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Federal Aviation Administration

Commercial Space Transportation Advisory Committee

COMSTAC

May 11, 2011

Meeting Minutes

COMSTAC Chairman Will Trafton convened the Commercial Space Transportation Advisory Committee (COMSTAC) meeting at 8:36 a.m. The meeting was held at the National Housing Center Auditorium, 1201 15th Street, N.W., Washington, D.C.

Mr. Trafton thanked COMSTAC members and the public for attending.

He introduced those sitting at the head table – Dr. George C. Nield, FAA Associate Administrator for Commercial Space Transportation and James Van Laak, FAA Deputy Associate Administrator for Commercial Space Transportation, from the Office of Commercial Space Transportation (AST). He also introduced COMSTAC Deputy Chair Chris Kunstadter, senior vice president, XL Insurance.

Mr. Trafton announced the wi-fi address for those who need to access the Internet.

He then introduced those who worked on coordinating the two days of meetings: Sue Lender, Bill Gordon, Harry Vaughn, and Brenda Parker.

Mr. Trafton noted that May 10 was one of the best days in terms of working group activities, participation, and outcomes. He estimated record turnouts of 50 to 65 people in each of the working group sessions. He then highlighted the concept of observations, findings, and recommendations following the model used by the NASA Advisory Council. When the working groups report, they will present their draft observations, findings, and recommendations. There is no requirement for the working group to present any documents, if it is not appropriate. Only recommendations require a response from the FAA. Mr. Trafton went on to note that the opportunity for the public to participate in drafting was on May 10. Comments on language today are limited to COMSTAC members.

Mr. Trafton noted some changes to the day's schedule. All the speakers will address the meeting, but in a slightly different order.

Mr. Trafton then introduced the new members of COMSTAC: Ray Johnson of The Aerospace Corporation, Bill Khourie of the Oklahoma Space Industry Authority, Paul Eckert of The Boeing Company, and Jayne Schnaars of The Boeing Company. Mr. Trafton extended a welcome to the new members and then asked the rest of the COMSTAC members to introduce themselves.

Mr. Trafton noted that there had been a request to be able to phone in to the working group meetings. He felt that it would be too unwieldy to attempt. Then he highlighted a letter from George Nield that came from the White House requesting input on the U.S. Space Transportation Policy. This topic will be discussed later in the day. Mr. Trafton then introduced Dr. George Nield, FAA Associate Administrator for Commercial Space Transportation.

Remarks by Dr. Nield

Dr. Nield noted his interest in aerospace history. May 11, 2011, marks the 130th anniversary of the birth of Theodore von Karman, considered by many to be the father of modern aerospace science. Dr. Nield traced von Karman's career through to World War II, when he and other scientists were told to look ahead 20 years in aviation and predict where the country would be going and how it would get there. The 1945 report, titled "Where We Stand," included supersonic flight, ICBMs and surface-to-air missiles. Dr. Nield suggested that with the looming retirement of the Space Shuttle we desperately need a modern-day von Karman to look ahead 20 years and point the way forward. Dr. Nield admitted we may not find another von Karman, but the Office of Commercial Space Transportation (AST) continually seeks well qualified, highly motivated individuals interested in joining the office. The most recent hire is Pam Melroy, a former Air Force test pilot with a master's degree from MIT. She was selected as a NASA astronaut and flew three shuttle missions, one as commander. He asked Ms. Melroy to stand and encouraged COMSTAC members and attendees to introduce themselves to her.

Dr. Nield continued with an overview of AST activities over the previous six months. Fall 2010 saw AST issue the first ever FAA re-entry license to SpaceX for its Dragon capsule. In February 2011, the President issued his FY2012 budget request that included a sizable increase for AST. Dr. Nield maintained that there was a solid basis for the request. He expects the number of licensed and permitted launches to increase ten-fold in the coming year. The office plans to start up operation of the Commercial Space Flight Technical Center at Kennedy Space Center. Initially, 50 people would be hired to staff this facility in the first year. AST plans to offer a $5 million prize for the first nongovernment team to demonstrate a launch system having at least one reusable rocket-powered stage that can deliver a one kilogram CubeSat to orbit. Dr. Nield noted that last year AST issued its first ever safety approval to NASTAR. This was followed by a second safety approval in April 2011 to Zero Gravity. Also in April, AST issued an experimental permit to Blue Origin for its suborbital reusable launch vehicle. Dr. Nield also noted the progress of the Commercial Space Transportation Center of Excellence. The COMSTAC meeting agenda includes a report on the Center of Excellence. Dr. Nield expressed the hope that the Commercial Space Infrastructure Grant Program will continue to be funded. In anticipation of this, grant proposals have been solicited. The due date for applications is May 13, 2011. Dr. Nield acknowledged AST's continuing work with NASA on its Commercial Crew Development Program. He noted that it will be very important that NASA's and the FAA's regulations are compatible. To that end the FAA/AST has scheduled a public meeting for May 26, 2011, to ask industry what kind of regulatory approach makes sense for commercial orbital human space flights. The FAA/AST is opening a docket to receive comments from those who cannot attend

the public meeting and others interested in commenting. Dr. Nield asked if there were any questions.

Ms. Rachel Yates asked about the white paper requested by the White House. She asked about the process and the timing of AST's submission to the White House.

Dr. Nield stated that the first Inter-Agency Policy Committee meeting to review the National Space Transportation Policy was held on May 10, 2011. It has been several years since the policy was set. He found it encouraging that the Administration was reaching out to industry early in the process. He did note that there was no set schedule.

Dr. Nield then introduced the FAA Administrator, J. Randolph Babbitt.

Remarks by FAA Administrator Babbitt

Mr. Babbitt expressed his pleasure to speak professionals who represent the next wave of aviation – this one on the space side.

He began by looking back in history 50 years. Yuri Gargarin became the first human to orbit the earth. A few weeks later, Alan Shepard became the first American to fly into space on his sub-orbital mission. Then on May 25, 1961, President John F. Kennedy set the goal of before the end of the decade landing a man on the moon and returning him safely to earth. Mr. Babbitt reviewed these events because he saw some interesting parallels between the development of commercial air transportation and what is happening today in commercial space transportation.

He noted that the shift from a government-funded sector to private sector development happened at the 50-year mark. This happened in aviation and he sees the same thing happening in commercial space transportation. The first 50 years of space flight saw the programmatic decisions and most of the research and development and operations funding coming from the Federal Government. That is changing. The National Space Policy of 2010 states "to promote a robust, domestic, commercial space industry, departments and agencies shall purchase and use commercial space capabilities and services to the maximum practical extent." The NASA Reauthorization Act of 2010 reaffirms this point. Very soon, the Government will cease to be a space developer or operator and become a customer. Mr. Babbitt sees the market, not the government, deciding the number of launches that will occur every year.

Mr. Babbitt noticed two general segments of the commercial space transportation industry: delivery of cargo and crew to low Earth orbit and suborbital reusable launch vehicle scientific and passenger missions. This brings big challenges for the FAA. One challenge is the shift from government to the private sector. Along with this is the need to develop strong partnerships with other government agencies, especially NASA. The FAA's role is the very critical one of ensuring safety. The FAA set the safety bar very, very high for the commercial aviation industry and industry has met the challenge. He expressed confidence that all partners and colleagues in commercial space transportation will also meet the challenge. The approach will be to develop regulations that promote safety without becoming a hurdle between industry and commercial space. The FAA wants to be the facilitator that makes things happen in this industry and the FAA wants to

make sure they happen safely. Mr. Babbitt cited the over 200 licensed launches without any fatalities, serious injury, or property damage to the public.

He commented that the government is not an entity that moves at such speed that industry cannot keep up. The private sector is the one that can move at lightning speed. The challenge for the FAA is to accommodate the speed and enable growth without sacrificing safety. To meet this challenge, the FAA needs groups like COMSTAC. COMSTAC can add to the FAA's practical knowledge and can make recommendations to the FAA based on real-world experience. Mr. Babbitt noted that the Tech Center will play a role, as will the Center of Excellence. He also noted that the use of safety management systems, SMS, is becoming more and more important in commercial space. He sees a critical role for SMS to play in on-going safe operations by mining data and using it effectively.

Mr. Babbitt observed that when commercial air transportation reached its 50-year mark, it was costly, available only to a privileged few, and lacked a dynamic infrastructure. He sees commercial space transportation at a similar point today. He expressed confidence that as the industry grows and as government and private partnerships develop to support it, we will see exciting developments over the next decade and quarter of a century. He again expressed pleasure at the opportunity to speak to COMSTAC.

Dr. Nield thanked Mr. Babbitt for his leadership and support for commercial space transportation. He then introduced NASA Administrator, Charlie Bolden.

Remarks by NASA Administrator Bolden

Mr. Bolden thanked COMSTAC for inviting him to speak again to the group. He took the opportunity to welcome Pam Melroy to the FAA and noted that it was a privilege to work with her as a NASA astronaut.

Mr. Bolden noted that he receives frequent queries about his strategy for NASA, specifically his strategy for exploration. He observed that the National Space Transportation Policy has as its fundamental goal "…to ensure the capability to access and use space in support of national and homeland security, civil, scientific, and economic interests." In the National Space Policy of 2010, the President stated, "Our goal is the capacity for people to work and learn and operate and live safely beyond Earth for extended periods of time, ultimately in ways that are more sustainable and even indefinite." Mr. Bolden's intention is to "broaden our scientific portfolio, enhance our aeronautics research and technology development efforts, and facilitate the development and success of a vibrant commercial space industry to provide for access of cargo and crew to the International Space Station and other low Earth orbit destinations."

