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**THE U.S. “VISION FOR SPACE EXPLORATION”
LEGAL ISSUES PRESENTED BY INNOVATIVE COMMERCIAL INITIATIVES**

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Abstract

As part of the U.S. Vision for Space Exploration, NASA is forging significant partnerships with the developing commercial space sector. With the recent success of the Ansari X-Prize and other ongoing private space efforts, the potential for the commercial space sector to engage new markets, especially those involving human spaceflight, is stronger than ever. NASA is pursuing collaborations that will help expand the commercial space sector while simultaneously supporting NASA's mission and the Vision for Space Exploration. By working with established commercial launch service providers and encouraging development of the emerging entrepreneurial launch sector, NASA, consistent with its mandate under the National Aeronautics and Space Act, seeks to accelerate the growth of the commercial space industry.

In summarizing these initiatives and discussing the innovative statutory and contractual legal arrangements necessary for their success, the paper focuses primarily upon the most ambitious of them: a US\$500 million “Commercial Orbital Transportation Services” (COTS) project for development and demonstration of technologies to deliver cargo – and at a later stage, humans – to low earth orbit, as well as on-orbit rendezvous and docking capabilities. The paper highlights the unique features of the COTS Demonstrations agreements. It also explains the legal and regulatory requirements to ensure COTS demonstrations are conducted consistent with U.S. international obligations under the Outer Space Treaty and Liability Convention.

Introduction

On January 14, 2004, President Bush set a new course for the U.S. space program and gave NASA “a new focus and vision for future exploration.” He stated: “We will build new ships to carry man forward into the universe, to gain a new foothold on the moon, and to prepare for new journeys to worlds beyond our own.”

Two important elements of this “Vision for Space Exploration” (VSE) bear highlighting. The first is the mandate to NASA to pursue opportunities for international participation in exploration activities. The second is to “pursue commercial opportunities for providing transportation and other services supporting the international space station and exploration missions beyond low earth orbit.”¹

In announcing the VSE, the President also chartered a national commission of business, academic, and government leaders to recommend specific measures for implementing the VSE.² One significant recommendation by the Commission was that NASA “aggressively use its contractual authority to reach broadly

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¹ “A Renewed Spirit of Discovery: The Vision for Space Exploration,” http://www.whitehouse.gov/space/renewed_spirit.html

² Executive Order 13326, President's Commission on Implementation of United States Space Exploration Policy, 27 January 2004.

into the commercial and nonprofit communities to bring the best ideas, technologies and management tools into the accomplishment of exploration goals.”³ The Commission's report further recommended that “Congress increase the potential for commercial opportunities related to the national space exploration vision by providing incentives for entrepreneurial investment in space, by creating significant monetary prizes for the accomplishment of space missions and/or technology developments and by assuring appropriate property rights for those who seek to develop space resources and infrastructure.”⁴

In implementing the VSE, NASA has moved aggressively to act on these recommendations:

Prizes

NASA has utilized legal authority from Congress to establish a “Centennial Challenges” program that is conducting prize competitions (or Challenges) that support the VSE and ongoing NASA programs. Specifically, the Centennial Challenges program conducts prize competitions to stimulate innovation in basic and applied research, technology development, and prototype demonstration that have potential application to NASA space and aeronautical activities.

By making awards based on actual achievements instead of proposals, Centennial Challenges encourages novel and lower-cost solutions to engineering ob-

³ *A Journey to Inspire, Innovate, and Discover*, Report of the President's Commission on Implementation of United States Space Exploration Policy, Recommendation 5-1, p. 32 (June 2004).

⁴ Recommendation 5-2, *Id.*, at p. 33.

stacles in civil space and aeronautics from sources of innovation in industry, academia, and the public. Currently, NASA has announced seven prize competitions for a total combined purse value of US\$13.9 million. Team registration has already begun for six of these contests and the rules for the remaining one will soon be made final. Three of the Centennial Challenges competitions, the Beam Power Challenge, the Tether Challenge, and the Lunar Lander Challenge, will be conducted at this year's "X-Prize Cup" event to be held in Las Cruces, New Mexico on October 20-21.⁵

Venture Capital

NASA's Red Planet Capital project (also known as the "Enterprise Engine") has engaged a venture capital fund to provide NASA earlier and broader exposure to emerging technologies and to leverage external venture capital in the development of products with a likelihood of supporting NASA's future mission needs.

NASA recently entered into an agreement with Red Planet Capital, Inc. (RPC), a non-profit corporation, under which RPC will become a Limited Partner in a strategic investment fund called Red Planet Capital Partners, L.P. RPC will invest in the fund, monitor fund operations and receive fund distributions.

