



**Commercial Space Transportation Advisory Committee
COMSTAC
May 16, 2008
Meeting Minutes**

COMSTAC Chairman Will Trafton convened the 47th meeting of the Commercial Space Transportation Advisory Committee (COMSTAC), at 8:42 am. The meeting was held at Federal Aviation Administration Headquarters in Washington, DC. He welcomed members and guests and acknowledged the U.S. Deputy Secretary of Transportation, Admiral Thomas J. Barrett, and the FAA Acting Administrator, Robert A. Sturgell. He also acknowledged two new COMSTAC members, Gerald Musarra, Vice President for Trade and Regulatory Affairs, Lockheed Martin, and Robert Dickman, Executive Director for the American Institute of Aeronautics and Astronautics. Mr. Trafton also congratulated Dr. George C. Nield on his recent selection as the FAA Associate Administrator for Commercial Space Transportation.

Remarks by FAA Acting Administrator Robert A. Sturgell

Administrator Sturgell discussed the growing potential of human space travel. He also mentioned the proposed opening of the commercial spaceport in New Mexico (Spaceport America) scheduled for 2010 and plans by Virgin Galactic to be present for that opening. He pointed out the participation by other countries in the development of spaceports, including Australia, New Zealand, Singapore, Dubai and Sweden, emphasizing America's lead in spaceport development. Mr. Sturgell then introduced Deputy Secretary Barrett.

Remarks by Deputy Secretary of Transportation Admiral Thomas J. Barrett

Deputy Secretary Barrett expressed his appreciation to COMSTAC members for their willingness to serve and to Secretary of Transportation Mary Peters, noting that her priorities are clear and consistent. He listed three Departmental priorities; safety and improving safety for all transportation modes; systems performance in transportation networks; and developing and bringing forward 21st century solutions to transportation issues. He also discussed three major issues that impact transportation as a whole and commercial space transportation specifically:

- The Enterprise Approach, i.e., the innovate spirit of the private sector supported by the government's promotion and encouragement to use commercial launch services to the maximum extent;
- Excellence, i.e., industry and government striving for the highest goals and being the best; and
- Patience, i.e., the determination and dedication to develop and test systems that will provide the safest, most reliable systems for all travelers.

Admiral Barrett emphasized FAA's work to ensure safety for all commercial launch activities, including future private human space flight; the efforts by the Department, along with the FAA in pushing for the development of the next generation air traffic system to accommodate launch and reentry operations; and the Department's support of the work of the U.S. commercial space transportation industry.

Chairman Trafton acknowledged COMSTAC member Michael S. Kelly and his work as the first and only chairperson of the RLV Working Group, since its establishment in 1998, noting that Mr. Kelly would be stepping down as chair and COMSTAC member George Whitesides would be the new chair. He also acknowledged COMSTAC member Dr. Alex Liang, chairperson of the Technology and Innovation Working Group for the 2008 Commercial Geosynchronous Orbit Forecast, Gwynne Shotwell, Space Exploration Technologies Corporation, for her work as the 2008 Forecast Team Lead, and John Sloan, FAA/AST for his work on the GSO and Non-GSO forecasts.

Report on AST Activities

Dr. George C. Nield, FAA Associate Administrator for Commercial Space Transportation provided an update on AST and industry activities since the last COMSTAC meeting in October 2007. He began by pointing out that many people are true believers in future commercial space transportation ventures, including young people, who are showing a renewed interest in space transportation.

In industry news, Dr. Nield reported on Bigelow Aerospace's Genesis I one-third inflatable test model, launched in July 2006, which completed its 10,000th orbit around the Earth, followed by Genesis II, launched in June 2007. He reported on the unveiling of the White Knight II and SpaceShip II by Burt Rutan and Richard Branson; the Zero G Tax Bill, signed by the Virginia Governor to create an income tax exemption for the sale of launch services to space tourists and the delivery of payloads to the International Space Station (ISS); the legislation to conduct feasibility studies for a spaceport which passed in Hawaii; and the passage of a bill by the Florida State Senate in April to provide immunity from liability for injury or death when a space flight participant has signed an informed consent.

For licensed launches since the October COMSTAC meeting, Dr. Nield reported that there was a Delta II launch in December; two Sea Launch Zenit 3SL launches, one in January and one in March; an Atlas 5 on April 14; a Pegasus EL also in April; and five permitted launches in October 2007. In other industry news, he reported on XCOR's March 26th unveiling of the Lynx rocket, a suborbital vehicle which allows private citizens to sit in the right-hand seat and look out; and the April 27th dismantling of the Titan service tower at Cape Canaveral to make way for a new tenant, Space Exploration Technologies Corporation (SpaceX).

