National Aeronautics and Space Administration
Commercial Space Committee
of the
NASA Advisory Council

February 16, 2010
NASA Headquarters
Washington, DC

Meeting Minutes

_____	_____
John Emond	Bretton Alexander
Executive Secretary	Chair, Commercial Space Committee
Commercial Space Committee	

Meeting report prepared by
Jill Hacker

CONTENTS

Welcome
John Emond

Mr. John Emond opened the public portion of the meeting at 10:10 am and asked everyone in attendance to sign in. Mr. Emond introduced Mr. Bretton Alexander, chair of the Commercial Space Committee, member of the NASA Advisory Council (NAC), and president of the Commercial Spaceflight Federation.

Mr. Alexander welcomed the committee members and introduced Mr. Ken Ford, the NAC chairman and Douglas Comstock, director of the Innovative Partnerships Program (IPP) Office.

Mr. Alexander reviewed the agenda: The meeting would begin administrative issues; then briefings would be presented; then there would be discussions.

Introduction of Committee Members
Bretton Alexander

Mr. Alexander introduced the other committee members present:

- Bernard Harris, CEO of Vesalius Ventures and former astronaut
- Lon Levin, founder of a number of satellite businesses, including XM Satellite Radio
- John Michael (Mike) Lounge, former astronaut, Boeing executive.
- Patti Grace Smith, formerly Federal Aviation Administration (FAA) associate Administrator for commercial space transportation
- Will Trafton, formerly NASA associate Administrator for space flight, executive at a number of aerospace companies
- John Emond, executive secretary for the committee.

Not present was committee member Major General Donald Hard, who had served 31 years in the U.S. Air Force.

Committee Direction

NASA's Deputy Administrator, Ms Lori Garver, welcomed the committee and thanked them for their service. She explained that NASA needs the committee's advice. In the spirit of the Federal Advisory Committee Act (FACA), Ms Garver asked committee members to share their honest opinions. The Commercial Subcommittee is a symbol of where NASA is headed, a bipartisan effort. Because the budget is limited, everything is a trade-off – so the question for the committee is where to put the resources. Through this program, NASA needs to tap into industry's innovation and its ability to grow markets, to try new approaches without compromising safety, and to undertake business risks that government is not mandated to take, towards operations in low Earth orbit (LEO), first with cargo and then with crew. Ms Garver said the committee constituted the only group of people with the expertise required to advise on many aspects of the commercial space program. She welcomed a dialogue.

Mr. Alexander asked Ms Garver how she sees the swirl in the political process affecting the pace and timing of commercial programs. Ms Garver replied that NASA is doing a lot and wants to do more, especially with the Commercial Crew and Cargo Program, for which there is strong support in Congress and which is expected to grow in FY11. The future of the International Space Station (ISS) depends on the commercial space program. NASA's task now is to take advice from the committee and establish strategy. Ms Garver asked the committee to recommend ways NASA needs to go forward with this program, things for NASA to keep in mind.

Mr. Alexander commented that the committee has the opportunity to be of great value to NASA with the new NASA plan. Human space flight has been government's province for 49 years; now NASA is embarking on a fundamental paradigm shift for lower-orbit access to space, a plan to leverage new markets, to bring in innovation, to take advantage of a risk calculus different from NASA's. The committee can be of value in clarifying attributes of what makes something commercial and generally elucidating the issues. He suggested that the committee begin with basic information about the NAC charter and the Commercial Space Committee (CSC), to establish a common understanding.

NAC, under Mr. Ford as chair, is chartered to provide advice to the NASA Administrator, to whom the NAC reports. NAC has nine committees, called out in its charter, of which CSC is one. The NAC holds quarterly meetings and it is envisioned that the separate committees will hold meetings in tandem with and prior to the NAC meetings. As a standing committee of the NAC, CSC can be involved in any NASA matters that it deems commercial.

Typically a NAC committee reports findings, observations, and draft recommendations to the NAC through the CSC chair Bretton Alexander. The NAC may forward these to the Administrator or may send them back to the committee for revision. The Innovative Partnerships Program office, now part of the Office of Chief Technologist, is the sponsoring organization for this committee but the observations, findings and recommendations of the committee are channeled to the NAC through the Commercial Space Committee chair.

