Commercial Space Transportation Advisory Committee

COMSTAC

October 14, 2011

Meeting Minutes

COMSTAC Deputy Chairman Chris Kunstadter convened the Commercial Space Transportation Advisory Committee (COMSTAC) meeting at 8:38 a.m. The meeting was held at the National Housing Center Auditorium, 1201 15th Street, N.W., Washington, D.C.

Mr. Kunstadter welcomed COMSTAC members and the public to the October 2011 COMSTAC meeting. He noted that COMSTAC Chairman Will Trafton was unable to attend and conveyed Mr. Trafton's regrets to the Committee.

Mr. Kunstadter observed that the agenda for the day's meeting was very busy and he would try to keep things moving. He reminded the attendees that while they certainly could leave belongings in the auditorium during the lunch break, there would be no one available to watch them.

Mr. Kunstadter then introduced the four new members of COMSTAC:

- Dr. Mark Campbell, Chairman of the Aerospace Medical Association Commercial Space Flight Working Group, and member of the Executive Committee of the Space Medicine Association and the Council of the Aerospace Medical Association,
- Janet Karika, Jacobs Director of Interagency Launch Programs for NASA's Launch Services Program,
- Carl Rising, Stellar Solutions,
- Rachel Yates, Holland & Hart.

Mr. Kunstadter extended a welcome to the new members and noted that COMSTAC now has 26 members.

Mr. Kunstadter noted that the observations, findings, and recommendations generated by the working groups at the May meeting were sent to the FAA. The FAA provided responses to COMSTAC. These were presented at the working group meetings on October 13. He thanked the FAA for the well-thought-out responses.

Mr. Kunstadter also noted that COMSTAC responded to the request from the FAA for input on the White House review of the 2004 U.S. Space Transportation Policy. A small

group of COMSTAC members worked diligently over a couple of weeks to respond to the request. In the Risk Management Working Group, John Sloan reported that the FAA presented COMSTAC's input to the White House. The White House has not yet taken specific action on it.

Mr. Kunstadter observed that this is a very important time in space. It is a time of change. While people have flown rockets for 50 years, the technology has not changed. What has changed is the paradigm under which the commercial space industry operates. There is a broader group of companies, people, enterprises, and even countries involved in space than 50 or even 20 years ago. The FAA has a very important role to play in this changing landscape. It is important for COMSTAC members to recognize that they have knowledge and expertise to offer the FAA. COMSTAC's job is to advise. COMSTAC certainly responds to requests from the FAA, but more importantly, it can generate new ideas and help to guide the FAA. Mr. Kunstadter stated that COMSTAC and the individual members need to push hard to participate in meetings, to participate in the working groups, and to take an active role in what COMSTAC has to offer.

Mr. Kunstadter then introduced Dr. George Nield, FAA Associate Administrator for Commercial Space Transportation (AST).

Remarks by Dr. Nield

Dr. Nield thanked Mr. Kunstadter for stepping forward to lead the meeting. He then introduced Greg Rasnake, AST's new Director of External Relations.

Dr. Nield noted that he likes to listen to music. One of his favorite musical groups is Chicago, one of the longest running and most successful groups in musical history. Their first album contains a track labeled 'Prologue, August 29, 1968.' It is a recording of one of the demonstrations that took place outside the International Amphitheater in Chicago during the 1968 Democratic National Convention. As the police attempted to disperse the crowd, the protesters chanted, "The whole world is watching."

Dr. Nield observed that he sometimes gets the feeling that the whole world is watching the commercial space transportation industry today. If he had to categorize the onlookers, he would divide them into three basic camps. The first group is made up of enthusiastic supporters. Most of the COMSTAC members and the audience would probably be in that group. People in this group are excited and impressed by the technical challenges being overcome and they look for a successful completion to the mission at hand. It does not matter whether it is a NASA mission, an Air Force mission, or one operated by a private company.

The second group of onlookers could be called determined opponents. These people don't like the idea of spending money on outer space when there are so many problems remaining here on Earth. Our nation can no longer afford to have expensive discretionary activities, such as a space program. Others in this group think that launching rockets is a governmental function and private industry has no role to play.

The final group consists of the skeptical fence-sitters. They are not necessarily against commercial space; they just can't see how it can be successful. Dr. Nield listed some of the objections. Industry is not capable of building a launch vehicle and spacecraft without government direction; a rational company would never travel to the International

Space Station with astronauts because there is no commercial market for crew transportation; companies will never be able to maintain a good safety record because the temptation to cut corners and maximize profits will be too strong. Dr. Nield refuted each of these objections: the history of the EELV program demonstrates industry can build launch vehicles and spacecraft on its own; companies continue to line up for the various phases of the commercial crew development program; and companies point out that it is not in their best interest to make a habit of killing or maiming their customers. If these are the three groups of observers, Dr. Nield asked what they are likely to observe over the next few years.

Dr. Nield counted six different kinds of missions that commercial companies will perform in the near future. Mission number one is satellite launch. Once launching satellites into geosynchronous orbit was almost exclusively what the commercial space transportation was all about. This still occurs, but it is no longer all there is. Mission number two is commercial cargo. In the coming months, two companies, SpaceX and Orbital Sciences Corporation, will attempt to demonstrate their ability to deliver cargo to the International Space Station.

Mission number three is commercial crew. There is a lot of work under way aimed at ending U.S. reliance on the Russians for human transport to LEO. It will not be long before we see abort tests followed by unmanned demonstration launches for the commercial crew mission. Mission number four is suborbital research. NASA's new flight opportunities program recently awarded contracts to six different companies that are developing commercially operated reusable launch vehicles capable of carrying science or technology payloads.

Mission number five is space tourism. If Futron's 2002 study of the market proves accurate, we should see space tourism become a billion dollar industry within the next 10 years. With the dedication of Spaceport America, commercial services are likely just around the corner. Mission number six involves developing and testing reusable launch vehicles. In addition to suborbital research and space tourism, there are several other technology programs underway to employ reusable launch vehicles.

Dr. Nield noted that with the wide variety of vehicles and missions in existence or soon to come, he is confident that the commercial space transportation industry is becoming more capable, more mature, and more sustainable. The Office of Commercial Space Transportation will do its best to keep up with the busy times ahead and to help the industry be both safe and successful in its efforts. It won't be easy, but if we are to convince the skeptics that commercial space really can get the job done, we will have to deliver. We'll have a pretty big audience. After all, the whole world is watching.

Mr. Kunstadter thanked Dr. Nield for his comments. He noted that this industry is going to grow and our job is to educate those determined opponents and skeptical fence sitters. Mr. Kunstadter then introduced Phil McAlister, Director of Commercial Space Flight Development at NASA to talk about the Commercial Crew Program.

Remarks by Mr. McAlister

Mr. McAlister thanked Dr. Nield for inviting him to speak again at a COMSTAC meeting. He also thanked Dr. Nield for being one of the most articulate proponents of the

commercial space industry. He noted that the partnership NASA has with the FAA is something he personally values.

Mr. McAlister stated that he plans to talk in-depth about how NASA plans to execute the Commercial Crew Program. The goal is to facilitate developing a U.S. Commercial Crew Transport system that is safe, reliable, and cost-effective. NASA wants to achieve all three so that customers can travel to and from low-Earth orbit and the International Space Station. The U.S. Government is not the only customer for these services. There is now a space policy where private industry is focused on low-Earth orbit. The technology is established – it's time for the private sector to take it over. Then NASA can focus beyond low-Earth orbit where there are not a lot of customers or potential for customers.

Mr. McAlister posed the question, how will NASA actually do this? He stated he would not talk a lot about the acquisition strategy, though he would touch on the contracting mechanism. He noted the discussion of Space Act Agreements versus contracts. NASA has held two webcasts on the subject. There is a draft RFP on the street and everything about NASA's current procurement is available to the public. He expressed his regret that NASA could not use Space Act Agreements for Commercial Crew. To give COMSTAC attendees a feel for what his day involves trying to work on Commercial Crew, he showed a video. The video contained clips of several films where the actor was screaming "NO." Mr. McAlister stated that he hears "no" a lot. He noted that the question is, "Can NASA really deliver on this promise of a commercial capability?"

That remains to be seen. However, Mr. McAlister noted that there are four or five years of development to be accomplished. There are elements NASA is putting in place that will enable the success of a commercial capability. The key to developing the commercially viable capability is working out the partnership with the FAA and ensuring the legal framework is in place.

The way NASA will achieve a commercially viable capability is through competition. There will be multiple awards and a non-traditional contracting approach. The approach is not a Space Act Agreement. NASA also has a unique, and hopefully efficient and effective, insight model and oversight model. This means stable requirements, application of standards, and program management.

He noted that CCDev1 consisted of five partners. While there was not a lot of money, NASA saw significant acceleration and maturation on each aspect. Now with CCDev2, there are six partners – four funded, two unfunded. Mr. McAlister expressed his pleasure at seeing the progress the partners are making towards their crew development systems.

Mr. McAlister noted that NASA has just published the draft RFP for the integrated design phase. This will be a 24-month effort. NASA wants to have multiple awards. How many will depend on the quality of the proposals and, obviously, on the budget. NASA also wants multiple partners through the Development/Test/Evaluation/ Certification (DTEC) phase.

Mr. McAlister displayed a slide detailing how the Integrated Design phase demonstrates the non-traditional contracting approach NASA is taking.

Contractor-owned and operated systems

First, the contractors will own and operate their systems. NASA will not dictate design solutions because the contractors will own the designs. This healthy tension between the Government and the partner will be a key to developing a cost-effective system.

Performance milestone payments

These are the same as existed in the Space Act Agreements. Contractors will be paid based on how much they accomplish through the milestones. There will be a firm fixed price contract.

