Commercial Space Transportation Advisory Committee
May 21, 2003
MEETING MINUTES

COMSTAC Chair, Livingston L. Holder, Jr., vice president, Space Systems, Andrews Space and Technology, convened the meeting at 8:38 a.m., and welcomed COMSTAC members and guests. Mr. Holder briefly discussed the state of the U.S. commercial space transportation industry, noting that the industry is struggling. He pointed out that NASA and the Air Force are working together to develop a new course for space transportation that would result in implications for the commercial space transportation industry, and he challenged meeting attendees to continue to work with FAA's Associate Administrator for Commercial Space Transportation (AST) and other government agencies to help ensure that commercial considerations are taken into account for new systems development. He also noted that "...we need to provide a reason for our young people to engage in [the commercial space transportation] field....We need projects to rebuild the enthusiasm that may have captured many of you in this room."

Report on AST Activities

Dr. George C. Nield, deputy associate administrator for Commercial Space Transportation reported on AST activities since the October 2002 COMSTAC meeting. He reported that AST had decided to issue a second Supplemental Notice of Proposed Rulemaking (NPRM) in order to address additional concerns by industry, to better articulate current practices, and address specific comments to the original NPRM. He also reported that activity had increased in the area of reusable launch vehicle (RLV) development, especially due to the X-Prize and its approaching contest deadline. He noted that AST was conducting a day-long workshop on Thursday, May 22nd to provide in-depth information on RLV application submittal procedures and requirements.

FAA Commercial Space Transportation Safety Office

AST staff member Al Wassel reported on the new Commercial Space Transportation Safety Office, located at Patrick Air Force Base (AFB) in Florida and established on November 4, 2002 as a result of the study on the Future Uses of U.S. Launch Bases and Ranges. Mr. Wassel is the Program Manager for the new office. He discussed the responsibilities of the Office, including support of the mission partnership between the FAA and the Air Force; coordination and participation in inspections and evaluations of flight hardware; resolution of requests for relief from common safety requirements; participation in the Common Standards Working Group; the facilitation of better understanding of issues that arise between the FAA and the range and launch operators; and coordination of the Air Force position in the AST Washington office.

Mr. Wassel noted that the office is the on-site point for launch operators responsible for facilitating FAA's roles and responsibilities on the day of launch and is located in the Range Operations Control Center next to the Range safety technical adviser. He said that since the office has been established, he has worked with the range safety officers to develop a temporary flight restricted area (TFR) that was previously only used by the Space Shuttle.

GPS Update

The Honorable Jeffrey N. Shane, under secretary for policy in the U.S. Department of Transportation (DOT), provided an update on the Global Positioning Satellite System (GPS) and some of the actions that DOT is undertaking for future transportation systems. Mr. Shane noted that an initiative would soon be in place to create a different architecture for air space management over the period of 2020 and beyond, which would be satellite-based, with GPS as an essential component. He added that DOT is committed to ensuring the improvement of GPS capability through a two-fold process of augmentation and modernization. He described augmentation as a means of extracting greater accuracy and functionality from the current system and modernization as the need for a better class of satellites. He explained that the current GPS uses the L1 civil signal and modernization would entail the development of a second signal, L2 or L2C by 2004 and an L5 signal by 2006, adding that ultimately a new generation system, GPS III, would be developed by 2012.

Mr. Shane reported that DOT works with the Department of Defense and the Air Force through the Interagency GPS Executive Board (IGEB), which was started in 1997 to ensure that civil users requirements were taken under consideration along with those of the military. He discussed the European's plan to develop their own system, called Galileo and the need for interoperability between GPS and the proposed Galileo system. He also discussed the current vulnerability of the GPS system, noting signal weakness and jammability.

COMSTAC member Alex Liang inquired about the extent to which DOT participates in financing a new system. Mr. Shane replied that more representation by the civil agencies is needed at the decision-making councils and more sharing of responsibilities by all agencies especially DOD and DOT to better facilitate financing. Dr. Liang also asked how the removal of selective availability has affected the wide area augmentation system (WAAS). Mike Shaw, a member of Mr. Shane's staff, replied that the WAAS has improved GPS service for the user through enhanced accuracy and through greater integrity and availability.

COMSTAC alternate Gerald Mussara inquired whether pending legislation adequately addresses the issues for civil agencies and whether COMSTAC could play a role in helping to articulate civil concerns. Mr. Shane described the process for DOT input into decisions regarding spectrum allocation and noted that the process needs to be modified for better consideration of DOT's position.