Mr. Ford explained that the NAC brings recommendations to the Administrator only once NAC agrees unanimously on them. If major changes must be made to recommendations before the NAC can be agree on them, then the NAC returns the recommendations to the committee for revision. Recommendations are formal and public; NASA has a timetable to respond them. Mr. Ford said CSC's recommendations must be very well thought through and must be actionable at the Administrator level and below. He recommended that the CSC first be in a learning mode and then make recommendations very carefully.

NAC committees may have subcommittees. The subcommittee chair must be a committee member; other subcommittee members need not be. Subcommittee members must go through the special government employee (SGE) process.

The CSC will hold about four meetings per year. Meetings will be more frequent in the coming months, because now, when the commercial space program is setting its direction, is when the committee's advice is most valuable. Meetings will take place in Washington, DC, and possibly at NASA offices in Houston, and in Florida. Most meetings will be face-to-face meetings, although some may be done by telephone. All meetings, even those done by telephone, must be done in a public way except for those communications that are administrative or fact-finding in nature.

Mr. Alexander explained that a committee report is to be presented at each NAC meeting; on Thursday, February 18, Mr. Alexander would present to the NAC a report on today's meeting.

Mr. Alexander discussed the group's work plan, which will remain in draft form until the Administrator approves it. The present draft contains four elements, as follows:

Draft Work Plan:

1. *Review and advise on how best to optimize NASA's organizational elements and address cultural issues to effectively encourage and promote the development of a commercial space industry.*

2. *Review NASA's strategy and plans for stimulating a commercial space industry, and provide advice on effective and appropriate methods for NASA to stimulate, encourage and partner with commercial space. What is the logical progression for developing a commercial capability for transportation to ISS and LEO?*

3. *Review and advise on NASA's strategy for partnering and cooperating with other federal agencies on commercial space.*

4. *Provide advice on how NASA should define "commercial space" to effectively implement "commercial space" programs and policies.*

Mr. Alexander commented that the first item may refer to administrative matters such as whether the program should have a single point of contact. NASA has laid out its proposed strategy for the program; according to the second item, it is up to the committee to provide advice on the strategy regarding a logical progression to ISS and LEO. The third item would apply to transportation to and from Low Earth Orbit and the ISS, as well as the suborbital program; these programs involve the FAA. For the fourth item, rather than try to define *commercial space,* Mr. Alexander suggested that the committee list attributes of commercial activity v government contracting, highlighting the advantages to working in a more commercial manner.

Mr. Alexander asked committee members to keep the work plan in mind through the meeting.

Mr. Alexander introduced Mr. Douglas Comstock

Presentation: Overview of NASA's Commercial Space Efforts
Doug Comstock, Director, Innovative Partnerships Program

Mr. Comstock provided an overview of commercial space activities going on within NASA.

Over the course of this year, IPP will be integrated into the Office of Chief Technologist. IPP's budget is about $200M this year. FY11's space technology budget, which includes IPP, is expected to be about $500M, increasing to about $1B by FY12. Commercial space will be an integral part of those activities.

Mr. Alexander asked whether IPP is supposed to provide a coordinating function for commercial space activities. Mr. Comstock replied that that has not yet been determined; he invited the committee's thoughts on the matter. Mr. Alexander pointed out that that is in the draft work plan.

Mr. Trafton asked whether IPP is to feed technology to industry, or whether industry is to feed technology to IPP. Mr. Comstock replied that both those things should happen: Technology will be moving both into and out of the agency.

Mr. Comstock talked about three themes in NASA's new paradigm for engaging with the commercial community:

1. The private sector as partner rather than contractor
2. Government purchase of services rather than hardware
3. Broader opportunities for innovation

An example of a partnership is the Commercial Orbital Transportation Services (COTS) program, in which NASA is partnering with the companies SpaceX and Orbital Sciences to develop new space transportation capabilities. One example of purchasing services rather than hardware is the Sabatier water production system deployed on the ISS. In this case NASA made some milestone payments but did not pay the cost of development. Another

example is the program for Facilitated Access to the Space Environment for Technology Development and Training (FAST), which simulates zero-gravity or low-gravity conditions using aircraft conducting parabolic flight activity. Mr. Lounge pointed out that when Spacehab offered this service, the government offered the same service at almost no cost, creating a barrier. Ms Smith suggested that the committee look at where there might be replication between the government and the private sector.