Dr. Nield discussed the findings in AST's report, entitled *Economic Impact of Commercial Space Transportation on the U.S. Economy*, released on April 17, noting that in 2006 commercial space transportation and enabled industries generated over \$139 billion in economic activity, a significant increase over the \$98 billion in 2004, and more than double the \$61 billion from 1999, the year of the first economic impact report. Also from the report, he noted \$35 billion for 2006 earnings, 40% over the \$25 billion in 2004 and over 50% for the \$16 billion in 1999; and 729,000 jobs for 2006, compared to 551,000 jobs in 2004 and 497,000 in 1999.

Dr. Nield introduced Jim Van Laak, who is on a six-month detail in AST from NASA, as AST's senior advisor for Human Space Flight, and highlighted Mr. Van Laak's experience as a former F-106 pilot in the Air Force and over 20 years with NASA as the deputy manager for the Shuttle Mir Program and the operations manager for the ISS. Dr. Nield also acknowledged and commended Mike Kelly's ten-year service as the chair of the RLV Working Group and presented him with a plaque.

Update on the Commercial Orbital Transportation System (COTS): Space Exploration Technologies Corporation and Orbital Sciences Corporation

Tim Hughes, vice president and chief counsel for SpaceX provided an update on that company's activities and plans for the COTS Program, reporting that SpaceX has grown from 3 employees to over 450 since 2002 and has recently moved to 500,000 square foot facility in Hawthorne, California with state-of-the-art propulsion testing facilities in McGregor, Texas. He noted that SpaceX has launch complexes at Kwajalein, Cape Canaveral, and Vandenberg Air Force Base and has become a NASA qualified launch services provider. He reported on the upcoming launch of the Falcon 1 rocket from Kwajalein in June as part of the Jump Start mission.

Mr. Hughes reported that the Falcon 9 launch vehicle with the Dragon Capsule would be on the pad at Cape Canaveral in December 2008 and that the COTS launch is scheduled for June 2009. He pointed out the commonality between the Falcon 1 and Falcon 9 rockets, including the Merlin 1C engine, and some of the same avionics and software. He noted that the COTS Program, called C3P0 for Commercial Cargo and Crew Program, is designed to demonstrate servicing to the ISS with possible ISS servicing after the Space Shuttle is retired, and to encourage the growth of the commercial space industry to bring about lower costs. He reported that SpaceX's agreement is split into the two COTS phases:

- Phase 1: Demonstrations with Capabilities A through C for cargo (pressurized, unpressurized, up mass and down mass) and Capability D for crew supply and return (SpaceX has an option for Capability D which is unfunded); done under Space Act Agreements.
- Phase 2: Operational Missions will be done under a FAR Part 12 contract; proposals are due in June 2008 and awards scheduled to be made in November 2008.

In reporting SpaceX's progress, Mr. Hughes described the Hawthorne facility and the launch facility at Cape Canaveral, LC40, noting that SpaceX would be using the concrete deck, the flame ducts, the water deluge, and would be constructing two 28,000 gallon tanks for RP1 storage and usage, a liquid oxygen farm, and nitrogen and helium storage tanks. He reported that the Falcon 9, designed for commercial, COTS mission, and NASA man-rating standards, has a liftoff mass of 325 tons, 10 tons to Low Earth Orbit (LEO), 5 tons to Geostationary Transfer Orbit (GTO), operating at a firm fixed price of \$37 million per launch. He also reported on the hot fire of the Falcon 9 in March. He reported that the Dragon spacecraft, which has a total cargo mass of 2,500 kilograms, will carry cargo, and may be configured for crew.

Mr. Hughes reported that under Capabilities A through C, out of 22, SpaceX has met 10 technical and financial milestones, with one more financial milestone to meet; and that the next milestone, which is a Preliminary Design Review is set for June. He noted additional milestones, including the scheduling of five engine tests fires; the completion of a successful Draco thruster hotfire in March; and passing the NASA ISS Safety Review Panel in record time. He added that they are currently pursuing FAA commercial launch licenses for launch and reentry and third party liability insurance for the COTS flights and they have positive cash flow.

