

**Commercial Space Transportation Advisory Committee (COMSTAC)
Systems Working Group Teleconference Minutes
October 23, 2012, 1:00-2:00 pm EDT**

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I. Introductions

- a. COMSTAC DFO, Paul Eckert, introduces himself as the new FAA administrative lead for COMSTAC, and welcomes teleconference participants as they join the call. He also reminds attendees on the call to e-mail a confirmation of their participation. **(Participants list on page 7).**
- b. Paul turns the telecon over to Pam Melroy, FAA, who thanks attendees for their continued participation in this, the third telecon on human space flight occupant safety regulations. She says another notice will come out soon for the schedule of the next few telecons.
- c. Pam then turns the telecon over to the FAA project manager, Randy Repcheck.

II. Presentation

- a. Background
 - i. Randy Repcheck asks for everyone to reference the presentation available on the FAA website as he begins speaking about the agenda for the telecon.
 - ii. He begins with background information on what the FAA could and could not do. For instance, the FAA may not propose regulations covering occupant safety until October 2015. However, they may listen to industry input, from groups such as COMSTAC, during telecons such as this one. To comply with Federal requirements, attendees must identify themselves when speaking, and a copy of the minutes from the telecon will be posted, along with a list of attendees. Also, a notice will be published for the next telecon, including a new call-in number.
 - iii. The previous two telecons covered level of safety, and what FAA oversight would look like.
- b. Today's Theme
 - i. Repcheck states this telecon will question what types of requirements and associated guidance material should the FAA develop. This includes discussion of the level of empirical or analytical data that is necessary to justify any performance-based human space flight regulation, the possible use of advisory circulars to add clarity to regulations, and what place government and industry standards should have in FAA licensing.
 - ii. He describes three types of regulatory requirements:
 1. The first type of requirement is performance-based. He defines it as stating a safety objective to be achieved, leaving the design and operational solution up to the applicant. In other words, this is an outcome-based requirement.
 - a. Example: Code of Federal Regulations, Title 14, section 460.11 (abbreviated 14 CFR § 460.11) on Environmental Control and Life Support Systems says an operator must provide atmospheric conditions adequate to sustain life and consciousness for all inhabited areas within a vehicle.

2. The second type of regulatory requirement is process-based.
 - a. He defines it as specifying identification, assessment and control processes that must be undertaken and documented.
 - b. Example: 14 CFR § 437.55 on Hazard Analysis says the permittee must identify and characterize each hazard and assess the risk to public health and safety and the safety of property, etc.
 - c. He points out that most process-based requirements used are for reusable launch vehicles, since the FAA does not know enough to have detailed performance-based requirements.
3. The final type of regulatory requirement is prescriptive.
 - a. He defines it as specifying particular features, actions, or programmatic elements to be included in the design and operation, as the means to achieving a desired objective.
 - b. Example: 14 CFR § 437.51 on Crew Rest, which specifies the exact number of hours that can be worked.
 - c. He points out these are the least common kind of rules.

III. Discussion

- a. Repcheck breaks the discussion into three separate topics: specifying regulations, the use of advisory circulars, and the use of government and industry standards.
- b. TOPIC ONE: Specifying Regulations
 - i. Repcheck asks what type of evidence of a hazard is needed to justify a regulation. He points out that under the moratorium, the requirement is a fatality, serious injury, or near miss.
 1. Ron Cole asks whether a hazard must occur before regulations can be considered, or whether persons can postulate potential hazards. From an engineer's perspective, just because a potential hazard has not occurred does not mean it will never happen. This should cover the full spectrum of activities related to humans getting to and being in orbit.
 2. Jeff Greason expresses the opinion that allowing every potential hazard to be open for regulation is premature. The use of regulation should be measured against whether the standards and practices put in place by the existing operators are sufficient to contain that risk.
 3. Cole responds that there should be a decision process to identify what potential hazards should be opened for consideration.
 4. Greason states the criterion for consideration, historically, has been when a hazard starts showing up in the field, or in other words, a near miss. He believes there are enough issues present in the field already to begin consideration.

