

FEDERAL AVIATION ADMINISTRATION

+ + + + +

COMMERCIAL SPACE TRANSPORTATION ADVISORY COMMITTEE

+ + + + +

FALL MEETING

+ + + + +

WEDNESDAY

OCTOBER 26, 2016

+ + + + +

The Advisory Committee met in the National Transportation Safety Board Conference Center, 429 L'Enfant Plaza, SW, Washington, DC, at 9:00 a.m., Michael N. Gold, Chair, presiding.

PRESENT

MICHAEL GOLD, Chair
MICHAEL LOPEZ-ALEGRIA, Vice Chair
BRETTON S. ALEXANDER, Member
JAMES ARMOR, Member
BILL BECKMAN, Member
DANIEL COLLINS, Member
RICHARD DALBELLO, Member
OSCAR GARCIA, Member
JEFFREY KENNETH GREASON, Member
KRIS LEHNHARDT, Member
WAYNE HALE, Member
DAN HENDRICKSON, Member
LIVINGSTON L. HOLDER, JR., Member
JANET KARIKA, Member
BILL N. KHOURIE, Member
CHRISTOPHER KUNSTADTER, Member
DEBRA FACKTOR LEPORE, Member

SAMANTHA MARQUART, Member
DALE K. NASH, Member
MARK SUNDAHL, Member
JENNIFER A. WARREN, Member
CHARITY WEEDEN, Member

ALSO PRESENT

RUDY deLEON, Senior Fellow, Center for American Progress
MICHAEL FRENCH, Chief of Staff, National Aeronautics and Space
Administration
KAREN GAHART, Director, Operating Budgets, Federal Aviation
Administration
CHRISTOPHER INGRAHAM, Senior Policy Advisor, Congressman Jim
Bridenstine
GEORGE C. NIELD, Associate Administrator for Commercial Space
Transportation
JOSEPH SCHMOLL, Legislative Assistant, Senator Steve Daines
ROBERT WALKER, Former Congressman and Executive Chairman of
Wexler Walker

* Present by telephone

Welcome/Opening Remarks by the Chair: Michael Gold, Chair

The COMSTAC Meeting convened at 9:30 a.m. Chair Gold introduced new members Maj. Gen. James Armor, Dr. Mark Campbell, and Charity Weeden to the rest of the committee.

Transitions and Commercial Space Policy: Michael French, Chief of Staff, National Aeronautics and Space Administration (NASA)

Mr. French began by thanking the COMSTAC for their assistance over the years, given that this will be the current administration's final meeting.

The upcoming transition to a new administration and new priorities will be a one- to two-year process. The first step is the appointment of a "landing team," or an agency review team, which is brought in to consider what projects a given agency should focus on and potential appointees. Not all agencies get a landing team, but it's likely that NASA will because of how large and integral it is. NASA has not yet received information about its landing team, however. The members of the landing team are codified in an official memo from the White House explaining that these are the choices of the President-Elect. Tom Cremins will be handling the information packets that will be given to the landing team members. The information contained in those packets will generally be subject to FOIA requests, but there may be specific items that require a separate Memorandum of Understanding prior to discussion. Many but not all of the members of the landing team will end up at the agency they are reviewing.

Using the example of the Obama Administration, two people were immediately placed in every agency, one person to act as a White House liaison and another as a point person for staffing and policy questions. NASA functions differently than most other agencies when it comes to transitions because it has less than 20 total political employees as compared with other agencies which have over a hundred.

Budgets are also handled differently in transition years. Instead of the usual OMB submission and passback, federal agencies set up a baseline budget that excludes allowances for policy, so that the new administration knows what the agencies' operating costs are. This is really what frames the yearlong transition process because new priorities are really only set with the conventional process for the FY '19 budget a year later. Again, using the Obama Administration as an example, it put out an FY '10 budget, but it was really the FY '11 budget that reflected the changing priorities.

The years 2017 and 2018 mark big milestones for NASA, including Commercial Crew, EM1, JWST, as well as many tech and science missions. These plans present the new administration with a series of low-risk, high-visibility successes, in that they have already been planned and any failures can be blamed on the previous administration. That being said, the new administration will also have to decide which programs they are going to continue. Specifically, this means deciding on whether to continue the ISS extension and ISS follow-on; which partnerships to perpetuate; what to do with small satellites activity and venture class launch; and what its relationship will be with the Chinese space program.

Mr. French focused on sketching the current issues faced by ISS extension and ISS follow-on to allow for questions. The first issue NASA has concerned itself with is the dual-use of NASA dollars. This means

funding programs like NextSTEP Broad Agency Announcements (BAAs), so that NASA answers some of its technology questions and business becomes invested in those innovations. Secondly, NASA has been figuring out how to navigate permitting certain technologies to go forward without discouraging competition by favoring one option.

How to address these issues will be up to the new administration because the ISS extension and ISS follow-on arrive on the budget horizon during FY '18 and '19. Out of the myriad possibilities, Mr. French identified three general scenarios that he sees as possibilities. The first one would be limiting NASA's dual-use dollars, focusing entirely on NASA's deep space exploration needs, and not doing anything with ISS follow-on. The second option would be the continuation of dual-use dollars. In this scenario, NASA would focus on investing in its low-earth orbit (LEO) needs by incentivizing industry solutions. The third one would be more aggressive than dual use. In this scenario, instead of just answering NASA's LEO tech questions, NASA would be actively sponsoring LEO commercialization itself. That final scenario requires NASA to be very careful about picking winners among a nascent set of options, but also must have a distinct set of milestone markers.

As far as new partnerships are concerned, there's a new practice for making NASA agreements. NASA's General Counsel and procurement branch have changed their approach to working with prospective partners to craft the proper partnership depending on the needs of the parties. The question facing the new team will be whether to continue this more permissive practice or to go back to more restrictive procurement.