Flexibility for the contractor to propose the specific design and development activities to meet NASA's objectives

This is also very much like the Space Act Agreements. NASA would expect contractors to mature their systems at least to a Critical Design Review (CDR) state. They can go further if they choose. A traditional contract would have many deliverables and a work breakdown structure down to a very low level. Here, NASA will allow the contractors define how they are going to reach the objectives.

Flexibility for the contractor to define their own pace of performance to meet NASA's objectives

NASA recognizes that the industry partners are at different levels of maturity. It does not want to slow anyone down, but a certain level of maturity is needed before moving to the next phase.

No requirement for certified cost and pricing

There may be a company that is not a traditional aerospace company, but it has a DCAS-approved accounting system, they are still able to bid on the Integrated Design phase contract.

Data rights aligned with commercial practices to maximize contractor retention of Intellectual Property rights

NASA has written a waiver to the Intellectual Property Clause and had the procurement office approve it. The hope is that it is acceptable to industry. The draft RFP is open for comments until October 20.

Balance of contract clauses, compliance documents, and deliverables to protect both industry and government investments

NASA has reduced the number of clauses, examining each one to make sure it is necessary to the contract. Many clauses are from executive orders and therefore required. Some of these give added protection to the contractor.

There is still some work to be done on specifying deliverables. These specifications will appear in the final RFP several months ahead.

Mr. McAlister turned to the subject of requirements. He noted that in a traditional human spaceflight program, NASA would control the requirements down to the bolt level. For the Shuttle Program this meant about 10,000 to 12,000 requirements for just Level One and Level Two requirements. The Commercial Crew Program will focus on the Level One and Two requirements. The other levels will be the responsibility of the partners.

Even the top level requirements will be greatly reduced. The partners will tell NASA how they are going to meet the goals. The final RFP will have a firm set of requirements and no "To Be Determineds" (TBDs). There may be small changes in the course of the program, but with mature and defined requirements, NASA believes it can control costs and work much better with the partners.

Mr. McAlister noted that NASA has treated standards as process documents. If a contractor is going to perform a certain task, these are the standards on the way it should be done. Meeting the standards can be a large cost for contractors and often the aerospace industry has perfectly good standards, sometimes better than NASA. For the Commercial Crew Program, NASA will inform contractors that if they have an alternative standard they would like to propose, they should do so. If it meets the intent of the NASA standard, they should not have to rework their system or rewrite a document to demonstrate how a procedure is consistent with NASA's procedures. NASA will have to approve the alternative standard, but contractors will not have to do a lot of rework just to satisfy NASA's standard. There are certain standards that will have to be met, but with the others contractors need to show that an alternative meets the intent.

Mr. McAlister displayed a slide illustrating the Constellation Program's decision-making process. When that program was cancelled, NASA took a look at it to see what could be done better. The Commercial Crew Program has designated two boards: the Program Control Board where milestone approval, waiving a requirement, or approving an alternative requirement decisions will be made; and the Technical Review Board of experts to advise the Program Control Board. Decision-making, as a result should be more efficient.

NASA plans to have a staff of 250 NASA employees assigned to Commercial Crew. There will some support contractors, but the plan is to keep these tailored to the specifics of the program. Mr. McAlister noted that this program is not breaking the state-of-the-art. The technology already exists to go to low-Earth orbit. And, Yes, there is a market for this. The commercial market assessment that NASA presented to Congress showed that the program justified a Government investment. NASA will be buying these services until at least 2020 and most likely beyond. Mr. McAlister expressed confidence in the program and urged COMSTAC members to hold NASA accountable for executing the program.

Mr. Kunstadter thanked Mr. McAlister for his comments and opened the floor to questions.

Mr. Holder thanked Mr. McAlister for the excellent presentation. Then he stated his question was related to budget and budget predictability. He noted that the three groups Dr. Nield described in his comments apply to Congress as well. Some people don't think we need anything to do with space. Some are on the fence and some are strident and ardent enthusiasts. Given that mix in Congress, Mr. Holder asked, how does Mr. McAlister see going forward in terms of predictable funding for the program, and how much direction does he see Congress trying to give the program?

Mr. McAlister stated there is no way to predict what Congress will do. Because NASA cannot rely on predictable funding, it has developed ways to be flexible in its approach to funding. For example, there are optional milestones in some of the phases and NASA is

looking at how to work the contracts to absorb funding decreases or increases. Mr. McAlister noted that Congress has the authority and the ability to dictate design solutions. NASA will have to react to the direction that Congress enacts. He stated that if NASA can demonstrate to the Congress that it is a reliable partner and can deliver on its commitments, the desire to dictate solutions will become less. This will also help the budget process. He stated his hope that the positive progress NASA is making will assist Congress to become confident in NASA's ability to work the program effectively.

Ms. Lepore noted that there was a lot of progress towards a creative acquisition solution. She asked if this could be a model or template for other programs at NASA, or other Government agencies, such as the Defense Department programs.

Mr. McAlister stated that he thought this could be the case. NASA will have to demonstrate some success. Until the program is a couple of years along and shown to be working, it would probably not be widely adopted. Other programs should not adopt this model wholesale. They should go through the process NASA has followed. He would hope that the model could be adopted elsewhere, but not just adopted blindly.

Ms. Schnaars observed that when the Soyuz failed with its Progress capsule, there was a lot of comment in the media. She would have thought this would provide a real impetus for moving ahead with Commercial Crew, but she didn't see that. She asked if there were any thoughts on Congress' reaction. Would Congress rather see the space station evacuated than an accelerated capability for crew or cargo?

Mr. McAlister noted he was also surprised. He observed that what is obvious to us is not so obvious in the world of politics. In the commercial space industry, INKSNA (Iran, North Korea, Syria Nonproliferation Act) is an obvious impediment. Changing this in a political environment is another issue. If we need the Russians as a partner, we need to recognize the costs.

Mr. Alexander had two comments. First, he stated that Mr. McAlister's work to bring NASA toward a commercial solution was excellent. Second, Mr. Alexander noted that while there may be skepticism about Congress' ability to deliver a budget, there is also a healthy skepticism on industry's part about NASA's ability to see this through in a commercial way for the next five years. The switch from Space Act Agreements to a contract structure was probably inevitable, but this underscores the skepticism. He found that change combined with budget concerns and prioritization, or lack thereof, of the program on the Hill puts NASA in tough spot. He wished Mr. McAlister the best for the next five years.

Mr. McAlister acknowledged he would need it. He also stated that the skepticism was warranted. NASA's history in terms of developing a commercial capability is not perfect. He challenged industry to hold NASA accountable to make this work. He noted that NASA's senior management is clearly on board with the program. There are NASA employees coming off the shuttle or other programs who will have to learn how to do a commercial program. It comes easy to those who have been working commercial crew for years. To others, it will take some time, but he sees a trend in the right direction.

Mr. Kunstadter opened the floor to the public and asked those with questions to be sure to state their name and affiliation.

Mr. Anhalt, of Space Systems/Loral in Palo Alto, CA, first complimented the impressive briefing. He then observed that NASA's acquisition process could be applicable to other sectors in the Government, such as the intelligence community and the Air Force. He wants to be able to go back to the military and intelligence communities and try to show them this new way of doing business. To do so he wants to understand how this is different from a Space Act Agreement and how did NASA plant itself within the FAR, yet find the ability to do something as creative as Mr. McAlister described. He also asked if NASA was having difficulty explaining to people on Capitol Hill that it has found a legitimate place in the FAR to exercise this type of creativity.

Mr. McAlister responded that there is not a simple answer to this. NASA employed several different approaches. It worked with the different clauses, minimized deliverables, allowed a statement of objectives instead of a work breakdown structure and CDRL list, kept requirements at a high level. It was an integrated strategy, not just one thing. NASA uses several FAR parts, not just one specific part. Why is this different from a Space Act Agreement? Mr. McAlister suggested that this is a very long discussion. He would be glad to talk with Mr. Anhalt offline. His personal opinion is that the Space Act Agreement is much like a grant. NASA cannot use a Space Act Agreement for a service or data. COTS was to stimulate U.S. based transportation cargo capability, not to deliver cargo to the ISS. Everything NASA put in place was to enable that outcome, but it was not the stated goal of the program. In this case, the shuttle was retiring. NASA had a legitimate need. It does not want to rely on the Russians forever. It's a strategic issue, and more importantly, it's a single point of failure. NASA has a stronger need for crew transportation. This is the reason it could not use a Space Act Agreement.

Mr. Koller, of SpaceTec, noted that standards down to the bolt level were driven by the early-day requirements to know what the sources of the suppliers were. He asked how NASA dealt with needing this information without delving down seven or eight levels.

Mr. McAlister emphasized that, just because NASA is controlling only Level 1 and Level 2, that does not mean it is ignorant of what is going on at other levels. It does not mean that those requirements are not controlled; they are controlled by the partners. The partners must represent to NASA that those controls are in place. The Government is not signing off on every single standard statement, but NASA wants to have insight into what the statement is. If a partner changes its supplier base, NASA wants to know. The aerospace industry is very mature. It has good configuration management. NASA is trying not to duplicate this. There are still controls; it's the redundancy that NASA is trying to remove. This is a paradigm shift. The partners have a bigger stake. NASA will not control everything. The first SpaceX demonstration flight was FAA licensed. NASA had nothing to do with it. If there were any anomalies on that flight, NASA would not have all the answers. This is the paradigm shift. There is another Federal agency as a partner that will play a bigger role with industry.

Mr. Holder commented that part of the FAA's mission is to promote the commercial space transportation industry. Consistent with that is COMSTAC's role to advise AST, Mr. Trafton has the objective of having an actionable outcome to each of COMSTAC's meetings. Mr. Holder asked that COMSTAC consider what it could do and say to

educate those who affect NASA's work and is there a specific action COMSTAC can take to support that activity.

Mr. Alexander noted that COMSTAC has in the past provided recommendations to the Administrator to forward to NASA. One was on the use of Space Act Agreements, another urged FAA licensing from the beginning. He believes that NASA has chosen to ignore those recommendations, or take them under consideration, or go another direction. He is not sure what COMSTAC would say in support of the program would be a value-added.