He also provided the proposed schedule for cargo launches:

- June 2009: Dragon Demo C1 – Core Functionality, a 5-hour up and back mission for testing;
- November 2009: Dragon Demo C2 – ISS Flyby, a 5-day mission in which Dragon flies within 10 km of the ISS and establishing a space-to-space communications link; and
- March 2010: Dragon Demo C3 – C3 ISS Briefing, a demonstration of delivery of a simulated cargo to the ISS and return safely to Earth.

Robert Richards, vice president for Orbital Systems, Launch Systems Group, Orbital Sciences Corporation (Orbital), reported on Orbital's COTS activities, noting that Orbital is a leading developer and manufacturer of smaller rockets (space launch vehicles, interceptor rockets, and missile/target vehicles) and satellites. He pointed out that Orbital has developed over 840 satellites and rockets (640 systems, including 497 launch vehicles, from 1982-2007 and 205, including 177 launch vehicles, systems under contract from 2008-2014); 3,500 employees and 1.3 million feet of state-of-the art facilities, including Dulles, Virginia and Chandler, Arizona; and a \$4.3 billion contract backlog; and \$1.08 billion in revenues for 2007. He added that Orbital has a 98% mission success record for the last 10 years.

Mr. Richards reported on the Taurus II, a medium class rocket, built with a 4-meter fairing that can launch Delta II-class payloads from existing facilities. He reported that it is scheduled to launch by 2010 from an East Coast site, i.e., Wallops or Cape Canaveral. Mr. Richards also described the COTS Visiting Vehicle (CVV), made up of a service module, a cargo module (pressurized or unpressurized), which would come up underneath and be grappled by the ISS arm from the U.S. side. To return, he said that the

CVV would do a controlled de-orbit and reenter over the Pacific Ocean. He added that throughout the mission, there would be continuous coordination and communication with NASA Johnson Space Center's Mission Control Center.

COMSTAC chairman Will Trafton asked if Orbital would build a new pad. Mr. Richards responded that Orbital would not start from scratch but would work on the existing facilities. COMSTAC member Dan Collins, United Launch Alliance, commented that, although not a part of the COTS Program, the Delta II launch vehicle is still operational, with contracts as far out as 2011 and beyond.

Human Spaceflight Legislation in Virginia and Florida

James Dunstan, a partner in the law firm of Garvey Schubert Barer, briefed the Committee on the legislative activities that states are carrying out in the growing competition to attract the RLV and human space flight industries. He discussed three types of legislative activities: state tort law (immunity and liability legislation); conducive business and tax environments; and launch infrastructure development

State Tort Law (Immunity and Liability Legislation)

Past air legislation included the establishment of the first air mail service in 1918 with 90% airplane reliability; in 1919 the first regularly-scheduled flight between London and Paris; in 1925, the passage of the Kelly Air Mail Act; in 1929 the adoption of the Warsaw Convention which limited the liability for passenger fatality on international flights to \$10,000; in 1966 the adoption of the Montreal Convention which increased the damage cap to \$75,000; and in 2004, the Commercial Space Launch Act Amendment and in 2006, FAA Human Space Flight Requirements for Crew and Space Flight Participants Final Rule which allows for private human space flight. However, because of the limited reach of federal regulations, Virginia and Florida developed tort laws.

Virginia

On July 1, 2007, the Virginia Space Liability and Immunity Act became effective, adding a New Article in Chapter 3 in Title 8.01 (Civil Remedies and Procedure) with a sunset of July 1, 2013. The Virginia legislation builds on the FAA regulations, provides limited immunity for spaceflight entities, including manufacturers or suppliers of components, services or vehicles, reviewed by the FAA as part of the licensing process; added an informed consent regime; and includes statutory language warning of the danger to spaceflight participants and that they are waiving rights to sue in case of an accident. Virginia doesn't have much legislative history.

Florida

On October 1, 2008, the Florida Informed Consent for Spaceflight Act will become effective. This legislation creates Part III of Chapter 331 of the Florida Statutes, Section 331.501 et seq., has no sunset, uses the Virginia legislation as a model, and only applies to suborbital flights (compared to Virginia which could apply to orbital flights). The Act will provide release from liability for spaceflight entities, is limited to FAA licensees, not permittees, does not apply to suppliers.

Conducive Business and Tax Environment

Virginia

- The Zero G/Zero Tax, signed into law on March 28, 2008, effective in July 2008 for the 2009 tax year;
- Adds subsection 33 and 34 to 58.1-322 of the Virginia Tax Code (corporate tax) and subsections 22 and 23 to 58.1-402 (partnership tax);
- Grants state income tax exemption for incomes resulting from sale of launch vehicles for space flight participants; and any gain recognized for payrolls under COTS; and
- To qualify for the deduction under the subdivision, launch services must be performed in Virginia, or originate from an airport or space port in Virginia.