He stated this is not being done for profit, but because at some point, humans are going need to live off this planet. We know from scientific exploration that there are places and sources of material that can make life better for people here on Earth. Humans will go back to the moon. For now the International Space Station is the anchor for exploration. We need the moon as a stepping off point to go to deep space.

Mr. Bolden gave several examples of how this is different from previous administrations.

- Within one year or less, resupply of the International Space Station will move toward using a mixed fleet of vehicles from U.S. commercial providers and international providers.
- NASA is about to close the COTS program. SpaceX and Orbital Sciences Corporation will complete their demonstration flights and will move out of COTS and into the commercial resupply services.
- Within the next few years, NASA plans to use commercial launch services to transport crew to and from the International Space Station.

These capabilities are critical to sustain full operation of the ISS until at least 2020 and probably beyond. They are also vital to enabling NASA to focus on undertaking and achieving the difficult challenges of resuming and expanding human space exploration beyond LEO and the moon. Mr. Bolden affirmed that his first priority is the safety of the astronauts and international partners traveling to and from, as well as onboard the ISS. The key part of that will be more than one way to access low Earth orbit.

Mr. Bolden noted that commercial capabilities will benefit our national security, intelligence, and economic interests as these capabilities support scientific research, technology development, and further exploration initiatives. NASA will depend on the capabilities and talents of companies represented on COMSTAC to provide LEO access for cargo and crew. NASA will take on the difficult and more risky challenges of deep space exploration. He noted that at the dawn of the space age getting a human into space was too risky and too costly for any company to take on by itself. That is changing. NASA does not intend to be the only customer to LEO access. Other government agencies, as well as other nations, academia, and private business are going to need these capabilities. Commercial providers will need to learn and practice the delicate balance between safety, schedule, and revenue. Safety is the number one priority.

Mr. Bolden observed that with the passage of the 2011 Full Year Continuing Resolution, NASA has made a second round of awards in the commercial crew development (CCDev) program. He noted also that there is an ongoing commitment to the Commercial Orbital Transportation Service Initiative. This is a program where the country is about to gain access to two new launch vehicles from Space X and Orbital Sciences Corporation. This is not new. The Space Act that founded NASA in 1958 required the use of commercial services to the extent feasible. The U.S. National Space Policy of 2010 continues this tradition.

Mr. Bolden cited several events that demonstrate how commercial space capability is expanding all around us.

- He recently attended the ribbon cutting at the Wallops Flight Facility for a commercially-owned horizontal integration facility. The first customer will be Orbital Sciences Corporation's Taurus 2 rocket.
- Spaceport America has been inaugurated in New Mexico.
- The Kennedy Space Center is poised for upgrades to make it a 21st century launch complex.

- The Stennis Space Center in Mississippi continues to provide test facilities and service for the AJ-26 engine that will power Orbital's Taurus 2.
- December 2010 saw SpaceX become the first private company to launch a capsule into space, orbit Earth, and safely retrieve it intact. Mr. Bolden thanked the FAA for granting the first commercial reentry license in history to make the mission a reality.

NASA is committed to a commercial space industry. Mr. Bolden stated his belief that this will stimulate the economy and create a job-producing engine for America. Mr. Bolden observed that we will need to dig into human rating standards for commercial transport systems. They will have to be reasonable but rigorous because safety is paramount. He sees the country on the verge of a new era of exploration. He is happy that NASA has so many energetic and entrepreneurial partners to help create what he believes to be a very bright future.

Mr. Bolden thanked COMSTAC and Dr. Nield for the opportunity to speak. He opened the floor to questions.

Ms. Lepore asked Mr. Bolden to talk about certifying. The FAA talks about licensing. What would be the line where NASA works with commercial providers and where the FAA/AST works with them? Secondly, Ms. Lepore referred to Mr. Bolden's previous visit to COMSTAC. Then there was some discussion about the commercial contracting environment – how contracts are written and how requirements are met. She asked where NASA is progressing on that front.

Mr. Bolden noted that NASA is not involved in licensing and doesn't plan to be. NASA has a process called COFR – Certification of Flight Readiness. This looks at the preparation for the vehicle, looks at any problems that may have been encountered with it in the past, ensures that problems have been resolved, goes back and looks at the hardware to determine if it is all legitimate and authentic. NASA has a well-defined process that it works with DoD and others and will continue to use that process

Mr. Bolden stated that the second question dealt with procurement methods. NASA uses the Space Act Agreement for the COTS program. It is still looking at whether it can use the Space Act Agreement for future programs. NASA does use SAAs for both CCDev1 and CCDev2. He believes, based on talking with NASA's attorneys, that a Space Act Agreement is not going to be possible when NASA begins contracting for crewed missions to the ISS. In the future, NASA will look for ways to used fixed-price contracts as much as possible. During the development process where a company is doing risky things and does not know what the outcome will be; NASA may still use some cost-plus contracts. When the production process begins, then there would be a move to a fixed-price environment. He reminded everyone that NASA does not have the money it used to have. NASA will have to find ways to do belt tightening and this means some existing contracts may be affected.

Ms. Lepore followed up by noting that there are many different ways to conduct fixed-price contracting. She encouraged looking at tailoring the contracting so as not to exclude small companies.

An Audience Participant commented that many people are excited that NASA is saying we will go back to the moon. What is next for NASA after that?

Mr. Bolden responded that the ultimate goal is Mars. NASA is working on an evolvable program that will allow exploration of the reasonable reaches of the solar system outside of the Earth-Moon complex. The President has set goals of a visit to an asteroid in the 2025 time frame and the first visit of humans to Mars in the 2030 time frame.

Mr. Alexander complimented NASA's support for the commercial sector. He observed that NASA will make decisions about its acquisition strategy for the commercial crew development phase in the next month or so. He then asked that NASA keep in mind partnership versus contractor relationships. If a FAR-based contract is set, even if it has exemptions and is tailored to a company, NASA is still directing a contractor what to do. This is not a partnership. To Mr. Alexander, a partnership means that parties go through a Space Act Agreement and both have a say in how things are done.

Mr. Bolden stated that NASA is still determining the type of instruments it will need. The instruments may be different for different companies. He noted that some people believe that NASA is fostering commercial space flight; some see this as heavily subsidized access to space by the government. He stressed that there is an incredible need for commercial entities to provide support for national security purposes, for science, for academia. However, NASA should not be the only customer for commercial spaceflight. NASA cannot provide transportation to low Earth orbit and at the same time explore space beyond low Earth orbit. Commercial entities are necessary for the low Earth orbit missions so that NASA can look beyond low Earth orbit.

Mr. Greason noted that he sees by the end of this decade there will be multiple capsules of different types available. Already there are launch vehicles that can put large upper stages into low Earth orbit. This can all be done before 2025 and start human exploration missions again. What is the pacing item?

Money, Mr. Bolden responded. NASA's budget has a flat top line. NASA struggles trying to make everything fit under that straight line. Mr. Greason responded that the challenge is for the commercial space community to help NASA find a cheaper way to meet its goals.

Mr. Szoka posed two questions. First, he asked if Mr. Bolden thought it was correct to state that the fundamental goal is, as the 2005 Space Policy states, to maintain access. Mr. Szoka observed that what Mr. Bolden has said indicates a belief that the goal should be to improve access by lowering cost. His second question concerned his sense that heavy-lift procurement seems to be proceeding on a no-bid basis. How does this reconcile with the expressed goal of buying commercial and buying competitive?

Mr. Bolden stated that NASA is not in a no-bid process. NASA is trying to determine if existing contracts fit the scope for what it wants to do in terms of exploration. If so, can NASA legally transition them and use them? Then, at what point does NASA open up so that other companies have an opportunity to compete.

Mr. Gold asked Mr. Bolden if there was anything in particular that COMSTAC and the FAA can do to be helpful in NASA's efforts.

Mr. Bolden responded that COMSTAC and the FAA are being incredibly helpful. NASA and the FAA have liaisons in each other's organizations. He charged members to keep asking questions. Press NASA on human rating standards – that is the next big hurdle. Will there be different standards for capsules and winged vehicles? He thanked COMSTAC for allowing him to come and talk.

Dr. Nield thanked Mr. Bolden for sharing his perspectives and for the work NASA is doing.

2011 Commercial Space Transportation Market Forecasts

Mr. Kunstadter introduced the commercial space transportation forecasts. He noted that one of the most tangible products COMSTAC produces is the annual commercial space transportation forecast. This assists the FAA to understand what the market is and who they need to be working with in terms of licensing and future launch activity. This can help AST with planning and budgeting. The draft report has been distributed to COMSTAC members for review. It consists of two parts, a forecast of the geostationary satellites and a forecast of non-geosynchronous satellites. Mr. Kunstadter introduced Ronnie Johnson, a development specialist from ULA, to present the *2011 Commercial Geosynchronous Orbit (GSO) Launch Demand Forecast*.

2011 COMSTAC Commercial GSO Launch Demand Model

Ms. Johnson described the report methodology. The working group members comprised representatives of the aerospace industry, the FAA/AST, and the insurance industry. She thanked Mr. Kunstadter for providing continuity and guidance for this effort over the past few years.

Ms. Johnson noted the purpose of the forecast is to determine the GSO satellite launch market that can be addressed by commercial launch vehicles potentially licensed by the FAA, and those that could possibly be open to the U.S. launch industry in general.