The X-Prize Foundation and the Zero Gravity Corporation

Dr. Peter Diamandis, chairman, X-Prize Foundation, calling it the "NASCAR of space," summarized the X Prize as an international competition that will award a $10 million cash prize to the first team to privately finance, build, and launch a ship that can carry three people to 62 miles (100 km), and that can complete two flights within two weeks (reusable). He noted that the X Prize has resulted in a new type of financing for space launch vehicles and has generated innovation. He also reported on other initiatives under

the X Prize, including the EGGS Prize educational initiative, in which 5th, 6th, and 7th grade students build a water-powered rocket which can launch a raw egg to 100 feet within two hours, and the recreation of the historic flight of Charles Lindbergh by his grandson, Eric Lindbergh in May 2002.

Dr. Diamandis reported that there are 24 teams from seven countries, including Burt Rutan (Scaled Composites, Inc.) with the SpaceShipOne; the DaVinci Project, Canada; the Arrow team, Canada; Advent Launch Systems, Houston; Pablo DeLeon and Associates, Argentina; the Suborbital Corporation, Russia; Starchaser Industries, Great Britain; Bob Truax (American Astronautics), San Diego; and Armadillo Aerospace, Dallas.

Dr. Diamandis discussed the X Prize Cup, an annual contest that would consist of approximately 50 to 100 launches over a two-week period with five categories of competition: 1) turn around time for launching; 2) maximum passengers, i.e., the most number of passengers per vehicle; 3) total passengers, i.e., the most that can be carried over a two-week period; 4) maximum altitude; and 5) fastest flight time. He emphasized that the X Prize Cup could be a way to create an exciting, high-revenue, annual event; bring global recognition and economic impact to spaceports; motivate X PRIZE teams to continue to build and improve their spaceships; bring the sponsorship revenue model to the space industry; and create tremendous public interest and participation.

Dr. Diamandis also discussed a proposal for certifying suborbital launches carrying passengers through the "Accredited Passenger Program" and the Zero Gravity Corporation, a company that offers parabolic flights, noting that Zero Gravity has identified five robust markets for its services: entertainment and film production, individual adventure travel, corporate incentive, research and education, and government.

COMSTAC member Lou Gomez asked about the dates for release of Requests for Proposals for spaceports as a venue for the X Prize Cup and whether the Foundation was interested in inland sites. Dr. Diamandis replied that the Foundation was in the process of starting pre-briefing meetings with spaceports and that selections would be based on what spaceports are willing to offer. COMSTAC alternate Jayne Schnaars asked whether there has been any impact on venture capital opportunity for commercial space transportation after the Columbia tragedy. Dr. Diamandis commented that hopefully the X Prize would have a positive effect on financing and investments. COMSTAC member Mike Kelly expressed thanks to Dr. Diamandis and the X Prize Foundation for providing the incentive for space entrepreneurs. Dr. Diamandis ended his presentation by stating that Americans must be willing to take risks in the space world because taking risks leads to breakthroughs.

Aerospace States Association

Tim Huddleston, Director of the Aerospace Development Center for the Aerospace States Association (ASA) reported on a proposed National Space Commerce Model that begins with a concept of standardization for spaceports, flight regulation, payloads and launch vehicles. He noted that this type of standardization requires a wiser spending of public

investments, e.g., for propulsion systems, as well as a massive amount of private investments. He next outlined the need for smarter markets, i.e., markets that appeal to more citizens and ways to enable markets through applications like science and exploration. He explained that once markets are enabled, then massive private and public return on investments is created, more money flows through the economy, more citizens' benefit, and, in turn, more public and private investments are created. He added that seed money investments make this process work. Mr. Huddleston requested input and feedback on this model.

GSO Forecast Report

Ethan Haase, Senior Analyst, Strategic Planning, International Launch Services, presented the ***2003 COMSTAC Commercial Geosynchronous Orbit Launch Demand Model***. He reported that the forecast covers the years 2003 to 2012 and that the average annual demand is down approximately 15 % from the previous year in terms of satellites (23.3 satellites per year vs. 27.3 for last year), adding that the 2003 report provides new insights into industry trends, including an estimate of a "realization" of demand which has been expanded to include a projection of the number of satellites launched over the first three years of the forecast period instead of the first year; an analysis of the growth in satellite mass and transponders per satellite; and respondents' views on the factors affecting demand.

