

Commercial Spaceflight Federation

Commercial Spaceflight in Low Earth Orbit is the Key to Affordable and Sustainable Exploration Beyond

Input to the Review of U.S. Human Space Flight Plans Committee

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Quite simply, the key to full utilization of the International Space Station and sustainable exploration beyond low Earth orbit (LEO) is to turn LEO over to the private sector, thereby allowing NASA to focus its resources and expertise on exploration of the Moon and beyond. Without engaging the private sector, there are not enough funds for NASA to both “extend the human presence across the solar system,” as set forth in the Vision for Space Exploration, while at the same time fully utilizing the International Space Station. Regardless of the exploration architecture, the development of commercial spaceflight capabilities over the next decade for reliable, affordable access to LEO for both people and cargo will free NASA resources for exploration, jumpstart private activity in LEO that will further lower the cost of access to space, and unleash the economic potential of space long promised.

Enabling the development of commercial spaceflight capabilities, therefore, is the single most important action NASA can take. Recognizing this, NASA’s commercial crew and cargo program has long been a critical component of NASA’s Constellation architecture. Indeed, the importance of the private sector has also been underscored by the President’s Commission on Implementation of United States Space Exploration Policy, chaired by former Air Force Secretary Edward C. “Pete” Aldridge, Jr. In June 2004, the Aldridge Commission stated:

“The Commission believes that commercialization of space should become a primary focus of the vision, and that the creation of a space-based industry will be one of the principal benefits of this journey.”

– President’s Commission on Implementation of U.S. Space Exploration Policy

Only Commercial Spaceflight to LEO Will Allow NASA to Afford Both Full Space Station Utilization and Sustainable Exploration Beyond

Only twelve humans have ever touched another world, and all during a brief but remarkable four-year period almost 40 years ago. Much has changed in American politics and society in the intervening years. To implement the Vision for Space Exploration, there is no rallying cry for an Apollo-like national effort to return to the Moon – nor the blank check with which to do it. At the same time, NASA has also been directed to complete the International Space Station, focusing U.S. use of the Station on supporting space exploration goals, possibly through 2020. Without engaging the private sector, NASA does not have the resources to both simultaneously fully utilize the Station and explore beyond low Earth orbit, even with a budget increase. Recognizing this reality, the fundamental premise of the Vision is that NASA excels best when it

Commercial Spaceflight Federation

is at the forefront of exploration and that the long-term human spaceflight program must be “sustained and affordable.”

Commercial crew and cargo transportation capabilities to LEO would both enhance our ability to fully utilize the International Space Station, as well as provide alternatives to our dependence on Russia for transporting Americans to space. After the Space Shuttle is retired, the United States will be dependent on the Russian Soyuz for crew transportation to and from the Station, limiting our ability to fully utilize the Station for scientific research due to severely limited down-mass capacity. In addition, Russian per-seat costs have continued to increase in recent years, increasing the amount of U.S. government funds spent overseas instead of here at home. Without domestic competitive pressure, the United States is vulnerable not only to further increases in Russian prices, but deterioration in the U.S.-Russia bilateral relationship. Finally, relying on a single-string capability exposes the \$100 billion investment in the Station to the risk of a single Russian technical failure.

For these reasons, the International Space Station represents a market that is particularly well suited for the involvement of the commercial sector. It was in this vein that the Vision for Space Exploration directed NASA to “pursue commercial opportunities for providing transportation and other services,” a direction that was expanded upon by the Aldridge Commission:

*“The Commission recommends NASA recognize and implement a far larger presence of private industry in space operations **with the specific goal of allowing private industry to assume the primary role of providing services to NASA, and most immediately in accessing low-Earth orbit.** [emphasis added]*

– President’s Commission on Implementation of U.S. Space Exploration Policy

The commercial spaceflight industry is in a unique position to step into this role and brings numerous attendant benefits to NASA and U.S. taxpayers:

- Commercial enterprises leverage non-government funds – With private sector development, each dollar of government investment is leveraged by two additional non-government sources of capital: private investment and revenue from other markets. This has been demonstrated by NASA’s existing Commercial Orbital Transportation Services (COTS) program for commercial cargo to the International Space Station, in which NASA’s investment in the development of commercial space transportation capabilities is augmented both by private investment and by advance revenues from sales in other markets such as telecommunication satellite launches.
- Additional commercial markets increase flight rates and reduce marginal costs – Providers of commercial crew and cargo capabilities will actively seek out as many new markets as possible for their services, increasing the volume of flights and thus reducing the marginal cost of access to space for NASA. Markets for commercial spaceflight include scientific research flights, national security missions, flights by individual private citizens (so-called “space tourism”), product sponsorship, television and movie production, telecommunications satellite launches, and education and outreach activities.

Commercial Spaceflight Federation

- “Pay for performance” procurement – The use of non-traditional procurement for such development, such as Other Transaction Authority (OTA) and NASA Space Act Agreements, has been successfully implemented by NASA, DARPA, and other government agencies, most notably by NASA in the COTS program currently underway for the development of commercial capabilities to deliver cargo to the Station. These firm-fixed-price agreements utilize pay for performance, in which the company is only paid upon the successful completion of performance milestones. This dramatically reduces NASA's exposure to risk and incentivizes commercial providers to keep development costs as low as possible. Likewise, NASA's successful Centennial Challenges program, which awards prizes for technology development, illustrates another innovative procurement strategy that leverages government dollars and focuses on results.
- NASA will benefit from significantly increased public engagement – With the upcoming retirement of the Space Shuttle, the visibility of NASA's human spaceflight program and, therefore, public engagement is at risk of dropping significantly. The strong public visibility of commercial spaceflight efforts, such as the Ansari X PRIZE winning flights of the private spacecraft SpaceShipOne which garnered over 5 billion media impressions, suggests that NASA has a unique opportunity to leverage these private sector talents for public outreach. Further, engagement with the private sector will reinforce NASA's image as a technological leader, helping to grow an entire new industry that creates new jobs, develops new technologies, and strengthens American economic competitiveness.

