

Testimony before the Senate Commerce, Science and  
Transportation Committee's Subcommittee on Science and Space  
Mr. Frank L. Culbertson, Jr. (Captain, USN, Ret.)  
Senior Vice President and Deputy General Manager  
Orbital Sciences Corporation  
Advanced Programs Group

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Good afternoon Chairman Nelson and Ranking Member Vitter, and members of the subcommittee. I appreciate this opportunity to participate in this hearing regarding the potential of commercial crew delivery capabilities to low Earth orbit to enhance our nation's progress in space exploration and development.

I am honored to sit on this distinguished panel with industry colleagues Michael Gass and Gwynne Shotwell, and former NASA colleagues George Nield, now with the FAA, and Malcolm Peterson, formerly NASA's comptroller. Needless to say, it is also an honor to sit alongside two fellow astronauts whom I hold in the highest regard: Lt. General Thomas Stafford, who commanded the vital Apollo 10 lunar landing dress rehearsal mission and 35 years ago blazed a trail for U.S.-Russian cooperation in space while commanding the American side of the Apollo-Soyuz mission, and Bryan O'Connor, a veteran of two Space Shuttle missions and since 2002 the NASA leader and agency conscience on all matters regarding mission safety.

For those of us who have had the great privilege to fly into space wearing the U.S. flag on our space suit—including the chairman of this subcommittee—I think it is fair to say that we are oriented toward achieving mission success through thoughtful risk taking. Every time I have entered

the Space Shuttle preparing for flight it was with the utmost confidence that the dedicated men and women of NASA and its contractor teams had done everything humanly possible to ensure my safety, and I'm certain my colleagues share this view about their experiences.

My job at Orbital Sciences Corporation includes oversight of all programs relating to Human Space Flight Systems, including not only our Cargo Resupply Services contract and the Cygnus Spacecraft, with a close connection to our Taurus II Launch Vehicle, but also the development of the Orion Launch Abort System under the auspices of the Constellation Program. In addition to our 28 years of work in other areas of spaceflight, such as satellites and launch vehicles, our company is totally committed to supporting the future of human space flight in this country, as well as to exploring business approaches that will continue to make space more accessible and productive for all potential users.

The recent CCDev procurement competition, with 36 bidders listed, indicates that a number of U.S. companies, large and small, with outstanding track records of providing NASA with launch and space services have an interest in supporting commercially provided crew transportation services.

NASA's proposed funding of about \$6 billion over the next five years, together with the addition of appropriate private capital, should be sufficient to enable at least one and probably two U.S. commercially-provided crew systems to be demonstrated by the year 2015.

I am confident that NASA can work with commercial providers to establish the proper safety and performance standards and oversight measures, the fundamentals of which are already well-established, that will enable industry to continue this successful era of U.S. human space flight for both U.S. government missions, and for other markets as they develop. I

would also expect that industry will make proper use of NASA's manpower, expertise, and physical infrastructure to not only enhance safety and mission success, but also to help maintain and build our national competence in these areas. Preeminence in exploratory and technical accomplishments remains as important as ever if we are to maintain our global leadership in space and continue to motivate future generations to do the hard work required to carry that banner.

Given your appropriate concern as to whether the commercial space industry is robust enough to develop reliable commercial launch services for crew to low Earth orbit within a reasonable time, at a fair cost, and, most importantly, with the requisite safety margins, let me clearly state again my response to the fundamental question of whether this model can work. Orbital believes, as do I, that U.S. industry, given the right conditions, relationships, and investments, should be able to develop and demonstrate safe and reliable crew transportation systems for International Space Station support by 2015.

Two of the important elements of ensuring safety in future transportation systems are close cooperation with NASA in developing a clear understanding and full implementation of Human Rating Standards, especially at the system level, and a robust, reliable crew escape system. Furthermore, once such a service is developed, tested, and certified, I would be happy to volunteer to strap in once again for a mission to the International Space Station. If I am not willing to join the first mission of an Orbital developed spacecraft that I share responsibility for, then no one should be on that flight.

I would also like to emphasize the importance of partnership to the success of a commercial crew transportation program. For programs of this nature to work, especially in the NASA context, what's required is a sound, trusting relationship between - and open, honest communication amongst - the appropriate government, industry, and international partners. This is not a simple or easy task, as evidenced by the major space programs of the last 50 years, but it can be done and results in powerful accomplishments, such as Apollo, Shuttle, and the International Space Station.

I do not envisage commercially provided crew services being conducted entirely by industry with a hands-off approach from NASA. Nor can these commercial services be provided efficiently with traditional levels of government involvement and oversight at every turn. Rather, to be successful, commercial suppliers must work closely with NASA and other potential customers at key milestones, tests, and reviews, providing insight to the program and demonstrating the willingness to listen to the technical judgment and leadership of NASA's seasoned government and contractor human spaceflight team in a mutually productive relationship. In addition, the FAA relationship must continue to grow and mature in order to establish a proper regulatory regime for commercial crew activities. In this serious business there is no substitute for open lines of communication and the appropriate balance of insight and oversight that will lead to shared progress in 21<sup>st</sup> century space activities.