The new administration will also decide whether or not to perpetuate NASA's internal Partnership Council, which filters partnership ideas to ease the decision-making process. Mr. French cited the Red Dragon partnership as an example of an opportunity which raised a lot of questions about how it could be executed within NASA. In that case, the Partnership Council produced a document which explained how and why to establish the partnership. Mr. French believes that the increased flexibility in establishing partnerships and the effect of the Partnership Council, if preserved by the next administration, will become a big part of NASA's future.

Questions from the COMSTAC

Vice Chair Lopez-Alegria challenged Mr. French's assumption that, with regards to LEO, companies would prefer that NASA wait rather than select an option quickly. He argued that well-established companies don't want to expend resources on an option that will eventually be closed, while developing companies need certainty to establish investments. Mr. French clarified that the tension comes from reluctance on NASA's part to kill potentially viable ideas, or fear of choosing the wrong idea because a choice was made too quickly.

Key Issues Facing FAA AST and Industry: George Nield, Associate Administrator for Commercial Space Transportation

Commercial space transportation is on the rise. Costs are falling while capabilities are increasing. While space flight continues to be risky, private companies have demonstrated a greater tolerance for risk

than the government. Companies are making announcements about progress toward goals like commercial spaceflights to the moon, satellite servicing, asteroid mining, or global satellite-based internet access.

Dr. Nield framed his talk in terms of outlining some of the challenges faced by the aerospace industry, as well as five specific ideas about how to meet those challenges.

Resources pose the first challenge. Aerospace Technology (AST) must keep abreast of new technology if these ventures are going to come to fruition as fast as possible, and, in order to do that, its resources must be increased. Current AST standards allow for 180 days before new licenses are approved while modern launch operators are asking for that timeline to be halved. New staffing models will provide more accurate budget requests that should alleviate some of the lag time issues. Between FY '15 and FY '16, launch requests increased 82%, inspector training hours increased 88%, and inspections increased 62%, all within a 7% budget increase. Congress' refusal to approve a new budget severely impacts this continued success, however.

The next challenge will be managing expectations for commercial space flight success, given that historically 1% of manned spaceflights have ended in fatal accidents. Dr. Nield believes it likely that suborbital manned spaceflights will be achieved by at least two companies by the end of 2018. In order to preempt the inevitable public relations backlash to a fatal accident, AST believes that it must reach out to Congress and the media with the message that space travel carries inherent risks. Integral to this message will be separating out the public perception of the safety of commercial airline travel from the actual safety of commercial space travel, since the latter is much riskier.

The third challenge is figuring out how to handle non-launch space-related activities. Currently, carrier-launch systems are beholden to two different statutes established by two different agencies. This creates inefficiencies both in terms of commercial operation and government regulation. The possibility of using military aircraft for spaceflight training or other AST-related purposes complicates this issue. While NASA uses T-38s for astronaut training, commercial enterprises would also like to use similar aircraft as part of private space training programs, which is not currently allowed under the regulations. Dr. Nield proposed defining and authorizing space-support vehicles in order to regulate them, potentially within the Commercial Space Launch Competitiveness Act.

The fourth challenge will be enabling new and non-traditional commercial space operations. OSTP drafted a report at the request of Congress that contemplated allowing AST to issue individual mission authorizations. This would allow AST to fulfill its obligations to monitor space activities under the Outer Space Treaty. There has been some disagreement among stakeholders about this proposal, however. Dr. Nield proposed making this issue the provenance of the FAA and allowing them to develop a method for executing these authorizations in an efficient and non-bureaucratic way. He explained that his interest wasn't that the FAA be the chosen agency, but rather that a specific agency be chosen and held accountable.

The fifth and final challenge AST faces is starting development of a civil space traffic management system. While some progress has been made on this question, concerns remain about cost,

implementation and accuracy. The FAA should develop a pilot program in tandem with the DoD for sharing safety-related space situational awareness (SSA) data. The pilot program would help answer questions about the overall architecture of the final system.

Member Holder asked Dr. Nield how he sees SSA data transitioning into space traffic control work. Dr. Nield clarified that AST sees space traffic control as a general term. AST will step up its activity to a detailed space traffic control architecture, beginning with simply proving AST's ability to share data and to protect national security concerns. The next step will be to map out orbits and traffic patterns. Dr. Nield sees the following step as engaging stakeholders to develop best practices. Stepping the complexity up in this way hopefully will reveal issues that will make clear what rules need to be codified, similar to common-sense traffic laws.

Questions from the COMSTAC

Member Armor asked how Dr. Nield was handling the transition process and whether he was satisfied with the attention AST was getting. Dr. Nield responded that departments across the FAA were in the middle of preparing documentation that will guide the landing party in the transition process. Specific individuals and plans, however, have not been established.

Member Greason said he believes there is general consensus around four out of five of the challenges and solutions, with how to handle the next fatal accident being the outlier. He said that industry bears the brunt of the responsibility for being unprepared to handle this issue. At the ASTM meeting last Monday, it was suggested by an industry representative that they strike improving space flight safety from a proposal because it suggested that space flight wasn't already safe. Besides the fact that all current metrics indicate the contrary, Member Greason argued that it's in the interest of all regulators to work consistently to increase safety. Dr. Nield thanked Member Greason for his comments and agreed that it was the responsibility of every stakeholder to work on this issue.

Vice Chair Lopez-Alegria asked Dr. Nield what he would do concretely to change public perceptions and what could COMSTAC do to assist in that process. Dr. Nield said that this is an area of high interest within the FAA, spurred by the FAA Administrator. He said that specific ideas are still being developed and he welcomed any feedback that COMSTAC members might be willing to give.

Member Garcia commented that he was in complete agreement with Member Greason's comments. He suggested that the commercial stakeholders represented in COMSTAC can work within their own domains to improve the safety of space operations.