Mr. Haase reported that 27 responses were received from spacecraft manufacturers, launch service providers, and satellite service providers, both international (including Arianespace and Astrium) and domestic (Lockheed Martin, Boeing, Orbital Sciences Corporation, and Space Systems Loral). He said that the working group looked at addressable commercial payloads only, i.e., those that are internationally competed and open to U.S. launch providers. He explained the two-part methodology of the forecast, noting that the near-term forecast that covers the first three years (2003-2005), is a bottoms up forecast based on manifests of launch service providers; and a long-term forecast covering the last years of the period (2006-2012) which is actually the average of the comprehensive domestic forecasts by mass categories.

Mr. Haase summarized the reports findings:

- The average satellite demand for the period 2003-2012 in 23.3 per year (down 15% from last year);
- Near-term demand is 22 satellites in 2003 (expected realization is 13-19); 18 satellites in 2004 (expected realization is 12-18); and 18 satellites in 2005 (expected realization is 10-18);

- Growth in the number of satellites over 4200 kg will continue but the projection of these satellites has decreased from the 2002 report;

- Growth in the number of transponders per satellite continues and the average number of transponders per satellite for 2002 through 2004 is 49, compared to 31 prior to 2000; and

- Factors affecting demand include global and regional economic conditions, demand for satellite services, availability of financing, and shifting operator requirements.

Non-Geosynchronous Orbits (NGSO) Forecast Report

John Sloan, senior policy analyst in AST's Space Systems Development Division, provided the briefing on FAA's *2003 Commercial Space Transportation Forecast for Non-Geosynchronous Orbits*. Mr. Sloan noted that the NGSO forecast uses payloads that are open to internationally competed launch services procurement and other commercially sponsored payloads but that for 2003 there are no secondary or dummy payloads used in the forecast and no robust market scenario. He reported the following projections:

Baseline Payload Forecast: 80 payloads for 2003-2012 (19% lower than the 2002 forecast). This includes 35 international science and other satellites (75%); 16 commercial remote sensing satellites (25%), and no telecommunications satellites (0%).

Baseline Launch Forecast: 51 total launches for 2003-2012 (19% lower than 63 launches projected in 2002 forecast). This is an average of 5.1 launches per year including 2 medium-heavy vehicles and 3 small launch vehicles. By sector, this includes 35 science payloads; and 16 remote sensing satellites.

Mr. Sloan pointed out several trends:

- The market has shifted away from telecommunications to international science;
- There are more multiple manifest small launches (e.g., using the Russian Dnepr and Cosmo launch vehicles);
- The emergence of the broadband market is still uncertain (ground fiber has overcapacity and low terrestrial prices;
- Digital audio radio (DARS) is gaining customers in the U.S. but is having a slow start in Europe;
- The first commercially-launches interplanetary missions are scheduled in 2003 (the Cosmos 1 solar sail for the Planetary Society and the Mars Express/Beagle 2 for the European Space Agency;
- The financial conditions for new ventures have not improved compared to the last two years.

He also listed several factors affecting launch demand, including:

- Strength of the U.S. and international economy
- Investor confidence after NGSO bankruptcies

- Need for replacement satellites
- Business case changes
- Corporate mergers
- Regulatory and political changes (i.e., the FCC's new license process guidelines in April 2003 and faster turnaround -- 270 days for NGSO applicants)
- Terrestrial competition
- Government missions open to launch services competition
- Example of clear broadband success via satellite
- Low cost launch vehicle for new markets (i.e., public space travel)

The Boeing Company

Jayne Schnaars, vice president, Boeing Launch Services, provided an overview on the Delta family of launch vehicles and the status of upcoming commercial, civil and military launches for Boeing, beginning with the Delta II, which is still performing as the workhorse for Boeing with a 98.1% success rate (104 successful launches out of 106). She reported on the two successful Delta IV launches, noting that the Delta IV has East and West Coasts capability, and that the Delta IV Decatur Rocket Facility is designed to produce 40 common core boosters per year. She pointed out that Sea Launch is currently Boeing's primary offering for commercial ventures. Ms. Schnaars also discussed the current market, noting the loss of the LEO constellations, its affect on the U.S. market and the overcapacity of launches.

Air Force/NASA Joint Efforts

General Simon "Pete" Worden, director, Development and Transformation, Air Force Space and Missile Systems Center, reported on the activities of the Air Force and NASA. He reported that access to space is back on the national agenda due to the space-based capabilities used in the war on Iraq; the Columbia disaster; international competition (China and India's announcement about going to the Moon); the establishment of the new U.S. Strategic Command under Admiral Ellis; and the reorganization of the Department of Defense (DOD) as a result of the Rumsfeld Commission. General Worden discussed the new strategic initiatives in DOD, headed by Peter Teets, who is the focal point for all acquisition across all of the services and the intelligence community and the growing interest in space as a global deterrent.