Just as the Shuttle-Mir Program was an excellent developmental program for producing the collaboration and joint operations being used so successfully in the International Space Station Program, the Commercial Orbital Transportation program and related Commercial Resupply Services program or COTS/CRS, are providing superb learning experiences for not

only developing new hardware that can fly to the Station safely, but also the operations concepts, relationships, and lines of communication that will enable all sorts of commercial endeavors in the future.

Though the willingness of industry to invest their own technical and financial resources in an incipient space project is not new, just as Orbital is now doing on the COTS/CRS programs, the levels of investment and financial risks are moving in new directions. We see the opportunity for commercially provided crew transportation as an extension and strengthening of NASA's current initiatives in commercial cargo delivery that will lead to exciting new partnerships with private industry. The challenge is to develop and operate commercial low Earth orbit transportation systems that will service not only the government but also the other markets that can be imagined.

Since 2008 Orbital has been fully engaged as one of two companies contracted to provide the delivery of crew and cargo to the International Space Station. Although this has been a huge development program for a company of our size, and unprecedented in scope for a purely commercial venture between a private company and NASA, I am very pleased to report that from Orbital's perspective, and that of our shareholders, we have made steady and valuable progress. We expect to have achieved all but 3 of 21 NASA program milestones by the end of this year, including successful completion of the critical Phase One and Phase Two Safety Review milestones. We are on pace for first launch of the Taurus II rocket from Launch Pad O-A at the Mid-Atlantic Regional Spaceport on Wallops Island, Virginia, next year. This progress is possible because of the hard work and cooperation of many talented people at NASA Headquarters and several NASA centers, as well as the FAA, the support of Virginia and Maryland

through the Mid-Atlantic Regional Spaceport Authority, the efforts of our teammates, suppliers, and international providers, and the internal corporate support we receive to resource this program.

I mention all of those players to highlight the point that it truly takes a complex mix of organizations to execute space missions, especially with crew involved. The mix and complexity have evolved over the last five decades, but this is still one of the most difficult and exciting endeavors known to humans, and I believe will be for some time to come. The addition of local and state agencies and organizations in new roles and levels of investment will only serve to enhance commercial opportunities for success. Executing parts of the development and operation in new and imaginative ways, while keeping the focus on safety and mission success, is our challenge for the near term, so that we not only expand our frontiers, but also give our children a space program that they can build upon – not be forced to rebuild.

For Orbital, we see the extension of the International Space Station as one of the cornerstones for a sound future in space, both scientifically and commercially, as we strive for more distant destinations and new technologies continue to be developed. Looking forward, we believe the ability to provide cargo and crew services to the International Space Station is absolutely critical given the pending retirement of the Space Shuttle and the Administration's wise decision to continue the International Space Station's mission from 2015 to 2020 (or beyond!), thus enabling our scientists and researchers to pursue a more aggressive program of scientific research and utilization at this multi-national orbital facility. I applaud its designation as a National Laboratory. In addition, based on my personal experience on board the Station, I firmly believe that the ISS is an ideal

platform for developing and simulating the operations, technologies, and techniques for executing more ambitious missions and lengthy missions to the Moon, Mars, and other destinations.

I often tried to imagine what we would need if the station were en route to Mars or were somehow placed on the moon, besides what we already had or expected to have in the future - such as regenerative life support and radiation protection – and one of the major requirements was a reliable supply line – and/or a lot more room! We at Orbital intend to be a key element in that supply line. It is indeed important to recognize that this new approach to meeting our nation’s commitment to fully utilize the International Space Station, including the designated National Laboratory portion of the facility, is part of a broader policy to advance American progress in space on a number of productive fronts.

By now turning anew to America’s innovative private sector to provide crew transport to low Earth orbit, NASA will be able to invest new resources in transformative technologies that will speed our exploration path to the Moon, Mars, asteroids and other deep-space destinations. New launch vehicle propulsion, in-space operations technologies and related robotic precursor missions are just a few of these. This approach will also enable increased funding for NASA’s other critical missions in earth and space sciences, thus helping us better protect life on our home planet through accelerated and expanded climate change research missions, and extend through our robotic emissaries and telescopes the profound search for evidence of life in and outside the solar system.

In closing, please allow me to mention that as an astronaut I have had the privilege of working on missions that have helped to enhance our national security, extend international cooperation in space science, and

increase the capabilities of the International Space Station facility, which has just been given a new lease on life. Clearly, the NASA budget that was recently delivered by the Administration has generated a firestorm of discussion that is rarely seen on the topic of space exploration. I sincerely feel the pain of some who are at the center of the storm, as well as those who feel threatened by parts of the budget, but I welcome the fact that finally we are having a broad and fervent debate on the subject. I know that a lot of energy is being expended at NASA to provide increased specificity of the goals, so I am hopeful that a more thoughtful and thorough examination of the available paths forward will result in an ambitious, sound set of programs that will fill us all with pride. Just as you are doing by holding this hearing, promoting meaningful dialogue within the relatively small but passionate group of people who truly understand and care about what it actually takes to execute what so many take for granted - that is, reliable access to space - will help move us in the right direction. I expect that U.S. industry will support challenging national space endeavors as it always has - with professionalism, excellence, and innovation.

Our nation continues to inspire people throughout the world for our commitment to freedom, creativity, exploration, and commerce. Opening the right doors for industry to participate more broadly on a commercial basis will help maintain and enhance America's leadership on the space frontier.

Thank you again for inviting me to appear before this important hearing today.