

Commercial Human Spaceflight Symposium

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“The Case for Commercial Crew”

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Welcome everyone. I want to thank our hosts at the Johnson Space Center for sponsoring this event along with AIAA. And, I want to thank you in the audience for coming and engaging with us over the next couple days to help further define the commercial crew program.

So what is this thing we are calling “commercial crew”? It is a partnership between NASA and the private sector to incentivize companies to build and operate safe, reliable, and cost effective commercial human space transportation systems. In the near term, NASA plans to be a reliable partner with U.S. industry, providing technical and financial assistance during the development phase. In the longer term, NASA plans to be a customer for these services, buying transportation services for U.S. and U.S.-designated astronauts to the International Space Station (ISS). We hope that these activities will stimulate the development of a new industry that would be available to all potential purchasers, not just the U.S. government.

This represents a true paradigm shift for NASA and industry. There are many challenges ahead – technical, financial, and cultural – and success is not assured. Both NASA and our industry partners will need to change the way we have traditionally done business in order for this program to succeed.

I want to make it very clear that embarking on this new approach is *not* a criticism of our traditional approach to human spaceflight. Working together, NASA and industry have enabled towering achievements for our nation using that traditional approach. The Space Shuttle and ISS are truly amazing systems.

So why pursue this innovative approach to crewed access to low-Earth orbit and why do it now? In my view, we have a fairly unique set of circumstances that make a new approach to ISS crew transportation an imperative. Let me articulate those circumstances.

First, we have an extremely constrained budget environment. While our historical human spaceflight programs were indeed amazing, they were extremely costly. The Ares-1/Orion combination would have resulted in a per seat cost of approximately \$600 million to transport a single astronaut to the ISS. Of course, Ares-1/Orion were part of an overall architecture that was not optimized for ISS crew transportation, but the need for cost effectiveness has become essential in today’s environment. We

simply do not have sufficient budget to pursue a crew transportation system using our traditional approaches.

Second, we will be using relatively well understood technology. Human spaceflight is very difficult, but the reality is that NASA and U.S. aerospace industry have been doing it for over forty years now, and no major technological breakthroughs are needed. We just need good, sound engineering with rigorous procedures and practices.

Third, the space industrial base has significantly matured recently. Global commercial space industry revenues have doubled from \$80B to \$160B during the last five years alone, according to the Satellite Industry Association. While there will always be areas of our industrial base that we wish were more robust, the fact remains that the financial and technical capability of the space industrial base is stronger and more mature than ever before.

Also, we have the very real prospect of other customers for these services, in addition to NASA. For example, NASA and Russia have been transporting astronauts from other countries to low-Earth orbit for over three decades. During that time, almost 100 astronauts from over 30 nations such as Slovakia and the Netherlands to France and Germany have been flown to space in Soyuz and Shuttle and visited MIR and the ISS. Over a third of those countries were repeat customers, demonstrating that the demand to fly foreign government astronauts to low-Earth orbit is a real, sustainable market.

In addition, private citizens have been flying to space since 2001, and several projections show this market may be very strong as well. The Futron space tourism market study indicated a demand for 60 passengers per year by 2021, assuming initial ticket prices of \$20M per passenger. Futron concluded that, quote, “the demand for the public space travel is real, robust, will eventually make someone very wealthy, and is one of the few areas where growth can be predicted for the launch industry.”

Another indicator of future demand is Bigelow Aerospace’s project to develop crewed space complexes. Robert Bigelow has reportedly spent \$180M on this venture, and his company recently announced that 24 annual flights will be needed to transport crews and supplies to his space complexes in the middle of this decade.

Lastly, the most positive reason to develop commercial human space transportation capabilities is the Administration’s decision, recently endorsed by Congress, to extend the life of the ISS to 2020 or beyond. With this decision, we now have a long-term, sustainable market for commercial human space transportation services like never before.

You put all those ingredients into a kettle and stir them around and you can see that the case for a *commercial* crew transportation program is quite compelling. Indeed, those ingredients are what led the members of the Augustine Committee to so aptly conclude, “Commercial services to deliver crew to low-Earth orbit are within reach.”

While the case for commercial crew is compelling, it represents a big change for us. There are many historical examples of programs trying to do something new under the banner of innovation, and falling short. However, we have a successful analog for NASA investing in commercial spaceflight capabilities.