Chair Gold echoed Member Garcia's and Member Greason's comments, pointing out the reflexive regulations that follow tragedies are often bad and can kill the industries they're supposed to govern. He said that the solution is to work prior to any accident on building a system that will address these issues, preventing a knee-jerk reaction.

Member Lepore suggested that her working group adopt Dr. Nield's language discussing the requirements of the Outer Space Treaty as it seemed to clarify some of the difficulties they were having.

Member Sundahl suggested that Dr. Nield's message about safety be oriented towards what the goal of commercial space operations was and the benefit to the world of succeeding in this venture.

International Space Policy Working Group Report: Mark Sundahl, Chair, International Space Policy Working Group

There have been two suggestions in particular that the working group has been refining, though they have not yet formally adopted them. The first is an expression of support for the U.S. Committee on Peaceful Uses of Outer Space (COPUOS) delegation. The delegation has adopted the first 12 guidelines for the Long Term Sustainability (LTS) for outer space, in the face of pressure against these guidelines from other nations. Member Sundahl presented to the working group and now to the COMSTAC the observation and finding to support the U.S. delegation's continued work on this subject. In this OFR, COMSTAC observes that the U.S. delegation to COPUOS continues to press for sustainability after passing the first 12 LTS guidelines. COMSTAC finds that the adoption of further LTS guidelines will benefit the U.S. space industry and therefore supports the delegation's continued efforts. COMSTAC commits to providing the U.S. delegation assistance in these efforts. In particular, COMSTAC pledges to send a representative to the appropriate plenary meeting or subcommittee to support the U.S. delegation.

There was discussion among working group members as to whether the language about benefits to the U.S. space industry should be expanded to include the international space industry. There was recognition, however, that the scope of COMSTAC's charter limits its concerns to the U.S. space industry, though the working group acknowledged that the health of the international industry affects the health of the national industry.

Member Greason stated his discomfort with saying that the COMSTAC supports further guidelines without knowing what those guidelines are. Member Sundahl agreed, saying that the COMSTAC has not delved into the guidelines and offered to postpone voting on the OFRs until they did. The idea behind the OFR was simply to encourage the U.S. delegation to continue to press for what will benefit U.S. industry.

Member Weeden corrected the findings, saying that she recalled the working group approving the pursuit of further LTS guidelines, wording which avoids the problem of approving them before they've been announced. Member Sundahl agreed and amended the document. He reiterated that his goal was to offer a general OFR. Member Greason moved to approve the amended OFR. The COMSTAC voted unanimously in favor of the observation and finding.

The next OFR concerned spectrum allocation. The NTIA's Office of Spectrum Management briefed the working group on the challenge it faces in allocating radio spectrum among large constellations and groups of nano-satellites. The current solution is to develop new models for sharing spectrum. Jennifer Warren drafted the OFR, which was discussed but not voted on by the working group. The COMSTAC observes that predictable and stable access to spectrum is necessary to support emerging and existing commercial space operations and that the international regulatory process has begun for considering changes to the international spectrum allocation table; finds that it's critical to ensure that the

commercial space industry has an advocate for preserving or securing spectrum access in order to advance U.S. leadership in commercial space operations; recommends that the appropriate office at the FAA advocate for U.S. commercial space spectrum interests.

Member Warren noted there are national spectrum issues as well which might form the basis for a collaborative working group with the body that handles domestic spectrum operations. The committee voted to adopt the observation, finding and recommendation.

The next two OFRs concerned export controls. The COMSTAC observes that it's been asked to assist with updating the Department of Commerce's 2008 manual Introduction to U.S. Export Controls for the Commercial Space Industry; recognizes the benefit provided by the manual, particularly for start-ups, and agrees that it needs changes; recommends that it would be beneficial for COMSTAC members and partners to assist in the revision of the manual. Member Lepore noted the OFR doesn't have to find any action for the COMSTAC; it can just read that the COMSTAC commits to a specific action. Mr. Beavin said DOT would need to be added to the OFR since the COMSTAC is an instrument of the FAA. The COMSTAC voted unanimously to adopt the observation and finding.

The second OFR related to export controls and the Department of Commerce's ruling on USML Category 15, which deals with spacecraft systems on the United States Munitions List. The rule has not been adopted yet, though Member Sundahl expects it to be by April 2017. The purpose of this OFR is to encourage the DDTTC and the Department of Commerce to make these rules final to give companies clarity about what the export regime is. The COMSTAC observes that the Department of Commerce intends to publish a final rule regarding Category 15; finds that industry would benefit from the publication of this rule; and recommends that the FAA AST convey the COMSTAC's support for the publication. The Committee voted in favor of the OFR.

John Sloan updated the working group on some of the international outreach efforts he's been working on as a part of COPUOS. Namira Salim, founder of the Space Trust, also spoke to the working group about some of her work. The working group with the standards working group was briefed on DARPA's CONFERS program. OFRs related to that discussion will be presented at the April 2017 meeting.

For the final OFR, the COMSTAC observed that the Space Resource Exploration and Utilization Act of 2015 promised U.S. industry that it would have ownership over any resources mined from celestial bodies. This was objected to by other countries as a violation of the Outer Space Treaty, though a panel convened by the International Institute of Space Law (IISL) convened in September determined that there was no substantial violation. The COMSTAC finds that, after discussion, there was no significant disagreement on the act's legality; and it recommends that the FAA and other agencies refer to the IISL consensus when defending the legality of the act.

Questions from COMSTAC Members

Member Warren suggested defending was too negative a word and that the language should read explaining instead. She also suggested that the OFR reference members of the international community and not members of the panel. Member Lehnhardt suggested that international acceptance

disingenuously suggested that all nations agreed, when the individuals in the room were not necessarily representatives of their country. After some discussion, the COMSTAC decided that the phrasing should be provides significant basis for. Member Lepore suggested that the language be softened to give the FAA more leeway when responding to inquiries. Member Warren suggested softening the language further by modifying it to read provides a significant further basis.