Florida

- The Florida Qualified Space Flight Contractor Tax Refund Act amends the existing state statute to include space flight contractors to allow them to receive refunds for certain taxes after entering into tax refund agreements;
- To be eligible for a refund, a new space flight business contract or a facility consolidation must result in a net increase in space flight business employment at an applicant's Florida facilities;
- Florida established a \$40 million prize to encourage the invention of a reusable space vehicle to replace the space shuttle. Half the money is to come from the state and half from unidentified private matches, but there are no funds currently appropriated for the prize.

Infrastructure Development

Virginia

- The 21st Century Capital Improvement Program passed on May 3, 2008;
- A public bond package, which includes new funding for the Virginia Commercial Space Flight Authority, to make significant infrastructure upgrades at Mid Atlantic Regional Spaceport at Wallops (\$15 million)

Florida

- Appropriated \$14.5 million for launch infrastructure modifications at the Cape Canaveral Spaceport;
- Appropriated \$4 million for Space Florida operations;
- Appropriated \$500 thousand for a suborbital spaceflight research and training program; and
- Appropriated \$1.25 million for an aerospace workforce training initiative.

Commercial Space Transportation Market Forecasts

2008 COMSTAC GSO Demand Model

COMSTAC member Christopher Kunstadter, (XL Insurance), provided the briefing for the *2008 COMSTAC Commercial Geosynchronous Orbit Launch Demand Model*, (2008-2017). Mr. Kunstadter stood in for Forecast Team Lead, Gwynne Shotwell, (SpaceX). He said that the report has been done annually since 1993, using a consistent methodology to develop a 10-year forecast, and updating the realization factor, the growth in satellite mass and transponders per satellite, the industry development that may affect demand, and the respondents' views on factors affecting demand. To gather data, the Forecast Team sent out approximately 92 letters and received 29 responses, including 6 U.S. and 3 international manufacturers and launch service providers, 20 individual demand inputs from satellite operators, and 18 questionnaires from satellite operators responding to questions on how various factors affected plans to procure satellites.

Mr. Kunstadter described the two-part methodology of the forecast, which includes the near-term forecast, a bottoms-up forecast of launch opportunities by name that covers the years 2008-2010, and a long-term forecast covering 2011-2017, which is an average of the comprehensive domestic forecasts by mass categories, using the international input as a cross check. He said that the working group looked at addressable commercial payloads only, i.e., those that are open for internationally competitive launch service procurement, adding that the 2008 report includes the first Long March launch of Palapa D, defined as addressable in 1997.

Mr. Kunstadter pointed out the higher number of launches in the 90s and the lower, but steady rate from approximately 2000-2007, adding that the historical comparison indicates a significantly higher rate over the next two years. He discussed the satellite launch "realization" factor, which is based on an historical analysis of forecast vs. actual satellite launches for the first and second year of the forecast, noting that the 2007 model fell within the range of the realization factor. He explained that launches are delayed due to factors such as satellite and launch vehicle issues, manifesting and scheduling issues, funding, weather and regulatory delays, and that in 2007, 23 launches were forecasted with 18 actual launches, a 78% realization factor.

For satellite mass, he reported that the findings show stability in satellites to be launched in two highest mass classes; that the number of small satellites is increasing in the near term, then decreasing and stabilizing at about 4,200 kg after a peak in 2005 at 4,500 kg,; and the number of transponders are expected to increase in 2009. Mr. Kunstadter summarized the report findings:

- The Forecast shows a slight increase in the number of satellites and launches;
- The Realization Factor works;
- The outlook for satellite operators is more positive;
- The average satellite demand for the period 2008-2017 is 21.8 per year; (an increase by 1 from the 2007 Forecast);

- The average launch demand is 16.2 per year (an increase by 1 from the 2007 Forecast);
- 2008 satellite demand of 27, between 17 and 22 for the realization factor;
- Growth in demand in the coming years will be due to DARS and MSS growth, hosted payloads and new commercial competitors such as SpaceX; and
- Economic conditions and recent launch failures may impact 2008-2009 results.

