COMSTAC Recommendations for
Human Spaceflight (HSF) Regulation

The Safety Working Group reviewed the following human spaceflight guidance documents for currency and relevance to future rulemaking efforts:

- Human Space Flight Checklist
- Guidance on Informing Crew and SFPs of Risk
- Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle Operations with Space Flight Participants
- Guidance for Medical Screening of Commercial Aerospace Passengers

The comments and recommendations below reflect inputs received from the following parties:

- Axiom Space
- Boeing
- SpaceX
- United Launch Alliance
- Virgin Galactic
- ASTM F47 Commercial Spaceflight Standards Committee

GENERAL COMMENTS

Differences from Commercial Aviation

While there are multiple insights that can be provided from the history of commercial aviation, differences between the commercial space industry and the world of aviation are significant. Many of these discrepancies would make implementation of models that work well in aviation more difficult in space. For example:

- Age/maturity: commercial aviation has been around for over a century while commercial space has seen only three decades. Rapid evolution of spaceflight systems continues to take place and regulations need to consider this in their approach.
- Vehicle Diversity: though the world of aviation sees a multitude of different aircraft, the differences among them are small compared to commercial space which includes everything from vertically launched rockets, horizontally launched spaceplanes, and reentry vehicles to stratospheric balloons without propulsion systems. This makes it more challenging to find commonality that would be the focus of new HSF regulations.
- Flight and Customer Cadence: The commercial space industry is nowhere close to flying the number of vehicles, passengers, or total number of trips as commercial aviation, nor will it be anytime soon. This lack of statistical significance must be factored into new regulations.

Continued Support of Industry Consensus Standards Development

- For many years COMSTAC has recognized the importance of developing industry voluntary consensus standards. A particular focus of standards and recommended practices was, and still is, human spaceflight safety. Industry voluntary consensus standards comply with U.S. Office of Management and Budget Circular 119-A and National Technology Transfer Advancement Act guidelines.

- Since 2016, the FAA, industry, and academia have been involved in standards development with ASTM International through the F47 committee on commercial spaceflight. Continued support of this effort will help provide a baseline for compliance with potential future regulations covering human spaceflight.

Scope of Future HSF Regulation

- Will FAA human spaceflight regulating authority remain limited to the current scope of transportation to and from a stable orbit as defined in terms of public safety (i.e., launch and reentry)? Occupied vehicle requirements could potentially extend to all orbital transportation, habitable orbiting platforms, and other destinations. Comments provided only address launch and reentry; further review would be necessary to determine applicability and suitability for orbital transportation and space-based platforms should the FAA be tasked with the authority to address these.
- Is on-orbit space transportation regulatory authority anticipated; if so, when? Lessons learned from human spaceflight underscore the need for regulation to create certainty that enables decisions related to investment, indemnification and insurance.

SUMMARY OF RECOMMENDATIONS

Pilot Qualification

Existing FAA pilot certification requirements are prescriptive and alternatives should be permitted, particularly with respect to vehicle characteristics and level of autonomy, or relevance of pilot certification to specific flight vehicle characteristics

- Most vehicles are primarily autonomous, and both dynamics and environments are vastly different than for aircraft, requiring extensive space operations training regardless of status as an FAA-certified pilot.
- Skilled space operations professionals, such as astronauts and senior spaceflight controllers are equally qualified to monitor and report system status, control the local environment, direct crew/SFP actions, evaluate commit criteria, and execute contingency procedures.
- Non-pilot responsibility for public safety is already recognized by FAA in provisions for remote operators. Additionally, Part 450 provides performance-based requirements for flight safety operator qualification to execute public safety responsibility (including airspace).

Human Spaceflight Vehicle Rating

While FAA doesn't certify vehicles for human spaceflight, NASA has an extremely robust certification process for orbital spaceflight that exceeds FAA Part 460 requirements and is accepted as a means of compliance. FAA should implement its own HSF qualification program under a future set of Part 460 requirements to indicate fulfillment of all requirements for carrying occupants. This does NOT suggest that FAA adopt NASA Human Rating standards. FAA HSF qualification should not be conflated with FAA aircraft certification, which communicates acceptance of passenger risk as consistent with public risk requirements while spaceflight occupant risk clearly exceeds public risk requirements and will for the foreseeable future. In the meantime, FAA acceptance of existing NASA HSF certification for certain orbital spacecraft under the current regulatory regime should constitute US Government certification

for human occupancy as applicable to informed consent requirements under §460.9. With interagency agreements, FAA can utilize NASA expertise and reduce industry burden while building its knowledge base.

Informed Consent

FAA should streamline the informed consent process. Potential options include:

- Defining a continuing accuracy policy, inclusive of expectations following FAA updates to the safety record after SFP signature of informed consent.
- Providing means of compliance for expressing launch/reentry risk to occupants so laypeople can understand. This would include establishing consistent methodology for occupant risk based on products already required for licensing, such as hazard analysis and flight experience/reliability.

HSF Safety Record

- Safety records should be limited to US vehicles, as data from foreign mishaps may be unreliable or difficult to obtain. FAA, not each individual operator, should maintain data to ensure currency and consistency, and to avoid duplication of effort.
- FAA should evaluate mishaps in coordination with the providers to determine if they're applicable to occupant safety and to other vehicles/operators. This will avoid vehicle and HSF safety records being adversely affected by mishaps that aren't relevant to occupant risk.

Guidance Documents

In addition to the comments submitted on the content of the guidance documents, COMSTAC recommends the following:

- Human Spaceflight Application Checklist – since the majority of the text is directly taken from the regulations, retire this document and refer instead to the Part 460 compliance checklist.
- Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle Operations with Space Flight Participants - as much of the information contained within this document is duplicated or superseded in "Guidance on Informing Crew and Space Flight Participants of Risk," combine these two documents into one, consistent with Part 450 which consolidated requirements for suborbital and orbital vehicles.