An example of opportunities for innovation is NASA's Centennial Challenges competitions.

Mr. Levin asked whether NASA benefits financially from the success of a company with which NASA works. Mr. Comstock replied that the answer varies; contracts are negotiated individually and may contain provisions for licensing fees or incentives for inventors within NASA to receive royalties. The goal is not to make a profit for NASA but to get technology out in a business-viable way.

Mr. Douglas Cooke, Associate Administrator for ESMD, welcomed the new committee. He explained that ESMD is now working through the COTS program's commercial cargo aspects. ESMD's new budget request includes the COTS effort.

Mr. Comstock continued: The exact meaning of *commercial crew* is under discussion with the Office of Management and Budget. It will be based in part on the Commercial Cargo program. Both commercial cargo contracts, SpaceX and Orbital Sciences, have made good progress.

Mr. Alexander asked about scheduling. If the committee submits its first recommendations in three months, will an opportunity for input be missed? Mr. Cooke suggested a private conversation to set up a timely interface.

Mr. Alexander introduced the next presenter.

Presentation: Commercial Cargo and Crew Overview Geoffrey Yoder, Director, Exploration Systems Mission Directorate Integration Office

The Commercial Crew Program Office was established in 2005 for the following purposes:

- To implement U.S. space exploration policy with investments to stimulate the commercial space industry
- To facilitate U.S. private industry demonstration of cargo and crew space transportation capabilities with the goal of achieving safe, reliable, cost-effective access to low-Earth orbit
- To create a market environment where commercial space transportation services are available to government and private sector customers.

Two contracts were awarded in December 2008 for ISS Commercial Resupply Services (CRS): one to SpaceX and one to Orbital. COTS also has two unfunded partnerships: PlanetSpace and SpaceDev. On these, NASA provides minimal support and oversight.

SpaceX is proposing three demonstration missions: Demo C1 for low Earth orbit operations, Demo C2 for ISS communication, and Demo C3 for berthing/docking to the ISS. Orbital proposes just one demonstration mission to the ISS. The schedule for Demo 1 has slipped by about 21 months. Mr. Levin requested that Mr. Yoder report back to the committee over time on adherence to the schedule. Mr. Yoder agreed.

The program is milestone based; partners get paid when they complete a milestone.

The human rating question has to be approached holistically. What are the requirements from a programmatic standpoint? Having reviewed a variety of insight/oversight models, ESMD is unable to recommend a single model as the whole solution. For example, FAA licenses for safety on the ground, but not for crew safety in orbit; a hybrid approach is needed.

The roles of various players are still being worked out. A metaphor for the question is taxi v rental car. Does the commercial company operate the vehicle, making it like a taxi, or does NASA operate it, making it like a rental car?

The chief engineer leads a core team to examine the balance of technical insight to oversight. The work will be done through government/industry partnerships, with civil servants on the contractor floor. The civil servants' guidance is advisory; they have no veto power on small decisions. NASA can vary the ratio of civil servants to contractors, depending on the situation, with more oversight personnel in higher-risk areas.

NASA is looking to eliminate requirements that are not safety related. For example, the optics quality requirement for the windows on the shuttle should not be a requirement for the program, because it does not relate to safety.

The Commercial Crew Program Office is developing human rating requirements for commercial crew for LEO. This process includes defining human rating requirements and gathering industry feedback through a request for information (RFI). First drafts have just been released within NASA, and the program may issue the RFI within a few months. NASA review of the documents may be complete by the end of FY10. The effort is to support an acquisition plan for services.

In response to a question from Mr. Lounge, Mr. Yoder said the team was considering whether to issue a separate follow-on to Commercial Crew Space Transportation Development (CCDev) for capability demonstration before going to a service contract, or alternatively going directly to a service contract. He said the tentative plan was to go through another series of Space Acts, an open competition to get them to a maturity level, and then a fixed price contract for services. He anticipates an ESMD-led development and demonstration activity like COTS Cargo and service activity by SOMD like CRS; how they link up and through what process is to be determined.