- ii. Repcheck asks whether problems in commercial spaceflight will be different from government human spaceflight experience.
 1. Greason responds that government history is better for advising new entrants to the industry, rather than a basis for new regulation.
 2. Tom Weiner compares this to a surgical classification system: (A) hazards that have occurred and are of major concern, (B) hazards that have not occurred but are of major concern, and (C) potential hazards that are less likely.
 3. Greason notes the purpose of regulation is to catch exceptional cases, not catch the majority of things that happen successfully.
 4. George Theismann compares this to aviation, both private and government, where there are lessons from the past that must be paid attention to.
 5. Derek Webber points out that human spaceflight will be happening on reusable spacecraft, a new and different class of vehicle than before. Since there is not as much history to compare, this may be a good place to use advisory circulars.
 6. David Alan says that either advisory circulars or regulations must be able to deal with new type of unknown public flyer, who is less experienced than NASA's highly-trained, highly-skilled astronauts.
 7. Greason responds that operators already have put into place appropriate safety processes to limit risk to third parties. He asks whether that needs to be regulated, or whether operators can show how they limit risk to the uninvolved public.
 - iii. Repcheck asks when a hazard should be addressed specifically in a regulation, as opposed to expecting an operator to identify and mitigate in a system safety process.
 1. Greason answers that in principle, the system safety process will catch everything, but in practice it will not. When there is evidence that hazards are not being addressed, ideally performance-based regulations should be considered.
- c. TOPIC TWO: Repcheck shifts to the second topic, use of advisory circulars.
- i. He describes the use of advisory circulars by the FAA, both for spaceflight and aviation. They are not mandatory, and are not regulations, but are meant to provide a means of demonstrating compliance with performance-based requirements. It allows the FAA to document government and industry experience.
 - ii. He then asks, in terms of guidance, whether people prefer general regulations with detailed advisory circulars, or detailed regulations with fewer advisory circulars.
 1. Greason answer that industry is moving too fast for anything beyond broad performance-based regulations. The revision and rule-making process is just too slow and too blunt an instrument.

2. Aaron Oesterle comments that advisory circulars do not necessarily need to correspond to a specific regulation, but can be used to promote overall safety.
3. Repcheck asks if there is a role for guidance documents in general, and Oesterle says the FAA can use them to advise companies on comparable events happening across the industry. It also allows industry to act before the need for regulation.
 - a. Greason points out the FAA can tie advisory circulars back to the safety system process regulations.
 - b. Repcheck comments that AST already has guidance documents tied to regulations, which they call advisory circulars. They are free to put out guides on topics associated with either public safety or human spaceflight.
 - c. Oesterle asks for clarification of the types of “guidance” the FAA can give, and Repcheck responds that advisory circulars are tied to regulations, whereas guidance documents are free-standing.
 - d. Webber clarifies his previous comments refer more to guidance documents. If the NASA database of the past 40 to 50 years could be converted for use as a guide.
 - e. Nigel Parker responds that his team at NASA-Johnson has compiled a history of all events of fatality or potential harm in human spaceflight, and will e-mail that to the FAA.
 - f. Pam Melroy responds that the FAA will e-mail that to all telecon attendees.
4. Tomaso DiPaola states a preference for the FAA to maintain some sort of regulatory mandate, to be able to issue something similar to an Airworthiness Directive.
 - a. Greason responds that FAA has that authority right now.
5. Repcheck asks whether people see a need for the FAA to roll the body of information available into a succinct series of guidance documents, or if the information is accessible enough already?
 - a. Greason states there is room to add value. The task of digesting that much information is difficult, but there should at least be a shared list of available repositories.
6. Brendan Lim asks whether advisory circulars could be in effect before the end of the moratorium.
 - a. Repcheck believes they can put out guidance documents that are not mandatory in nature, before the moratorium ends.
7. Geoff McCarthy asks what role NASA’s Aviation Safety and Reporting System can play, especially considering the competitive nature of the industry, and possible disincentives to sharing information.

- a. Greason states it has been a topic of discussion, but the problem is that there are too few operators and too few incidents to make the data truly anonymous.
 - b. David Gerlach, FAA, also states it has been discussed, and is working on how to make that data available to industry.
- d. TOPIC THREE: Repcheck moves the discussion to the final topic, the use of government and industry standards.
 - i. He mentions OMB circular A119 that directs federal agencies to use voluntary consensus standards in lieu of government unique standards. The goal is to not recreate or reinvent standards already out there.
 - 1. Example: NASA commercial crew requirements, CCT req. 1130, incorporating approximately 43 government and 19 industry standards.
 - ii. Repcheck asks how the FAA and industry can best use the existing body of knowledge.
 - 1. Greason says industry readily adopts standards that make sense. So the question becomes how to use industry standards appropriately. The problem is that industry does not have enough standards right now. There are not enough documented practices common within a sufficiently large segment of the industry. The most useful guidance from FAA would be to ask industry to codify standards in areas of potential future regulation.
 - 2. Repcheck asks to confirm the idea that FAA should communicate its top concerns to drive industry to codify those standards.
 - 3. Greason says writing standards is difficult work, even for industry that is employing technical experts. It is also difficult finding consensus among 4 or 5 different groups working in different ways. But maybe they can find overlap in areas of future regulatory concern.
 - iii. Repcheck asks whether the FAA should sponsor industry standards development through an organization.
 - 1. Greason says it would not be as helpful, since most industry consensus organizations cast a broader net beyond the core group of stakeholders. If the core group cannot work it out on their own, then a larger group probably will not be able to either.
 - iv. Dave Powell suggests looking into the AIAA's technical committees. The Life Sciences and Systems committee has developed standards documents. Overall, the committees are representative across academia, government, and industry.
 - v. DiPaola states a desire to see the FAA create a minimum level of requirement for the industry to use a consensus standard to flesh out more details.

