Commercial Space Transportation Advisory Committee
October 25, 2006
MEETING MINUTES

COMSTAC Chair John Vinter, International Space Brokers, Inc., Rosslyn, Virginia, convened the meeting at 8:51 a.m. He began by welcoming the Committee members and guests and introduced two new members, Wilbur Trafton, executive vice president, Rocketplane Kistler and Timothy Hughes, legal counsel for Space Exploration Technologies. He congratulated COMSTAC Members, Mike Kelly and Lou Gomez on the successful Wirefly XPrize Cup, which took place in Las Cruces, New Mexico, October 17-21. Mike Kelly is vice president for Operations for Wirefly XPrize Cup, and Lou Gomez is program manager in the New Mexico Office of Space Commercialization. Chairman Vinter also recognized member Debra Lepore, president of AirLaunch LLC, for a successful drop test of the QuickReach rocket on July 26, noting that it was the largest single object to be dropped from a C-17.

AST Activity Report

Dr. George Nield, FAA Deputy Associate Administrator for Commercial Space Transportation, provided an update on the activities of FAA's Office of Commercial Space Transportation (AST) since the May 2006 meeting. Dr. Nield began by describing the highlights of the Wirefly XPrize Cup, including a rocket-powered bicycle, a rocket truck, static engine firings, and the participation of Armadillo Aerospace in the Lunar Lander Challenge with the Pixel rocket. He emphasized the progress made in safety for space launch operations and stressed the FAA's commitment to safety during launch operations.

He reported on three licensed launches since the May meeting: two Sea Launch missions (Galaxy 16 and Koreasat) and Boeing's Delta 4 launch (GOES-N weather satellite). He also reported on several industry developments; including

- Space Adventures announcement of a venture with the Russians to offer customers a space walk during trips to the International Space Station;
- Bigelow Aerospace's successful subscale test of Genesis I and the subsequent announcements to launch the 3-person Sundancer space station in the 2009-2010 timeframe and to enter into an agreement with Lockheed Martin to study the potential for using the Atlas V for launching the space station modules;
- AirLaunch's successful drop test of the QuickReach rocket;
- Virgin Galactic's unveiling of the full-scale model of the Spaceship 2 cabin in New York on September 28th;
- The formation of the Benson Space Company, also on September 28th;
- Anousha Ansari's flight aboard the Space Shuttle; and
- The Federal Trade Commission's approval of the formation of United Launch Alliance on October 3rd.

Dr. Nield also reported on AST accomplishments since May, including;

- The sixth license for a non-Federal launch site issued in June to the Oklahoma Space Industry Development Authority (OSIDA) site at Burns Flat, the second licensed inland spaceport;
- The publication of the Final Rule on Safety Approvals, which will allow the developer of systems, subsystems, training programs, etc., an opportunity to have their hardware, software, and processes reviewed and approved by the Government;
- The issuance of the new Launch Safety Standard for Expendable Launch Vehicles on August 25th; and
- The issuance of the first experimental permit to Blue Origin on September 15th.

Dr. Nield acknowledged and congratulated Bill Khourie of OSIDA and the two winners of the Commercial Orbital Transportation Services contract, Rocketplane Kistler and Space Exploration Technologies. He also mentioned the AST publication, ***Funding Resources for Launch Vehicles and Spaceport Technology Research Development***, intended to help launch providers and spaceport operators identify potential sources of public and private funding.

The COTS Winners: Space Exploration Technologies Corporation

Tim Hughes, Chief Counsel for Space Exploration Technologies Corporation (SpaceX) provided information on SpaceX's plans for implementing the COTS program, pointing out that the COTS objectives are consistent with the SpaceX goals and aspirations of reducing costs of access to space, stimulating commercial enterprise in space, and enhancing government and industry efficiency. He reported that SpaceX received $278 through 2009 to do three options:

- Third Quarter 2008, Core Functionality Flight – first Dragon flight to demonstrate orbital maneuvering, structural integrity, systems functioning, entry, descent, and landing;
- Second Quarter 2009, Autonomous Rendezvous and Berthing – use of the 2nd stage of the Falcon 9 launch vehicle as a physical target and mapping a virtual space station to verify that the Dragon can approach the ISS safely; and
- Third Quarter 2009, ISS Berthing and Return Down-Mass – this will demonstrate the capability of the Falcon 9 to deliver cargo and return safely to Earth.