Ms Smith asked Mr. Yoder how he sees the FAA being involved in this process. Mr. Yoder replied that the FAA is tied in with the team, to help them understand where the bridge points are, the licensing activity, and what needs to be covered for mission assurance and safety. FAA will be asked to review the RFI before the RFI is issued.

Ms Smith asked whether NASA is open to a performance-based business approach rather than a prescriptive approach for meeting safety requirements. Mr. Yoder replied that NASA wants to be responsible for mission success, but is moving from very detailed prescription to simply making sure to get the key things that are really crucial to safety. Ms Smith expressed hope that NASA would consider any new approach to doing business that seems to work. Mr. Yoder agreed, saying NASA needs a culture change. Safety remains NASA's responsibility, but how NASA ensures safety is open to change.

Mr. Alexander asked what the process will be to get to an RFP, a competition, and a source selection for the Commercial Crew program, similar to what was done in the COTS program. Mr. Yoder replied that his team is considering that question now, as they work to issue an RFP. He said the program would try to start the project before CCDev ends.

Mr. Levin asked whether an unpressurized cargo module is currently being built for COTS. Mr. Yoder replied that one is, as a separate module. There is no requirement for unpressurized cargo missions.

Presentation: Commercial Reusable Suborbital Research and a Potential NASA Strategy for Achieving Low-Cost and Reliable Access to Space
Charles E. Miller
Senior Advisor for Commercial Space
Innovative Partnerships Program

The purposes of the program for low-cost and reliable access to space (LCRATS) are to transform how Americans relate to space, making it more personal; to generate economic growth; and to make human spaceflight affordable and sustainable. As Administrator Bolden has pointed out, the U.S. Post Office supported private investment in airlines in the 1920s by being a customer for airmail; similarly NASA, through the Commercial Reusable Suborbital Research (CRuSR) program, will encourage the development of low-cost access to low Earth orbit by buying space transportation services. Several past efforts at low-cost access to space have failed.

Mr. Miller cautioned against the centrally planned approach taken by the U.S. Department of War in 1898 to invent the airplane, an effort that cost many times as much as the Wright brothers' effort but failed. Instead NASA will pursue the holistic approach of the National Advisory Committee for Aeronautics (NACA) in building the industry rather than the program; that is, by stimulating industry capability.

In workshops in FY09, NASA asked the research community what research use they would make of a capability for frequent, low-cost, reliable launch to 300 km or 400 km. One suggestion was to look at mesosphere/thermosphere, the area between where balloons

and satellites can go, which is now underobserved. Exploration of this area could be of great value for education, with children being able to imagine realistically that they could go to space, and perhaps with teachers going into space.

NASA wants to help foster the industry, with NASA helping companies to develop orbital reusable capability. The CRuSR program, for example, would create markets. The program would not be limited to reusable vehicles, as long as order-of-magnitude reduction in cost and a similar increase in reliability are achieved.

William Gerstenmaier, Associate Administrator for Space Operations, joined the discussion. He explained that NASA struggles with the question of what is commercial and asked the committee for a definition. He explained that NASA needs a way to have crew and cargo provided to the ISS, as well as rescue capability. Two contracts have been issued for commercial cargo: SpaceX and Orbital. Mr. Gerstenmaier sees SOMD's role in Commercial Crew and Cargo as user, looking for a way to get crew and cargo to station, putting into place requirements for, e.g., delivery of crew, rescue capability, and ability to return on a moment's notice. Mr. Gerstenmaier and Sam Scimemi were prepared to talk only about cargo, not about crew, but Mr. Gerstenmaier said they would talk to the committee about crew at a later time.

Presentation: International Space Station Status
S.J. Scimemi
Deputy, ISS

The ISS has been on orbit with crew for over 10 years. It now has a six-person international crew. It is now 91% complete by weight, 98% complete by volume. There is commercial utilization related to vaccine development, with more commercial activity expected in the future.

Two Soyuz craft, each with six seats, service the ISS. NASA is responsible for three seats on each vehicle. Through agreements, NASA provides seats for non-NASA human spaceflight missions. Soyuz flights will be overlapped with flights of a commercial company that will be brought on line.