Dr. Diane Howard, member of the executive board of the IISL, stated on behalf of the board that this OFR mischaracterizes the proceedings by unduly focusing on what was happening in one section of the consortium. The academic consortium was so crowded with eager participants that not everybody was able to present nor be a part of the following Q&A. Furthermore, the use of consensus implies a decision was made when in fact there wasn't. At the force of Dr. Howard's comments, Member Sundahl agreed to table the OFR though he disagreed with her position. The COMSTAC voted in favor of tabling it.

Presidential Transition Space Policy: Rudy deLeon, Senior Fellow, Center for American Progress and Robert Walker, Former Congressman and Executive Chairman of Wexler Walker

Mr. deLeon began with a brief tribute to the late test pilot Bob Hoover. He outlined five recommendations for the upcoming transition period. Firstly, NASA must keep on track. This transition is unlike the previous one 8 years ago in that there are many important programs that have begun which need further commitment if they're to be completed. NASA has invested a lot of money in space launch and crew vehicles and all the parts are going to need to work together if NASA is going to improve U.S. LEO capabilities. The next recommendation is that NASA stick to its plan. Mr. deLeon is in favor of tried and true methods like the proving ground missions. He proposed opening these methods up to interested private partners in order to deepen their relationships. The third imperative is that NASA continues to foster such private partnerships. Through contracts to assist with ISS deliveries, NASA has sponsored commercial transportation in space. It should continue to encourage competition to drive both jobs and innovation in the industry. The fourth recommendation is to focus on utilizing the current technology in the best way possible to the end of seeing another launch at Cape Canaveral in the next several years. The fifth and final recommendation is that NASA engages its global partners. Space exploration gives the U.S. an unparalleled opportunity for international leadership. While the U.S. already has established relationships with European, Canadian, and Japanese space programs, there may be room to cooperate with the emerging Chinese and Indian space programs towards a mutually beneficial result.

Mr. Walker, as the advisor to the Trump campaign on its space policy, provided a sketch of what the Trump administration would likely do for its space program. Mr. Walker called the plan visionary, disruptive and resilient. The plan envisions total human exploration of the solar system by the end of the century. The ulterior motive behind this ambitious plan is that it would drive technological development in order to achieve its goals, similar to the Apollo program. The administration would turn non-military LEO projects over to the private sector. Moreover, Earth-based missions would be transferred to other agencies so that NASA could focus its resources on deep space exploration. The administration would like to leverage private

partnerships to continue investment in the ISS through contracting. In general, the administration envisions a greater application of public-private partnerships and may consider restructuring the agency in the manner of JPL. A National Space Council would oversee the various projects in order to ensure resources are being used properly. The resiliency of the administration's plan is related to the military space applications, increasing the constellation and implementing robotic servicing. It sees an agile and responsive military capability as a primary reason for developing this technology.

Mr. Walker enumerated nine actionable items in response to these proposals. (1) The U.S. would announce a commitment to global space leadership to produce technology and jobs; (2) a National Space Council would be appointed to take advantage of efficiencies in U.S. space activity; (3) set a goal of human exploration of the solar system by the end of the century with the necessary technological advances to reach that goal; (4) redirect Earth-based mission spending on climate change projects to deep space projects; (5) develop a new generation of military satellites; (6) commit to hypersonic technologies for increased military responsiveness; (7) turn over LEO projects to the private sector to provide them with new resources for innovation and job creation; (8) begin negotiations to include more private and public partners; and (9) demand that every federal agency incorporate space projects into the fulfillment of their missions.

Questions from COMSTAC Members

Chair Gold started off the questions by asking Mr. deLeon what role he sees the moon and cislunar space playing in this transition process. Mr. deLeon responded that because of the lengthy timelines for NASA projects, the return to the moon begins with a budget agreement in Congress so that NASA knows what resources it has to work with. Without a predictable budget process, planning long term projects is not viable. He argued that NASA needs to first figure out the best uses for the technology that has already been developed to apply that knowledge to cislunar missions.

Mr. Walker agreed with Mr. deLeon that improvements need to be made to add clarity to the budget process. But because any new budget deal is not likely to include large appropriations for the space program, the task will be marshaling the resources that are already being spent on commercial space projects. Specifically for the moon, Mr. Walker stated that he's been convinced since the Aldridge Commission that the moon should be a goal of the space program.

Member Greason asked the panelists what their views were on NASA as an agency charged with keeping the peace in space, given budget constraints and bad actors in the international community. Mr. Walker answered that NASA's stretch goals of establishing peace in space might be best achieved by looking outside of the traditional realms for innovation. One of the ways to avoid conflicts is to make partners out of potential adversaries. Mr. Walker suggested bringing China on to participate in the space station project. Mr. deLeon replied that he believes that it's important to preserve the historical division

between the military and space technology. Beyond that, he stated that DARPA and NASA must integrate with the new business models of the private sector companies that are also producing the most innovative technology.

Member Lepore asked Mr. Walker how he sees the budgets working if NASA's earth-based missions are indeed turned over to other agencies. Mr. Walker argued that many of these missions are more appropriate to NOAA and that NOAA's budget would have to be increased in order to absorb those tasks. He sees this as an opportunity to seek out alternative methods of funding NASA projects. Mr. deLeon generally agreed with Mr. Walker's comments.

Member Garcia informed Mr. Walker that there's a portion of the private sector that's very interested in commercial applications of military-grade hypersonic technology for near-space transit. Mr. Walker agreed and believes that military developments will be gradually dispersed, but that the military application takes priority. Mr. deLeon recalled the funding difficulties for the national aero-space plane (NASP) and said that the same funding issues would not be repeated for the development of hypersonic flight.