He noted that each mission would deliver approximately 1400 kilograms of pressurized cargo, 1700 kilograms of un-pressurized cargo, 1400 kilograms of pressurized down-mass, and 1700 kilograms of un-pressurized trash disposal, adding that the Dragon spacecraft provides pressurized and un-pressurized cargo and crew transportation, the Dragon and the Falcon 9 are both designed for reusability, and that the proposed missions would be licensed by the FAA.

Mr. Hughes outlined the fourth option, which he noted would require additional NASA funding and pointing out that each mission will have the capability to carry seven crewmembers to the ISS:

- Demonstration 1, 2009, Unmanned, High Altitude Abort – to demonstrate the crew escape system and verify the abort and recovery systems;
- Demonstration 2, 2010, Three-Person Crew and Minimum Cargo to the ISS – to demonstrate maximum Delta V and life support margins; and
- Demonstration 3, 2010, Crewed Flight to the ISS – to demonstrate the capability to transport a full crew to the ISS and return safely to Earth.

Mr. Hughes outlined the Concept of Operations, reporting that all missions would take place and end in Kwajalein. He described the two-stage Falcon 9 launch vehicle and its construction, noting that it is man-rated consistent with NASA requirements, a Merlin first-stage engine, and a Merlin upper stage, capable of carrying 10 tons to low Earth orbit. He also described the Dragon spacecraft.

The COTS Winners: Rocketplane Kistler

Will Trafton, executive vice president for Rocketplane Kistler (RpK), provided an overview of RpK's plans for implementing the COTS program, describing the proposed mission of the K-1 launch vehicle to the ISS in approximately 2009-2010, the fourth option under the COTS program. He reported that the mission would take place from the spaceport in Woomera, Australia and would last up to nine days.

Mr. Trafton outlined RpK's proposal for Capability D, including converting a pressurized cargo module to carry five crew members, developing ways to safely fit the crew into the module, and providing displays and mechanisms for controlling the rocket.

Mr. Trafton described the two-stage, (Launch Assist Platform and the Orbital Vehicle), fully reusable K-1 launch vehicle, with LOX/RP engine, capable of carrying 5,700 kilograms to low Earth orbit and 3,500 kilograms to the ISS, and with two payload module options, standard or extended. He emphasized that a large part of the K-1 is already complete (about 75%), including 30 first-stage engines and nine-second stage engines. He reported that the K-1 will have an integrated vehicle health monitoring system, which will provide information on how well the launch vehicle performed during a mission. He noted that RpK is planning to have the site at Woomera for polar launches and a second site, possibly at Cape Canaveral.

COMSTAC member Lou Gomez inquired about the limiting factor on the proposed nine-day turnaround for the K-1. Mr. Trafton replied that it will probably be the engine because of the need to replace the tiles. COMSTAC member John Logsdon asked about the size of the target area to reenter and Mr. Trafton described the process of reentry with three parachutes (pilot, drogue and main) into a circle of about 6,000 feet. Dr. Logsdon also asked if RpK Phase II engines would eventually be produced in the U.S. and Mr. Trafton replied that Aerojet would probably start producing the engines in Sacramento eventually. In response to a question from the audience, Mr. Trafton reported that RpK is planning to reuse its engines 10 times, with inspections after each flight, and a complete tear down after the tenth flight, adding that RpK is also planning to ship the engines from Sacramento to the Marshall Space Flight Center to run them before installation into the vehicle.

Satellite Industry Update

David Cavossa, Executive Director, Satellite Industry Association (SIA), provided an overview of and market status for the satellite industry, noting that the SIA is a consensus-based trade association, comprised of approximately 25 companies (satellite operators, manufacturers, launch providers, ground equipment suppliers, and resellers of satellite capacity. He reported that the total 2005 revenue for the global commercial satellite industry was $88.8 billion, representing a 6.7% growth rate over a five-year period (2001-2005), and $52.8 billion (over 60%) is in the services sector, i.e., the provision of voice, video, and data. He emphasized that of that $52.8 billion, over $41 billion is revenue from the direct-to-home sector. He also reported $1.7 billion for mobile satellite services in 2005, noting that this sector has been steady over the last five years but may see an increase due to the roll out of new systems; and $9.8 billion for fixed satellite services, remote sensing, and transponder agreements.