With the conclusion of the Shuttle program, ISS is moving away from its former practice of bringing repairs back to Earth to be carried out and toward more in-situ work. This will become more important as space exploration moves further out in the solar system.

Dr. Harris asked whether SpaceX and Orbital seem to be able to meet requirements. The reply was that there may be some delay but indications are that their work is of good quality.

Mr. Trafton pointed out that the head of the Russian space agency had made some public comments about the cost of a seat on Soyuz. Mr. Gerstenmaier expressed confidence that through negotiations a reasonable price will be agreed upon.

Mr. Scimemi reviewed the schedule for planned COTS and CRS flights. Mr. Gerstenmaier explained that a delay in these flights could result in a reduction in the science done on the ISS or in a reduction in the crew size. There are enough back-up provisions so that delays up to about a year can be tolerated without much impact. After that, the impacts become progressively worse.

As an example of a commercialized system, Mr. Scimemi cited Hamilton-Sundstrand, which was was contracted for water delivery on board ISS utilizing the Sabatier Reactor System. The program is looking for other things related to habitation and life support that could be commercialized.

For some needs, Mr. Gerstenmaier explained, NASA might provide standards and ask a company to create a design. There was discussion about the kind of standards that companies should be required to meet. Mr. Scimemi suggested that commercial standards might be equivalent to, or more workable than, the government's. Mr. Gerstenmaier commented that it was because the standard was well known that Hamilton was able to work without pay to develop an acceptable water system that they were eventually able to contract. In other areas this might not be the case and the risk might be too great for a developer. Many things are so customized that there is very little standardization.

Mr. Alexander asked whether NASA is satisfied with the COTS contractors' performance. Mr. Gerstenmaier replied that the contractor has had typical start-up problems and NASA has not seen technical performance yet, but the contractors seem to be technically responsive. He said NASA does not have insight into the contractor's costs; in fixed-price contracts like these, NASA does not ask for detailed cost data, because that would necessitate auditing and obtaining data from subcontractors; that effort would cost the company too much.

Mr. Alexander thanked Mr. Gerstenmaier and Mr. Scimemi for their presentation and said he would like to hear from them about Commercial Crew at the next meeting.

Committee Members' Initial Remarks/Reflections on Commercial Space Commercial Space Committee.

Mr. Alexander discussed the attributes that make something commercial. He delineated three commercial categories and listed examples of each:

1. Technology development: SBIR programs and the Commercial Resuable Launch Vehicle Technology Roadmap
2. Capability development and demonstration: COTS Cargo and Commercial Crew programs
3. Services: IPP's FAST and CRuSR programs; SOMD's Commercial Resupply and Crew Services programs.

Mr. Alexander asked the committee to focus on the attributes of commercial and on whose role is what in those three phases.

Mr. Lounge noted that there had been no discussion at this meeting of past programs with similar commercial structures. Spacehab, for example, faced all the same barriers: operational, technical, political. In that program, NASA did some things that enabled and some things that disabled; understanding those things would be a good case study. For example, in the course of a Spacehab review it became clear that NASA should limit its oversight to safety issues; mission success was the company's risk. In a case in which mission success was NASA's responsibility it would be harder for NASA to take a back seat, and government oversight could become a barrier to a partner. The corporate memory is still there but someone would have to assemble it. Mr. Lounge suggested Launch Services Business as another example to consider.

Dr. Harris raised several issues. He asked what is commercial v what is government, what is commercial v what is private. He also asked if budget details could be distributed to the committee. Mr. Alexander replied that at that time there was only a short budget, which mentioned the $6B for Commercial Crew; the detailed NASA budget was not out, but might be soon.

Dr. Harris commented that if NASA buys into commercial involvement there may be an opportunity for NASA to capture revenue and develop profit centers. He asked what *commercial crew* really means. Are the astronauts going to become commercial? Is NASA going to buy space? He asked whether healthcare – private institutions like medical schools or health insurance companies – could participate in the program.

Mr. Levin asked what the business plan is, how people would make money in the program, and how NASA has insight into how the business is doing, as would any investor that provides seed capital. Cost insight is necessary to make sure the company is on track to meet its commitment. The best way for a company to operate – the way to get the most freedom – is to meet its milestones. If a company fails to do that, NASA needs cost insight to decide what to do.