The fund will be operated by a team of three experienced venture capital fund managers. It will invest in emerging, privately-held companies developing

innovative technologies with potential for both government and commercial applications. NASA will provide strategic direction and technical input for investments to RPC and the fund managers.

Commercial Orbital Transportation Services Demonstrations

In January 2006, NASA released an announcement concerning a "Commercial Orbital Transportation Services (COTS) Demonstrations" project, seeking proposals from U.S. companies for development and operation of an end-to-end space transportation system of services. The project will culminate with a crew/cargo transportation mission to and from a low earth orbit "test bed," such as the International Space Station. NASA will make available US\$500 million for this effort over the next five years. These sums, however, will fund only a portion of the total anticipated investment needed to achieve mission objectives. Thus, to supplement this financial support, the companies receiving funding for COTS Demonstrations will need to obtain significant additional private funding and contribute substantial resources of their own.

Twenty companies responded to the COTS announcement. NASA entered into further negotiations with six of these companies. This past August, the agency selected two start-up space companies to receive funding for COTS Demonstrations:

- Space Exploration Technologies Corp. (SpaceX), El Segundo, California
- Rocketplane Kistler Limited, Inc. (RpK), Oklahoma City, Oklahoma.

⁵ The X-Prize Foundation is conducting the Lunar Lander competition and the Spaceward Foundation is conducting the Beam Power and Tether competitions, all pursuant to Space Act agreements.

Each of the above commercial initiatives raises novel and sometimes complex legal and policy issues. This paper, however, will focus upon the largest and most ambitious of the initiatives: the COTS project. It examines how these issues are addressed in a unique NASA legal instrument used for funding COTS demonstrations: “funded” Space Act Agreements. It also explains the legal and regulatory requirements to ensure the COTS Demonstrations will be conducted in accordance with U.S. international obligations under the Outer Space Treaty⁶ and Liability Convention.⁷

Overview of the COTS Demonstrations Program

NASA has established a “Commercial Crew/Cargo Program Office” within its Exploration Systems Mission Directorate. The major objectives of the Commercial Crew/Cargo Program are to:

- Implement U.S. space exploration policy with an investment to stimulate commercial enterprise in space;
- Facilitate demonstration by U.S. commercial providers of cargo and crew space transportation capabilities, with the goal of achieving reliable, cost effective access to low Earth orbit; and

- Create a market environment in which commercial space transportation services are available to Government and private sector customers.

COTS is the initial development and demonstration phase of the Commercial Crew/Cargo Program. NASA’s agreements with SpaceX and RpK for COTS are for the purposes of developing and demonstrating the vehicles, systems and operations needed to re-supply and return cargo from a space facility, with the International Space Station providing the representative requirements for such a facility. Crew transport is included as a potential future option in each of the COTS Demonstrations agreements. If the options were to be funded, it would represent the first time NASA utilized non-government vehicles for human space flight.⁸

COTS represents a significant opportunity for U.S. commercial providers because of the likely needs for: (1) logistics support during International Space Station assembly, (2) cargo and crew transport during the time between Shuttle retirement in 2010 and the availability of NASA’s Crew Exploration Vehicle (CEV) , and (3) the ongoing need for ISS transport capability even after the CEV becomes operational.

The goal is for successful flight demonstrations in the 2008-2010 timeframe.

⁶ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 27 January 1967 (entered into force 10 October 1967).

⁷ Convention on International Liability for Damage Caused by Space Objects, 29 March 1972 (entered into force 1 September 1972).

⁸ Legal and policy issues associated with human space flight by private entities are beyond the scope of this paper. For information on U.S. Government oversight of human space flight activities, *see*: Federal Aviation Administration (FAA), Human Space Flight Requirements for Crew and Space Flight Participants; Proposed Rule, 249 Federal Register 77262 (29 December 2005).

During the first phase of this technology demonstration initiative, NASA intends to provide capital and assistance similar to an investor, to help provide the financial stimulation necessary to ensure the success of this venture.

“Funded” Space Act Agreements

As mentioned above, NASA’s agreements with SpaceX and RpK were concluded as “funded” Space Act Agreements. NASA’s organic statute, the National Aeronautics and Space Act of 1958 (Space Act),⁹ grants NASA broad discretion in the performance of its functions. Specifically, the Space Act authorizes the NASA Administrator “to enter into and perform such contracts, leases, cooperative agreements, *or other transactions* as may be necessary in the conduct of its work and on such terms as it may deem appropriate...” (Emphasis added.)