Mr. Holder responded that COMSTAC needs to be consistent in its message, also NASA has been slow to pay attention. However, there are others who hear the message beyond NASA. To a certain extent, it comes to the message that Congress hears. He expressed the hope that as COMSTAC transmits the message, some of the some of the fence-sitters will become advocates and some of the opponents not oppose so vigorously.

Mr. Alexander expressed the concern that by commenting on the fact that NASA might be going in a direction COMSTAC might agree with, comments could do harm to the program as opposed to being helpful by showing a better way. He feels that COMSTAC members are strong supporters of the idea of Commercial Crew; there might just be differences on the implementation. He was not sure how to express that in a way that would be helpful to NASA and to the program's possibility of success.

Mr. Holder noted Mr. Alexander's skill as a wordsmith and suggested there might be ways to draft a statement that would be valuable. Mr. Alexander suggested they talk offline.

Mr. Kunstadter noted that observations, findings, and recommendations could come from COMSTAC as a whole, not just from the working groups. He suggested that Mr. Holder, Mr. Alexander, and he get together during a break and see whether they can draft something.

Mr. Gold commented that the Space Act Agreement versus FAR issue is not fully resolved. He would not characterize that our recommendations have been completely ignored. There are those at NASA who still support Space Act Agreements. He quoted from the NASA policy directive on Space Act Agreements – funded agreements are agreements under which appropriate funds are transferred to a domestic agreement partner to accomplish an agency mission. He stated that it is pretty clear that Space Act Agreements can be used to accomplish an agency mission. He did not think COMSTAC's previous recommendations have been ignored. They haven't been adopted. He urged that COMSTAC not abandon the issue.

Dr. Campbell asked Mr. McAlister to provide some broad insight into the partnership between NASA and the FAA. How are the responsibilities going to be divided up?

Mr. McAlister stated that this is something that is still under discussion. NASA and the FAA are actively engaged in discussion on this issue. NASA's requirements and the FAA's regulations need to be compatible. In the long term, NASA may be out of the regulation issue so that it can do other cool stuff. This will be an incremental process.

Mr. Reed asked if NASA and the FAA were working on an interagency MOU for commercial crew.

Mr. McAlister stated, Yes, that is in the works. Even without the MOU, the two agencies are working together. There are some tricky technical issues to resolve. There will be decisions fairly soon, but NASA is not establishing an arbitrary schedule. Both agencies must be comfortable with the approach.

Mr. Gold asked if Mr. McAlister anticipated a future commercial crew launch would be licensed by the FAA. Mr. McAlister stated that was a possibility. There are some issues that still need to be resolved.

Ms. Sattler, a commercial space lawyer with Posternak, Blankstein & Lund in Boston, asked if NASA has given any consideration to allowing a private citizen to fly with the crew to the International Space Station and spend some time there the way the Russians are able to facilitate.

Mr. McAlister answered, Yes. Most of the vehicle designs for CCDev2 are for seven persons. NASA has a requirement for four. This means there are three other seats that can be filled with other customers. The details have to be worked out. Space Adventures already does this through the Russians. This is something NASA wants to enable.

Mr. Hughes focused attention on the appropriation situation. He noted that for FY12 the House of Representatives has moved forward with $312 million. The Senate has moved forward with $500 million. The deficit commission is going to put forward an opinion that could have a profound impact across the Government. If the appropriation is for $312 million, what impact will that have on NASA's procurement approach and on the time frames for achieving goals?

Mr. McAlister noted he could not speak for NASA, but at $312 million, the agency would have to revisit its acquisition approach and would most likely withdraw the RFP. It would not make sense to go forward with a $1.6 billion contract if all the agency had was $300 million. At $500 million, there would also be an impact since this is less than the President's budget of $850 million, but there are some ways forward at this level. The less money budgeted, the longer the program will take. The longer it takes, the more it will cost. Mr. McAlister finally noted the compelling case for commercial crew. Equally compelling cases can be made for all of NASA's programs. While he looks at the commercial space transportation issues, there are equal challenges in other areas for NASA.

Mr. Kunstadter expressed appreciation for Mr. McAlister's remarks and for his responses to the many questions. He hoped that Mr. McAlister would be able to update COMSTAC on the program in the future. Mr. McAlister stated he would be happy to do so.

A short break followed at 10:00 a.m.

Mr. Kunstadter called the meeting back to order at 10:15 a.m. He introduced the next speaker, Mr. Kubendran, the Program Executive for Flight Opportunities in NASA's Office of the Chief Technologist.

Remarks by Dr. Kubendran

Dr. Kubendran first displayed a slide showing NASA's Space Technology Program under the Office of the Chief Technologist. He noted that early stage programs lead to middle

stage game-changing programs that may become cross-cutting demonstration programs. The idea is to develop space technology that could be used in future missions. Flight Opportunities is located on the cross-cutting demonstration side of the office.

The program objective is to provide flight opportunities for sub-orbital platforms that can attain a reduced or zero gravity environment. The key is to provide funding for flights and payload integration.

There are three things the program looks at. First, to develop flights and payloads; second to develop the technology enhancement, mostly the sub-orbital vehicles; third some onboard research facilities that could be used along with the payload. Dr. Kubendran was asked if the RFI was still open. It closed on August 2nd, but he stated he was willing to accept feedback from the user community for another two weeks. NASA is trying to consolidate the response received from the community and wants to go forward with the solicitation in the near term.

The program has an open call for flight opportunities proposals that will be open through 2014. Every now and then NASA posts a cut-off date to collect payloads or payload proposals. The next cutoff date will be announced later this month. The payload cutoffs come from other mission directorates within NASA or from other Government agencies. NASA is still trying to fly an FAA payload, ADS-B, in one of the development test flights.

Dr. Kubendran noted that NASA decided to use a commercial acquisition process for the Flight Opportunities Program. If NASA wanted to develop technology, it would need frequent flights. One flight in six months is not enough to develop technology. NASA also wanted to have multiple vendors on contract so that multiple vehicles and multiple platforms are possible. This spurs competition and the program can move forward inexpensively. NASA also wants to ensure it is one of many customers, not the only customer for a company. Further, the solicitation stated that the payload, the payload integration, and the flight should all be provided by the same vendor. Another requirement is that all launch vehicles falling under FAA jurisdiction must be licensed.

The contract would be a firm, fixed price contract. A solicitation would be put out for a short period – two years. Then NASA could issue a subsequent solicitation to bring in new companies.

Dr. Kubendran showed the service requirements for three different altitude levels. L1 is for vehicles going to an altitude of six kilometers then coming down and landing. This works for approach and landing activities. L2 is for 20 to 100 kilometers – high altitude, long duration applications. L3 is more than100 kilometers for long duration, reduced gravity applications.

Dr. Kubendran outlined the specific requirements for a qualified vehicle. It must be reusable; this helps give NASA low-cost access to space. It must be capable of frequent flights; the RFP stipulated that the payload should be flown twice within five consecutive days. It should be able to return the payload undamaged; there could be a penalty for not returning the payload. Lastly, the company should be able to demonstrate that its vehicle can fly within the period of performance. NASA did not require that the vehicle could already fly. The contract was awarded in August of 2011. Seven companies were

selected and awarded IDIQ contracts for a minimum of $10,000 and a maximum of $10 million. NASA expects the companies to provide two flight this year and eight additional flights next year. NASA expects the program to last for a couple of years to "prime the pump." It expects the pipeline to be filled with payloads from within the Space Technology Program and from outside. The focus is on suborbital flights with frequent commercial low-cost access.

Mr. Kunstadter opened the floor to questions.

Dr. Nield asked if NASA had additional payloads, could they be brought into the first round, or is it filled up for the first year period. Dr. Kubendran stated NASA would consider them. Dr. Nield noted that the FAA has been working hard with the Center of Excellence and other ways to reach out to academia and to industry. It is difficult to find something that's sitting on the shelf and ready to go. But to the extent that there is an opportunity to get some flight experience, this is wonderful.

Dr. Kubendran observed this is why NASA wants to put out a solicitation in the near term. Some stakeholders have said that payloads could be from $50K to $100K. NASA wants to challenge them to actually develop payloads for that kind of money.

Mr. Kunstadter asked what the minimum time was from someone applying to launch a payload to when they could actually fly. Dr. Kubendran noted that most of the vendors require about six months lead time.

Mr. Anhalt, of Space Systems/Loral, commented that NASA's Office of the Chief Technologist should be congratulated on another approach for using the commercial space model. He asked if Dr. Kubendran could comment on how NASA is using commercially hosted opportunities to advance NASA science. Dr. Kubendran responded that NASA wants to minimize the launch cost and maximize the technology development. This is how it can use commercial satellites to its advantage.

Mr. Kunstadter posed a question to Dr. Nield. How would the three levels of altitude fall into the FAA licensing scheme? Dr. Nield noted that six of the seven vehicles are rocket vehicles and one is a balloon. FAA/AST does not deal with balloons. NASA's goals are to require a license. The benefit of a license is that it allows an operator to do things commercially, as opposed to just having the Government as the primary customer. There are no altitude limits on permits or licenses. Either is appropriate for test flights. He reiterated that the program, as NASA has envisioned it, requires a license.

Dr. Kubendran noted that NASA wants to make sure the vendors take their flights seriously and follow the rigorous procedure for a license. This will be good for everyone in the long run.

Mr. Kunstadter thanked Dr. Kubendran for his presentation. Then he began the report from the Risk Management Working Group.

Risk Management Working Group

Mr. Kunstadter noted that the Risk Management Working Group had a very good turnout. In fact there were good turnouts for the entire day of working group meetings. He observed that many topics covered in one working group spilled over into the subsequent working group.

Mr. Kunstadter reported on the individuals who spoke to the working group.