Mr. Cavossa described each sector beginning with the fixed satellite services sector, which includes Intelsat and PanAmSat, which recently merged forming the largest fixed satellite operator with 49 satellites; and SES, (formerly SES Astra, SES Americom and NEW Skies) as the second largest with 45 satellites. For the mobile satellite sector, he reported recent growth, after some high-profile failures and bankruptcies.

He also discussed satellite manufacturing revenues, which he noted experienced a drop in the late 1990s and early 2000 due to telecommunication and Internet bubble bursts, but said that these revenues are increasing due to the number of new orders. He also discussed launch industry revenues and satellite industry trends, noting that the satellite industry has started to rebound because of new technologies, new applications driving demand, and new markets opening worldwide. He pointed that consumer demand especially for video is a key factor along with government demand and investment in technology, and consolidation in the fixed satellite sector.

Mr. Cavossa also provided a detailed overview of the current focus for the satellite industry – disaster relief and recovery, national security, and emergency preparedness. He reported that after September 11th and especially, after Katrina, the use of satellite services as a backup communications infrastructure for first responders and public safety have become part of the solution, because they are independent of public telephone networks and line/mobile radio. He reported that the SIA has developed a publication, entitled ***First Responders Guide to Satellite Communications***, and he emphasized that over 80% of the Department of Defense's communications needs were met by the commercial satellite industry in Operation Iraqi Freedom. He discussed what the DoD wants in satellite services for the future and he discussed the role that operationally responsive space can play in this area.

COMSTAC member Debra Facktor Lepore recommended that the SIA provide its Guide to the state of Hawaii and meet with the Pacific Air Forces to help Hawaii deal more effectively with disaster response. COMSTAC member John Logsdon asked about the remote sensing sector. Mr. Cavossa explained that the statistics for that sector are

included in satellite services sector but that revenues for remote sensing in 2005 was about $15 billion, including GPS. COMSTAC member Chris Kunstadter commented that the two European companies (Alcatel Alena and EADS Astrium) have more market share than the four U.S. companies (Boeing, Lockheed, Loral, and Orbital), inquiring whether this was due to ITAR issues. Mr. Cavossa responded that ITAR was partially responsible but that some of the ITAR issues may be resolved sooner than expected since they are now impacting national security.

COMSTAC member Lou Gomez asked what percentage of DOD contracts go to U.S. companies and what percentage goes to foreign companies. He also asked whether there are ITAR issues related to running military data and voice through foreign satellites. Mr. Cavossa responded that the issue of what is a U.S. company comes up for the discussion of what is or isn't a foreign satellite. Mr. Gomez also asked if there were ITAR issues when contracts for satellites are given out. Mr. Cavossa responded that ITAR probably plays a role and also the Office of Foreign Asset Control. COMSTAC member Livingston Holder asked whether there were plans by commercial entities to include more security features that could satisfy DOD requirements and Mr. Cavossa advised that commercial entities are planning to do so with the help of the National Security Telecommunications Advisory Committee, which is examining this issue.

The Programmatic Environmental Impact Statement for Experimental Permits

Stacey Zee, environmental specialist in AST, provided information on the Programmatic Environmental Impact Statement (PEIS) that AST is developing to analyze the impacts of launches and re-entries of reusable sub-orbital rockets operating under an experimental permit, noting that experimental permit applicants can use this information to streamline their environmental review. Ms. Zee provided an overview of the National Environmental Policy Act (NEPA) process, explaining that AST issues licenses and permits which are considered major Federal actions with the potential to significantly impact the quality of the human environment, and all such major Federal actions are subject to NEPA, 40 CFR, Parts 1500 to 1508.

Ms. Zee described the three levels of NEPA review:

- Categorical Exclusions (CATEX) – actions that don't, individually or cumulatively, have a significant impact on the quality of the human environment;
- Environmental Assessment (EA) – an analysis of proposed action and reasonable alternatives that could result in preparation of an Environmental Impact Statement or Finding of No Significant Impact; and
- Environmental Impact Statement (EIS) – a detailed analysis of environmental consequences of proposed action and alternatives, cumulative impacts, and mitigation actions.

She noted that currently the FAA does not have a CATEX for issuing a license or permit, therefore, an EA or EIS must be done for commercial launch licenses or experimental permits. She also defined programmatic analyses as documents that provide the analysis and documentation from which subsequent NEPA documents can be tiered, meaning that an applicant would only conduct the analysis specific to their permit application.