Under this “other transactions” authority of the Space Act, NASA is able to enter into agreements in furtherance of its mission with reduced administrative burdens and greater flexibility in negotiating terms. In the great majority of activities conducted under Space Act agreements, NASA does not provide funding to the other party. Instead, each party contributes resources (personnel, facilities, etc.) to the effort, or NASA performs reimbursable work for the other party. For example, all such agreements between NASA and its international partners or with other foreign entities are based upon Space Act authority.)

In contrast, a “funded” Space Act agreement, such as COTS, is used by

NASA to transfer funds to another party to accomplish the goals of the agreement. These agreements involve funded R&D collaborations (usually jointly-funded) with individual companies or consortia to advance NASA’s mission-related projects, to enhance U.S. industry’s global competitiveness, or to commercialize aerospace technology. In addition to funding, NASA may provide services, facilities, equipment, information, intellectual property, or personnel to support the collaboration.

COTS Demonstrations Agreements

The provisions of funded Space Act agreements are unique to the particular entity and activity being funded. The COTS Demonstrations agreements, in particular, are designed to minimize NASA requirements and oversight of the commercial ventures. Indeed, certain provisions differ significantly from legal provisions found in a standard NASA procurement contract. For example:

- Government cost accounting standards do not apply, and the Government has limited audit rights. Payments will be made based on meeting negotiated milestones. When a milestone is met, the participant receives the negotiated payment for that milestone.
- Maximum retention of intellectual property rights by participant(s) allowed by law and regulations.
- The space transportation systems developed with assistance from the COTS program will be owned by the companies that develop them, not by NASA. NASA will have a limited

⁹ 42 U.S.C. § 2451 *et seq.*

negotiated right to repurchase COTS property at a reduced cost.

- NASA has more limited rights to terminate the agreements. This is in contrast to the typical “termination for convenience” clauses found in U.S. Government procurement contracts.

Other noteworthy features of the agreements include the following:

- Foreign participation is permitted to the maximum extent allowed by law and policy, including participation as commercial partners, investors or subcontractors.
- Launch activities are subject to Federal Aviation Administration (FAA) licensing, including risk allocation requirements.
- NASA Centers may provide participants with technical support on a reimbursable basis (e.g., wind tunnel testing).

Once it has been demonstrated that a commercial entity or entities can provide an orbital transportation service, NASA plans to acquire the service under standard contracting procedures (i.e., via requests for proposals from any company, including non-participants in the COTS program). The provider will also be able, of course, to offer these new services to non-NASA customers. The intent is to help spread development costs, thereby reducing costs to government customers and further stimulating the commercial space industry.

The following sections examine some of the above features in greater detail:

Foreign Participation in COTS

As stated above, the COTS Demonstrations project is structured to enable foreign participation to the maximum extent allowed by U.S. law and policy.¹⁰ To receive NASA funding, SpaceX and RpK were required to demonstrate that U.S. nationals have more than a 50 percent ownership interest.¹¹

¹⁰ Specifically, U.S. Space Transportation Policy, Guideline IV.5(b) (6 January 2005):

The use of foreign components or technologies, and the participation of foreign governments and entities, in current and future U.S. space transportation systems is permitted consistent with U.S. law and regulations, as well as nonproliferation, national security, and foreign policy goals and commitments and U.S. obligations under the Strategic Arms Reduction Treaty, Intermediate Nuclear Forces Treaty, and the Missile Technology Control Regime. Such use or participation will not be permitted where it could result in critical national security or civil space launches being jeopardized by delays or disruptions in receipt of foreign-produced systems, components, technology, or expertise.

¹¹ U.S. Law also permits funding of a subsidiary of a foreign company, provided the Secretary of Transportation finds (A) a substantial commitment to the United States market through long-term investments in the United States, (B) significant contributions to employment in the United States, and (C) the country or countries in which the foreign company is incorporated or organized, and, if appropriate, in which it principally conducts its business, affords reciprocal treatment to companies comparable to that afforded to the foreign company's subsidiary in the United States. This would include the ability to participate in government sponsored research, absence of barriers with respect to local investment opportunities, and protection of intellectual property rights.

In addition, Guideline V.1(b) of the Space Transportation Policy provides, in relevant part, that: "United States Government payloads shall be launched on space launch vehicles manufactured in the United States, unless exempted by the Director of the Office of Science and Tech-

In addition, the participants must comply with all U.S. export control laws and regulations. Specifically:

(a) the International Traffic in Arms Regulations (ITAR)¹² and the Export Administration Regulations (EAR).¹³ In the absence of available license exemptions or exceptions, participants will be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of hardware, technical data, and software, or for the provision of technical assistance;

(b) obtaining export licenses, if required, before utilizing foreign persons in the performance of the agreement, including instances where COTS efforts are to be performed on-site at NASA Centers, where the foreign person will have access to export-controlled technical data or software;

(c) all regulatory record keeping requirements associated with the use of licenses and any applicable exemptions or exceptions; and

(d) ensuring that the above provisions are made applicable to their subcontractors.