John Sloan presented a brief review of COMSTAC's input to the FAA on the 2004 Space Transportation Policy. COMSTAC contributed 10 specific points with several subpoints. The White House review of COMSTAC's input is pending.

Laura Montgomery gave an overview of some work that AST has been doing on liability exposure for manufacturers, suppliers and operators in commercial human spaceflight. Ms. Montgomery looked at parallels in other industries for managing liability exposure. She mentioned several methods to reduce the liability impact. These included extinguishing the liability all together, capping it, or having a time-based cap on it.

The working group then discussed the fact that there really are no standards that have been developed for commercial human spaceflight. Attendees recognized that there is no single source or clearinghouse for the historical information that could help commercial spaceflight operators to conduct their operations. There seemed to be agreement on the need for some sort of best practices or lessons learned clearinghouse. There are many issues related to sharing information on anomalies and lessons learned. Even if there is a guarantee of anonymity, the industry has a small number of actors and few events. It is possible to reverse engineer an event and identify the people and companies involved. Nonetheless, it is important to develop some guidelines to help people avoid the pitfalls experienced by others. There are 50 to 60 years of history in rocketry – there is a lot that can be learned from the experiences of others.

Mr. Kunstadter noted that the working group had developed one finding and one recommendation.

The finding concerned the indemnification regime under the CSLAA. This will expire on December 31, 2012. The industry cannot survive without the indemnification regime. COMSTAC stands ready to work with the FAA to extend this for a longer period than three years. The finding states that COMSTAC and the FAA need to work together to make sure the indemnification regime is extended.

The recommendation dealt with the limitation on liability issue presented by Laura Montgomery. Limitation on liability for U.S. commercial spaceflight manufacturers, suppliers, and operators will enhance the certainty in managing financial risks of those companies. COMSTAC applauds the FAA's research into the liability limitation strategies and would like to see this continue.

Mr. Kunstadter asked for questions. Mr. Alexander noted that COMSTAC needed to vote on the finding and recommendation. He stated that the recommendation, rather than urging continued research, should recommend the action.

Ms. Lepore asked what steps would be necessary to implement the recommendation. What should the end result be?

Mr. Vinter stated that it would behoove the Risk Management Working Group to put some effort into this area and try to develop requirements.

Mr. Eckert noted that the intent of the recommendation, from the discussion in the working group, was that the FAA continue its effort with all requisite speed.

Mr. Hughes spoke to Ms. Lepore's question. This may or may not result in a statutory change. That is not an easy thing to do.

Mr. Kunstadter called for a vote on the finding that reads:

> Extension of the indemnification regime under the CSLA beyond the current expiration date of December 31, 2012, is critical to the viability of the commercial launch industry in the U.S. COMSTAC and the FAA must work together to ensure timely extension of the indemnification regime, preferably for an extended period.

This finding was accepted by the Committee.

Mr. Kunstadter then called for a vote on the recommendation.

> Limitation on liability for U.S. commercial spaceflight manufacturers, suppliers and operators will enhance certainty in managing financial risks. Failure to limit liability presents significant hurdles to the industry. COMSTAC applauds the FAA's research into liability limitation strategies. COMSTAC recommends that the FAA pursue liability limitation with all requisite speed.

This finding was accepted by the Committee.

Mr. Kunstadter noted that all the presentations from October 13 and 14 will be on the AST website very shortly. He then introduced Ms. Lepore to report on the Space Transportation Operations Working Group.

Space Transportation Operations Working Group (STOWG)

Ms. Lepore noted the working group meeting on October 13 was well-attended and there was a full agenda. First, the working group looked at a few outstanding action items that have been carried over for the last couple of meetings. One was the survey results from the orbital debris survey. Three responses were received and passed on to the FAA. Unless the FAA wants the STOWG to try again, this matter is considered closed. The second item was the Concept of Operations on Reentry Debris (CONOPS) report. This study is ongoing within the FAA. As more input is needed from COMSTAC, the working group will be happy to take up the issue again. The third item was the space operations framework presented by Mary Lynne Dittmar. This is an ongoing subject. The working group is open to feedback on this subject. Fourth, the FAA/AST has offered to be a communication mechanism for industry inputs to the consolidated launch schedule review board. Al Wassel of the FAA's Florida office assists with this. This remains an open item. Finally, Randy Repcheck provided an update on the public meeting held during the summer. This concerned the regulatory approach for commercial orbital human spaceflight. The working group will continue to follow this issue.

Ms. Lepore then introduced two major topics under discussion in the working group meeting: the European Union's proposed code of conduct for outer space activities, and a United Nations committee on peaceful uses of outer space and long-term sustainability of space. She noted that COMSTAC did not have a lot of insight into these two processes and expressed gratitude to the State Department and the FAA/AST for clarifying many of the issues. Dick Buenneke of the State Department updated the

STOWG about ongoing activities. His presentation will be on the FAA/AST website. Ms. Lepore reported that there is some effort to shape the code of conduct into an international effort as opposed to just a European Union proposal.

The long term sustainability of space activity has encouraged direct industry involvement. She stated that the UN Committee on Peaceful Uses of Outer Space (UN COPUOS) has set up a working group with four expert groups: Group A – sustainable space utilization; Group B – space debris, space operations, and tools; Group C – space weather; and Group D – regulatory regimes. The State Department made a request for industry involvement to the FAA, which then asked COMSTAC to nominate volunteers to the expert groups. Two volunteers expressed an interest and have been nominated: Rachel Yates to Group D and Chris Kunstadter to Group B. Input to the expert groups is not from an individual company, but is industry consolidated input gathered from all of COMSTAC. This is an opportunity to represent COMSTAC views, and as COMSTAC represents the public, COMSTAC can collect input from the public. The State Department is also reaching out to trade associations and other groups, such as the Aerospace Industries Association, which would compile input from the companies it represents. The next step is to respond to a request from the UN Office of Outer Space Affairs for inputs from all member states and national private sector organizations. The U.S. Government and private sector inputs must be submitted by the State Department no later than January 15, 2012. The inputs will be evaluated by the expert groups during meetings in February. Deliberations will continue for another year. Results are expected in June of 2014.

Ms. Lepore presented a finding and a recommendation on these two topics. The finding states:

- Visibility into the Code of Conduct process is necessary, and the communication mechanisms being used to keep industry informed are working.
- Participation in the LTSSA activity by industry is necessary and important to ensure industry points of view reflected.

The recommendation is that

- FAA/AST facilitation of communication is welcome, appreciated, and working. FAA/AST should continue to engage the State Department and the international community, and share industry concerns as voiced by COMSTAC.
- COMSTAC should gather and submit a consolidated set of inputs to the State Department by the January 15, 2012 deadline.
- FAA/AST should continue to participate in these discussions.

Ms. Lepore asked for comments. Ms. Yates had a couple of comments on the phrasing of the finding. These were quickly resolved. She also noted that the second line of the recommendation stated that COMSTAC is recommending to itself what it needs to do. Ms. Lepore commented that COMSTAC's next step is to gather inputs and the FAA should accept them and facilitate passing them on to the State Department.

Dr. Campbell asked if the third bullet was redundant. Ms. Lepore agreed that it probably was. Dr. Campbell then asked how the second bullet would be implemented. Ms. Lepore answered that was on the next slide. Mr. Kunstadter observed that the second bullet could read "COMSTAC will gather…" Ms. Lepore agreed.

Ms. Lepore displayed the next slide that continued the recommendation as follows:

- Recommended COMSTAC accept the following coordinated process and schedule for submitting industry inputs to the State Dept by January 15
  - Oct 28: RFI to industry
  - Nov 17: STOWG telecon (this subject and others)
  - Dec 1: Industry responses due to COMSTAC
  - Dec 13: COMSTAC draft responses sent to COMSTAC members
  - Jan 3: COMSTAC final report distributed
  - Jan 5: COMSTAC telecon to accept and vote
  - Jan 6: Submit report to FAA/AST
  - Jan 12: FAA/AST acceptance of report
  - Jan 15: Deliver to State Dept

Ms. Lepore noted that the RFI to industry is really an email to COMSTAC members and the public that attends COMSTAC meetings to request input for Groups B and D. A teleconference is planned for mid-November to gather more input. She expressed confidence that this schedule would work.

Mr. Kunstadter observed that there is a responsibility for COMSTAC members to respond. This is an opportunity to put industry interests before the State Department.

Ms. Lepore called for a vote on the finding. She asked all in favor to indicate with a show of hands. Hands were raised. She asked for those opposed. There were none. This finding was accepted by the Committee.

Ms. Lepore modified the recommendation be deleting the third bullet, which was considered redundant. She asked all in favor to indicate with a show of hands. Hands were raised. She asked for those opposed. There were none. This Recommendation was accepted by the Committee.

Ms. Lepore then reported on the comments from Tom Shearer, DoD Executive Agent for Space. He spoke about the DoD proposal to update Title 10 of the U.S. Code to enable more partnership and private funding coming into the ranges. The STOWG had put forward a finding at the May meeting for an update on this proposed legislation. There had been an expectation that Congress would move faster on the issue than it did. Mr. Shearer reported that there are continued opportunities for industry engagement on this issue.

Ms. Lepore presented a finding and a recommendation that reads as follows:

- **Finding #2**

- Although progress is slower, it is useful to keep industry informed and engaged on this topic

- **Recommendation #2**
  - COMSTAC should continue to be used as a mechanism to keep industry informed. If the legislative effort has matured by the time of the May 2012 COMSTAC meeting, then a formal briefing would be warranted.

Ms. Lepore asked for comments. Mr. Kunstadter if this was a recommendation to the FAA. Ms. Lepore stated that the working group wanted the FAA to continue to follow this legislative process. For this meeting, the FAA had followed the process and inquired of the DoD if the timing was right for a briefing to the full COMSTAC. Since there had not been a lot of progress, the decision was made to keep the briefing at the working group level. She suggested combining the two as a finding. The final language reads:

- Although progress is slower, it is useful for DOD to keep industry informed and engaged on this topic, and using COMSTAC as a mechanism is working. It is useful for FAA/AST to stay apprised of developments. If the legislative effort has matured by the time of the May 2012 COMSTAC meeting, then a formal briefing will be warranted.