Ms. Zee reported that AST is planning to analyze the potential impacts of launch and reentry activities from specific launch sites and asked industry representatives to send in proposed launch and reentry sites (not just licensed sites) so that they can be included in the analysis. She also reported that AST is currently in the scoping phase of the PEIS process, noting that scoping is the process wherein agencies solicit input on the nature and extent of issues to be analyzed in the PEIS document, and that the draft PEIS will be released for public review in the spring 2007.

Report: Liability Risk Sharing Regime for the U.S. Commercial Space Transportation Industry

James Vedda, The Aerospace Corporation, provided a briefing on the report entitled ***Study of the Liability Risk Sharing Regime in the United States for Commercial Space Transportation***, a study mandated by Congress in 2004 to assess methods by which the current system could be eliminated or modified, to evaluate the impacts of elimination or modification of the system on U.S. competitiveness in the world launch market and U.S. assured access to space, and to examine the liability risk sharing in other launching states. Dr. Vedda provided background on the three-tiered system for coverage of third party liability in the case of catastrophic commercial launch accidents in place since the 1988 Commercial Space Launch Act explaining that the first tier is Maximum Probable Loss (MPL) based insurance purchased commercially, the second tier is government payment up to $1.5 billion (1988 dollars) in excess of the MPL insurance through the indemnification statute, and the third tier is responsibility that reverts back to licensee or legally liable party for anything above the government indemnification. He noted that the second tier required Congressional appropriation of funds and that there have been no claims to date. He also noted that the statute includes a sunset provision which has been renewed four times and which is scheduled to expire on December 31, 2009.

Dr. Vedda reported that chapter 1 descibes the current risk-sharing regime, acknowledges the U.S. treaty obligations for third-party liability for damage that occurs outside U.S. borders, and reviews the policy objectives for the indemnification regime, i.e., assurance of adequate liability coverage for catastrophic events; minimizing U.S. Government risk; and improving the economic benefits and strengthening the U.S. industrial base for space capability.

He reported on chapter 2, which includes a discussion on the maturity of the commercial space transportation industry, U.S. commercial space transportation industry market share, Government impacts (as a customer and a regulator) including export controls and responsibility for safety at Federal ranges. He noted that chapter 2 also includes a discussion of other Government risk-sharing experiences including the Price-Anderson Act, which was set up in 1957 to help the nuclear power industry. He added that the nuclear power industry is similar to the commercial space transportation industry because of the high consequence, low probability of risk and has never had a catastrophic claim, but it is different because it is a larger sector, not aimed at international markets, national security or prestige.

Dr. Vedda reported that chapter 3 examines the alternative of eliminating the indemnification regime, including self-insurance, trust funds, publicly-subsidized insurance, captive insurance, and catastrophe bonds, an industry pool similar to the Price-Anderson Act, and a pre-funded industry pool managed by the Federal Government. He emphasized the industry's position that the indemnification regime should be retained and strengthened, and if eliminated, it would drive business to foreign companies. For chapter 4, he noted that it discusses the risk-sharing regimes of other countries, including Australia, Brazil, China, Europe (France, United Kingdom, Sweden), India, Japan, and Russia.

He summarized that the current regime has become an industry standard and that elimination would send bad signals to international customers and competitors. The report includes two options:
Option 1: maintain government sharing of low-probability, but potentially high consequence, third-party risk; and
Option 2: phase out U.S. Government (taxpayer) risk exposure for commercial launch activities.

COMSTAC member Livingston Holder asked Dr. Vedda's opinion of why Congress continues to ask about questions and require studies about the indemnification regime. Dr. Vedda stated that some members and staffers may feel that the industry is mature enough to take "...care of all of its needs." COMSTAC member George Whitesides asked how indemnification might be affected by RLV operations and Dr. Vedda responded that it would probably become more complicated since it will have to cover launch and reentry.

WORKING GROUP REPORTS

Risk Management Working Group (RMWG)
Chris Kunstadter, Vice President, XL Insurance, provided a report on the RMWG meeting on Tuesday, October 24, noting that the focus of the group over the last year has been the Liability Risk Sharing Regime study that Dr. Vedda reported on. He reported that the Risk Management Working Group agrees that the phase-out option is not a viable option, since it would undermine the commercial space transportation industry and U.S. competitiveness. He presented the following recommendation:

- that DOT/FAA recommend extension of the risk-sharing regime, including recommending that the regime be retained, that the indemnification cap be removed, and that the expiration date be removed or extended for a period of ten years or more.