Intellectual Property

As mentioned earlier, the COTS Demonstrations agreements emphasize that participants will retain the maximum rights to intellectual property allowed by law and regulations. Specifically:

nology Policy, in consultation with the Assistant to the President for National Security Affairs."

¹² 22 Code of Federal Regulations (CFR) Parts 120 through 130.

¹³ 15 CFR Parts 730 through 799.

- NASA will not obtain rights in a participant's "background" intellectual property (data and inventions developed at private expense that existed or were made prior to, or outside of, the participant's agreement with NASA).
- NASA may request a participant's technical data (engineering, software, etc.) arising from work under a COTS agreement with NASA. Such data will be used only to evaluate a participant's performance under a COTS agreement.
- For any inventions made by participants in performance of work under a COTS agreement, NASA is required by law – the National Aeronautics and Space Act of 1958 – to take title to such inventions. However, upon petition by a participant, NASA will grant an advance waiver of title to such inventions to the participant. NASA will retain only a "government purpose" license to use inventions for which it has waived rights, but will refrain from any NASA use for a period specified in the COTS agreement.
- A participant's proprietary data, both pre-existing proprietary data and data arising from work conducted under this agreement which a participant considers proprietary, will be appropriately marked by the participant and protected by NASA.

**Authorization and Supervision of
COTS Demonstrations Launches:
FAA Licensing**

Article 6 of the Outer Space Treaty requires that launching states authorize and supervise space launches by their nongovernmental entities. The U.S. fulfills this responsibility through the Commercial Space Launch Act (CSLA),¹⁴ which requires that U.S. companies obtain licenses issued by the Secretary of Transportation through the Federal Aviation Administration (FAA). Because COTS Demonstrations launch activities will be conducted by Space X and RpK and not by NASA, the launches will therefore be subject to CSLA requirements.

The scope and content of State responsibility for authorizing and supervising launches conducted from its territory or facilities, or by its nationals, has been a subject of extensive discussion within the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (UN/COPUOS) in recent years. That discussion culminated in a U.N. General Assembly resolution urging that

States conducting space activities, in fulfilling their international obligations under the United Nations treaties on outer space, ... as well as other relevant international agreements, consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-

governmental entities under their jurisdiction.¹⁵

While there is as yet no formal international consensus regarding the required contents of national space laws regulating commercial space activities, discussions in UN/COPUOS and other fora suggest that such statutes should include, at a minimum, certain common elements or "building blocks." These include:

- *Authorization* (licensing and regulation), including application to activities with regard to territory and persons (legal/natural); observance of treaty principles (e.g., avoidance of harmful planetary contamination); sharing the financial risk of liability between government and nongovernmental actors; fulfillment of the obligation concerning cooperation and mutual assistance;
- *Supervision*, including periodic reporting by licensees or collected by the public authority concerning the terms of the authorization; sanctions for violating license conditions, including revocation or suspension);
- *Registration* of space objects; and
- *Indemnification*, including implementation of a right of recourse if the (launching) State has paid indemnification to another State under Art. VII of the Outer Space Treaty and the Liability Convention. Indemnification should apply even if the damage has been caused solely by a nongovernmental entity, limited to a cer-

¹⁴ 49 U.S.C. 70101 *et seq.*

¹⁵ U.N. General Assembly, Res. 59/115, Application of the concept of the "launching State," 10 December 2004.

tain fixed sum, to the insured sum, or to the policy period, beyond which the State will guarantee payment (or, alternatively, provide State payment for all claims).¹⁶

NASA and FAA supervision of COTS Demonstrations encompasses all of these elements. Briefly stated, applicable FAA launch and reentry licenses will govern the launch and return of COTS vehicles; the International Space Station agreements, applied contractually through the Space Act agreements with SpaceX and RpK, will cover the rendezvous and docking activities of the vehicles within the operational control zone of the ISS.