This finding was accepted by the Committee.

Ms. Lepore reported that a new topic was introduced to the working group. This concerned commercial spaceport development and licensing. Two STOWG members, Oscar Garcia and Brian Gulliver, presented a briefing. They looked at the spaceport licensing process and what really needed to be done at a spaceport. They examined also the economics and business case, public relations, and other activities. They offered some of the different strategies that could be used as new spaceports come online.

This was followed by a discussion of the rulemaking process for a license to operate a launch site. It was noted that a notice of proposed rulemaking published in February 2011. There was a discussion on whether the proposed changes were positive and whether more changes were needed. If there were further observations from industry, STOWG members were encouraged to make them sooner rather than later. Ms. Lepore noted that this will be a topic for discussion at the mid-November teleconference. She presented a finding that reads as follows:

- The Notice of Proposed Rule Making related to 14 CFR Part 420 on February 16, 2011 includes a number of changes to Part 420 based on experience gained during the licensing of a number of spaceports.
- The debate within industry on this rulemaking is ongoing.
- Engagement by industry and solicitation of further feedback is worthy and can be facilitated through STOWG telecons in the near term.

Ms. Lepore thanked Mr. Garcia and Mr. Gulliver for their briefing. This subject will come up at the November teleconference and at future meetings.

Ms. Lepore reported there was some discussion about holding the working group meetings in conjunction with another conference in a different part of the country or perhaps in conjunction with AST's conference in February. It was decided to keep these ideas in mind as possibilities for the future.

Mr. Kunstadter thanked Ms. Lepore for her report. The meeting broke for lunch at 11:20 a.m.

Mr. Kunstadter called the meeting back to order at 12:30 p.m. He introduced Kate Maliga of Tauri Group to brief COMSTAC on the Suborbital Characterization Report that was prepared for the FAA.

Suborbital Characterization Report

Ms. Maliga introduced the Suborbital Characterization Report. COMSTAC members had a copy in their folders. Others can access the report on the AST website. The report provides a snapshot of the commercial reusable sub-orbital industry and identifies the providers, their launch sites, and their sources of funding. She stated that this is the first of a two-part report. What will follow will be a 10-year forecast for suborbitals. Ms. Maliga thanked those COMSTAC members and their staff who had provided input for this report.

The report highlights six companies, each with a two-page spread describing the company, its approach, its vehicles, and statistics on those vehicles. The companies are Armadillo Aerospace, Blue Origin, Masten Space Systems, UP Aerospace, Virgin Galactic, and XCOR Aerospace. There is also a section that describes systems under development. The report then highlights the launch sites where the companies will conduct their launches: Cape Canaveral Spaceport, Cecil Field Spaceport, Mojave Air and Space Port, Oklahoma Air and Space Port, and Spaceport America.

Ms. Maliga noted the sections that detail funding sources for the suborbital industry. These sources range from private investment to prize money, to Federal programs. Finally, the report looks at the markets for this technology and the advantages and disadvantages of each.

Ms. Maliga stated again that the next step is to prepare a 10-year forecast. This will be prepared for the spring of 2012 and hopefully add to the other forecast reports to COMSTAC. Ms. Maliga asked for any questions.

Dr. Nield asked Ms. Maliga to speak to the market survey portion of the report. He noted that people on Capitol Hill and others want to understand what the market looks like. Who would be surveyed? Potential ticket buyers? Academic institutions? Developers? If the developers are aiming for a certain niche, why are they willing to share that information with a broader community and cut into their competitive advantage? He asked for Ms. Maliga's thoughts, and also Mr. Greason's, as to the value of this effort.

Ms. Maliga stated that Tauri Group spent a lot of time looking at the markets. They identified the markets that made sense and then how to obtain information on that market. The methodology depended on the market. For some of the information, surveys were appropriate, for other information, interviews with the providers provided the data.

Mr. Greason noted that market survey is about products or services that aren't yet in the market, and as such may be a questionable exercise. He referenced the commercial space transportation study that NASA did in the 1994 period. It never purported to project what the volume of demand for different services might be. It did survey different customers and shed some insight into what kind of characteristics a provider would have to have

before a class of customer would be interested in participating in the market. This type of study is more valuable than guessing what much a customer might buy.

Ms. Maliga stated that the intention was to have two parts to the study: an analytical one and a strategic one.

Mr. Kunstadter had a question concerning NASA and Swedish Space Corporation, two organizations with very robust sounding rocket programs. Do they plan to stay in the business or would they likely give this over to the commercial world? How is the commercial world addressing this? He stated this might be a question for NASA. Ms. Maliga observed she could not speak for NASA.

Mr. Kunstadter noted that this report should survey these entities also. Ms. Maliga agreed. Mr. Kunstadter continued that it's important for COMSTAC to know whether something is 95 percent of the market or five percent. It would help COMSTAC advise the FAA on what sort of licensing requirements might be appropriate and how it might impact the work COMSTAC does. It would also be helpful to know where it fits in.

Dr. Campbell noted that the 10-year projections are going to be very dependent on the overall economy. What assumption will Tauri Group make on the performance of the U.S. economy over the next 10 years? Ms. Maliga stated that the work has not started yet, so no assumptions have been made. Dr. Campbell asked if the assumptions would be for a flat economy or another scenario. Ms. Maliga noted that the company has an economist on staff. They would examine the latest data and go from there. They would conduct a sensitivity analysis, base their numbers on where the economy is now, and take other factors into account. There will be a range with some assumptions.

Mr. Eckert observed that it may be impossible to predict what customers will actually buy, but it's not impossible to characterize the kinds of market demand that might exist. When looking for investment, one can say that there are credible markets where demand may exist. There are customers who have needs, have resources, and have a history of consuming. Therefore, you can't determine whether they will buy, but they might. That leads to the crucial element of any new industry – credibility. Even if it's not there yet, does it make sense? He stated that he thinks this effort is an important challenge, though methodologically it has a number of difficulties.

Mr. Eckert suggested that another factor that may be very important to examine is the historical precedents for adoption of new services of this type. It would be good to look at other industries and examine the parallels between this particular kind of service and other kinds of services We can't tell what consumers will do, but we can tell what they might credibly do. We can tell what they have done in the past. This begins to create that web of credibility that could support the industry and the Federal entities that are concerned with it.

Ms. Maliga stated that Mr. Eckert made excellent points. She would add that when anyone conducts this type of study, it's important to have transparency and methodology. When Tauri Group makes its report, it will show where it found the data and how the data was generated.

Mr. Reed noted that Tauri Group limited the review of vehicles to reusable suborbital. The linkage to future markets was based only on this. Yet Ms. Maliga acknowledges that

there are expendable suborbital vehicles, as well. He wondered, if the report is to present a market analysis, why did Tauri Group choose to limit the market relative to the vehicle.

Ms. Lepore noted that years ago when the LEO and GEO forecasts were started, there was the desire to try to understand what demand would be out there and how would this relate to FAA/AST licensing requests or safety requests. She saw this report as being the start of the same thing for this market. She recommended that Tauri Group look at those forecast reports and their methodologies as very useful tools.

Ms. Maliga stated they would definitely look at those reports and see what does or doesn't make sense to use.

Mr. Claybaugh observed that the available market studies for human suborbital spaceflight suggest the possibility that much of that demand is pent up demand, and there is little or possibly no outgoing demand once that demand has flown off. He asked if the report would address the question of what the outgoing demand for that activity is, and when the pent up demand will fall off the cliff. Ms. Maliga stated that the report would look at those factors.

Ms. Schnaars stated that there seems to be multiple segments to the market study. One is going to be, can this be done technically? The next is, can it be done profitably – this is the company's business case. The third is, how does this impact the FAA. While it's true that Iridium was a financial disaster, there was still incredible work to be done licensing and launching those systems. The FAA may have an incredible workload, regardless of whether the system has ever proved to be a profitable venture. Ms. Maliga responded that they would present the objective data. The FAA would hopefully be able to say, "This is what it means for us."

Ms. Schnaars noted that it took almost eight years to figure out the LEOs weren't going to make money. The launch vehicle builders started building and couldn't stop. The sensitivity analysis will be key. The LEO constellation took years to deploy there before the launch price became difficult. Still, in terms of the FAA's budget, AST may still have a tremendous amount of work regardless of all these other issues.

Mr. Eckert observed that it's very important that any market study that addresses the issues that have just been raised be neutral. The root of credibility is always to be honest and never exclude any aspect of potential study because it may lead in a negative direction. Pent up demand is a good example. What has been the case of other markets of this type where there was pent up demand and the market collapsed? There may be other examples where it appeared there was pent up demand and then there was solid long term demand because of changes in the consumer marketplace. As long as Tauri Group approaches this in a way that's open to all of the issues, and is ready to report any result, the report will be credible.

Ms. Maliga stated that is what they plan to do.

Mr. Garcia, of Interflight Global, noted that the private sector is very interested in these numbers – the companies like XCOR and Virgin Galactic. This group will tolerate an approximation. It is necessary for this sector to have access to this type of information, whether they fund it or public groups fund it. He expressed his strong support for this effort.

Mr. Seibold, of Aerospace Corporation, noted that NASA has just purchased three flights on Virgin Galactic for research. Ms. Maliga stated that she had heard that also.

Mr. Pournelle, of NanoRacks, asked if there would be any effort to characterize the existing market in terms of how much these companies have in deposits, how much money is being given by the government, and specifically from the Flight Opportunities Program. Is that money available only once they fly, or is there some money for before they fly?

Ms. Maliga stated that Mr. Kubendran had said in his talk that there is money for development of payloads. Further than that, she would not speak for NASA.