COMSTAC member Frank Culbertson (SAIC) pointed out that year two of the Forecast is always positive and Mr. Kunstadter explained that this is the case because the satellite operators know what happening by the second year. COMSTAC member Livingston Holder (Holder Consulting Group) asked whether the reports (GSO and non-GSO) would be briefed to the interagency community and he was advised that they would be. COMSTAC member Dan Collins asked about the data concerning the impact of launch vehicle availability on the industry. Mr. Kunstadter noted that launch failures and other factors, decrease launch vehicle availability, which, in turn, holds back the deployment of new satellites. Mr. Collins noted that since Sea Launch is launching again, there is improvement.

Chairman Trafton called for a motion to vote on adoption of the 2008 GSO Forecast, the motion was made, the vote taken and the report adopted by the full Committee.

2008 Non-GSO Forecast

John Sloan, senior policy analyst in AST's Space Systems Development Division, provided the briefing on FAA's *2008 Commercial Space Transportation Forecast for Non-Geosynchronous Orbits*. Mr. Sloan stated that the NGSO forecast uses payloads that are open to internationally competed launch services procurement and commercially competed launch services for the ISS, payloads that generate launch demand, and no secondary payloads. He reported a total of 12 launches for 2007 and for new information in the Forecast, he listed:

- Iridium with 72 satellites (66 and 6 spares);
- Orbital Facility Assembly and Services (OFAS), a new category to capture commercial supply flights to the ISS; the mass estimates for OFAS are based on the SpaceX Dragon and Orbital's Cygnus;
- COTS Demonstration Flights; and
- Bigelow Aerospace as a placeholder.

Satellite Forecast: 276 satellites for 2008-2017, (45% higher than the 2007). This includes international scientific and other satellites (28%); telecommunications satellites (53%), OFAS (10%); and commercial remote sensing satellites (9%).

Launch Forecast: 112 total launches for 2008-2017 (38% increase compared to last year, i.e., 81 launches in 2007). This is an average of 3 launches per year with all new launch in the medium-heavy launch vehicle class (8.1 per year) and 3 for small launch vehicles (showing no growth from 2007). Small launch vehicle developers don't see growth in their mass class.

By sector, telecommunications (148 satellites) is half of the market at 24 launches, which is only 21.5% of launch demand because of dual manifesting; 44 scientific/other satellite launches (this sector is down from 52 in 2007 because COTS was transferred to the new OFAS sector); OFAS has 28 launches; and 16 remote sensing satellites launches.

Satellite mass trends: 47 satellites in the 600-1,200 kilogram category (44%); no mass for Iridium which could launch 6 at a time (1st generation was 640 kg); ORBCOMM Generation 2 has a 130-150 kg estimated mass and could launch 6 satellites at a time.

For the near-term launches that have contracted activity or planned launches, Mr. Sloan noted 24 total payloads, 11 total launches and 8-10 launches for the realization factor. He also pointed out that most of the launches are Russian, Ukrainian, or U.S. provided with one Indian launch planned for 2010.

Mr. Sloan discussed the following trends:

- Russia still leads with about 63% capture of the near-term NGSO launch services market (2008-2011).
- Environmental first stage debris concerns cited by Uzbekistan have delayed Russian Dnepr launch of Thailand's THEOS remote sensing satellite.
 - Dnepr could relocate back to Baikonur from Yasny (i.e., Domborovsky, a former ballistic missile site).
- Only one delayed launch from 2007 did not carry over into 2008.
 - South Africa's SumbandillaSat was on a Russian sea-launched ballistic missile, the Shtil.
- South Korea plans first launch of KSLV small vehicle by end of 2008.
- European Satellite Radio added to forecast for the first time.
 - European Satellite Radio has been developing slowly, Ondas Media, based in Madrid has been signing more contracts than other companies.
- Impact of the XM and Sirius satellite radio merger is unclear right now so previous Sirius NGSO plans are still factored into the Forecast.
- Currently, there are no new telecommunications systems planning to compete against ORBCOMM, Iridium and Globalstar.

COMSTAC member Dan Collins (United Launch Alliance) inquired whether Picosats would be included in future forecasts. Mr. Sloan responded that if Picosats are included with another payload, they are not creating demand.

FAA Safety Approvals

Sherman Council, program lead for the FAA Safety Approval Program in AST, provided an overview of the Safety Approval process. He noted that the 1998 Amendments to the Commercial Space Launch Act added the authority for establishing procedures to issue safety approvals for use in conducting licensed commercial space launch or reentry activities, which was augmented by CFR Part 414, Safety Approval Final Rule, effective September 14, 2006. This rule states that safety approvals can be issued for "..... launch

vehicle, reentry vehicle, safety system, process, service or any identified component thereof ; qualified and trained personnel performing a process or function related to licensed launch activities....” (i.e., crew, not necessarily passengers). Mr. Council emphasized that safety approvals are voluntary, not required by the FAA, but they allow an operator to use an approved item without reexamination during the license or permit application process and may be issued separated from the license or permitting process.