Member Hale asked the panelists to share their thoughts on the transition of space traffic management from the DOD to the FAA. Mr. deLeon answered that it's ultimately going to be accomplished through and interagency effort regardless of who has ultimate authority. Mr. Walker concurred, pointing out that NASA at one point held that everyone who wanted to go into space had to seek its approval first. He also said that though space traffic management does seem to belong under the FAA's purview, members of the commercial space sector are worried that the agency's regulatory tendencies will quash innovation.

Member Armor asked the panelists for more in depth comments about their positions regarding the Space Resource Exploration and Utilization Act, specifically whether this act should be interpreted as a laissez-faire attitude towards private companies or whether it was more specifically limiting liability coverage, et cetera. Mr. Walker responded that he envisioned NASA using the promise of the act to leverage its technical expertise with companies interested in gathering resources. He emphasized, however, that private industry needs the project of exploring resources in space. Mr. deLeon agreed with Mr. Walker, saying that there were a host of questions that need to be worked out on an individual basis. He said that the rules on operating sovereignty especially posed problems for interagency cooperation.

Chair Gold asked if both Mr. Walker and Mr. deLeon could agree that NASA needs to expand commercial opportunities and that the U.S. should explore a deeper relationship with China's space program. Mr. Walker agreed. He dismissed concerns that China might steal technology or that we shouldn't partner with China in this regard on account of its human rights abuses, explaining that China has as much to offer the U.S. as the U.S. has to offer it. Mr. deLeon stated that space exploration and commercial space activities shouldn't be a partisan issue because they are good for business and good for the nation. He also shared that there have been some inroads towards establishing a relationship with Beijing. That being said, he reiterated his belief in perpetuating the separation of military applications from the

development of space technology and stated that China would have to make clear its purpose in space. Nevertheless, the future of space exploration and the commercial utilization of space will require so many resources – intellectual, engineering, and financial – that the U.S. should be considering forging as many strong partnerships in this realm as it can.

Member Beckman asked two questions. The first was about the International Space Station and whether 2028 was a firm end date. The second was about the hurdles that the U.S. faces with the Chinese space program being integrated into the Chinese military. Mr. Walker said that he believed that the issue of China's militaristic space program could be worked out diplomatically. He added that he doesn't believe that the nations involved in the ISS will commit to dropping a \$100 billion asset into the ocean and that the focus, rather, should be on upgrading the station. Mr. deLeon agreed, explaining that there are still many options on the table as to what can be done with the ISS, from research to technological upgrades to commercial applications.

Standards Working Group Report: Oscar Garcia, Chair, Standards Working Group

The working group has held three conference calls since the last full meeting. In July, it met with STPI in support of Section 111 of the congressional report regarding metrics and thresholds; in September, the group discussed 111 (5) with ASTM; and also in September, the group discussed the establishment of a new consensus platform under ASTM. For the first observation, the COMSTAC Standards Working Group praises ASTM and IDA-STPI for seeking industry response on occupant safety standardization and readiness metrics. The COMSTAC adopted the observation.

Member Garcia updated the COMSTAC on the industry consensus standards development. A week earlier, ASTM held a meeting to start work on establishing a commercial spaceflight standards committee. This committee would allow industry members to bring in experts to develop consensus standards for the American National Safety Institute (ANSI), with regards to commercial space flight operations. This committee, denoted as committee F47, will potentially have Human Spaceflight and Occupant Safety as its first subcommittee. The organizational committee decided that F47's scope will be development and maintenance of standards and recommended practices for commercial spaceflight, including design, manufacturing, and operational use of vehicles. The work of F47 will be coordinated with other standards development projects.

Member Greason commented that this committee will be very helpful but that industry members should temper their expectations because standards development is a difficult process. Member Garcia informed the committee that this was one of the concerns discussed and that there is no expectation of a high turnover rate for standards. Member Holder said that ASTM's highly structured process makes results more predictable and reduces uncertainty. Member Collins expressed concern about the narrow scope of the committee conflicting with the more general scope of the subcommittee. Member Garcia thanked the members for their points and suggested that having ASTM observe this committee will create a means for ongoing discussion about these issues. ASTM will also play a kind of checks-and-balances role by performing a gap analysis to prevent work from being duplicated among other standards development organizations. The related observation is that the COMSTAC supported ASTM,

CSF, AST and other industry participants for attending a successful meeting for the establishment of this committee. The COMSTAC voted to adopt the observation.

The next finding regarded standards road mapping. The COMSTAC standards working group supports and will assist with an ASTM commercial standards road mapping subcommittee which will develop and promote standardization tools geared toward improving safety. The COMSTAC voted to adopt the finding.

Member Garcia stated that, in conjunction with the tools being developed with STPI and AST, he expects to see a Safety Data subcommittee emerge from this process. The idea is that this safety data would be used to preempt problems, just as it is in airline safety. He suggested that coming to an agreement about what data should be shared could help with the development of that project. Member Garcia clarified that these standards road mapping activities will be conducted by the standards working group until next spring while F47 is being organized in order to assist with the development of safety standards.

Member Dalbello expressed concern that having a COMSTAC standards working group project that operates separately but in tandem with the ASTM process is trying to do too much at one time in terms of standards development. Member Greason interposed a suggestion that the COMSTAC consider rechartering the standards subcommittee to not only focus on the development of future standards, but to also work on more immediate safety issues. Vice Chair Lopez-Alegria agreed and Chair Gold suggested that the working group address this offline, adding that he would also like to reexamine COMSTAC's charter in that same meeting.

The working group was also briefed by the U.S. Technical Operations Chair for ISO Subcommittee 14 and it seems that there is a misperception among industry members that participating in ISO might have complications for ITAR. The issue with this is that other countries such as China are populating the ISO working groups with experts. U.S. industry members are not necessarily limited by export controls in leading the development of new ISO standards, though it does constrain some of their behavior in taking up that task. The COMSTAC voted to adopt the finding to this effect.