Mr. Pournelle continued to ask if there was an effort to characterize that as well as the rest of the market. How big is the market today? He stated that Virgin Galactic has published some deposit numbers. Is it possible to talk with other operators and gather an aggregate data on how much they have in deposits?

Ms. Maliga responded that this report is a small report, so it didn't have all that detail. The follow-on report will contain that data. It is important to know what the starting point is.

Dr. Kubendran stepped forward to answer part of Mr. Pounelle's question. He noted that the $10 million NASA has contracted is only for flights. NASA has put out an RFI for developing payloads. If there was, for example, a demand for launching satellites off some of the vehicles, NASA might consider funding some of that activity. It would not be a lot of funding, but definitely not zero.

Mr. Kunstadter stated that this report is a great start and a great addition to the forecast COMSTAC already has. He looks forward to a continuation of this. He then introduced the next speaker, Mr. Sean Monogue, Chairman of the Missle Technology Export Control Group Office of Missile and Chemical Non-Proliferation at the U.S. Department of State.

Remarks by Mr. Monogue

Mr. Monogue thanked Mr. Kunstadter. He observed that part of his reason for speaking to COMSTAC was to let the members know what his organization is and that it exists. Many of his office's decisions are made on a case-by-case basis. Mr. Monogue indicated that he would be happy to discuss particular issues individually.

Mr. Monogue addressed some of the foreign policy perspectives that influence space activity. In particular, on the international scale, he would look at those policies that affect the ability to conduct export operations, to cooperate in international partnerships, and to conduct operations overseas. He would target the parts of U.S. foreign policy that affect industry's ability to operate, particularly with respect to missile technology.

Mr. Monogue noted that the Missile Technology Control Regime (MTCR) underlies the U.S. Government policy towards missile non-proliferation. The MTCR's objective is to control the flow of missile technology in order to prevent proliferation of systems that are capable of delivering weapons of mass destruction. This is really where the State Department's concern with missiles originates.

The MTCR was created in 1987. It currently has 34 partner countries right now. It's important to understand that it is a voluntary political arrangement. It is not a treaty, so

there are no binding or legal mechanisms associated with MTCR membership. The State Department is essentially able to control all the most important technologies associated with missile development or missile proliferation. It can't control everything, and much technology has a dual use. It tries to focus on technologies that are unique and those that are most important for missile development. The MTCR annex lists all the controlled technologies. The lists are broken out into Category I and Category II. Category I is of the most concern. Items on this list are the most de-stabilizing and the most relevant towards weapons of mass destruction delivery vehicles. Category II items are important, but not quite as critical as Category I. Export of Category I systems is subject to what is called an unconditional strong presumption of denial, regardless of purpose or regardless of destination. Export of complete production facilities for Category I items is expressly prohibited. The MTCR does not distinguish between space launch vehicles (SLVs) and ballistic missiles. They are both controlled because of the inter-changeability of all the technology. Category II items are all the sub-items that contribute to missile development. These are evaluated on a case-by-case basis.

Mr. Monogue noted that the State Department evaluates all exports against the MTCR guidelines and annex items to determine if there is a proliferation concern associated with a given export. There is an inter-agency working group called the Missile Technology Export Control Committee (MTEC) that meets weekly to review all the export licenses involving missile technology and to make a recommendation on how those licenses should proceed.

Mr. Monogue observed that there are a variety of larger U.S. Government policies that have been put into place since the MTCR commitments were made. One of these policies is a long standing non-proliferation policy for missile systems, which says that the U.S. does not support the development or acquisition of MTCR Category I systems in non-MTCR countries.

The second part to that concerns SLVs. Even though they are missile systems per the MTCR and the State Department is concerned about their proliferation because of their transferability to missile technologies, it knows that there is a lot of SLV activity out there. Therefore, there is potential to cooperate on SLVs.

Mr. Monogue noted that being a member of the MTCR as a partner does not entitle a country to technology from other partners, nor does it obligate a country to provide technology to other partners. When the State Department makes export control export decisions, it does not say, "Well, if that guy is a partner, he's entitled to all the missile technology we have, or I'm obliged to give it to him." They look at a transfer to a partner, essentially the same as they would evaluate transfer to a non-partner. If a country is a partner in the MTCR, that's going to give the U.S. some confidence in their ability to control technology and may help inform a decision, but it doesn't automatically give them the right to access that technology.

Even in partner countries, the U.S. doesn't encourage new SLV programs. In places like South Korea, Brazil, Argentina, South Africa, different countries that may be involved in developing an indigenous SLV capability, the U.S. Government has made clear that it will not support or encourage the development of that indigenous SLV capability.

Russia is in its own category. The U.S. recognizes that Russia has what it has. It is a nuclear ballistic missile capable state. The U.S. has decided to allow the launch of U.S. satellites on Russian SLVs. However, the U.S. does not typically contribute technology directly to the Russian SLVs or support the further development of Russian SLVs, particularly in a manner that would provide technology that could be transferable to ballistic missle systems.

This has implications for space tourism. If a company is exporting something that is involved with helping establish a spaceport somewhere, that sort of policy is going to affect every level of export from Category I through catch-all controls. His office is often asked about space policy and the push for international cooperation. The State Department fully supports this. Mr. Monogue pointed out that in the majority of space policy direction, there is always going to be some language stating, "consistent with international obligations, consistent with foreign policy, consistent with national security, consistent with multi-lateral commitments." Those sorts of statements are the ones Mr. Monogue's office inserts into the space policy documents. While the State Department supports international cooperation on the peaceful uses of space, it will fence off launch technology from the cooperation. An offshoot of this is, the State Department will not support the import of items into the U.S. from MTCR systems that it does not support. This would legitimize a system about which the U.S. has a concern.

Mr. Monogue stated that the most important thing to take away from his comments is that if a company is involved in international activities, and looking to conduct exports associated with missile technology-related things, or in support of missile or SLV systems in other countries, it's important to talk to the State Department early.

The office is open to speaking with industry. Mr. Monogue can get the MTEC together on a regular basis, to meet with different industry representatives. They can give a company a very early opinion on whether its vision is the possible or what some of the pitfalls may be.

They can't necessarily give a company a firm export decision; that's only going to result from an export license vetted through the entire inter-agency process. They can certainly give a read or a vector on the non-proliferation aspects and how that may impact what a company is trying to do. Mr. Monogue stated he was happy to take questions.

Mr. Kunstadter thanked Mr. Monogue for his comments. Then he asked for a clarification of the process by which a satellite manufacturer, for example, would export a satellite to Russia for launch from Kazakhstan. Does the Directorate of Defense Trade Controls (DDTC) do its work and then the process goes to this inter-agency group? Or is it all one process?

Mr. Monogue noted that the license application is submitted to DDTC, via their DTrade system. The licensing officer wil review it and then send it out to the various review agencies, which have a 30 to 60 day timeline to complete their review and response. MTEC is one of those review agencies. From MTEC it will go to DoD, NASA, and possibly some other agencies within the State Department. All these entities review it and return it to the DDTC with a recommendation. The licensing officer adjudicates all the recommendation. Then the DDTC will issue a license or a denial.

Mr. Eckert noted that several of the images Mr. Monogue used were of Indian and Israeli launch vehicles. He asked Mr. Monogue to clarify how his comments related to India.

Mr. Monogue observed that India is not currently an MTCR partner. The United States does not encourage SLV programs in India. There is some movement to support Indian membership in the regimes. That will probably take several years. The U.S. has completed a technology safeguards agreement (TSA) with India. This gives the U.S. assurance that if we put a payload or satellites with U.S. components on top of Indian boosters, there will be no unintended on intentional technology transfer that would support their SLV or ballistic missile systems. There is no commercial space launch agreement (CSLA) with India. In the absence of a CSLA, the U.S. would not authorize exports where U.S. components could be on a commercial satellite that would then be launched out of India. The U.S. will authorize U.S. component satellites to be launched out of India only if they are civil satellites or government satellites.

Mr. Gold asked what impact, if any, the current export control reform effort would have on MTCR and MTEC.

Mr. Monogue responded that from the State Department's perspective, none. Missile technology items, whether they are on the CCL or ITAR are going to be controlled and reviewed by the MTEC for missile technology concerns. If items move off of ITAR and onto CCL, the State Department will still look at every single case just as they have previously.

Mr. Alexander noted that the policy does not support the import of Category I items from non-MTCR countries. That leaves open the MTCR countries with the caveat of not supporting development of new systems. How does that play into some of the commercial cooperation where entire stages are being imported for U.S. launch systems? Where is that in the policy?

Mr. Monogue commented that Mr. Alexander was probably referring to some of the Russian engines that are imported. Russia is an MTCR partner. There is not a blanket prohibition against Catergory I systems in partner countries. The U.S. is actively engaged with European Space Agency (ESA) programs, Japan programs, even some ballistic missile programs with some of our closest allies. Russia is a unique case because of the ballistic missile forces in Russia. It does not behoove the U.S. Government to transfer technology that would further development of Russian SLVs or Russian ballistic missiles. At the same time, the U.S. recognizes that Russia has what is already there. What we would not want is a collaboration where a technology transfer would improve a Russian engine, which then becomes imported and those same improvements could translate to ballistic of SLV systems outside of the U.S. The State Department would make decisions on a case-by-case basis.

Mr. Alexander noted the repeated references to Russia as a special situation. He observed that there is important discussion of a European stage. How does that affect government cooperation? If NASA wanted to bring partner nations into the space launch system, where would that fall?

Mr. Monogue stated he could not give a definite answer. Decisions would be on a case-by-case basis. However, if there was an effort to import ESA systems into the U.S., that

would probably be viewed favorably. If one were to pick a European country that does not currently have an SLV program and it was trying to develop its own indigenous SLV program, then that might be a case where the U.S. would not import a stage from them. That could be encouragement of their SLV program. MTEC reviews government sales, as well. Foreign military sales processed through the Defense Department come to MTEC for review. The policies outlined would apply to government to government engagement, as well.