Mr. Council explained that a safety approval indicates that the FAA considers the use of the approved item to be consistent with FAA launch and reentry licensing or permitting; that Safety Approval usage must be consistent with launch or reentry safety and fall within the operating limits of the approval; and that a safety-approved item may be offered to a prospective launch or reentry licensee or permittee. He emphasized, however; that safety approvals are not:

- FAA certifications;
- An indication of mission success or failure;
- A finding of suitability for purposes outside the stated limitations of the safety approval;
- An authorization to conduct a launch or reentry, or to operate a launch or reentry site; or
- A guarantee that a safety-approved element of a launch or reentry proposal will function in accordance with supplier specifications.

He noted that launch vehicle/component manufacturers, safety system and safety process designers/developers, and personnel that perform safety critical functions for licensed or permitted launch and reentry are eligible for a safety approval. He added that launch or reentry vehicle and personnel who perform safety functions and certain safety systems, services and processes integral to launch or reentry operations are examples of the types of things eligible for a safety approval; however, FAA’s determination of eligibility is based upon acceptance of identified standards and safety approvals will not be issued for items that do not perform a safety function in the conduct of a licensed or permitted launch or reentry. To establish standards, he added, the FAA will rely on FAA or other Federal regulations, government-developed or adopted standards, industry consensus standards, and applicant proposed safety standards which must be made publicly available.

Mr. Council described other criteria for obtaining a safety approval including:

- Performance and Verification Requirements, i.e., the applicant must demonstrate satisfaction of a standard and also conduct verification and submit results;
- Scope of the Safety Approval (limited by the scope of the demonstration contained in the application); and
- Terms and Conditions which will be determined by the FAA on a case-by-case basis.

Mr. Council noted that safety approvals are valid for 5 years, can be transferred, renewed and/or modified and that the holder of a safety approval must maintain all records and may request confidentiality for these records. He concluded by noting that the

development of a safety approval application is facilitated through early and frequent consultation between the applicant and the FAA to assure public safety issues are identified and adequately addressed.

COMSTAC member Tim Hughes asked whether AST had issued any safety approval yet, whether there is any benefit to obtaining a safety approval, what is the motivation for obtaining a component that has been approved by this process if there is one available that's cheaper and just as good. Mr. Council advised him that AST has not yet issued a safety approval but is currently reviewing applications. He also responded that a component that has been approved by the FAA through this process would be more readily accepted by a launch operator, and a component that hasn't been approved, might still be evaluated under a license or permit application, but having the safety approved component would probably save time and money. Dr. Nield noted that with the Safety Approval Program, AST hoped to have more contact with subsystem developers and suppliers and provide a service similar to the Underwriter Laboratory seal of approval.

COMSTAC member Collins (United Launch Alliance) commented that the program may be a paradox since for entrepreneurs, the hardware changes faster than the approvals. COMSTAC member Livingston Holder (Holder Consulting Group) commented that he thought that component manufacturers could benefit from the program. COMSTAC member Chris Kunstadter (XL Insurance) commented that the insurance industry will need to know more about the program and make sure that there is independent verification of the program. Dr. Billie Reed, (Mid Atlantic Regional Spaceport) inquired whether safety approvals would eventually be similar to certification. Dr. Nield explained that the process could provide a package which would be a record of the types of standards, validation and verification testing, and data, which would be streamlined and could be used from program to program, launch to launch and vehicle to vehicles.

COMSTAC member Debra Lepore (Air Launch LLC) asked whether government programs such as NASA's docking system, could go through the Safety Approval process. Mr. Council replied that FAA would review these types of systems to see if they could apply. COMSTAC member Janet Sadler (AIG UK) asked about the criteria for determining when a component has a safety function. Mr. Council explained that such determination is part of the licensing and permitting process. COMSTAC member Bob Dickman asked if the engine has a safety function and Dr. Nield responded that it does.

The Next Generation Air Transportation System

Kelvin Coleman, aerospace engineer and program lead for the Space and Air Traffic Management System Initiative (SATMS) provided a briefing on the Next Generation Air Transportation System, noting that AST developed the SATMS Initiative almost 10 years ago to accomplish the goal of ensuring seamless integration of commercial space transportation into the National Air Space System (NAS). He explained that AST works with FAA's Air Traffic Organization (ATO), the Department of Defense and NASA for the SATMS Initiative and also for long-range planning pertaining to the modernization of the NAS. He added that this long-range planning is an interdepartmental effort to

develop a new entity to manage air traffic in the U.S. called the Next Generation Air Transportation System of NextGen.