Mr. Levin also suggested that NASA could charge licensing fees to recoup the cost developing technology. Mr. Alexander commented that that idea has been debated in Congress. One side of the debate is that there is money left on the table that NASA is not recovering. The other side is that the goal is to get technology out, not to get money back from it. Dr. Harris pointed out that if NASA received something in return for some of the technologies it develops, then it would be self-sustaining. Mr. Levin commented that at a time of limited resources, it would make sense to explore the possibility of recouping some costs. Ms Smith asked whether it is in the public interest to have NASA receive paybacks. Businesses may not want the government to have that much insight into business.

Ms. Smith asked if government-industry partnership means a full partnership or a "partnership" where NASA maintains control. If industry's work is reliable and safe, NASA can let it go. Ms Smith approved of the use of fixed price contracts, rather than cost-plus contracts, in the program, since most companies prefer fixed price. She asked to hear more

about the specific kinds of targeted research that NASA needs and to hear specifically what Mr. Gerstenmaier had found to be satisfactory about the two COTS contractors.

Mr. Trafton expressed appreciation for the presentations and commended NASA for the COTS program. He said NASA needs a good definition of *commercial.* He asked Mr. Miller for clarification, at the next meeting, of the expressions *broadly stimulate, don't pick winners,* and *build an industry, not a program.* He agreed with Ms Smith that NASA should not develop profit centers and become commercial. NASA has to figure out how to write a contract for commercial service, how to control risk, and how to insert technology.

Mr. Alexander began a general discussion about the attributes of *commercial*, comparing what is traditionally done in government contracting with what would be done in commercial partnering. The goal would be to make a recommendation to NASA for example to apply the COTS model with certain adjustments to make it a commercial effort – or perhaps apply a different model altogether.

Mr. Levin suggested that even if it is important to keep government intrusion minimal, the government still needs insight, because in some cases NASA is the only client and is acting as an investor. On the question of licensing, he said the government should not be competing with the private sector. Still, if NASA has technologies available, it would be good to recoup the cost of developing them so that NASA would continue to develop technologies that industry is not going to develop.

Committee Discussion
Commercial Space Committee

Mr. Alexander handed out a worksheet to facilitate the discussion of commercial attributes, as a step toward answering the work plan question about the definition of commercial and toward making recommendations. Dr. Harris suggested that different models (e.g., fixed price, cost plus) may be appropriate for different aspects of the program. Mr. Lounge commented that the committee's recommendations could include suggesting different places on the continuum for each attribute. Mr. Alexander suggested that that is where lessons from COTS and from Spacehab are relevant.

Mr. Lounge asked whether NASA would require contractors to have other clients before they could be classified commercial.

Mr. Alexander commented that NASA has never been good at looking at business plans and choosing a winner. Mr. Levin commented that business is about identifying risk and choosing investments. Mr. Alexander said that would indicate a portfolio approach. Other factors to consider, he said, include who is driving the design, who is the owner/operator, and whether the pricing is market based. Mr. Lounge suggested that value-based pricing could also be considered.

Mr. Lounge raised questions about barriers of various kinds: technical, operational, financial, political, operational, and contracting. For example, a company has to raise

money and spend it over five years to develop a product – but there is no guarantee of funding beyond a year or two. Another example is third-party liability. In this FAA has helped a lot; that kind of protection needs to be extended. An operational barrier involves questions of who decides when a mission is ready to fly and whether the mission is a success. A technical barrier is not knowing until flight readiness review whether a mission has passed safety requirements. A contracting barrier is the challenge of writing a contract that provides the necessary control and freedom. For this industry to survive, big companies must be involved, but big companies will look for something more lucrative and safer.

Mr. Trafton suggested that the committee's top priority for the day should be the second item in the draft work plan, specifically the question "What is the logical progression for developing a commercial capability for transportation to ISS and LEO?"

Mr. Comstock raised the question of what are the best longer-term opportunities, such as infrastructure that could be put in space to enable space transportation once low-cost, reliable access is attained. He asked for ideas from the committee for investments made today could enable the future.