She reported that information was gathered by sending out surveys to approximately 90 satellite operators, launch providers, and satellite manufacturers. Twenty-two companies responded. This is a big increase over 2010 when only 14 were received. This is comparable to the 21 responses received in 2009.

Two types of questionnaires were sent out: individual questionnaires that had to do with the satellite operators and manufacturers and comprehensive questionnaires that went to launch providers and also to the satellite manufacturers.

Ms. Johnson summarized the report findings:

- The average demand going into the future is 20.5 satellites per year. This equates to 15.6 launches because of the dual-manifest launch for a number of the satellites.
- A number of factors can influence the forecast – technical issues, scheduling issues, business planning, and financing.
- Hosted payloads could become an important factor in the future as the U.S. government looks at putting its military payloads on commercial satellites.

- ITAR-free satellites have become important for the coming years as China has attempted to enter the launch market.
- A realization factor has been applied to assess previous forecasts. The working group analyzed the inputs and determined what the actual range of performance will be based on historical input. By applying the realization factor, the report shows between 19 and 27 launches for 2012.
- The mass category forecast shows a dramatic change over the last 20 years in the size of the satellites.
- In comparison with 2010, there is a decline in the number of small satellites from 17 to 9 and a similar decline in the medium range from 69 to 63. Those declines are offset by the increase in large and extra-large satellites.
- In the surveys sent to satellite operators, the working group asked for an assessment of the market environment. Of the 14 operators who responded this year, only 2 responded last year. These responses could be from an entirely different set of operators.
- The forecast shows the number of satellites being launched per year as being stable over the next 10 years.

Mr. Kunstadter thanked Ms. Johnson for the report. Then he introduced Kate Maliga, Program Manager, from Tauri Group to present the *2011 Commercial Space Transportation Forecast for Non-Geosynchronous Orbits*.

2011 Non-GSO Forecast

Ms. Maliga described the purpose of the forecast as a way for U.S. industry, government, and the FAA to understand the trends and scope of what is the NGSO market. This is a 10-year forecast.

The methodology is a little different from the GSO forecast. Analysts conducted interviews with industry, the government, and outside experts. They conducted analysis of financing, asked if there were signed contracts, and looked at investor competence.

The report contains five segments: commercial telecommunications, commercial remote sensing, science and engineering, commercial cargo and crew transportation services, and other payloads launch commercially.

Ms. Maliga summarized the report findings:

- The average demand is for 13 launches per year world wide during 2011 – 2020.
- Launch demand peaks in 2015 with 18 launches due to overlap in the replacement of the Iridium constellation and frequent commercial crew and cargo launches to the ISS.
- Launch demand declines after 2017 when telecommunication constellations, including Iridium, finish deployment.
- It is still too early to predict with accuracy new and emerging markets.

- Launch demand is divided into two vehicle size classes, with an average of 11.1 medium-to-heavy launch vehicles per year and 1.9 small vehicle launches per year.
- Telecommunications makes up 43 percent of the satellite market, but only 15 percent of the launch market because of multiple manifesting.
- Science and engineering payloads constitute 30 percent of the satellite market and 31 percent of the launch market.
- Commercial remote sensing satellites account for about 5 percent of the payload market and 8 percent of launch demand market.
- Commercial cargo and crew transportation services account for 46 percent of the launch market, an increase from 34 percent projected in the 2010 forecast. This increase is due to including commercial crew launches to the ISS in the forecast.
- Based on published manifests, the forecast predicts 11 NGSO launches for 2011 and 13 launches for 2012. Applying a realization fact, the actual number of NGSO launches is more likely to be between 6 and 8 for 2011 and 8 to 10 in 2012.

Ms. Maliga asked for questions.

Ms. Schnaars noted that Bigelow complex flights were not included. She asked about the flights that actually put the complex into orbit, not the crew.

Ms. Maliga stated that this is discussed in the report. They had determined that for every area except science and engineering to use signed contracts or something that could identify a specific time line. Mr. Gold clarified that Bigelow could not execute contracts until they had a commercial crew system available.

Ms. Lepore noted that the report shows mass numbers and identifies the orbit as LEO. Are there data showing where in LEO most of these are going? Ms. Maliga stated that they do not have this in the report, except maybe in the appendix. They do have the data, however, and it can be added.

Ms. Lepore observed that some of the demand is based on what is available now as opposed to what may come down the line. However, there isn't a lot of talk about SpaceX, for example, not servicing the smaller market. She asked if some of the effects of what's happening on the supply side have been examined. Ms. Maliga noted they acknowledge the smaller payloads and have asked if they are going to go on smaller launch vehicles or piggyback on SpaceX flights. SpaceX is amenable to piggyback. The forecast does discuss this a little bit, but they did not feel there was enough data to make credible predictions at this time.

Mr. Kunstadter thanked Ms. Maliga and Ms. Johnson and the others who contributed to this report. He noted that this is a draft report. COMSTAC members should take the opportunity to review it and return any comments to Mr. Kunstadter. He will collate them and work with Ms. Maliga and Ms. Johnson on any revisions. He asked for comments within two weeks.

Mr. Trafton thanked Mr. Kunstadter, Ms. Johnson, and Ms. Maliga. He stated that the vote to accept the final report would be an email vote.

A short break followed at 10:35 a.m.

Mr. Trafton called the meeting back to order at 10:58 a.m. and introduced Ken Davidian, Director of Research for the FAA/AST to update COMSTAC on Center of Excellence (COE) activities.

Update on the Center of Excellence for Commercial Space Transportation

Mr. Davidian provided an overview of the Center of Excellence for Commercial Space Transportation. He acknowledged Dr. Patricia Watts, who runs the Center of Excellence Program for the entire FAA; there are currently about six in existence. All Centers of Excellence are partnerships of academia, industry, and government. The goal is to create a world-class consortium that will address current and future challenges – in this case, for commercial space transportation.

Mr. Davidian noted that the duration of an FAA-sponsored Center of Excellence is 10 years. They are funded at about $1 million or more per year. The COE for Commercial Space Transportation was funded at $2 million for Year 1 and $1 million for Years 2 through 10. For FAA-sponsored Centers of Excellence, every dollar provided by the U.S. government for research must be matched by the university or by industry one to one.

The COE for Commercial Space Transportation is about three or four months from its one-year mark. Mr. Davidian displayed a map showing the geographic distribution of the Center of Excellence participants of which there are nine universities. They have met three times so far during the first year and are working on a fourth meeting to be held in Boulder Colorado.

Mr. Davidian described the management structure within the FAA/AST that oversees the Center of Excellence. He noted there is and R&D coordination plan detailing how AST solicits proposals, reviews proposals, makes the selections, and directs the strategy for R&D. The plan designates the senior steering committee comprised of senior managers and an advisory board of technical monitors within AST. Mr. Davidian observed that COMSTAC might want to take part in the coordination plan at some point.

The Coordinating Committee is chaired by Pat Hynes of New Mexico State University. She coordinates the activities of all the member universities. For long-term strategic planning, the COE has a Planning Committee consisting of Mr. Davidian, Pat Hynes, and Dr. Scott Hubbard from Stanford University. International representatives can participate through relationships with the member university, not with the FAA directly.

Mr. Davidian outlined the four major research areas, all of which support AST's mission goals. These research areas are: space traffic management and operations, vehicle-based operations and technology, human spaceflight, and industry promotion. The COE is just starting the process of soliciting proposals from the COE members to continue the existing tasks or introduce new tasks for the FY11 funds. Mr. Davidian asked for any questions.

Mr. Kunstadter asked if the matching funds were guaranteed by the university or industry.

Mr. Davidian noted that the matching funds come in from industry partners through the university. He did not know if they were guaranteed by the university.

Ms. Lepore observed that Mr. Davidian mentioned a potential role for COMSTAC in R&D coordination. She noted that the Space Transportation Operations Working Group had addressed some orbital debris questions. She noted there might be an at least informal role for COMSTAC. Mr. Davidian agreed.

Ms. Lepore continued by noting she is on the faculty of Stevens Institute of Technology that runs a University Affiliated Research Center for the Department of Defense. A big question with this is what is the relationship with industry? How does industry get input or get results from the research? Secondly, she noted that the four research areas are very similar to working group subject matter that COMSTAC has discussed over the past six months. She urged her fellow COMSTAC members to take note.

Mr. Davidian mentioned that a COE workshop is planned for mid-August in Washington, DC. He urged COMSTAC members to contact Dr. Scott Hubbard for information.

Mr. Trafton thanked Mr. Davidian for the update. He then introduced the next speakers: Damon Wells from the Office of Science and Technology Policy and Chirag Parikh from the National Security Council.

White House Request for White Paper on U.S. Space Transportation Policy

Mr. Parikh stated that he and Mr. Wells are looking for input from COMSTAC on the review of the U.S. Space Transportation Policy and the National Security Presidential Directive 40. Since releasing the National Space Policy in June 2010, the Administration is moving forward to reviewing the sectoral policies. The first one is the Space Transportation Policy. Then they will move to the Commercial Remote Sensing Policy and finally the Space-Based PNT (Positioning, Navigation, and Timing) Policy. This effort is jointly run by the National Security Council and the Office of Science and Technology Policy.