Mr. Coleman reported that NextGen was established in 2003 by the Vision 100 Act, by Congress and entailed the establishment of a Joint Planning and Development Office (JPDO), which has overarching coordination responsibility for NextGen. He stated that the JPDO consists of the Departments of Transportation, Defense, Homeland Security, and Commerce, FAA, NASA and the White House Office of Science and Technology Policy, noting that the JPDO mission is to transform the Air Transportation System, to improve safety, (post-9/11 environment), environmental impact, and increase capacity in the system by two to three-fold by 2025. He described the JPDO organizational structure, pointing out that AST works primarily through the Enterprise Architecture and Engineering Division and that the Secretary of Transportation, the Deputy Secretaries of Homeland Security and Commerce, the FAA Administrator and the NASA Administrator make up the Senior Policy Committee for the purpose of governance.

Mr. Coleman listed the challenges facing NextGen, including inadequate performance due to delays which are up 20% since 2006, increasing demand, and en route saturation by 2015; limited system which cannot be expanded by adding more sectors or controllers. He emphasized the NextGen transformational approach to these challenges which entails establishing foundational programs to address midterm challenges, including research and development requirements, noting that the cost of not moving to NextGen would be in excess of \$40 billion by year 2020, and more than \$100 billion by 2030.

He compared the current NAS system with NextGen, noting that today's system uses ground-based technology, is dependent on human interface and decisions made on the ground, has limited use of automation, single-channel voice control and has aging infrastructure, while the future NextGen will use satellite navigation, digital non-voice communication and advanced networking, collaborative operations with decisions made in the cockpit, and flight crews will have increased control over their trajectories. He discussed costs associated with NextGen, including \$4.6 billion for the first five years for the ATO capital appropriation and research, engineering, and development and over 10 years, \$8-10 billion and through 2025, \$15-22 billion.

Mr. Coleman also described the implementation approaches set up by each department, including: the Operation Evolution Partnership (FAA); the NextGen Program Office (DOD); the Interagency Weather Team (Commerce/NOAA); and the Aeronautics Research Plan (NASA). He discussed the Operational Evolution Partnership, designed to manage an evolutionary process for operational improvements, eliminate redundancy of effort, ensure that the efforts done in parallel are complementary; tracks investments; provide a time line for implementation; and ensure FAA's commitment. Mr. Coleman encouraged the meeting attendees to read the NextGen Concept of Operations (Conops), which provides the vision of the Next Generation Air Transportation System. He also noted that FAA has been working with NASA Kennedy Space Center and Air Force Space Command to develop an Annex to the Conops which focuses on the future of commercial space transportation operations and civil and military operations in the NAS. Mr. Coleman also mentioned the

NextGen Institute, the mechanism for industry involvement with the JPDO and encouraged meeting attendees to become involved.

COMSTAC member Lou Gomez (Spaceport America) asked whether there was representation from White Sands Missile Range on the NextGen working groups and Mr. Coleman advised that he was not aware of involvement from White Sands. COMSTAC member Debra Lepore asked if there was information on the types of investments and when they would be made and how could industry learn more about the types of research and development needed. Mr. Coleman responded that the FAA's Operational Evolution Partnership lays out the roadmap for investments and the Conops Annex includes information about R & D.

COMSTAC Working Group Reports

Technology and Innovation Working Group (TIWG)

Dr. Alex Liang, general manager, Vehicle Systems Division, The Aerospace Corporation, thanked the companies that have allowed their employees to give their time and effort in the development of the 2008 GSO Forecast and asked for volunteers to head the 2009 report.

Risk Management Working Group (RMWG)

Chris Kunstadter, vice president, XL Insurance, provided a report on the RMWG meeting on the previous day, listing six topics discussed by the working group. He listed the requirements and availability of insurance; FAA safety regulations as they apply to commercial human space flight issues; loss calculation methodologies; inter-party waivers of liability; the definition of third-parties; and training, informed consent, and ITAR, adding that all six topics fall in the context of on-orbit liability issues, different from launch and reentry. He noted that representatives from Bigelow Aerospace were present at the meeting. He reported that the RMWG also discussed the impending expiration of the indemnification regime in 2009, urging FAA and DOT to express the group's support to continuing the regime to Congress. COMSTAC member John Vinter (former COMSTAC chair) commented that not only the RMWG, but the full Committee has supported the indemnification regime continuously over many years.