Operations Working Group Report: Janet Karika, Chair, Operations Working Group

Discussion about range status and spaceport has been tabled until the spring meeting. Eight out of ten spaceports have contributed to the spaceport guide, and the OWG is working closely with FAA to capture the data which has been provided thus far. The group focused primarily on space traffic management and space support vehicles for this meeting. Stephen Earle, Space Traffic & Air Force Interfaces Lead, and Moriba Jah, University of Arizona, spoke to the group about space traffic management while Glenn Rizner, Special Projects, FAA AST spoke about space support vehicles.

The observations the working group adopted for space support vehicles were as follows. The COMSTAC observes that the FAA AST and the GAO are required to submit reports to Congress on commercial Space Support Vehicles (SSV) in the Commercial Space Launch and Competitiveness Act; and that both the FAA AST and GAO have received input from industry regarding the use of commercial SSVs for space

flight participant and crew training including safety-related data gathered from routine flight operations at spaceports and in the National Airspace. The finding was that utilizing commercial SSVs for space flight participant and crew (government and non-government) training will reduce safety-related risk and provide critical safety-related data from routine flight operations at spaceports and in the NAS.

The idea behind waiting to offer the recommendation is that this method will give the working group time to analyze and respond to the reports that will come out between now and then. Member Karika anticipates asking the FAA to streamline the permitting process for space vehicles for hire. The COMSTAC voted to approve the observations and findings.

The next observations, findings and recommendations related to space situational awareness, formerly known as and now distinct from space traffic management. In the first observation, the COMSTAC observes that Congress passed the CSLCA and Section 110, Space Surveillance and Situational Awareness Data, of the CSLCA gave direction to the Secretary of Transportation, in concurrence with the Secretary of Defense, to submit a feasibility study on space situational awareness data sharing; and also that it observes that it did sign and submit the report titled, *Report on Processing And Releasing Safety-Related Space Situational Awareness Data*, to the Senate Committee on Commerce, Science and Transportation and the House of Representatives Committee on Science, Space and Technology. The COMSTAC finds that the report concluded that a civil agency, specifically the DOT acting through the FAA AST, could provide SSA data and information to commercial, civil and foreign entities; it also finds that the current USG practice of providing orbital safety services as a public good with no fees is beneficial, and that any civil space agency assuming that role of data provider must be able to provide at least the same level of data and other products without fee. The recommendation based on these acknowledgments is that AST develop a civil SSA data sharing pilot program, in consultation with the private sector. This is the kind of step-by-step program Dr. Nield envisioned in his comments. The COMSTAC voted to adopt these observations, findings and recommendation.

As a final note, Member Karika informed the COMSTAC that SSA will become a part of the Business/Legal Working Group. She has also discussed with Member Warren the possibility of including spectrum issues in the OWG purview.

Business/Legal Working Group Report: Chris Kunstadter, Chair, Business/Legal Working Group

The working group has been discussing space situational awareness and space traffic management as a certainty that will eventually become an issue. Space situational awareness is not the same as space traffic management which is not the same as space traffic control, as each represents a different level in a hierarchy. Establishing these guidelines promotes safety, compliance and defense. The working group decided that the payload review process must be timely, transparent and offer recourse options. And finally, if the FAA is going to assume the responsibility for payload review, it needs authority, indemnity and resources.

Member Kunstadter agreed with Dr. Nield's comments from earlier in the day that the government does not have to wait for Congressional action to decide which organization is going to regulate enhanced

payload review projects. On behalf of the COMSTAC, he thanked the FAA for being willing to take on that responsibility.

At a payload review process panel convened by the working group, Ben Roberts, White House OSTP, noted that this new process will facilitate commercial activity and will provide a necessary supplement to current procedures. Christopher Ingraham, Office of Rep. Bridenstine, discussed the opportunities this process would create for new space ventures. Brian Israel, State Department, spoke about the importance of international compliance with Article VI of the Outer Space Treaty. And lastly, Josef Koller, Office of the Secretary of Defense, talked about the Pentagon's view on the U.S.'s leadership in space technology.

The working group decided on several OFRs. The COMSTAC observes that Article VI of the Outer Space Treaty stipulates that "activities of non-governmental entities in outer space ... require authorization and continuing supervision by the appropriate State Party to the Treaty". Secondly, the COMSTAC further observes that Article IX of the Outer Space Treaty seeks to avoid harmful interference in the conduct of space activities among state parties.

As for findings, it finds that the U.S has not yet identified an agency to support the continuing supervision required by Article VI of the Outer Space Treaty for commercial space activities that are not currently explicitly under the supervision of a U.S. government agency. The next finding is that the current lack of an explicit, defined process for commercial space activities that are not currently explicitly supervised by a U.S. government agency has resulted in a lack of stability, predictability, transparency and efficiency, which has and will continue to hinder the development of U.S. commercial space activities.

The recommendations were that in meetings and discussions with policymakers, regardless of the ultimate approach taken to meet the nation's international treaty obligations, the U.S. government should take expeditious action to enable a safe, predictable and conducive environment for the growth of commercial space operations and activities, including opportunities for recourse under the Administrative Procedures Act; and that, where no other U.S. government agency is providing continuing supervision, the FAA should advocate in meetings and discussions with policymakers, for the Office of Commercial Space Transportation to serve as the lead entity to support such activities, leveraging the AST's expertise and experience in successfully conducting interagency reviews. The COMSTAC voted to adopt the observations, findings and recommendations.

FAA Budget Briefing: Karen Gahart, Director, Operating Budgets, FAA

Ms. Gahart discussed the unique funding structure within the FAA. The four main budget accounts within the FAA are operations; facilities and equipment; research, engineering and development; grants and aid for airports. This breaks down further to 61% operations, 17.5% facilities and equipment, 20% aid for airports, and the final 1.5% for research.