Mr. Kunstadter asked if there was some sort of defect in a Russian engine, for example, and the U.S. was risking national security payloads on the rocket, how would the U.S. deal with this when we don't want to improve the engine.

Mr. Monogue responded that there are nuances in the policy. The provisions are very detailed and do allow for some quality control failure analysis issues. Correcting an anomaly on an engine is a little lower in scope than improvements that would boost the overall thrust of the engine. It's a fine line.

Ms. Karika noted that there are provisions for monitors to discuss an engine anomaly, for example. She recalled her experience on the MTEC and observed that companies found it valuable to come in and consult with MTEC when they were first pulling their business cases together. It can be very helpful for a big program.

Mr. Monogue thanked Ms. Karika for the support. He noted that consultation before a company invests a lot of time and money can be very helpful.

Mr. Kunstadter asked if there were questions from the audience.

Dr. Kubendran referred to an earlier conversation on markets for sub-orbital vehicles. There is some interest from NASA's international partners to fly technology payloads that could fall into Category II. How does NASA promote interchanges with international partners?

Mr. Monogue observed that for payload cooperation, it is going to come down to the launch system that is intended for use. If it's a payload with ITAR control placed on it, then the State Department is going to be concerned about what system it will be launched on. If it's a system that the U.S. Government does not support, then that's providing encouragement for that system. That is something we do not want to do.

Dr. Kubendran asked further if the payload is to develop some of the Category II technologies mentioned, is that okay?

Mr. Monogue responded that this would be decided on a case-by-case basis.

An Audience Participant noted that many things are now happening in the export control world. The DoD has come out with a directive regarding MTCR Category I unmanned aerial vehicles (UAVs). He noted that Mr. Monogue had mentioned the September 1993 policy document stating there is no support for an MTCR Category acquisition by a non-MTCR partner. Is that also subject to review at this time?

Mr. Monogue responded, No. UAV systems are controlled per the MTCR because they can be used to deliver weapons of mass destruction in the same way that a cruise missile could be used. The MTCR meets annually to review the annex and discuss changes.

There has been some discussion about the control of UAV systems, however he does not foresee any change in the immediate future.

The Audience Participant observed that on rare occasions the United States has overcome the strong presumption of denial. Have any other MTCR partners ever acknowledged transferring an MTCR Category I system?

Mr. Monogue responded, Yes. By acknowledge he means it is available in the press. Partners don't necessarily come to other partners and acknowledge every single transfer. The U.S. consults with partners, but there is no requirement to tell every partner everything we've done. This type of transfer is on rare occasions.

Mr. Kunstadter thanked Mr. Monogue for the excellent overview of the MTCR. He then called for a short break.

Mr. Kunstadter called the meeting back to order at 1:55 p.m. He introduced Brett Alexander to report on the RLV Working Group.

Reusable Launch Vehicles Working Group (RLVWG)

Mr. Alexander began with a personal announcement. At the end of October, he will be working full time with Blue Origin.

Mr. Alexander reported on the review of the findings the RLV Working Group put forward at the May 2011 meeting. The first finding supported the adoption of regulations worldwide that are consistent with the U.S. regulatory framework. It encouraged the FAA to present this viewpoint at international venues. The FAA response was that it would continue to do this. The second finding provided the rationale for the first one. At the time, the European Aviation Safety Agency (EASA) was considering imposing an aircraft-like regulatory framework on winged sub-orbital vehicles. The finding opposed that and asked the FAA to make this opposition known to EASA. The FAA did send this message in a number of fora.

Mr. Alexander reviewed recent developments in commercial human spaceflight. He then detailed John Sloan's presentation that updated the working group on the International Outreach Program for AST. Mr. Alexander commended Mr. Sloan and Dr. Nield for their work in this arena. The EASA had proposed new rules to require certification for any winged sub-orbital vehicle. EASA informed Mr. Sloan that this rulemaking activity had been put on hold with the feedback that they had been advised to make their regulatory approach "more FAA-like."

Mr. Sloan also reported on the IAC meetings in South Africa. With engagement in the international community over the last few years, the U.S. has received recognition as "the player in the regulatory world." Mr. Sloan chairs a commercial spaceflight safety committee and Ken Davidian, also of AST, chairs the entrepreneurship and investment committee. Mr. Alexander repeated his appreciation for the work AST is doing internationally.

The next topic raised in the working group was a presentation by Jesse Hanson, of AST, on the Lessons Learned Database. Mr. Alexander noted that this subject has been presented to COMSTAC in the past. AST has now implemented the web-based system. Participation by industry is voluntary and there is a way to make anonymous inputs.

Industry, however, has not been using it. A number of reasons were given for not populating the database. A number of companies expressed concern about proprietary data.

Mr. Alexander reported that a lively discussion followed on the need for access to the lessons learned that AST already gathers in the form of reported mishaps, safety critical issues, etc. This led to the proposed finding:

> COMSTAC finds it would be beneficial for the FAA to develop a process for disclosing, to the industry, the pertinent data from reported safety critical anomalies, mishaps, and incidents and precursors where they are relevant to current and future operations.

Mr. Alexander stated that proprietary data would have to be protected. However, it came as a surprise to some that there have been mishaps that are not known industry-wide.

Mr. Van Laak had a suggestion for industry. The FAA is very respectful of the proprietary data it receives in the process of approving a launch license. Industry needs to decide that it values safety more than keeping this data proprietary. If the failures are not widely known, it is because industry has restricted that information. The FAA would be happy to share the information. It needs industry to make it available for release.

Mr. Alexander noted that there are two components to this. One is the voluntary lessons-learned database; it is on industry to populate this database. The other is that data reporting the FAA receives through the permitting and licensing process and finding a way to make both available to industry.

Mr. Greason stated, first of all, that evolving the behavior of industry is a process. What one should learn from this finding is that there was a reasonable consensus in the working group that industry needs to know this information. We can't improve our vehicles if we don't know what else is going on. Second, Mr. Greason observed he has long been an advocate for developing industry standards and practices. That task would be easier if people can see that in certain areas they are not alone. There really are some anomalies that we should be on the lookout for. Third, if we develop a process to disclose this information, in a suitably laundered, non-proprietary form, and to U.S. nationals, everyone would see that a certain amount of trials and tribulations are part of the process. Then people may not be so reluctant to discuss their problems because everyone is in the same boat.

Mr. Gold recommended removing the commas surrounding 'to the industry.' Secondly, he noted where the finding reads 'and comply with ITAR.' ITAR is just one of several export control rules. He suggested replacing the words with 'and comply with relevant export control restrictions.'

Ms. Aldrich added her congratulations to John Sloan and the presence AST had at the IAC.

Mr. Van Laak noted that about five years ago, he reviewed approximately 6,000 lessons learned from NASA and boiled these down to a small set, each of which was represented about 500 times in the database. It is interesting to note first, that this data is available from NASA if one asks for it. Secondly, we keep learning the same lessons.

Mr. Pittman, from NASA Ames, commented that one of the questions on the lessons learned database deals with informed consent. He asked how one can give informed consent if one doesn't know all the things that have gone wrong, not only for a subject vehicle, but for other similar vehicles.

Mr. Van Laak stated that the operator would have all the information concerning the system one would fly on. The FAA would be present to oversee and make sure that information is disclosed. There is a range of potential events that come from hazard analyses; these are briefed to a potential spaceflight participant. The operator may generalize failures so as not to identify other individual operators.

Mr. Kunstadter asked if AST has a process already for collecting the data. Mr. Van Laak responded that AST has a database that can be populated if the data is clearly not proprietary. If companies volunteer information and indicate that we can share it, we'd be delighted to do that. No one has come forward and said, "Please advertise my mishap."

Mr. Greason stated that when there is a crash, the NTSB details why there was a crash and how it happened. He believes the sense of the working group is to suggest that the FAA and COMSTAC work harder to how to make information on events available and still protect proprietary information.

Dr. Nield observed that the FAA is very receptive to that idea. He would appreciate specific recommendations from COMSTAC and others on what makes sense for a possible implementation.

Mr. Van Laak asked if this was an action that COMSTAC could take on itself to help shape a code of conduct in how FAA could take the data it has and share it appropriately.

Mr. Alexander noted that several companies that participated in the working group had stated they would look at using the lessons learned database. Mr. Kunstadter commented that the RLV Working Group might be able to develop a framework, identify what the issues are, and perhaps poll the industry to see how willing companies are to participate. Mr. Alexander stated that the working group could certainly discuss the issue.

Dr. Nield noted that the FAA would work with COMSTAC to make this a joint initiative. The FAA would also try to raise the visibility of the issue. The FAA needs COMSTAC's help to craft the message and the purpose.

Mr. Alexander asked if members were ready to vote. There were a couple of suggestions to make this an action for both the FAA and COMSTAC. Mr. Alexander noted that a finding is addressed from COMSTAC to the FAA. He asked all in favor to indicate by saying 'Aye.' There was a chorus of 'Ayes.' He asked for those opposed. There were none. This finding was accepted by the Committee.

Mr. Alexander finally reported that Brian Meade of AST and Kate Maliga of Tauri Group had reported on the new publication on the commercial sub-orbital industry. Ms. Maliga had given a complete report on this earlier in the meeting.

Mr. Kunstadter thanked Mr. Alexander for his report. Then he introduced Mike Gold to report on the Export Control Working Group.

Export Controls Working Group (ECWG)

Mr. Gold recalled the discussion at the May 2011 meeting about Commodity Jurisdiction requests. The Export Control Working Group submitted a recommendation to the FAA to express COMSTAC's support for the public release of Commodity Jurisdiction requests and advisory opinions. Mr. Gold reported that the results of Commodity Jurisdiction requests are now on the Directorate of Defense Trade Controls website. He could not say whether this action was solely the result of the COMSTAC recommendation, but he believed that there was a good chance that the change was based on COMSTAC's feedback alone, and, if not, COMSTAC's recommendation helped make the change a reality. Mr. Gold subsequently thanked the FAA for its role in achieving this result.