General Worden discussed the joint activities with NASA to develop a new set of options for small launch vehicles, an initiative that has been given over $500 million for at least two years. He reported that the Air Force and NASA are examining the common aerovehicle, a hypersonic glider with a Mach 10 to 15 capability, and the development of

new microsats in the 100 kilogram class capable of communications, surveillance, situational awareness, and fast response.

COMSTAC member Mike Kelly asked if the Chinese Moon announcement would generate a 50's-like response by the U.S., General Worden responded that it would not be like the 50's when a single event was enough but that a combination of things would create a pronounced U.S. response. Chairman Holder inquired about DOD programs to generate interest and enthusiasm in the space field. General Worden expressed an opinion that both DOD and NASA should focus on programs for Mars, asteroids and other deep space initiatives to generate excitement and interest in students.

Legislative Strategies for Space

Janice Dunn, general counsel and director of Federal Government Relations for the California Space Authority, provided information on legislative strategies for Space. She discussed:

- the Satellite Trade Security Act, a bill to put export licensing back in the Department of Commerce, introduced by Dana Rohrabacher, Chairman, Subcommittee on Space and Aeronautics and Howard Berman, both from California; the Spaceport Equality Act;

- the Spaceport Equality Act, a federal tax exemption for bonds that would be used for building spaceports;

- the Invest in Space Now, a bill that provides tax incentives for launch companies or individuals to build launch vehicles, introduced by Ken Calvert, a California representative;

- the Space Tourism Promotion Act;

- the Zero Gravity, Zero Tax Bill;

- the Aeronautics Research and Development Bill, which provides funding to FAA and NASA for the development of new aircraft and could apply to vehicles such as Burt Rutan's SpaceShipOne;

- the Rocket Propellants Bill, introduced in the Senate for hobby rockets;

- the Nanotechnology Bill, providing funding to NASA and the National Science Foundation;

- the NASA Flexibility Act, which would provide scholarships to graduate students; and

- the Department of State Authorization Act, which would allow the Administration instead of Congress, to make determinations as to which technologies should be on and off the U.S. Munitions List.

Ms. Dunn also discussed indemnification for commercial launch operations and COMSTAC's recommendation to Congress to delete the sunset provision or extend indemnification for another 10 years.

Lockheed Martin Corporation

Eric Thoemmes, vice president, Space and Strategic Missiles for Lockheed Martin, provided a briefing entitled "Spiral Development of Responsive Launch." He described spiral development as a low-risk approach using controlled, incremental steps, which has resulted in the Atlas V evolved expendable launch vehicle (EELV). He noted that there have been 65 consecutive successful Atlas Centaur flights; 100% mission success for Atlas II, IIA, IIAS, III and V families; seven out of seven first flight successes; and 474 total launch successes since the beginning of the Atlas program and pointed out that Atlas V provides the capability for heavy and super heavy lift. He also discussed the responsive launch capability and flexibility of the Atlas V due to the clean pad approach and the state-of-the-art operations center, which is geared toward commercial customers and allows international customers access to their data through an electronic card process.

Mr. Thoemmes noted that the Atlas V has met or exceeded all of the requirements set by the Air Force for EELVs, including covering the full range of performance, reduction of cost by 50%, reduction of infrastructure (from 36 facilities to 3) and personnel (from 1200 site personnel to 200), improved reliability (elimination of 5200 parts and 300 suppliers); and responsiveness (5% reduction in integration timelines). He discussed the potential for the Atlas V to be the basis for the next-generation launch technology such as the orbital space plane, the intelligent vehicle help monitoring management system, or new propulsion technologies.

COMSTAC member Alex Liang asked about Lockheed Martin's decision not to have West Coast capability and whether there would be such capability in the future. Mr. Thoemmes replied that it was a business decision made with the Air Force since there was limited market for heavy lift at the time (about five years ago). He noted, however, that the market seems more favorable for heavy lift now and Lockheed Martin is interested in going back to the West Coast in the future.

WORKING GROUP REPORTS

Risk Management Working Group (RMWG)

John Vinter, president and CEO of International Space Brokers, Inc. and chair of the RMWG, reported on the status of the insurance industry, noting several important factors, including the emergence of heavier, less mature launchers; bigger satellites with emerging generic problems on orbit; more privatization (e.g., Intelsat); more consolidation, mergers, and acquisitions (e.g., GE Americom and SES in Luxembourg); economic slowdown for space and telecommunications, exacerbated by September 11th; financial markets that are cooled toward commercial space; worldwide economic

slowdown; insurance rates which rose sharply between 1999 and 2003, reduced coverage periods and tighter terms; and insurance sectors that are under pressure due to poor underwriting results, tougher stance by capital providers, and reinsurance restrictions.