Mr. Parikh noted that many things have changed since the policy was released in December 2004. There have been inter-agency meetings to discuss the policy; Dr. Nield has participated in those. The Administration wants input from industry. Therefore, the request for a 10-page white paper from COMSTAC has been made. If individual companies have specific concerns not expressed in the white paper, they are encouraged to submit a two-page discussion of their concerns.

Mr. Wells acknowledged COMSTAC's unique view of space transportation issues and stated that they look forward to the contributions COMSTAC can make to the Space Transportation Policy. He then asked for questions.

Mr. Holder noted that there are independent entities, not all companies, who would like to comment. How should those entities submit their comments? Mr. Parikh stated that they are also working with the Department of Commerce, Office of Space Commercialization. That would probably be the best contact. Mr. Wells stated that the

two-page individual comments should be funneled through the FAA. Mr. Holder asked if individuals from the audience wanted to submit comments, how they would do that. Mr. Parikh responded there was no formal mechanism right now. The best channel would be the Department of Commerce or the FAA.

Mr. Kunstadter asked about the timeline. What is the Administration going to do and when is it going to do it and what does it hope to come up with? Mr. Wells stated that they are looking at a four- to five-month process. This is a target. The process will be to take stock of new developments, or challenges, and of opportunities. They will examine the existing text and determine where improvements should be made. They will work in a fully consultative manner with other agencies; this will be a collaborative process. Mr. Parikh added that this is a commercial issue as well as a national security issue. They are seeking heavy, up front input from industry.

Mr. Szoka asked for an explanation of how the space transportation policy is supposed to interact with the space policy. Mr. Parikh noted that in the past the sectoral policies were drafted first followed by the national space policy. This time the National Space Policy was prepared first. There are sections within it that track to the sectoral policies. Now they will prepare the sectoral policies to support the National Space Policy.

Mr. Szoka followed up by asking if they were going to start with the old text and tweak it or start anew on the language. Mr. Wells noted this might be difficult to answer. They will look at the existing policy and look for potential areas to improve. They will look at the language for tone and level of detail. They would certainly welcome specific comments on language. He added that the national policy and the sectoral policies are meant to function as a suite. There is the overarching national policy. The sectoral policies provide detail that supports the broad national policy.

Mr. Wells thanked COMSTAC for their time. Mr. Trafton thanked Mr. Wells and Mr. Parikh for speaking to COMSTAC and taking questions. He then introduced Mr. Alexander to report on the RLV Working Group session. He reminded the audience that any editing of the observations, findings, and recommendations that the working group chairs present will be done by COMSTAC members only.

Reusable Launch Vehicle Working Group (RLVWG)

Mr. Alexander reported on the briefings the working group received from the FAA. John Sloan and Megan Mitchell reported on the international activities and outreach that FAA/AST is engaged in. Mr. Alexander first mentioned the IAF Commercial Spaceflight Committee, which AST chairs. This committee is part of the International Astronautical Congress Conference and holds a paper session that has historically concentrated on technical topics. The next conference will be held in South Africa in October. The FAA has been able to use this as an avenue to promote the U.S. regulatory framework for orbital space flight.

In the international outreach arena, Mr. Alexander noted, the FAA has established a new International Affairs website and created an informational brochure. Through the FAA's international representatives, AST is providing information to many countries about commercial space transportation and expressing a willingness to discuss regulatory

issues. The FAA is also exploring MOUs with other countries as part of the process to promote its regulatory framework.

Mr. Alexander also noted that John Sloan participated in a space law conference held at the University of Nebraska where Mr. Sloan discussed interoperability versus harmonization.

Mr. Sloan and Ms. Mitchell also briefed the RLV Working Group on the European Aviation Safety Agency (EASA) and its proposal to regulate winged suborbital vehicles through certification rather than licensing. The Europeans are saying they will define winged suborbital vehicles as aircraft, and therefore will certify them as they do other aircraft. This would be inconsistent with U.S. licensing.

Mr. Alexander finally noted that AST will work with ISU on a small study of a possible beacon transponder for commercial space vehicles. It would be a safety feature. The FAA will seek input from commercial providers on using these transponders.

Mr. Alexander then presented the first proposed finding from the RLV Working Group. This finding states: COMSTAC finds that adoption of regulations world-wide that are consistent with the U.S. regulatory approach is important to the long-term success of the industry and commends the FAA/AST effort to promote the U.S. regulatory framework for licensing of space transportation to the international community.

Mr. Trafton stated that a finding should be supported by facts. It does not require a response from the FAA. He asked for comments. There were none. He called for a vote. There were only votes in favor, none opposed. This became a finding to be sent to the FAA.

Mr. Alexander presented the RLV Working Group's second proposed finding. This states: COMSTAC finds that aircraft-like certification of winged space vehicles is premature and if imposed could be detrimental to the early development of the suborbital space transportation industry. COMSTAC is particularly concerned about the European Aviation Safety Agency, EASA proposal for aircraft-like certification.

Mr. Trafton asked for comments. Mr. Khourie noted that there was quite a battle to get this implemented back in 2004. Mr. Alexander noted that industry has supported this view for some time. This is a way for COMSTAC to put this on the record. The rationale for doing so now is because of EASA's activity. Mr. Trafton asked for any other comments. There were none. He called for a vote. There were only votes in favor, none opposed. This became the second finding to be sent to the FAA.

Mr. Alexander asked if there were any other questions. There were none. He thanked COMSTAC for their attention. Mr. Trafton thanked Mr. Alexander for his report. Then Mr. Trafton called for a lunch break. The meeting broke at 11:43 a.m.

Mr. Trafton called the meeting back to order at 1:00 p.m. He introduced the featured speaker, Ed Mango. Mr. Mango is the Program Manager for the Commercial Crew Program at NASA (KSC).

Remarks by Mr. Mango

Mr. Mango observed that part of his talk was to look at where NASA is today, especially the Commercial Crew Program (CCDev). Then he will look at how NASA works with the FAA to support the two CCDev goals: capability for NASA astronauts to get to the International Space Station (ISS) and the capability to provide transportation to and from low Earth orbit (LEO).

Mr. Mango noted that the CCDev program was established about 18 months ago. Half the staff is in Florida, the other half in Houston. They are trying to stay as small as possible. The mission is to develop the capability to fly safely, reliably, and cost-effectively to LEO and the ISS. They have been asked to take a non-traditional approach. That is to minimize cost growth as opposed to using cost plus contracts. They are buying services; they do not want to own hardware or the designs. They must be able to ensure safety.

Mr. Mango observed that the Commercial Crew Program is leading NASA's efforts to develop an American-made system. Mr. Mango noted that after two more shuttle flights there is no more American-made system to bring people to LEO. NASA will have to rely on foreign systems. It is in America's interest to build an American system. The mission is safe, reliable, cost-effective transportation to LEO and the ISS. To facilitate this mission, Mr. Mango stated that his deputy is a former astronaut. Therefore, flight crew is part of the management structure. They will have feedback on what is needed from the flight crew standpoint.

Mr. Mango stated that NASA will manage the certification process. His program is responsible for making sure any vehicle can get through certification. It must be safe enough to fly with NASA astronauts.

Mr. Mango presented an overview of CCDev1 and CCDev2 and the review stages. He emphasized that throughout the CCDev2 effort, NASA is in a partnership. Both NASA and industry bring money and capabilities to the table. NASA will put out a draft set of requirements. Before the requirements become final, there is a dialogue among the partners. NASA is also open to input beyond the companies selected to work directly with NASA.

Mr. Mango displayed a map of the United States that called out the locations of the CCDev commercial partners and their suppliers. This illustrated the broad geographic distribution of activity across many states.

As NASA moves on from CCDev2, it will have a more prominent role. NASA will have to buy off on certification. It will have to make sure that the hardware is going to be safe enough to fly. Mr. Mango stated that when NASA and industry have successfully created the capability to get a crew to low Earth orbit and to the ISS and back, then that same capability can be used for other companies to fly people to space that have nothing to do with NASA astronauts. At this point, the vehicles fall under the umbrella of FAA regulation. If NASA and the FAA do not work together from the beginning and work to understand how each other thinks, licensing the future commercial vehicles could become complicated.

Mr. Mango noted that NASA and the FAA have set up rotational assignments between the two organizations. A NASA engineer was stationed at the FAA for the past year. Likewise, the FAA sent an employee to NASA. Mr. Mango recognized that the two agencies have different missions, but it is necessary to get into each other's camp and really understand what certification means and what a license is. What is the difference between requirements and regulations? The more the two agencies collaborate, the better NASA's requirements and the FAA's regulations will coincide, and the better they'll be able to operate for the benefit of industry.

Mr. Mango compared NASA's and the FAA's missions. NASA is responsible for the safety of its crews while ensuring mission success. The FAA is a regulatory agency. Its focus is on public safety. Mr. Mango sees FAA licensing as a desired state. There is a need, though, to balance the issues crew safety and public safety. Both parties bring knowledge and experience to the table. NASA sends some of its best people to help the FAA and the FAA sends some of its best people to help NASA. Mr. Mango displayed a slide showing a program roadmap. This roadmap includes NASA certification and FAA licensing to demonstrate compatibility between public safety and crew safety. Together the FAA and NASA can ensure that the federal government will promote commercial space and create an American-made capability to get to low Earth orbit and the ISS. Mr. Mango indicated his willingness to take questions.

Ms. Schnaars referred to the morning's conversation about Space Act Agreements and FAR Part 12 fixed price contracting. She asked if there is another phase, a CCDev3, that will move towards CCR and would be a Space Act Agreement, and BDT&E would be a fixed price. How does Mr. Mango see that moving forward?