Dr. Harris suggested inviting a representative from a large aerospace company to speak to the group about barriers that concern them and what it would take for them to participate in the program. Mr. Alexander suggested inviting representatives from a cross-section of companies of different sizes to a closed meeting. Mr. Lounge commented that companies would likely speak publicly about such matters, which are not proprietary.

Mr. Alexander suggested that at a future meeting SOMD be invited to talk about top-level requirements for a commercial crew.

Mr. Lounge commented that getting information about barriers may be more work than the committee can do. He suggested recommending a NASA RFI. Other committee members felt that a recommendation to issue an RFI is not what is expected of the committee. Mr. Comstock suggested asking NASA look at the issues and see which ones it can control. Committee members agreed, saying that, for example, indemnification and multi-year commitment of funds are Congressional issues.

Mr. Alexander suggested inviting current COTS participants to the next meeting to discuss their experience in the program and inviting FAA to a meeting. Ms Smith suggested that FAA be invited to the meeting after the next one.

Mr. Alexander suggested scheduling two meetings before the coming NAC meeting in Houston on April 28 and 29, one at NASA Headquarters about halfway between the present meeting and the NAC meeting and the other at Johnson Space Center shortly before the NAC meeting. The participants agreed to set the first meeting for Tuesday, March 30, and the second for Monday, April 26.

Mr. Lounge offered to ask Spacehab executives what could have been done better in that program and what was done right. Mr. Alexander offered to arrange for some companies come in and brief the committee.

Mr. Alexander asked committee members to think about the definition of *commercial*. He said Charles Miller had obtained information from some industry people about what is commercial. Mr. Miller had offered to provide those to the committee, absent the attribution. Mr. Comstock said the information can be put in the public domain as long as it does not contain attribution.

Mr. Alexander asked the group to discuss the programmatics of the commercial program. In last week's speech, Deputy Administrator Garver had laid out a portfolio approach, a firm-fixed-price, pay-for-performance program along the lines of the COTS model. The committee should consider including as part of a recommendation the question of how the program would sustain technology development, capability development, and services, as well as whether it is appropriate to focus on all those phases together. Mr. Lounge paraphrased the last question: "What is the phase-in strategy?"

Recap of Briefings and Committee Discussions, Next Steps
Commercial Space Committee

Mr. Alexander said the committee is off to a good start, with lots of open questions. He explained that the committee's task will be to translate their thoughts into finding/observation/recommendation. He asked committee members propose draft wording. The ultimate product should be the right level of information, should be actionable, and should be concise.

Mr. Emond suggested that parallel tracks were emerging – one for cargo and one for crew. Mr. Lounge suggested that if that is the case, then cargo, the lower-risk effort, should be done first.

Mr. Alexander offered to put together a draft recommendation for the next meeting. He would consult with Mr. Ford in doing that and see if the committee is limited to the form of NAC committee recommendations in the past, which are short, or whether this committee's recommendations can provide more substance.

Mr. Alexander explained that Mr. Ford will take the draft work plan to the NAC for approval. The approval process may take several weeks. Mr. Alexander said he would draft recommendations for the next meeting and that he would send out the draft committee report. He asked committee members to review it quickly and provide feedback to him before the NAC meeting at 1 pm Thurs, February 18.

Mr. Alexander reviewed the commitments made:

- Mr. Alexander would put together committee report from today to present to the NAC on Thurs, February 18. He asked members to review it quickly.

- Mr. Alexander will send out action items electronically.
- Mr. Lounge will canvass Spacehab for lessons learned.
- Mr. Alexander would ask Mr. Miller for his discussion of the definition of commercial without attribution. [I'm not sure I got this right.]
- Mr. Alexander will invite industry to talk about lessons learned as well as things industry would need to be able to participate in the Commercial Crew program
- Mr. Alexander will circulate the briefings [viewgraphs, I think] electronically and
- Mr. Alexander will come up with straw man draft recommendation.

Mr. Levin recommended developing a list of questions for Lockheed or Boeing before they come, so that the companies would have guidance in choosing representatives who could speak to the questions. Dr. Harris offered to draft questions.

Mr. Alexander and Mr. Emond thanked those in attendance for coming.