For that analog, one has to look no further than right here at the Johnson Space Center where, for the past five years, the Commercial Crew and Cargo Program Office has been making steady progress with its industry partners in developing and demonstrating ISS cargo delivery systems. This program cannot be considered a full success yet since no cargo has been delivered to the ISS. However, NASA is poised to gain two new launch vehicles, two spacecraft capable of delivering cargo to ISS, and all the associated ground and launch infrastructure for an investment of only \$500M.

I should point out that NASA has proposed a \$300M augmentation to the COTS Cargo budget, and as soon as Congress appropriates it I will adjust my speech. However, the \$300M is NOT for cost growth. We are using Space Act Agreements for the COTS Cargo program, which limits NASA's investment. We can't just give our industry partners more money as we could (and would) under a cost-plus contract. We will be adding new content to the Agreements to reduce NASA's risk in the development of these systems. With the decision to extend the life of the ISS, it has become more important than ever to have a robust cargo delivery capability. Thus, NASA plans to add milestones to the COTS Cargo Space Act Agreements to reduce *our* risk. But, even for \$800M, it will be a bargain for what NASA stands to gain.

Among the many innovation features used in the COTS Cargo program, and one that we will be using for commercial crew, is leveraging alternative capital sources for development, including private and corporate investment. Having "skin in the game" increases the total funding available for development, and it incentivizes our industry partners to find other customers in order to get a return on their investment.

Also, this program will receive the benefits of increased efficiency associated with a corporately-managed business model. It is well known that private industry generally provides better services for lower costs, in part through the efficient and effective development model used in businesses around the world. The commercial crew program will take advantage of this business model by allowing private industry to determine the optimal approach to satisfying NASA's ISS crew transportation needs.

Lastly, the commercial crew program represents a shift in scope and requirements to the private sector, freeing NASA (and NASA's limited resources) to pursue other exploration-driven capabilities. The commercial crew program will enable NASA to go further and faster in its space exploration quest.

Within this new paradigm, NASA will maintain our stringent safety requirements and standards. Much has been said about the private sector's ability to take on more of the responsibility for building safe space transportation systems. Besides the fact that the private sector, in conjunction with NASA, has built every U.S. human spaceflight system in history, my response to that issue is quite simple, "These systems will not fly unless and until NASA is convinced that they are safe." Thus, the final arbiter of safety will still be NASA. We will be doing this by way of a crew transportation system certification, and no system will receive this certification until NASA has confidence that our personnel will be safe.

I have outlined a very difficult set of parameters under which our commercial partners will operate. As I said, human spaceflight is a very difficult endeavor, and our commercial partners will have the responsibility for the full end-to-end system. So how do we *know* they will succeed?

The fact of the matter is that we cannot guarantee their success, just as we cannot guarantee the success of traditionally-run spaceflight development programs. But what we can say is that the commercial crew program's structure incentivizes the commercial partners to "stay in the game" even when encountering difficulties. In addition, NASA plans to execute agreements with multiple commercial partners, thereby insulating the agency from the impact of any single partner not completing its agreement milestones. And lastly, we simply do not have enough budget to do it any other way.

While there are challenges and uncertainties ahead, we need keep in mind the benefits to NASA, the nation, and all of humanity that will come from a successful commercial crew program. For NASA, it will give us *assured access* to the ISS, enabling robust utilization of the now fully outfitted laboratory. For the nation, it further strengthens our industrial base and puts the U.S. at the leading edge of a new, high technology industry. And finally, I believe this program will benefit all of humanity. We have seen how tenuous our human spaceflight endeavors can be. We cannot have the future of human spaceflight completely dependent on the prevailing political winds or partisan concerns. By pushing the boundaries of private enterprise and commerce into low-Earth orbit, we will have planted the first truly sustainable flagpole in our expansion into space. There will be no turning back once commercial human spaceflight to low-Earth orbit is a robust, vibrant, profit-making commercial enterprise with many providers and a wide range of private and public users. This is the ultimate goal – one that I believe unites all of us at NASA and the space industry. So let us come together over the next two and half days of this symposium and then over the next several years to achieve this goal. Thank you.