Mr. Mango replied that NASA is in the middle of looking at this. He stated that Space Act Agreements are great tools to partner with a company and move forward at their pace. At some point, however, NASA has to pay attention to its requirements and certification process. These do not work well under as SAA. Then there is the need to convert to a contract. The question is when and how. NASA is working on this. They expect to have more data by the time of the workshop at the end of May.

Ms. Schnaars noted that the big issue for industry is that SAAs involve IR&D in terms of investment, but FAR Part 12 is another set of reviews. Mr. Mango responded that NASA wants a fixed government investment as well as the partner's investment. There has to be some contribution from the companies in order for development to happen.

Mr. Greason noted that for the program to meet its objective, the per flight cost has to be kept low enough so that someone other than NASA can afford to buy it. The way to have low costs is to have fixed requirements. If these exist, companies can bid on a contract. He stated that when Mr. Mango said he was not sure NASA could do this development on a Space Act Agreement, what Mr. Greason hears is that there are actually no fixed requirements. Mr. Greason asked Mr. Mango to clarify why NASA can't do a Space Act Agreement.

Mr. Mango stated that under the legal requirements in a Space Act Agreement government cannot buy anything. It must be in a partnership. The government cannot buy a certification saying a company is now certified to fly NASA's crew. In terms of requirements, they are on the street now and probably 80 percent complete. The public

can read them at any time. The program expects to go through more iterations. There will be a public workshop at the end of May and probably another at the end of the summer. NASA is looking for feedback on the requirements from those workshops.

Mr. Collins noted that in the transition from government-run programs to commercially procured launch services, the government was very careful to set up protections of intellectual property. He asked what protections the CCDev2 program has to ensure intellectual property is not compromised.

Mr. Mango stated that the people working on CCDev2 receive data from various companies and they are not allowed to share that data unless they are on the list of people and companies working on CCDev2. This applies during the SAA period. After that, the answers are not as clear. The issue is definitely one of the top three or four risks for the program.

Ms. Lepore noted that when doing something on a commercial basis, the terms and conditions are very important to the commercial company. When the government tells the company what to do and how to do it, it moves into a not very commercial mode. There is a perception that because you are in a full FAR environment the system will therefore be safe. She requested that NASA be aware of this. Ms. Lepore then asked about fixed requirements. Are these fixed requirements for all or fixed requirements for each? Will there be one set of requirements? She noted that one size does not really fit all. She asked for Mr. Mango's thoughts on tailoring requirements.

Mr. Mango commented that regardless of the acquisition process in use, the guidelines are the same. NASA wants milestone-type processes. They need the ability to understand and approve the certification and to see the data resulting from the certification. Safety also should not be driven by the architecture of the acquisition. With regard to requirements, Mr. Mango noted that NASA is looking for feedback. The actual requirements are probably only 30 pages long. The rest of the requirements are in the form of "meets the intent." He has asked the engineers and safety folks to show him the key nuggets that would meet the intent. Then the partners can come forward with their tailored process for meeting the intent. NASA wants to have a discussion with industry on the requirements.

Mr. Alexander expressed concern about the partnership relationship. If the SAA is a partnership and then moves to a CCDev3 and then a certification phase where a fixed price contract comes into play, then this becomes a customer to contractor relationship – the partnership is gone. He felt that the partnership is key to making the process commercial and for NASA meeting its goals: satisfying its own needs and enabling any commercial transportation system. Mr. Alexander noted that he has not seen any parts under the FAR that would not impose a customer-contractor relationship. He thinks that is why NASA wants to go to the FAR. This means a loss of partnership. He suggested certification might be done during the services phase. Development should be done through demonstration to maintain the partnership. He noted that maintaining the partnership is the key to success for NASA.

Mr. Claybaugh asked if NASA came up with a good set of firm fixed requirements and if a commercial company met those requirements, will that company in order to go to the ISS have to go through the safety review process.

Mr. Mango noted that the safety review process is a NASA process, and as such, NASA can change it. For the CCDev2 missions, they plan to fold the safety review process into the program. There will be a technical board and a program board. The safety review would be conducted under the technical board. NASA wants its engineers and safety folks to be part of the company's panels or boards. They would not have voting power, but this would be part of the partnership relationship. For the ISS, Mr. Mango noted that it has been there a long time and has some of its own requirements. To enter that laboratory, companies are probably going to have to meet those requirements. NASA is working to streamline that process.

Mr. Gold commented that there is a substantial cost to the FAR. If companies have to abide by the FAR, costs will skyrocket. He encouraged Mr. Mango to remain with SAAs as long as possible to achieve the goals of the Commercial Crew Program. Mr. Gold then asked for a clarification. He noted that one of Mr. Mango's slides stated that FAA licensed missions for CCP is a desired state. In the CRRES opinion in the current legal regime there should be Certification of Flight Readiness (COFR). However, the actual launch license must be issued by the FAA. He asked Mr. Mango to confirm his reading and acknowledge this.

Mr. Mango reiterated that there are two goals for the program. The second goal is to create capability that anybody can use. Given this, it does not make sense to say that for one mission you don't get a license and for another you do. Does that mean that for the first mission a license would be required? That's NASA's desire, but can we get there? There are a lot of things to be accomplished before then.

Mr. Gold encouraged Mr. Mango to read the CRRES opinion that provides an outline for when it's AST and when it's NASA. His understanding is that it would be very hard to fit the Commercial Crew Program under an interpretation where there would not be an FAA license.

Mr. Irengar had a question regarding safety requirements. He noted that the FAA has consolidated its requirements in the Code of Federal Regulations; the Air Force Range Safety has consolidated its requirements under 91-710. Is there any plan for NASA to consolidate all safety requirements under one banner number?

Mr. Mango noted that the Air Force has a set of range safety requirements, as does the FAA. He observed that if they are doing a government mission, they follow the Air Force documents; if they're under a license, they follow the FAA rules. The rest of NASA's safety requirements concern crew safety and mission success. Mr. Irengar asked if these were consolidated into a single document. Mr. Mango stated that could be done, but it would be a large document. He noted that NASA would be soliciting feedback at its conference in late May.

Mr. Trafton noted that it was time to continue with the rest of the COMSTAC program. He thanked Mr. Mango for his comments. Then Mr. Trafton introduced Debra Facktor Lepore to report on the Space Transportation Operations Working Group.

Space Transportation Operations Working Group (STOWG)

Ms. Lepore thanked those who participated in the Space Transportation Operations Working Group. She noted that the working group's agenda was so full, that other working groups kindly took on some of the load. Also, because of the full agenda, some action items had to be deferred until the next teleconference.

The first action item was to look at the economic impact of complying with orbital debris standards if those standards were to become requirements. Ms. Lepore noted that there were three responses to a survey that was sent out. She will submit those responses to the FAA. If more responses come in, she will submit those as they come. She encouraged those companies who have not responded to the survey to send it in.

The STOWG meeting then looked at two special topics. The first dealt with international development in space operations. The working group hosted a panel on the European Union's proposed Code of Conduct for outer space activities. The panel consisted of Dr. Laszlo Deak from the European Union, Dick Buenneke from the State Department, and Dr. Scott Pace from the GW Space Policy Institute. Part of the conversation was a second activity taking place within the United Nations with COPUOS (Committee on Peaceful Uses of Outer Space). This committee looks at long-term sustainability of space. Ken Hodgkins from the State Department provided perspective on this.

Ms. Lepore reported that the EU Code of Conduct status is that it was approved by the EU ministers in September 2010. It is now going through a process of engagement. Ms. Lepore noted that Dr. Deak provided reaction from some of the European countries. Reaction ranged from no reply to very complicated to we never heard of it. It appears there will be quite a bit of discussion before there is any formal acceptance.

Ms. Lepore presented a proposed observation and a proposed finding regarding the Code and the long-term sustainability of space. Proposed Observation # 1 states:

- The "EU Code of Conduct" recently came to the attention of the commercial space transportation community. The open dialogue with COMSTAC is part of a broader communication effort that is needed as the Code matures.
- The EU Code of Conduct contains issues of interest to the commercial space transportation industry, including ones that come under the FAA/AST purview. For example:
  - Safety and integrity standards
  - Proximity and on-orbit operations
  - Mechanism to investigate proven incidents (orbital debris)
  - Etc.
- The "Long Term Sustainability of Space" activity is actively soliciting industry input, and COMSTAC is pleased to have been the venue for expanding this discussion to the public and should continue to do so.

Mr. Trafton asked for comments. There were none. He called for a vote. There were only votes in favor, none opposed. This observation was accepted by the Committee.

Ms. Lepore then presented the proposed finding. This finding reads as follows:

European Union's Code of Conduct and UN Long Term Sustainability of Space

- Industry input into both activities is necessary, as there are many open issues that can affect commercial space transportation activities.
- It is important for FAA/AST to voice effects on industry from the perspective of regulations, best practices, standards, orbital debris, proximity operations and incident investigation. COMSTAC should be the mechanism to solicit this input.
- Both activities need a broader global dialogue, with government and industry, before any "acceptance," with a goal of a predictable and transparent framework for discussion and any resulting agreements.

Ms. Lepore explained the working group's opinion that a dialogue with government and industry is needed before the United States accepts any document. If the U.S. signs on to something before the dialogue is complete, it's hard to tell what the results would be.