Reusable Launch Vehicle Working Group (RLVWG)

George Whitesides, executive director, National Space Society and newly-selected chairman of the RLVWG, began by acknowledging the work of Michael Kelly, former RLVWG Chairman. Mr. Whitesides noted the completion of several actions and provided summaries of the topics discussed at the RLVWG meeting. He reported that the group heard a briefing on the development of human space flight safety performance targets by Ken Wong, manager of AST's Licensing and Safety Division, noting that the RLVWG submitted comments regarding this issue and would continue providing assistance to AST on this issue. He reported on the other briefings at the meeting, including the status of the Human Space Flight Study required by Congress; an overview on FAA's Experimental Permits Program by Michelle Murray, AST's Experimental Permit program lead; and the Task Force on Human Space Flight Training.

Mr. Whitesides noted the following action items for the RLVWG: continued assistance on the human space flight safety performance target and providing input for the Human Space Flight Study.

Launch Operations and Support Working Group

Robert Davis, Director of Business and Strategy Development, Air Combat Systems, Northrup Grumman Corporation, reported on the Launch Operations and Support Working Group (LOSWG) meeting. He noted that based on the need to broaden the scope of the working group, that the working group will now be called the Space Transportation Operations Working Group. He reported on the topics discussed at the working group meeting, including orbital debris and the consequences for reusable systems in the future. Mr. Davis reported that the working group also discussed quantity-distance determinations (Q-D) and a recommendation for the LOSWG to develop a problem statement on the issue of Q-D calculations in the context of reusable systems operations, taking into account the operating area, the buffer zone and the day-to-day reusable system passenger/participant operations.

Mr. Davis also reported on other recommendations developed at the LOSWG meeting, including a recommendation to review and update a system engineering study of emerging reusable and spaceport operations; and a recommendation to work with Kelvin Coleman on airspace policy and regulatory issues for reusable operations. He reported that the group also discussed the possible divergence of DoD and FAA licensing requirements and regulations and the need to interface with the Common Standards Working Group regarding this matter; and the possibility of having the LOSWG address the issue of space-based range technology.

New Business and Wrap Up

Chairman Trafton thanked the speakers, working group chairs, and acknowledged the work done by Maurice Kennedy on the Human Space Flight Training Standards Task Force. COMSTAC member Debra Lepore invited all to attend the 6th Annual Rocket Contest hosted by the Aerospace Industries Association in Virginia. Chairman Trafton also acknowledged the support and leadership of Brenda Parker, COMSTAC Executive Director. Since there was no new business, Chairman Trafton adjourned the meeting at 1:14 p.m.

Signed by
Wilbur C. Trafton
Chairman, COMSTAC



COMSTAC Members Present

Wilbur C. Trafton, Will Trafton & Associates, COMSTAC Chair
Eleanor Aldrich, American Institute of Aeronautics and Astronautics
Randall Claque, XCOR Aerospace (Alternate for Jeffrey Greason)
Daniel J. Collins, United Launch Alliance
Frank Culbertson, Science Applications International Corporation
Elaine David, Lockheed Martin Corporation (Alternate for Gerald Musarra)
Robert M. Davis, Northrop Grumman
Robert S. Dickman, American Institute of Aeronautics and Astronautics
Louis R. Gomez, Spaceport America New Mexico
Livingston Holder, Holder Consulting Group
Timothy Hughes, Space Exploration Technologies Corporation
Michael S. Kelly, AMPAC Technology Group, LLC
David Keslow, Orbital Sciences Corporation
Christopher Kunstadter, XL Insurance
Debra Facktor Lepore, Air Launch LLC
Dr. Alexander Liang, The Aerospace Corporation
Dr. Billie M. Reed, Virginia Commercial Space Flight Authority
Janet Sadler, AIG UK Limited
John W. Vinter, International Space Brokers, Inc.
George T. Whitesides, National Space Society

Department of Transportation/Federal Aviation Administration Representatives Present

The Honorable Thomas J. Barrett, U.S. Deputy Secretary of Transportation
The Honorable Robert Sturgell, Acting Administrator, Federal Aviation Administration
Dr. George C. Nield, FAA Associate Administrator for Commercial Space
Transportation
Brenda A. Parker, COMSTAC Executive Director, Federal Aviation Administration