LEO is Within the Capability of the Private Sector

Just as important to the Aldridge Commission's findings was the fact that the private sector is capable of providing launch services for NASA's needs to Low Earth Orbit:

“The Commission believes that the private sector is willing and capable of providing the initial boost into low-Earth orbit for the payloads associated with the vision. To foster the continued development of this emerging market, the Commission believes that NASA should procure all of its low-Earth orbit launch services competitively on the commercial market.” [emphasis added]

– President's Commission on Implementation of U.S. Space Exploration Policy

Significant recent developments have shown that after more than 50 years of spaceflight, human transportation to low Earth orbit should no longer only be the province of governments:

- Commercial cargo shows the way forward – NASA has recently demonstrated its confidence in the commercial cargo sector by declining to purchase additional Russian cargo flights after 2011 and instead awarding \$3.1 billion in domestic Commercial Resupply Services contracts for Space Station cargo. Moreover, these competitively selected flights will be performed by the same launch vehicles and capsules that NASA had earlier helped to develop via \$500 million in COTS program seed funding. Thus, commercial cargo illustrates how NASA can work with the private sector to enable

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highly useful domestic capabilities that may not otherwise be developed, and it is time to extend this strategy to commercial crew.

- The necessary experience exists within the US industrial base – For more than 20 years, the private sector has been successfully launching commercial unmanned payloads to low Earth orbit, as well as multi-billion-dollar national security and scientific satellites. Further, almost five decades of human spaceflight missions to low Earth orbit have created a deep foundation of experience within the United States industrial base across a wide range of companies and workers.
- No new private launch vehicle development is required – Human spaceflight to LEO can be accomplished using existing launch vehicles and those currently under commercial development, such as the Atlas V, Falcon 9, and Taurus II launch vehicles.
- The commercial spaceflight sector is already underway – Significant capital is being invested in the commercial human spaceflight industry by the private sector, with more than \$1 billion committed between suborbital and orbital efforts. In addition to orbital vehicles discussed previously, commercial suborbital companies and spaceports are training a new generation of engineers and developing new vehicles and infrastructure. Suborbital spacecraft are maturing key technologies that will feed into improvements for orbital launch vehicles, and are helping to create a more diversified space-based economy through multiple markets in the scientific, educational, microsatellite, and national security sectors.

NASA Can Affordably and Quickly Enable Commercial Spaceflight for Crew

By making a series of careful, targeted investments, NASA can affordably and quickly enable the development of commercial spaceflight capabilities for both people and cargo to the International Space Station. To do so, NASA should create a program for commercial crew based on the model of NASA's existing Commercial Orbital Transportation Services program for cargo to the Station. To maximize benefits to NASA and the taxpayer, this program should be structured to create vibrant competition during both the vehicle development and vehicle operation phases, incentivize companies to stay on schedule and on budget, and maximize the likelihood of successful operational vehicles being developed.

For these reasons, important attributes of a commercial crew program would include:

- Multiple awards – NASA should provide significant funding to support the earliest possible competitive development and demonstration of multiple U.S. commercial crew transportation capabilities.
- Outside investment – NASA should require private sector investment so that commercial companies “have skin in the game.”

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- Milestone-based payments for demonstrated performance – NASA should utilize firm-fixed-price Space Act Agreements that pay for performance upon successful completion of program milestones.
- Commitment to purchase services from the winners – NASA should guarantee a minimum purchase of flights for resulting commercial spaceflight services following successful demonstration of vehicle capabilities.

Conclusion

Government and commercial spaceflight are not a “zero-sum game” – they are complementary and not competitive. Regardless of the specific exploration architecture chosen, commercial spaceflight in low Earth orbit is the key to fully utilizing the International Space Station and freeing up NASA resources for sustainably conducting exploration of the Moon and beyond. NASA’s Commercial Orbital Transportation Services (COTS) program is enabling the development of commercial capabilities to deliver cargo to the International Space Station, based on the principles of fixed-price, milestone-based, competitive awards leveraged by private investment. NASA must now extend that cost-effective strategy to enable commercial human spaceflight capabilities as well, through a commercial crew program.

On behalf of:

Armadillo Aerospace	<i>Caddo Mills, Texas</i>
Blue Origin	<i>Kent, Washington</i>
Masten Space Systems	<i>Mojave, California</i>
Mojave Air and Space Port	<i>Mojave, California</i>
NASTAR Center	<i>Southampton, Pennsylvania</i>
Oklahoma Spaceport	<i>Burns Flat, Oklahoma</i>
Orbital Outfitters	<i>North Hollywood, California</i>
Scaled Composites	<i>Mojave, California</i>
Sierra Nevada Corporation	<i>Sparks, Nevada</i>
Space Adventures	<i>Vienna, Virginia</i>
Space Florida	<i>Kennedy Space Center, Florida</i>
Spaceport America	<i>Upham, New Mexico</i>
SpaceX	<i>Hawthorne, California</i>
Virgin Galactic	<i>Mojave, California & Upham, New Mexico</i>
X PRIZE Foundation	<i>Santa Monica, California</i>

About the Commercial Spaceflight Federation

The Commercial Spaceflight Federation is the industry association of companies working to make commercial human spaceflight a reality. Commercial Spaceflight Federation members include commercial spaceflight developers, operators, and spaceports. The mission of the Commercial Spaceflight Federation is to promote the development of commercial human spaceflight, pursue ever higher levels of safety, and share best practices and expertise throughout the industry.