

Statement of Robert T. Bigelow  
Founder and President, Bigelow Aerospace, LLC

Before the

United States Senate Committee on Commerce, Science, and  
Transportation  
Subcommittee on Space, Science, and Competitiveness

On

*“Reopening the American Frontier: Reducing Regulatory Barriers and  
Expanding American Free Enterprise in Space.”*

(April 26, 2017)

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to speak to you today and to present my views on the subject of this hearing: Reopening the American Frontier for Free Enterprise in Space. First, let me thank the Committee for the work it has done to support the commercial space industry. The Committee has been an invaluable leader in providing coherent space policy and supporting the private sector's ability to compete to make America a leader in human spaceflight once again. However, over the next two years, Congress will need to address a variety of risks and threats to free enterprise in space. Congress has the important role to establish the business and regulatory environment necessary for the viability of low Earth orbit and cislunar economies to develop. Much work is left to do.

For over seventeen years, I have personally funded the development of space habitat stations at Bigelow Aerospace. I am proud of the accomplishments my company has made in the development of expandable habitat systems, architecture that Congress forced NASA to abandon in the 1990's. I personally have spent over \$350 million dollars designing, manufacturing, testing, and launching hardware because commercializing expandable habitat systems will dramatically lower costs to NASA and other customers, providing affordable destinations, and thereby enabling the growth of new markets in space.

To date, we have successfully launched three habitat station prototypes. These new technologies comprise the basis for the structure of our spacecraft and in full-scale provide superior radiation, debris and micro-meteorite protection as compared to the modules of the ISS. In 2006 and 2007, respectively, we launched the Genesis I and II prototype spacecraft from the Yasnny missile base in Siberia, Russia. The Genesis program was the first test of these new technologies in the space environment. Both spacecraft exceeded our expectations and we achieved invaluable data from those test flights. In April of 2016, the Bigelow Expandable Activity Module, or BEAM, was launched to the International Space Station ("ISS") in the trunk of the SpaceX Dragon cargo vehicle under a partnership agreement with NASA. BEAM was expanded in May of 2016 and has undergone continuous testing attached to the Tranquility module of the ISS. The BEAM program helps NASA and Bigelow Aerospace understand and demonstrate the strong viability of these new technologies that make up the base architecture of expandable habitats. And I would like to note that the BEAM exemplifies the first time the ISS has been augmented with habitable volume since the end of the shuttle program in 2011.

Today, I am focused on our primary goal, which is to provide customers with an affordable and safe station that can be augmented and outfitted for almost any type of mission to almost any practical destination in space. Bigelow's primary spacecraft, the B330, offers 330 cubic meters of pressurized volume; volume that traditional metallic structures – including the ISS – cannot match in terms of total up mass per launch at significantly less cost. A single, fully deployed B330 expandable habitat provides approximately one third of the current usable volume of the ISS. We have the ability to dramatically increase the usable volume in space, to double and triple that of the ISS, with single digit launch rates. This illustrates the advantages that Bigelow Aerospace's habitat technology provides to the market and to NASA. The opportunities my company can enable through our habitat architecture will help revolutionize the commercial space industry provided that the regulatory environment remains minimal, transparent, and clear.

What Bigelow Aerospace seeks to achieve is to offer the market affordable, safe, and robust habitat technology. While NASA early on envisioned the original architecture of expandable habitat technologies through the Transhab program in the 1990's, Bigelow Aerospace has created many innovations and is now marketing the concept. The Bigelow Aerospace business model is built on time sharing volume and other assets. As a long-time real estate developer in the United States southwest, I know something about selling volume and time. We should view future low Earth orbit locations and businesses as the wellspring for deep space capabilities because it makes affordable the operational experience, increases performance efficiencies, provides for more robust technologies, and supports novel applications necessary for deep space missions. Commercially available habitat stations like the B330 provide affordability and potential access to space that otherwise has been out of reach for almost all nations and companies of the world. Whether the volume and time are used for traditional science, manufacturing, on-orbit servicing, or tourism, to list a few uses, we cannot get the necessary economies for free enterprise unless we start to address some of the existential and near-term issues that will affect America's future in space.