Mr. Vinter reported that the space industry is faced with a low number of anticipated new satellite orders; excess satellite manufacturing and launch services capacity compared with current demand; new launchers commencing operation (i.e., Atlas V, Delta IV, Ariane 5 ECA and a heavy lift Sea Launch); reliable launchers retiring (Ariane 4 and the Atlas IIAS); the space insurance market is under pressure and less responsive to buyers' needs; and ITAR issues that make communication of technical information difficult. He also reported that the largest share of the insurance market is Europe (the U.S. has about 15%). He noted that for launch risks (launch plus 1 year), $200 million is achievable, $300 million is a challenge and above that is problematic, and for in-orbit risks, $150 million is achievable, $200 million is a challenge and above that is problematic. He concluded that there are several claims that are outstanding for approximately over $1 billion and that when those claims are settled, the insurance market will have a possibility of moving forward.

He also presented a report on third party liability by COMSTAC member Janice Sadler, senior vice president, Redholm Underwriting Agents, London. Ms. Sadler was unable to attend the May meeting. Her report indicated that there were no significant changes to the insuring market; all required limits of liability are still available although the higher levels required for in orbit activities may experience some pressure; the Columbia disaster has not been an issue; and basically it is business as usual.

Technology and Innovation Working Group (TIWG)

Dr. Alex Liang, general manager for Vehicle Systems Division, The Aerospace Corporation, acknowledged the work of the 2003 GSO Market Forecast and noted that a new chairperson is needed for the 2004 forecast. He also pointed out the need for the entire space community to continue to work to increase students' interest in space.

Reusable Launch Vehicle Working Group (RLVWG)

Mike Kelly, founder of Kelly Space & Technology, reported on the issues discussed by the RLVWG on Tuesday, May 20th, including a briefing on AST's draft Guidelines for Operation and Maintenance for RLVs; a draft report on "top down" analysis of RLV operations and maintenance; and a report on AST's considerations on the regulation of human spaceflight. Mr. Kelly discussed the need for a detailed study of the debris effects of the Columbia accident, including the update of an analysis of the expectation of casualties for aircraft accidents and missile attacks. Mr. Kelly also reported on future tasks for the RLVWG including providing feedback on the AST Guidelines for Operation and Maintenance of RLVs, and a meeting or telecon in July.

Launch Operations and Support Working Group (LOSWG)

The LOSWG report was presented by Dr. Billie Reed, Executive Director, Virginia Commercial Space Flight Authority. (Dr. Reed is acting as LOSWG Chair temporarily). He reported that the issue of launch site security is closed. He noted that the LOSWG

will examine the issue of advanced range technology, improve interaction with the Advanced Range Technology Working Group and the Advanced Spaceport Technology Working Group by reviewing recommendations, providing review comments, seeking to provide industry/commercial validation, and seeking to provide synergistic support for recommendations. He added that the LOSWG will provide input to the Interagency Common Standards Working Group through LOSWG's Safety sub-working group, headed by Sri Iyengar, Lockheed Martin.

New Business and Wrap Up

For new business COMSTAC member Mike Kelly recommended that COMSTAC address the suborbital market and that he would be willing to take on that task. Chairman Holder also asked the TIWG to examine the percentage of addressable launches actually awarded to U.S. versus non-U.S. companies.

Since there was no additional new business, the meeting was adjourned at 3:42 p.m., subject to the call of the Chair.

Livingston L. Holder, Jr.

Livingston L. Holder, Jr., Chairman, COMSTAC

ATTENDEES

COMSTAC Members
Livingston Holder, COMSTAC Chairman, Andrews Space & Technology
Eleanor Aldrich, American Institute of Aeronautics and Astronautics
Louis Gomez, New Mexico Office of Space Commercialization
Michael Kelly, Kelly Space & Technology, Inc. (via telephone conferencing)
Alex Liang, The Aerospace Corporation
Billie Reed, Virginia Commercial Space Flight Center
John Vinter, International Space Brokers
Gerald Mussara, Lockheed Martin (Alternate for Mark Albrecht and Thomas Marsh)
Ed Morris, Orbital Sciences Corporation (Alternate for Mark Bitterman)
Jayne Schnaars, representative for the Boeing Company