The recommendation was adopted by the full Committee.

Launch Operations and Support Working Group (LOSWG)
LOSWG Chair Don Pettit, Executive Director, Aero Thermo Technology, Inc., reported on the October 24th LOSWG meeting, noting that the working group heard reports on the status

of the FAA Launch Safety and Human Spaceflight rules and AST Research and Development projects. Gen. Pettit also reported that the group heard briefings on the spaceport development activities at NASA Kennedy Space Center; launch and test range activities by the Air Force, and spaceport updates from Virginia, New Mexico, and Florida. He noted that the Air Force briefing included information about the DOD mandate to switch to GPS metric tracking at the Eastern and Western ranges by 2011 and about responsive launch traffic control. He also reported on the briefing by Spaceport Associates on the Adventurers' Survey, a survey that gathered data on the perceptions and that people have about space tourism

RLV Working Group (RLVWG)

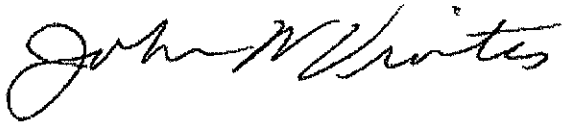
RLVWG Chair Mike Kelly provided a summary of the RLVWG meeting on Tuesday, reporting on the briefings on Liability for Commercial Human Space Flight; Security for the Next Generation Air Transportation System; and a report on the AST Research and Development project on the Rocket Failures Database.

Mr. Kelly asked that RLVWG members submit R&D topics by January 12, 2007. He also provided a review of the Wirefly XPrize Cup, explaining that this was actually the first XPrize Cup, (the 2005 event was Countdown to XPrize Cup). He acknowledged Armadillo Aerospace's Pixel rocket flight as the first flight under an FAA Experimental Permit. He also explained that the Lunar Lander Challenge was a contest that required the development of a vehicle that could take off vertically, climb to 50 meters altitude, translate 100 meters horizontally, land on a target within a ten meter circle, refuel, and launch again from the same pad and all within a period of two hours and 30 minutes.

New Business and Wrap Up

Chairman Vinter brought up the issue of ITAR and asked that all working group members examine the issue and report on how it is affecting their particular areas of responsibility at the May 2007 meeting. COMSTAC member Livingston Holder added that members should also examine ways to adjust the regulations so that they satisfy ITAR requirements but don't negatively impact the industry. Mr. Vinter commented that ITAR has served to protect technology, but as a result, customers are going to foreign companies to purchase satellites.

Since there was no additional new business, Mr. Vinter adjourned the meeting at 12:42 p.m.



John W. Vinter, Chairman, COMSTAC

ATTENDEES

COMSTAC Members/Alternates

John Vinter, COMSTAC Chair, International Space Brokers, Inc.
Louis Gomez, New Mexico Office of Space Commercialization
Livingston Holder, Holder Consulting Group
Erik Evenson, Science Applications International Corporation (Alternate for Frank L. Culbertson, Jr.)
Michael Kelly, X Prize Cup
Christopher Kunstadter, XL Insurance
Eleanor Aldrich, American Institute of Aeronautics and Astronautics
Debra F. Lepore, Air Launch LLC
Jack Maguire, The Aerospace Corporation (Alternate for Dr. Alex Liang,)
Dr. John Logsdon, George Washington University
Don Pettit, Aero Thermo Technology, Inc.
Robert Parker, Virginia Commercial Space Flight Authority (Alternate for Dr. Billie Reed)
Frank DiBello, International Technology Ventures
George T. Whitesides, National Space Society
Robert Davis, Northrup Grumman
Tim Hughes, Space Exploration Technologies
David Keslow, Orbital Sciences Corporation
Robert Bocek, Boeing/Sea Launch Company (Alternate for Sea Launch LLC)
Elaine David, Lockheed Martin Corporation (Alternate for Mark Albrecht and Thomas Marsh)
Randall Clague, XCOR Aerospace (Alternate for Jeff Greason)
William Panter, ATK Thiokol, Inc. (Alternate for Charles Precourt)
Wilbur C. Trafton, Rocketplane Kistler

Federal Aviation Administration

Patricia G. Smith, Associate Administrator for Commercial Space Transportation
Dr. George Nield, Deputy Associate Administrator for Commercial Space Transportation