Termination

NASA may terminate a COTS agreement if a participant fails to perform, but may terminate unilaterally only under limited circumstances: (a) upon a declaration of war by the Congress of the United States; (b) upon a declaration of a national emergency by the President of the United States; or (c) upon a NASA determination, in writing, that NASA is required to terminate the demonstrations for reasons beyond its control. Reasons beyond NASA's control include, but are not limited to, acts of God or of the public enemy, acts of the U.S. Government other than NASA, in either its sovereign or contractual capacity (to include failure of Congress to appropriate sufficient funding), and for other specified emergency circumstances. NASA's liability

¹⁶ See: Schrogl and Gerhard, "Findings of the Project 2001 Workshop – Need and Prospects for National Space Legislation, 29 January 2004 (in *Project 2001 Plus: Global And European Challenges For Air And Space Law At The Edge Of The 21st Century* (<http://www.uni-koeln.de/jur-fak/instluft/projectplus/presentations.html>))

for damages due to unilateral termination is limited to the next milestone payment under the agreement.

In the event of termination of a COTS agreement due to failure by a participant to perform, NASA may immediately exercise any government-purpose license to inventions arising under the COTS agreement, and will have the right to use and disclose for governmental purposes any technical data produced by a participant under the agreement. The participant and NASA will negotiate rights in data in the event of termination for any other reason.

Risk Allocation / Liability

Finally, in light of the considerable interest in liability arrangements for private commercial launch activities, I will conclude by outlining the liability arrangements applicable to COTS Demonstrations. These include extensive provisions governing third party liability as well as inter-party liability.

Liability between parties directly involved in launch activities is addressed through "cross-waivers" between the launch companies and U.S. Government agencies (and their related entities). Under a cross-waiver arrangement, each party agrees not to bring claims against the other or the other's related entities (e.g., contractors, subcontractors, users, customers or investors) for any harm to its property or employees. This means that each party reciprocally agrees to accept the risk of its own participation in the activity. Each party is thereby relieved of concern that other parties involved in the activity may bring claims against it.

Cross waiver provisions are important elements of NASA's agreements with SpaceX and RPK for activities under those agreements as well as for FAA-licensed launch activities. For a cross-waiver to apply, both the entity causing damage and the entity sustaining damage must be involved in activities under the agreement. Each party then requires its own related entities to agree to waive claims against similar entities that may be legally related to any other party. This is referred to as the requirement to "flow down" the cross-waiver.

Third party liability is also addressed through FAA licensing. The FAA provides limited, conditional government indemnification for third-party claims arising from activities conducted under the license. FAA cross-waivers effectively require a private launch participant to assume responsibility for its employees' losses and property damage, as these claims are excluded from third party coverage.¹⁷ The FAA also requires the COTS licensee/participant to obtain a specified amount of third party liability insurance and property insurance for government property used in a licensed activity.

For COTS activities not subject to the provisions of an FAA license or permit, the Space Act agreements between NASA and the COTS participants provide the risk allocation scheme. As the participants will be demonstrating rendezvous, proximity operations, docking or berthing, or other activities that are related to, or which could affect the ISS,

¹⁷ Commercial Space Transportation Financial Responsibility Requirements for Licensed Launch Activities, 14 CFR Chapter III Part 440, Sec. 440.5(b)(2).

the cross-waiver provision required for ISS activities will apply.¹⁸

NASA is not authorized to, and will not, indemnify a COTS participant for any claims or damages of any kind. Thus, COTS participants will need to consider obtaining appropriate insurance coverage, in addition to FAA requirements. Such insurance coverage could include coverage for damage caused by anyone to the participant's property (such as its launcher and any other flight hardware) and for third-party damages not subject to FAA requirements.

Moreover, the COTS Demonstrations agreements provide that each party is responsible for damages to third parties arising from that party's own negligence.

Conclusion

The COTS Demonstrations project represent a significant NASA investment in commercial space, offering the prospect of more efficient, and less expensive, means of access to LEO. The potential reward is great, but so is the risk: the funded Space Act agreements will place much of the risk and liabilities associated with developing a new program on industry rather than NASA. At the same time, the initiative will remove as many barriers to commercial development of space as allowable, to encourage maximum participation and innovation. Participants will be able to retain rights to their work, and once their technologies are successfully demonstrated, the opportunity to provide commercial launch services to NASA, other federal agencies and private entities. If successful, COTS Demonstrations may also enable ISS

¹⁸ See: Cross-Waiver of Liability, 14 CFR Part 1266, currently being revised by NASA.

commercial servicing while NASA is undergoing the transition from the Space Shuttle to the Orion Crew Exploration Vehicle.

As the legal and policy issues surrounding the COTS Demonstrations are further identified and addressed, their resolution will have significant influence on future NASA efforts to encourage commercial space ventures to further NASA's mission and the Vision for Space Exploration.