The meeting was adjourned at 4:48 pm.

Appendix A
Agenda
Commercial Space Committee
February 16, 2010

9:00	Welcome by Brett Alexander and introduction of committee members
9:00-10:00	Mandatory Ethics Briefing
10:00-10:15	Committee meeting is open to the public. Welcome by Brett Alexander
10:15-10:30	Introduction by Brett Alexander of committee members, outline objective of this first meeting of the Commercial Space Committee
10:30-10:50	**Innovative Partnerships Program/IPP**: Doug Comstock provides an overview of NASA's commercial space efforts and activities
10:50-11:10	**IPP:** Charles Miller to provide an overview of the Commercial Reusable Suborbital Research (CRuSR) program
11:10-11:20	Break
11:20-12:20	**Exploration Systems Mission Directorate/ESMD:** Geoff Yoder/Commercial Orbiter Transportation Services/COTS to discuss COTS, Commercial Crew Development/CCDEV and Commercial Crew Program
12:20-1:15	Lunch; Committee members have a box lunch in MiC 6B
1:15-2:15	**Space Operations Mission Directorate/SOMD:** Sam Scimemi provides an overview of the ISS cargo Commercial Resupply Services (CRS) program.
2:15-2:45	Committee member initial remarks/reflections on commercial space, and reflecting on presentations given during the day. ~5 minutes per committee member.
2:45-3:00	Break
3:00-4:15	Committee discussion including topic areas to be explored by the committee, goals/ charter of the committee to support NASA's commercial space strategy
4:15-5:00	Recap of briefings and committee discussions, next steps
5:00	Adjourn

Appendix B
Committee Membership

Bretton Alexander, Chair
President, Commercial Spaceflight Federation

John Emond, Executive Secretary
Collaboration Program Manager, NASA Innovative Partnerships Program

Bernard Harris
Former astronaut; CEO, Vasalius Ventures

Donald Hard
Retired major general, U.S. Air Force

Lon Levin
Founder, XM Satellite Radio

John Michael Lounge
Former astronaut; Boeing executive

Patti Grace Smith
Former FAA Associate Administrator for Commercial Space Transportation

Wilbur Trafton
Former NASA Associate Administrator for Space Flight

Appendix C
Attendees

Committee Members
Bretton Alexander, Chair
John Emond, Executive Secretary
Bernard Harris
Lon Levin
John Michael Lounge
Patti Grace Smith
Wilbur Trafton
Ken Ford, Chair, NASA Advisory Council

NASA and General Public
James Ball, NASA Kennedy Space Center
Bill Beckman, Boeing Corp.
Marguerite Broadwell, NASA HQ Exploration Systems Mission Directorate
Douglas Comstock, NASA HQ Innovative Partnerships Program
Robert Davis, Northrup Grumman
Charles Divin, AIAA
Paul Eckert, Boeing Corp.
David Gump, Astrobotic Technology
Jill Hacker, Harris Corp. (contractor support Committee meeting)
Diana Hoyt, ASA HQ Innovative Partnerships Program
Dave Huntsman, NASA HQ Innovative Partnerships Program
Chuck Larsen, FAA Office of Commercial Space Transportation
Gerald Lefebvre, SAIC, Houston
Charles Miller, NASA HQ Innovative Partnerships Program
Trish Morrissey, NASA Ames Research Center
Lindsey Ohmi, CSIS/Defense Industrial Group
Chuck Petrilla, URS Corporation
Michael Reilly, retired NASA, consultant
Robert Shaw, NASA Glenn Research Center, Business Development and Partnerships
Nantel Suzuki, NASA HQ Exploration Systems Mission Directorate
Cynthia Wallace, Harris
Derek Webber, Spaceport Associates
Romae Young, NASA Goddard Space Flight Center

Appendix D
List of Presentations

1. Overview of NASA's Commercial Space Efforts, Doug Comstock
2. Commercial Cargo and Crew Overview to the NAC Committee for Commercial Space, Geoffrey Yoder
3. Commercial Reusable Suborbital Research and a Potential NASA Strategy for Achieving Low-Cost and Reliable Access to Space, Charles E. Miller
4. International Space Station Status, S.J. Scimemi