Mr. Trafton noted that the second paragraph could be turned into a recommendation at some point. He called for a vote. There were only votes in favor, none opposed. This finding was accepted by the Committee.

Ms. Lepore moved to the second topic the working group discussed; this was a Department of Defense proposal to enhance commercial operations at the federal ranges. Tom Shearer from the Air Staff and the DoD Executive Agent for Space and Kevin Fleming from the 45th Space Wing presented the information to the working group. This subject emerged from previous discussions from about a year and a half ago when the STOWG was asked for input on the challenges and barriers of doing business at the Federal ranges. The working group conducted a survey and received some input from companies. The outcome was acknowledgement that a continual and open dialogue is necessary as more operations and facilities transition to commercial hands. Currently, companies may make use of excess capacity at Federal ranges. The DoD has submitted a legislative proposal to Congress to deal with some of the legalities of this arrangement and include donations from companies for the services and infrastructure. Ms. Lepore presented the STOWG's proposed finding to support the DoD's position and urges for the topic to be formally briefed to the COMSTAC at its October meeting. The proposed finding reads as follows:

DoD Proposal to Enhance Commercial Interactions at Federal Ranges

- COMSTAC observes that the effort by DoD to expand excess capacity to include industry funding for enhanced capability at the range is useful and the FAA/AST should help consolidate industry comment on the utility of this proposal.
- Given DoD's timeline of engaging industry over the summer, STOWG should be utilized as the forum to gather input, such as during its regular telecons.
- It would be useful for this topic to be formally briefed to the full COMSTAC meeting in October as the DOD proposal will have matured by that time.

Mr. Trafton asked for any discussion.

Mr. Holder noted that COMSTAC does not represent everyone. There are companies who may want to use government facilities or infrastructure, but they are not on COMSTAC. They would have to deal with the government directly.

Ms. Lepore suggested changing 'the forum' to 'a forum' in the second paragraph. She noted that STOWG was the first venue to hear this presentation. Others will follow. She asked Kevin Fleming if he would like to add anything. Mr. Fleming stated that they were

going to reach out to everybody they could think of. The legislative proposal just went to the Hill. The timing was excellent to put this information in front of the Committee. Mr. Holder stated that the wording change in the second paragraph satisfied his concern. The change was made to the text.

Mr. Trafton asked for any other comments. There were none. He called for a vote. There were only votes in favor, none opposed. This finding was accepted by the Committee.

Ms. Lepore presented the STOWG's new business items. First, Al Wassel from the FAA/AST's Florida office briefed the STOWG on an opportunity to submit action items to the Consolidated Launch Schedule Review Board. This board meets periodically to determine the manifest of launches at Federal ranges. It's a good place for small companies who do not sit on the Board to use FAA/AST as a mechanism for input. The next item will be fully briefed during the Risk Management Working Group report. That is the request for COMSTAC to review and submit comment on the space transportation policy. Finally, there will be a public meeting at the end of May on commercial orbital human space flight regulations.

Ms. Lepore invited everyone to join in the periodic teleconferences the STOWG holds. Also, the STOWG is looking into a meeting during the AIAA SPACE 2011 conference at the end of September. Sue Lender is looking into the logistics of doing this.

Mr. Trafton thanked Ms. Lepore for her presentation. He called for a short break. The meeting broke at 2:20 p.m. and was called back to order at 2:31 p.m. Mr. Trafton introduced Mike Gold to report on the Export Controls Working Group.

Export Controls Working Group (ECWG)

Mr. Gold noted that the working group began its meeting with a panel discussion. This panel was made up of David Fite, Senior Professional Staff Member for the House Foreign Affairs Committee, and Tony DeTora, Legislative Assistant to Congressman Dana Rohrabacher (R-CA).

A good portion of the discussion focused on China. Mr. Gold pointed out a contrast between the way the China issue is treated in terms of NASA civil space policy and export control reform. Most Republicans oppose NASA engaging in any activities with China. The Administration, on the other hand, has expressed a desire to engage with the Chinese for civil space activities. In contrast, for the issue of export control, there is bipartisan agreement that any reform policy that includes China, or lessens restrictions on China, is "dead on arrival" politically.

At the previous COMSTAC meeting, Mr. Gold noted, the working group looked at the Four Singles plan comprised of a single control list, single primary coordination agency, single IT system, and single licensing agency. The panel from the May 10 meeting informed COMSTAC attendees that Congress does not like the single control list concept or the single primary coordination agency idea. The only element that might find support is the single IT system.

Mr. Gold reviewed the Administration's proposed tiered list structure of the Administration's export control reform effort. The Administration has completed a review of Category VII, transportation vehicles, including tanks. The results are that 74 percent of the 12,000 items that were licensed should be decontrolled entirely. The next category to be tackled will be the space category, Category XV. Mr. Gold commented that the Congressional staffers felt that the Administration's export control reform plan would not work, nor would it make its way through Congress.

Despite the fact that the Administration's ambitious export control reform may not be enacted any time soon, Mr. Gold expressed his opinion that COMSTAC can still play a positive role in making recommendations.

The first recommendation that the Export Control Working Group proposed was:

> The COMSTAC recommends that during interagency review the FAA communicate COMSTAC's strong supports of the export control reform effort to create a single, tiered list.

Mr. Gold noted that there is an interagency group that has been looking at the export control reform issue. It can only help if the FAA can express its support for this effort.

Mr. Trafton asked if the Administration had started an effort to create a single, tiered list. Mr. Gold stated, "Yes, that's what the reviews are." Mr. Trafton proposed removing the 's' from 'supports.' Mr. Gold agreed.

Mr. Trafton asked if COMSTAC needed to tell the FAA to support the President of the United States.

Mr. Holder asked why Congress hates the four singles approach. This is a problem that erodes the industry every day. Export control has repeatedly done harm. The harm may have been small in each case. Cumulatively, it may not stop work for the entire industry, but it has that effect over time. He stated his belief that it is very important for COMSTAC to voice its collective support for the approach that has been offered that radically improves industry's situation.

Mr. Van Laak noted that the FAA does not need to be told to support its boss. What we would like is for COMSTAC to have a finding saying that it supports this effort.

Mr. Trafton expressed support for this path. Mr. Holder stated that a finding would offer COMSTAC's opinion to the FAA for consideration. Mr. Gold expressed concern with making this a finding versus a recommendation because a recommendation would require the FAA to do something. The Export Control Working Group would like to see some sort of response to its recommendation – this has been lacking in the past.

Mr. Van Laak suggested making a recommendation that the FAA communicate COMSTAC's strong support for this position.

There were several refinements to the wording. Mr. Szoka suggested targeting the President with this recommendation, rather than the Administration. There were comments on this idea. Mr. Greason noted that reference to the Administration or the President was not necessary. We can strongly support export control reform.

Ms. Schenewerk asked if there was a desire to be more specific in communicating COMSTAC's strong support during the interagency review. There were several comments supporting this. After a couple more edits, the final recommendation read as follows:

> The COMSTAC recommends that during interagency review the FAA communicate COMSTAC's strong support of the export control reform effort to create a single, tiered list.

Mr. Greason moved to approve the wording. Mr. Trafton called for a vote. There were only votes in favor, none opposed. This recommendation was accepted by the Committee.

Mr. Gold presented the second recommendation from the Export Controls Working Group. This proposed recommendation read as follows:

> The COMSTAC endorses the current review of USML Category XV, in particular, and urges the FAA-AST to express support for the Department of State's efforts.

Mr. Gold noted that COMSTAC might want to edit this for the AST to express COMSTAC's support. He then offered a comment that the reform will probably not get through Congress. However, there is something called a 38(f) procedure. This allows certain items and technologies to be transferred from USML to CCL. It is the working group's hope that when the Category XV review is final, it will be the basis for proceeding with several 38(f)s to transfer technologies from USML to CCL.

Mr. Holder suggested editing Recommendation 2 as was done for Recommendation 1. That is to make this a COMSTAC opinion expressed to the FAA. Mr. Gold agreed and suggested integrating the concept of "during the interagency process" to the recommendation.

Mr. Alexander asked Mr. Gold to explain the difference between the USML Category XV review and the single tiered list. Mr. Gold noted that the single tiered list affects every category – the overall review of everything on the USML. Mr. Alexander asked if this was a subset, and Mr. Gold stated it was. Mr. Gold also noted that Congressman Ruppersberger had recently introduced a bill that would grant the President the authority to remove satellites from the USML. He was doubtful the bill would be enacted.

Mr. Trafton called for a vote. There were only votes in favor, none opposed. This recommendation was accepted by the Committee. The final language read as follows:

> The COMSTAC endorses the current review of USML Category XV in particular and urges the FAA-AST to express the COMSTAC's support for the Department of State's efforts during the interagency process.

Mr. Gold presented the third proposed recommendation that read as follows:

> The COMSTAC recommends that the FAA support the public release of commodity jurisdiction requests and advisory opinions to help enhance clarity, consistency, and transparency.

Mr. Gold explained that a commodity jurisdiction (CJ) request is a request for the Department of State's Directorate of Defense Trade Controls to make a determination whether a technology should be on the USML, controlled by the ITAR, or on the CCL, controlled by the EAR, a less restrictive regime. When these requests are filed, they remain private and proprietary. They may not even be available through a FOIA request. There is no opportunity to create a precedent, which is important for any sort of knowledge or predictability, and sustainability of a regime. When one doesn't know what decision was made on a topic the last time, there's nothing to build on.