The sources of funding for those areas are the airport and airway trust fund and the general fund. Each budget account comes with different restrictions on how money must be spent and when. Operations,

for example, has a yearlong timeframe within which to allocate its allotted money, while facilities and equipment has a three-year timeframe. The airport and airway trust fully funds the Airport Improvement Program, facilities and equipment, and research and development. It also contributes a variable amount to operations each year. Congress must be petitioned each time the FAA wants to transfer money from one budgetary account to another.

Users of the FAA system may for the majority of the FAA's costs, driven by passenger ticket taxes and taxes on cargo and shipping. In FY '15, these sources generated \$14 billion and another \$273 million in interest from the trust fund. The appropriation for that year was \$16 billion. This makes up about 1% of the total discretionary spending of the U.S. government in a single budget year. These appropriations have tended to be either flat or declining over the last six years. The sequester in 2013 resulted in a \$300 million hit for the agency from which it has not fully recovered. Furthermore, because of the trend in appropriations, pay raises outpace increases in spending which means that the FAA has had to turn to restricting personnel as a way of controlling its budget.

Breaking down operations further, air traffic takes up \$7.5 billion and is the largest item in the agency's budget. Aviation Safety is the next largest, followed by finance and management. This latter organization handles the administration and information technology. Smaller items include the staff offices as well as AST. Doing the same for facilities and equipment, Activity 2 makes up the largest portion of the budget. It includes air traffic control facilities and equipment. Research and development takes up only \$166 million and is divided among five different categories. Commercial space specifically accounts for \$18 million in operations, \$2 million in facilities and equipment, and \$2 million in research.

The outlook for FY '17 remains unclear because the government is operating on a continuing resolution. The request is basically flat, with less than a 1% increase in operations, a decline in facilities and equipment, and a small increase for research. The budget appears to contain a \$450 million cut for airports, but the FAA plans to raise the passenger facility tax to offset that. Ms. Gahart expects to be building a FY '18 budget in February and March to be submitted in May, as was done with the previous administration transition.

Questions from COMSTAC Members

Chair Gold asked, given the lengthy multi-year budget process, where changes could most likely be accommodated in the budget. Ms. Gahart responded that any changes require authorization first and then the appropriators must decide to fund the budget item. She believes that FY '19 will be the next viable time to put in a budget request, though she noted that sometimes the authority is granted without the proper appropriations being ensured. Member Holder commented that it seems difficult to plan so far in advance given all the moving parts which need to be coordinated.

Chair Gold asked if it would be possible to get authority to grant a budget request under the current authorization that's under consideration by Congress. Ms. Gahart said that the current authorization lapses in September 2017, so the next technically possible time would be the FY '18 budget. Chair Gold then asked if there was any chance that DoD would offer a budget item in support of commercial space

projects. Dr. Nield confirmed that DoD's position is it's not its responsibility to provide this kind of support, even though additional responsibilities are being given to the FAA.

Member Holder asked if Dr. Nield's six-month pilot project could be considered research. Dr. Nield responded that it really depends on how the project was described. Ms. Gahart agreed, explaining how prototype work began as funded by research and moved through different accounts as the project developed.

Member Karika commented that it was irrational, if this transition of space traffic management is a joint program, for its funding to come from only one agency. She suggested describing it as a joint interagency program, which makes it harder to kill. Member Weeden echoed these comments and Chair Gold asked if Doug Levarro has mentioned anything about cost-sharing to Member Karika. She responded that DoD's position seems to be that it's happy to transform the responsibility of civil space traffic control, but that it will not transfer budget as well. She differentiated, however, between ceding ultimate control and the exploratory pilot project and expressed confusion as to why DoD wouldn't sweeten the deal with a relatively small amount of money. Member Holder added that managing Congress' perception of the budgetary matters surrounding this transfer adds another layer of difficulty.

Brian Gulliver, Kimley-Horn, P.C., asked whether there was a plan to continue grant funding to AST through the Space Transportation Infrastructure grant program. Dr. Nield answered that the previous method of funding this program was deemed inappropriate and that it is up to Congress to decide whether or not to fund it.

Member Nash argued in favor of creating a more robust funding apparatus for sponsoring spaceports, in anticipation of their importance in our infrastructure. He suggested that it be modeled after the airport matching fund. Member Greason pointed out that the airport matching fund is funded by passenger surcharges, the equivalent of which has not been discussed yet for commercial space flight. Dr. Nield stated his belief that some version of a surcharge would be essential to establishing such a fund. Chair Gold asked the spaceport operators present about the degree to which surcharges would be deleterious to business. Member Dalbello responded that with the current state of things he believes its best left to the agreement of the operators and their customers. Dr. Nield encouraged the COMSTAC to brainstorm what some acceptable taxable items or services in spaceports might be. Chair Gold asked the FAA to review for the COMSTAC how airports were established so as to consider models to imitate for spaceports. Member Garcia pointed out that horizontal launch sites are utilized by jets that already pay fuel taxes and other surcharges.

Congressional Space Policy Update: Joseph Schmoll, Legislative Assistant, Senator Steve Daines and Christopher Ingraham, Senior Policy Advisor, Congressman Jim Bridenstine

Mr. Schmoll spoke on behalf of Senator Daines. Sen. Daines is the only engineer in the Senate and considers himself very friendly to the concerns of engineers, aerospace or otherwise. He sits on the Senate Appropriations and Commerce committees. He promotes both the STEM and STEAM programs as a means of training the next generation of employees as well as a regulatory framework that allows for business and innovation. Specifically, Sen. Daines looks to unite kids in Montana with NASA's HUNCH

program, as well as its Space Grant and EPSCoR programs. As for NASA's reauthorization, the Senate Commerce committee unanimously supported the 2017 reauthorization act in September. This act would keep major programs at NASA running until a longer term budget can be established next year. Specifically, it keeps the ISS running through 2024 and states that the Commercial Crew Program should be the primary means of transit to the station. The act also requires NASA to establish a transit improvement plan with the commercial space industry. It also generally promotes commercial space capabilities in LEO and encourages commercial satellite servicing.