Mr. Gold described the panel discussion from the October 13 meeting. It was certainly a high-profile panel consisting of Brian Nilsson, Director for Non-Proliferation of Export Controls for National Security; Dana Rohrabacher, Congressman from California; and Nathan Remy, Vice President for International Affairs, AIA. The four singles plan seems to be headed towards a series of 38(f) requests. These are requests to take technologies off of the USML and ITAR and move them onto the CCL. The head of the Directorate of Defense Trade Controls at the Department of State puts the request forward. While technically only Congressional notification of such changes is required, Mr. Gold explained that, from a practical perspective, Congressional consent has always been necessary in the past. This can take time. White House officials estimate 215 days to approve each item. Mr. Gold sees the need for a substantial shift in the amount of time Congress takes in reviewing 38(f) requests.

He observed that the Department of Commerce is updating its badly outdated computer system. He anticipates this will lead to a single IT system among the Departments of Treasury, State, Defense, and Commerce for export control work. If the different agencies can talk to each other, the industry may see a coordinated enforcement process. The 38(f) process can lead to deconflicting the USML and CCL and modernizing both lists. This could lay the groundwork for the administration eventually merging the USML and CCL into a single list.

Mr. Gold observed that the changes will have the built-in caveat that it does not involve China. Also there will be no changes to Category XV. The White House hopes to deliver legislation to normalize Category XV. Mr. Gold was not optimistic about changes here.

He described a best-case scenario where the USML and CCL would be updated via the 38(f) process. The impact to a lot of space technology would be negligible because the industry is still under Category XV. The White House has drafted a new version for Category XV, but has not released it yet.

Mr. Gold presented one observation.

> COMSTAC members, in their individual capacities, should support legislation that would provide the President with the discretion to remove space craft, satellites, and any related technology and defense services from the USML, including Category XV.

Mr. Gold asked that if members contacted their Congressional Representatives, they might urge them to treat 38(f)s in a rapid and comprehensive fashion. If they dig into the details of every single widget, then nothing is going to happen.

Mr. Gold called for a vote on the observation. He asked all in favor to indicate by saying 'Aye.' There was a chorus of 'Ayes.' He asked for those opposed. There were none. This observation was accepted by the Committee.

New Business

Mr. Kunstadter thanked Mr. Gold for his report. He asked if any COMSTAC members had new business to bring to the Committee. There was no new business.

Public Comment

Mr. Kunstadter opened the floor to public comment.

Mr. Anhalt, Vice President for U.S. Government Programs, U.S. Government Solutions at Space Systems/Loral, rose to speak. He wanted to bring a nuance in the commercial space sector to COMSTAC's attention. He noted the growing demand for hosted payloads is such that the Air Force has an office for hosted payloads. He estimated that commercial telecommunications satellites, hosting U.S. Government payloads for traditional military missions will represent between a billion and 10 billion dollar industry in the next 10 years.

He noted that there are 43 GEO commercial satellites in the manufacturing flow today. Of those, 41 will be exported to foreign shores for launch. For a U.S. payload to be launched on a foreign rocket requires an application for an exemption to the White House Office of Science Technology Policy. For a staff officer in the U.S. Air Force, it is fundamentally not a legitimate approach to beseech the White House for a waiver to Presidential policy in order to even consider hosting a U.S. Government payload on a space craft that is likely to be launched overseas.

He suggested the time might be right for COMSTAC to recommend a modification to U.S. space transportation policy so that it does not apply to the use of foreign launched vehicles when a U.S. Government payload is hosted on a U.S. manufactured commercial satellite. He noted that this small change would in no way disadvantage the U.S. commercial launch base.

Mr. Kunstadter thanked Mr. Anhalt for his comments. He summarized Mr. Anhalt's argument. Mr. Anhalt observed that this kind of change needs leadership from COMSTAC to inform the U.S. policy community as it reviews the U.S. space transportation policy. Mr. Kunstadter noted that COMSTAC had responded to an FAA request in May 2011 for COMSTAC's view on the review of the U.S. space transportation policy. He suggested that John Sloan might know the status of that. Mr. Anhalt stated that his company had provided input also.

Mr. Sloan offered some comments. He stated that this issue was brought up by the Commerce Department during the review of the transportation policy. He reminded everyone that the FAA is in charge of promoting commercial space transportation, not necessarily satellites. The Air Force has also briefed this issue. Right now the FAA is waiting for the review to continue.

Mr. Kunstadter thanked Mr. Anhalt and urged him to continue a dialog with Mr. Sloan. He opened the floor to comment from COMSTAC members. Mr. Vinter observed that all U.S. satellites are launched by nine U.S. launchers. He would guess that price was a factor. If foreign launches are cheaper, then maybe that is something COMSTAC should look at. He noted that Mr. Anhalt offered a creative solution, but it doesn't solve the problem.

Mr. Kunstadter encouraged Mr. Anhalt to pursue whatever avenues are open to him and encouraged him to come back and brief the working groups at the next meeting on any progress. Mr. Kunstadter asked if there was other comment from the public.

Mr. Bray, of Sunshine Aerospace, asked about the Innovation and Technology Working Group. Was there any intention of reviving it?

Mr. Kunstadter noted that the Innovation and Technology Working Group had become the vehicle for the GSO forecast. He stated that COMSTAC was actively looking at how to make the working groups more relevant to the topics that it needed to address.

Mr. Bray offered a suggestion. He referred to the discussion on October 13 on standardization. Could a working group be formed to enable and foster communication among the commercial entities on what sort of standards may or may not be available? Mr. Kunstadter observed that that was an excellent topic for one of the working groups to take on.

Mr. Raley, of Sunshine Aerospace, proposed, as he had in the October 13 meetings, a COMSTAC subcommittee for standards and standardization. He noted that the FAA's position in the international arena would allow it to get good comments on standards developed internationally. He also believes COMSTAC needs to address any design process and material ideas that have to do with safety and would be subject to possible FAA regulation.

Mr. Kunstadter repeated his observation that this should be a component of one of the working groups. Mr. Raley commented that leaving standard development to one of the working groups could bog down their other work and slow any progress. Mr. Kunstadter acknowledged Mr. Raley's point of view. He reminded everyone that COMSTAC's mandate is to advise the FAA on matters the FAA seeks advice on or that COMSTAC thinks needs the FAA's attention. Standards are important to industry, but he believes they need to be developed within the specific industry. COMSTAC can certainly review standards and advise the FAA about support of standards. Developing standards is something for an industry association. Mr. Raley noted again that the international arena was something to consider.

Mr. Greason noted he would not want to use COMSTAC to develop industry standards. He sees a gradual movement towards industry developing standards. We need to start exposing the data that might reveal the areas where there needs to be a discussion of standards. The process should work gradually.

Mr. Davidian, of the FAA/AST and Program Manager for the Center of Excellence, mentioned that one of the tasks underway in the Center of Excellence is a look at spaceports and possible frameworks for their operation that might lead to standards. This

activity has been going on for approximately nine months and will continue into the next year.

Mr. Garcia noted that AST is part of the FAA. The FAA participates in the International Civil Aviation Organization (ICAO), which is the United Nations area that regulates commercial air transportation. He has noticed in international conversations that when the topic of commercial space transportation comes up, the immediate reference is not to the UN committee for the peaceful uses of outer space, but to ICAO. ICAO is forming an AST equivalent that will regulate global standards. He asked Dr. Nield if AST has interactions with ICAO.

Dr. Nield responded that AST has had informal discussions with ICAO. There are advantages and disadvantages working with a group like that, especially given the timelines associated with decisions in the international community. The U.S. industry is at the forefront of the exciting developments. Asking them to slow down while we have discussions about what they will be allowed to do may not be the right solution. He also recognizes the value of standards that will allow industry to sell its products and operate worldwide. This will become important when we get to point-to-point transportation between nations around the world. What bodies are best suited to take this on is not yet clear. FAA/AST is trying to have a dialogue with other nations and stakeholders so that we can be aware of what has been done so far, and how we can be compatible with guidelines and regulations as we go forward.

Mr. Kunstadter asked for any other comments. There were none. Mr. Kunstadter stated that he appreciated the opportunity to serve in Will Trafton's absence at the meeting. He noted that the commercial space transportation industry is at critical time. COMSTAC appreciates the input from industry to the working groups. We want to make sure that continues. He also expressed COMSTAC's appreciation for the feedback received from the FAA on the observations, findings, and recommendations. He thanked the public for attending and the COMSTAC members for their participation.

Mr. Kunstadter adjourned the meeting at 3:15 p.m.

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Signed by

Wilbur C. Trafton

Chairman, COMSTAC

COMSTAC Members Present

1. Christopher Kunstadter, XL Insurance, COMSTAC Deputy Chair
2. Eleanor Aldrich, American Institute of Aeronautics and Astronautics
3. Bretton Alexander, Independent Consultant
4. Mark Campbell, Aerospace Medical Association
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. Timothy Hughes, Space Exploration Technologies Corporation (SpaceX)
11. Ray F. Johnson, The Aerospace Corporation
12. Janet Karika, Jacobs NASA Launch Services
13. Bill N. Khourie, Oklahoma Space Industry Development Authority (OSIDA)
14. Debra Facktor Lepore, DFL Space LLC
15. Charles Precourt, ATK Launch Systems
16. Joseph Potter (for Daniel Collins), United Launch Alliance
17. Billie M. Reed, Virginia Commercial Space Flight Authority
18. Carl Rising, Stellar Solutions
19. Jayne Schnaars, The Boeing Company
20. Berin M. Szoka, TechFreedom
21. John W. Vinter, Consultant
22. Rachel Yates, Holland & Hart

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