Mr. Holder asked if releasing an opinion could be done without violating proprietary information. Mr. Gold responded, absolutely. There may be a redacting process to remove any proprietary information, but that would not sacrifice the usefulness of the determination.

Mr. Alexander asked if they were made public voluntarily now. Mr. Gold stated that would be up to the entity making the request.

Mr. Trafton expressed his unease with this recommendation. He felt it was a very specific recommendation. Mr. Gold stated that this may seem like a trivial or detailed issue. However, when a new company wants to build on the CJ determination of a previous request, it's difficult to do so. It would make all the difference in the world for industry to view previous decisions.

Mr. Holder stated that currently no one can learn from the process a predecessor went through. Each company must become knowledgeable about the process and fight its way through the system. If you do not already know the system, you cannot read old opinions and learn what issues have been rejected and why. Each new entrant must fight the battle solo. Without transparency, the government decisions could be wildly inconsistent.

Mr. Collins asked if industry could agree to make their CJ decisions public without turning to the government for this. Mr. Gold stated that having to make the decisions public would encourage the government to be consistent, also some companies might not participate. Mr. Collins noted that that was their prerogative. Why should a company's information be made public? Mr. Gold noted that proprietary data would be redacted, but the policy represented by the determination is what would be valuable for industry to have.

Mr. Greason stated that within the Commercial Space Flight Federation they are already sharing the data among members, but this doesn't go far enough. We can't help the government respect its past behavior by sharing information with each other. We can only help each other. It's a good step, but it's not enough.

Mr. Szoka suggested adding "redacted, as necessary to protect recognized trade secrets" to the recommendation. He commented that the rules industry has to follow are not actually the ones in the ITAR. They are in the decisions. You have to learn the rules each time. This change would fix that problem.

Ms. Lepore asked if a requester could release everything if it wants to do so. Mr. Gold responded yes. She asked if a company could release the decision, whether positive or negative, and the rationale. Mr. Gold affirmed this could be done. The Commercial Space Flight Federation is doing this, but only for members.

Mr. Alexander asked to clarify that a CJ is not country specific. Mr. Gold responded that the CJ is to determine if a technology is USML or CCL. The response could be country specific.

Mr. Alexander stated he would like to see this recommendation in the same format as the previous two. That is, it is COMSTAC's support that we are communicating.

Mr. Trafton called for a vote. There were only votes in favor, none opposed. This recommendation was accepted by the Committee. The final language read as follows:

> The COMSTAC recommends that the FAA express COMSTAC's support for the public release of Commodity Jurisdiction requests and advisory opinions, to help enhance clarity, consistency, and transparency.

Mr. Gold presented the fourth proposed recommendation as follows:

> The COMSTAC requests that the FAA/AST provide feedback from the Managing Director of the Directorate of Defense Trade Controls on the feasibility of implementing the process described in Recommendation 3.

Mr. Gold explained the purpose of this recommendation is to ensure a response from the Managing Director of the Directorate of Defense Trade Controls on this issue.

Mr. Szoka asked what would be the feasibility issue. The only one he could think of was redaction. Mr. Gold responded that it would be interesting to get DDTC's perspective on this. They might see no reason not to make decisions public. On the other hand, there might be issues we are not aware of that would prevent this from happening. What might those issues be?

Mr. Vinter felt this was getting too specific. Mr. Greason agreed. The FAA/AST knows COMSTAC's thinking. We do not have to tell them how to relay answers to us. Mr. Gold agreed to drop the recommendation.

Mr. Gold presented the Export Control Working Group's proposed finding:

> The COMSTAC finds that the deemed export rule under the ITAR is aggravating the aerospace industry's already challenging problem of being able to hire and retain qualified engineers.

Jeff Greason explained that workforce issues present one of the greatest challenges to the commercial space industry. A significant percentage of people graduating with aerospace degrees in the United States are dual nationals or citizens of other countries. While hiring foreign nationals from some countries is a more sensitive subject than others, right now he faces the same scrutiny whether he wants to hire an ex-Libyan or an ex-Canadian. He believes we should do something about this situation.

Mr. Holder expressed surprise that this issue would be at the top of the list for hiring. He wanted to clarify that in the hiring process, Mr. Greason needed to consider a person's ITAR status.

Mr. Greason stated that it is a problem. He can hire a foreign graduate student, but in the aerospace industry, he cannot have the person work on anything until after he becomes a U.S. citizen. This is not practical. Mr. Gold noted his company had trouble relative to Canada because of this issue.

Ms. Lepore asked if COMSTAC was not already on record that ITAR aggravates a lot of things. Is this one that we have not addressed in the past? Why is there a need now?

Mr. Greason responded that during the panel discussion, the government participants stated that one of the challenges they face in addressing export control reform is it's difficult to find provable harm. It's not easy to define concrete examples of a specific thing causing this specific harm. The working group saw an opportunity to do that in one area.

Mr. Trafton called for a vote. There were only votes in favor, none opposed. This finding was accepted by the Committee.

Mr. Gold thanked COMSTAC members for their patience.

Mr. Trafton introduced Chris Kunstadter to present the Risk Management Working Group report.

Risk Management Working Group (RMWG)

Mr. Kunstadter noted that the working group meeting on May 10 was very well attended and thanked everyone for their participation.

The working group dealt with three topics. First was the fact that the indemnification regime expires in a year and a half. Obtaining an extension is an arduous process. Mr. Kunstadter noted that the working group will have to begin working on it. The last extension was for three years a year and a half ago. He expressed the hope that the next extension can be longer.

Mr. Kunstadter turned to the second topic – the public hearing to be held in late May on the regulatory approach for commercial orbital human space flight. Randy Repcheck gave the working group an overview of hearing. He is taking note of the fact that the restriction on regulating commercial human space flight expires in December 2012, about a week before the indemnification expires. There was some discussion about what the restriction covered and whether it is a ban or not. The hearing is important and COMSTAC members should take an interest in it.

Mr. Kunstadter proceeded to the proposed recommendation from the Risk Management Working Group that reads as follows:

> COMSTAC recommends that at the autumn 2011 COMSTAC meeting, the FAA provide a briefing on the results of the FAA public meeting, and any subsequent activity on the regulatory approach for both orbital and suborbital commercial human space flight.

Mr. Holder asked if we could not simply request a briefing from AST without a formal recommendation. Mr. Kunstadter replied that was certainly possible.

Ms. Lepore stated that COMSTAC wants to continue to be engaged in the discussion. We could recommend that COMSTAC be a place to provide observations or advice on some of the results from the public meeting. She felt that the recommendation is that COMSTAC be engaged.

Mr. Van Laak stated that there are a set of laws surrounding the regulatory process. He would require advice from AGC on when AST staff has to remain silent on the process. The public meeting and comments submitted to the docket are all public. AST is happy to share that information. He felt the recommendation might be inappropriate because AST might be at a point where it cannot legally share information. He reminded the COMSTAC that the public hearing is to deal with orbital, rather than suborbital, commercial human space flight. This is because of the energy NASA has in the Commercial Crew Program. The goal is to inform industry what AST sees as the regulatory environment so that it can have confidence that a system built to meet a NASA mission will be sufficient to meet any FAA licensing requirement in the foreseeable future.

Mr. Greason expressed his concern that once the NPRM process starts, it is not possible to have a back and forth conversation about a rulemaking. He advocated using the time before that process starts to have a more free form back and forth conversation about what rulemaking might be.

Ms. Schenewerk suggested adding "in accordance with the law governing the regulatory process" to the recommendation.

Mr. Van Laak stated that AST would certainly have as much dialogue as possible with COMSTAC on the rulemaking process. He noted that the public meeting at the end of May should help to reduce concern on this issue.

Mr. Holder expressed his concern that this recommendation might harm COMSTAC's relationship with the FAA. He suggested asking for a briefing, rather than formalizing the request with a recommendation.

Mr. Van Laak assured the Committee that the recommendation would hurt no one's feelings.

Mr. Greason recommended adding this issue to the agenda for the October COMSTAC meeting and dropping the recommendation. Others agreed.

Mr. Kunstadter stated the recommendation was dropped.

Mr. Kunstadter turned to the third topic. This was the White House pending review of the 2004 Space Policy. Mr. Kunstadter noted the letter Dr. Nield sent to Mr. Trafton requesting input from COMSTAC. The request is for a white paper, not to exceed 10 pages, to be sent to the FAA within two weeks. Individual companies and associations are also invited to submit comments.

Mr. Kunstadter volunteered to be the focal point for this effort. Risk Management Working Group members have offered assistance. Mr. Kunstadter stated he would be happy for any and all help that members could provide.