- vi. Weiner suggests at least for medical issues, potential regulatory issues could be identified in current medical regulations, such as radiation exposure. Other issues, like space obstructive syndrome, visual problems, and intracranial hypertension are currently under a great deal of research.
- vii. Oscar Garcia notes that the Experimental Aircraft Association has used the AFCM industry standards quite successfully with a minimum level of regulation.
- viii. Allen comments on Tom's mention of medical issues. Work has also been done on neuro-psychiatrics and the effect of hypoxia and altitude on those phenomena. He thinks the FAA should address the use of medication by the public as they fly.

IV. Conclusion

- a. Repcheck thanks all attendees for joining in the telecon, and states that the tentative date for the next telecon is November 13, when the theme will be key terms and definitions for commercial human space flight safety.
- b. Livingston Holder, Chair, COMSTAC Systems Working Group, also thanks all attendees for participating. He encourages everyone in the industry to use telecons like these to provide feedback and inform the FAA about industry opinions, options, and experience. So if and when regulations do surface, the FAA has the full knowledge of the industry, and can determine what will help or hurt as the industry matures.

Teleconference Participants*

Livingston Holder (Holder Aerospace), Chair, David Allen (Black Sky), Sirisha Bandla (Commercial Spaceflight Federation), Chris Burns (Cutting Edge Communications), A.C. Charania (Virgin Galactic), Adam Dershowitz (Exponent Failure Analysis Associates), Anton Dolgoplov (Tauri Group), Phil Engelauf (NASA), Pete Fahrenthold (Northrop Grumman), Christine Fanchiang (Colorado), Tim Franta (FL Tech Consulting), Robert Frize (Carrick Consulting Ltd.), Oscar Garcia (InterFlight Global Corp.), Jeff Greason (XCOR), Brienna Henwood (NASTAR Center), Ruth Hunter (U.S. DoT/Volpe Center), Patricia Hynes (New Mexico Space Grant Consortium), Ray Johnson (Aerospace Corp.), Bill Jordan (NASA ISS), Angelo Karavolos (NTB Technologies and Associates Inc.), David Klaus (Colorado), Ronald Kohl (R.J. Kohl & Assoc.), Bryan Kuklinski (Orbital Commerce Project), Marshall Lammers (Zuckert Scoutt & Rasenberger LLP), Barbara Larsen, Charles Larsen (FAA retired), Michael Lembeck (Boeing), Raymond Leung (George Washington University), Teresa Lin, Shawn Linam (Qwaltec), Geoffrey McCarthy, James McMurry (Boeing), Robert Millman (Blue Origin), Aaron Oesterle (PoliSpace), Brad Owen (US Aircraft Insurance Group), Nigel Packham (NASA-Johnson Space Center), Bob Patlach (wyle), Mark Purcell (Lockheed Martin), Randy Raley (Sunshine Aerospace), Luis Rodriguez (USAF-Space & Missile Systems Center), Alex Saltman (Commercial Spaceflight Federation), Mike Snead (Spacefaring Institute LLC), George Tyson (Orbital Commerce Project), Lars Ulissey (NASA-Johnson Space Center), James Vanderploeg (UTMB Aerospace Medicine Program), Jay Venger, Mary Ellen Vojtek (Aerospace Corp.), Carl Walz (Orbital Sciences), Derek Webber (Spaceport Associates), Tom Weiner, Lashown Williams

*Affiliations listed where information available.

Participants from the FAA Office of Commercial Space Transportation (AST): Pam Melroy, Randy Repcheck, Jeff Sugar, David Gerlach, Stewart Jackson, Ken Wong, Brian Meade, John Howell, Howard Searight, Henry Lampazzi, Rene Rey, Thomas Martin, Mike Kelly