional training opportunities to members.

Building a Commercial Space Safety Institute

	COMPANY	SAFETY INSTITUTE	REGULATORY BODY	INT. ORG
POLICIES	-	*advise*	*develop*	*coordinate*
STANDARDS	*implement*	*develop*	*validate*	-
CERTIFICATION	*data*	*perform*	*oversight*	-
PROCESSES	*establish/execute*	*establish/execute*	*establish/execute*	-
AUDITS	-	*Company*	*Safety Institute*	-
	COMPETENCE			
		INDEPENDENCE		
			AUTHORITY	

Announcement