He gave a brief overview of the history of the policy and noted its goals and objectives. He then asked what has changed since 2004. The Shuttle is retiring, Constellation is on hold, civil space programs are under pressure, global economic conditions have changed, commercial space transportation has taken a much more prominent role, and regular commercial human spaceflight is on the horizon. So, we are looking for ways to achieve availability, reliability, responsiveness, and affordability. He reported that there was a lot

of discussion within the working group and a number of points came up that participants agreed should be part of the white paper. These points are:

- Creation of actionable language and activities that the U.S. Government can do to foster the U.S. industrial base and competitiveness. For example,
  - The U.S. Government should become a stable, predictable, reliable user of commercial launch services.
  - The U.S. Government should facilitate certification and licensing of new entrants to eliminate any barriers there might be in the process.
- Goal of reducing the cost of commercial launch services to enhance competitiveness of the U.S. launch industry in the international marketplace, and to fundamentally transform the U.S. into a spacefaring nation
- Extension and expansion of the liability risk-sharing regime, including limiting liability associated with human spaceflight participants
- Reform of the export control process to ensure competitiveness of the U.S. commercial space industry
- Support for NASA to provide sufficient resources for developing and using commercial human and cargo spaceflight
- FAA/AST is both the proper and the legal entity to issue licenses for commercial human spaceflight, including NASA's commercial crew program
- Critically important role of FAA/AST as the only federal agency with authority to regulate commercial human spaceflight
- Suborbital human and scientific spaceflight policy specifically addressed, as well as encouraging U.S. Government to be customers
- Ensuring safe commercial access to suborbital space and beyond
- Providing capacity support to allow affordable commercial launch services
- Technology development and improvement of in-space propulsion, range infrastructure, ground systems and associated space flight support systems

Mr. Kunstadter noted that over the next couple of weeks, he and several other members would synthesize these points into a single paper.

He then presented a proposed observation: COMSTAC affirms the critically important role of FAA/AST as the only federal agency with authority to regulate commercial human spaceflight.

Mr. Van Laak explained that the FAA chief counsel and NASA chief counsel had conferred on the options available to NASA with regard to FAA licensing. He noted the government can conduct a launch without FAA-licensing of a commercially procured item. If the launch is a service, then it must be licensed. He cautioned that the observation be factually correct.

Mr. Gold agreed that there have been many commercially procured launches and payloads flown for the government. However, he believed that the key word in this is

regulating commercial human spaceflight. He maintained that current law directs that launches under the Commercial Crew Program and commercial spaceflight as we know it would have to be licensed by the FAA.

Mr. Trafton noted that this is an observation. COMSTAC affirms this statement to be true.

Mr. Eckert commented that even though there is a clear legal definition of a commercial launch, which the FAA would regulate, and there is a two-fold test for that (i.e., by and for the government), there seems to be continuing ambiguity about this in the field. Part of the intent of this observation was to clarify the way for determining whether we are dealing with a commercial launch licensable by the FAA or whether we are dealing with something else, which does not require a license.

Mr. Holder asked if Mr. Eckert would recommend that the observation include language about the two-part test. Mr. Eckert responded that to reflect the intent of the working group, the observation should make some reference to that issue. The fact that the FAA has regulatory authority doesn't get to the core issue, which is there is continuing confusion about which launches the FAA has authority over. The definition of commercial launch is at issue.

Mr. Alexander stated that if this is input to the space transportation policy review, COMSTAC should tell them we would like to the policy to direct NASA under the Commercial Crew Program to have FAA licensing.

Mr. Greason stated that the issue was that COMSTAC needed to clarify that there is a clear basis in law and in precedent for this position.

Mr. Alexander noted that NASA and the FAA will state there is precedent and the ability to do it legally. There is also the ability not to have to do it. NASA is taking that route.

Mr. Greason stated the broader issue is that the United States has one central gatekeeper agency for licensing of commercial space activities in the United States. That is the FAA/AST. This is what the observation should say.

Mr. Alexander stated that the reason he questions why COMSTAC should say this is that it's not in dispute. The only place it comes into question is with NASA, and they are not saying they want to regulate. They are saying they want to certify their own astronauts.

Mr. Greason expressed concern that when NASA does certification with its 500 pages of documentation and nest of documents within that for human rating requirements, that that will be imposed on the FAA to impose on commercial industry.

Mr. Szoka noted that the debate centers on the definition of commercial. As Mr. Eckert noted, there is a legal test for this. He maintained the white paper offers the opportunity to help people understand that the FAA has sole jurisdiction for licensing and also has a promotion role for the commercial sector.

Mr. Van Laak clarified that the FAA will have its regulatory structure. NASA has its contract. If a company elects to contract with NASA, it will have to deliver what is in the contract. There will be a set of higher level safety requirements that we will hold in common. NASA has not committed to either an acquisition strategy or whether or not

they are going to license their early flights. He did not have an objection to the wording of the observation. He cautioned about reading deeper meaning into the words.

Mr. Trafton indicated that he did not think COMSTAC should get into the definition of commercial space here. This is an observation from the Risk Management Working Group. He asked if COMSTAC could take a vote.

Mr. Gold noted that the debate was around which agency should license a launch. There is a Department of Justice opinion on whether a launch is licensed by the government or by the FAA/AST. The observation is that AST is a licensing authority. He is concerned that if NASA removes the ability of AST to license Commercial Crew launches, he if skeptical that AST will ever get that authority back. Mr. Holder questioned how they could remove AST's authority. Mr. Gold stated they could just say the launch is by and for the government and not commercial from a regulatory perspective.

Mr. Van Laak noted that there are intense government-to-government conversations that he is not at liberty to discuss. This issue, however, is not settled

Mr. Vinter noted there was nothing COMSTAC could do to regulate NASA's behavior.

Mr. Trafton closed the discussion and called for a vote. There were only votes in favor, none opposed. This observation was accepted by the Committee.

Mr. Kunstadter thanked those who worked on the policy review and noted that there was more work to complete it.

New Business

Mr. Trafton had a single new business item to raise. He proposed that COMSTAC amend its bylaws to require every COMSTAC member be assigned to a working group. This would require members to make every attempt to attend the working group meetings. He proposed this item be discussed via email.

Mr. Trafton asked if there were any comments from the audience. He then expressed the hope that people were reacting positively to the new format of observations, findings, and recommendations. He thinks it is a good way to convey COMSTAC's thoughts to AST in a format that makes sense.

Mr. Szoka noted that he enjoyed NASA Administrator Bolden's comments. However, he remains concerned by Mr. Bolden's statement that he is in favor of competitive bidding, but not yet. If there is something COMSTAC could do about this, he would be in favor.

Mr. Greason expressed approval for the three-tiered output. He noted the discussions COMSTAC has had about how we formulate our working groups. He feels that the current structure is no longer suited to our task. We need to find a way to reorganize. Mr. Trafton noted that COMSTAC will discuss this over the coming weeks.

Ms. Schnaars noted Dr. Nield's comments that AST's workload was increasing by 10 times and its budget by 75 percent. Also a new center in Florida was anticipated. She noted that there was nothing in the GSO and non-GSO forecasts that would drive this kind of increase. She proposed adding another category, or broadening the definition of

NGSO, to include suborbitals. This is what is driving AST's workload, yet it's invisible in these projections.

Mr. Kunstadter thanked Ms. Schnaars for her suggestion. He noted that the next report would definitely look at this.

Mr. Van Laak noted that changes in the amateur rocket rule had opened up some unanticipated consequences and AST's workload had increased in this arena. This aspect does not show up in the forecast reports. He also noted that changes in the Air Force's approach to protecting aircraft has resulted in an enormous amount of new work and restrictions as some of the new launch operators have seen. This load was also not anticipated.

Mr. Greason expressed the opinion that trying to calculate a market projection for suborbitals might be premature. However, surveying future activity could be beneficial for those who reach out to investors. It is helpful to be able to show investors information about market size. He asked if there was something else COMSTAC should be tracking that would correlate with the work AST does. This would give AST another set of eyes looking ahead to anticipate workload problems.

Mr. Van Laak answered that would be an interesting thing to discuss off line. If it looks like some of AST's efforts take a long time, it is because the office tries to err on the side of making sure the public is well protected.

Mr. Trafton asked for other comments. There were none. He thanked the members and the audience for their participation and anticipated communicating with the members on these subjects over the coming months.

Mr. Trafton adjourned the meeting at 3:53 pm.

Following the meeting, Mr. Gomez circulated a study titled *A Lightning Climatology Study Based on 3D Flash Properties*. This study was intended for distribution at the COMSTAC meeting. Circumstances prevented Mr. Gomez from attending and distributing the study in person. Comments from other COMSTAC members are welcome.

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Signed by

Wilbur C. Trafton

Chairman, COMSTAC

COMSTAC Members Present

1. Wilbur C. Trafton, Will Trafton & Associates, COMSTAC Chair
2. Eleanor Aldrich, American Institute of Aeronautics and Astronautics
3. Bretton Alexander, Commercial Spaceflight Federation
4. Daniel Collins, United Launch Alliance
5. William Claybaugh (for Frank Culbertson, Jr.), Orbital Sciences Corporation
6. Paul Eckert, The Boeing Company
7. Michael N. Gold, Bigelow Aerospace
8. Jeffrey Kenneth Greason, XCOR Aerospace
9. Livingston L. Holder, Jr., Holder Aerospace
10. Caryn Schenewerk (for Timothy Hughes), Space Exploration Technologies Corporation (SpaceX)
11. Ray F. Johnson, The Aerospace Corporation
12. Bill N. Khourie, Oklahoma Space Industry Development Authority (OSIDA)
13. Christopher Kunstadter, XL Insurance, COMSTAC Deputy Chair
14. Debra Facktor Lepore, DFL Space LLC
15. Charles Precourt, ATK Launch Systems
16. Dr. Billie M. Reed, Virginia Commercial Space Flight Authority
17. Jayne Schnaars, The Boeing Company
18. Berin M. Szoka, TechFreedom
19. John W. Vinter, Consultant

Federal Aviation Administration Representatives

Dr. George C. Nield, Associate Administrator for Commercial Space Transportation

James Van Laak, Deputy Associate Administrator for Commercial Space Transportation

Susan M. Lender, COMSTAC Executive Director, Federal Aviation Administration