Mr. Ingraham spoke about some of Rep. Bridenstine's recent activities with regard to commercial space. The Space Renaissance Act was always meant to be a jumping off point, to be passed only in part. Ten provisions of it were included in NDAA and six provisions in the CJS bill passed in the House Appropriations committee. Furthermore, several provisions were included in the Senate's NASA reauthorization bill. In general, Rep. Bridenstine supports as broad a reauthorization for NASA as possible. The Senate Commerce staff and the House Science staff are currently working on a more detailed bill. For the upcoming Congress, Rep. Bridenstine is planning an updated version of the Space Renaissance Act. Mr. Ingraham also outlined some of the things Rep. Bridenstine has done in his efforts to ensure that AST is funded properly. With the Section 110 report findings in hand, Rep. Bridenstine wants to ensure that the FAA is fully equipped to handle the new SSA responsibilities. Working to shift the focus away from terrestrial operations, he also advocates for the FAA to be the proponent of spectrum issues related to commercial space operations. With the Section 201 report and the upcoming Section 202 report, remote sensing licensing reform is also in the works. Rep. Bridenstine's intent with regards to the enhanced payload review proposal is to provide industry a transparent process to help industry secure funding.

Questions from COMSTAC Members

Chair Gold asked Mr. Schmoll about where the FAA stands in the budget process and whether industry should be concerned about yearlong continuing resolutions. Mr. Schmoll expressed confidence that Congress would come up with an omnibus spending bill once it returns in two weeks. Mr. Ingraham, for the House's perspective, said that an omnibus bill was likely, but that Rep. Bridenstine would prefer the full, normal budget process.

As for the Article VI enhanced payload review concerns, Member Greason let it be known that he would be happy with Rep. Bridenstine's bill. The issue in his mind is that there are too many options on the table. Chair Gold disagreed, saying that he sees three options on the table but nevertheless joined Member Greason in hoping that Rep. Bridenstine's bill would pass.

Member Warren asked Mr. Schmoll if commercial space had spoken with his office about spectrum issues. He responded that no one has come forward yet, but welcomed feedback. Chair Gold followed up and discussed the need for students in the middle of the country to be introduced to space technology. Mr. Schmoll commented that introduction programs do a lot to foster interest and to stoke the imagination of students.

New Business

Member Greason asked the COMSTAC to rethink the OFR format. He acknowledged that it created efficiencies when first implemented, but that wordsmithing OFRs and making nuanced changes takes up time that could otherwise be used for substantive discussion. Moreover, many of the observations made in the OFR format are obvious to anyone in the industry. Member Holder countered that members can simply elect to make these changes without formalizing them. Member Greason offered in turn the suggestion that the COMSTAC limit OFRs by adhering to certain ground rules about their use. Member Kunstadter gave a little history of how the COMSTAC came to use the OFR format and agreed that working groups should perhaps try to limit the use of OFRs to accomplish a specific goal. Chair Gold concurred, noting that the OFR gets treated like an equation (O+F=R). He wondered if there wasn't a more expeditious way to provide context for recommendations and discussions.

Member Warren commented that the purpose and use of the OFR format has not been made clear to new members. She added that, since part of COMSTAC's purpose is to advise the FAA, perhaps the FAA's specific concerns could help sift through which OFRs to offer. Member Marquart agreed with Member Warren that the COMSTAC is meant to provide advice, not to wordsmith OFRs. Member Kunstadter responded to Member Warren's comments that COMSTAC's role is not purely advisory but also involves anticipating future changes. He also suggested that the majority of wordsmithing go on in offline meetings.

Chair Gold stated that a certain amount of wordsmithing will go on in any meeting. He went on to ask, though, how other advisory committees handle their mission and their meetings. Member Hale, as the interim chairman of the Human Exploration Committee for the NAC, explained that in those meetings, committee members travel and therefore end up putting in time the night before or after a meeting doing work that COMSTAC accomplishes in telecons. He also said that the Chair assigns specific individuals to accomplish the wordsmithing instead of inviting comments from the whole group. Vice Chair Lopez-Alegria as a member of Member Hale's committee, agreed and pointed out that there's a lot of redundancy in COMSTAC's current procedure where the meetings sometimes feel like an echo chamber for AST. As a part of streamlining, he suggested that special attention be paid to recommendations, while observations and findings are deemphasized.

Member Warren suggested that there be some kind of summary document from the telecons so that less summarizing had to be done during full meetings. Member Karika agreed that some kind of carbon copy of the discussions, via email, et cetera, would be helpful. She went on to give her view of the COMSTAC's purpose.

Dr. Nield gave his perspective on the discussion. AST appreciates the advocacy the COMSTAC provides as well as the feedback about new initiatives. Chair Gold praised Dr. Nield's leadership, but also went into further detail about some of the ways in which COMSTAC's recommendations have had a beneficial impact on AST and Congress. He recommended that working group leaders meet with himself and the Vice Chair offline to discuss procedure going forward.

Chair Gold solicited the COMSTAC's thoughts on the length of meetings. Member Greason responded that if anything, the working group sessions should be a little longer and the full meetings could be compressed. Member Karika thought that two hours was a good amount of time for working group meetings. Member Warren expressed frustration at the redundancy between the working group sessions and the full meetings, commenting that two days was a long time to spend on that. She suggested conducting external briefings via telecon. Member Holder and Member Karika disagreed, expressing preference for interacting with speakers in person because of the opportunity for conversation. Member Marquart suggested adding agendas to working group meetings to create a more fluid discussion and to reduce overlap between groups.

Member Karika expressed extreme frustration with meeting in the current building, citing a lack of internet and a confusing layout. Mr. Beavin said that there are other solutions and that AST will look at them.

Public Comments

There were no public comments.

Adjournment

Chair Gold adjourned the meeting at 4:20 p.m.