NASA took the first step to address its destination deficit recently when it instituted the Next Space Technology for Exploration Partnerships program, also known as NextSTEPS. Part of the NextSTEPS program is to develop the necessary technology for NASA to transition to deep space activities. This is achieved through cost-savings by partnering with commercial entities to assist NASA's

efforts to get out of low Earth orbit, return to the Moon and open up other new American frontiers across the Solar System. As a Phase I and II awardee of the NextSTEPS habitation program, we have worked hard to keep production on schedule so that we can produce two flight-ready B330's by the end of 2020.

While I hope that the Congress and President Trump will work together to provide NASA the financial resources it needs to succeed, I am moving ahead with the B330 program. As noted, we are on schedule to have two flight-ready B330's completed by the end of 2020 for any customer. Therefore, as this Committee deliberates over the creation of a new commercial space bill, I believe that the Congress should concern itself with the necessary business and regulatory environment for habitats to serve as the backbone for all activities in space. Commercial space station development is underway now. I do not believe that we need more reports on space activities. What we need is forward-thinking on how to ensure that America is leading the way to commercial space stations as well as the means by which to permit our customers to achieve the full value of space. The Congress has already enacted the right for Americans to obtain space resources. Now it is time to consider how to give life to those rights. Not only in the form of title, but laying out the conditions for space commercialization in the ways that Americans have always substantiated their rights to commerce - through registry and notice of business activities. This will be essential to provide operational safety, integrity of revenue streams, and evidence in future litigation regarding commercial rights to operate and use space resources in situ. I believe addressing the issue of registry and notice will help grow investor confidence in space activities enabling the large capital investments needed to provide certainty in the market as it develops over time.

Now let me briefly describe some of the risks and threats I see the Congress needing to address. First, I believe that the United States is quickly approaching a cross-road where opportunities will rapidly arise from the innovative space technologies Bigelow Aerospace and other companies are currently developing. There are no destinations for American transportation systems besides the ISS. Where shall NASA and this nation go once the ISS is no longer available? NASA will always need training and testing facilities in LEO and beyond. Commercially affordable facilities, where the customer is king, is the practical answer. We should not repeat the mistakes of the past to move on without a plan. We should not move ahead by allowing others to lead. This nation should recommit itself to returning to the Moon and then on to Mars because it is the only practical way to

guarantee that future space activities will have a foundational infrastructure capable of growing and maintaining stable economies to ensure NASA and American enterprise can continue to explore and utilize space. To that end, NASA needs to be a strong and diverse customer of the commercial space industry.

Second, Bigelow Aerospace is committed to playing a vital role to ensure that there is no “space station” gap like there was a “shuttle gap” that cut-off American independence in human spaceflight. Bigelow Aerospace continues to develop partnerships with launch providers and other companies to ensure that NASA and other potential customers have alternatives and choices for the utilization of affordable habitats. My company is ready to provide the means to achieve the twin goals of exploration and the development of a sustainable space economy. Bigelow Aerospace is ready to take the next step in human spaceflight to ensure that America regains its leadership role in the exploration of space. But in order to achieve a truly free enterprise in space, NASA is too vital a customer to ignore. NASA needs the necessary funding and policy direction to transition from the ISS to supporting space missions based on utilization of commercially supplied space habitats and other transportation assets.

Third, regulatory processes should be streamlined, transparent, fair, and appealable. The proliferation of commercial activities in space has led to many challenges for the industry and government. That is why in 2013 Bigelow Aerospace asked the Federal Aviation Administration’s Office of Space Transportation (FAA AST) if there would be any regulatory obstacles to launching and landing a Bigelow habitat on the surface of the Moon. As a result of this trailblazing effort, FAA AST, in consultation with the Department of State (DOS), NASA, and several other relevant federal entities, adopted a major policy change regarding how to evaluate private sector missions to the Moon. Through FAA AST leadership, the Federal government has begun to understand that the commercial space industry needs a workable framework to enable and support innovative commercial space activities in space and on planetary bodies. I especially applaud the tremendous efforts of FAA AST Associate Administrator George Neild, DOS Director of the Office of Space and Advanced Technology Ken Hodgkins, and DOS Attorney-Advisor Brian Israel in achieving this most productive policy change. I know that Congressmen Brian Babin and Jim Bridenstine are working hard to achieve the regulatory balance of liberty, safety, and international obligations. We are grateful for all their efforts because American leadership in space policy will be essential to expand the American

principles of free enterprise and self-determination into space, enabling the same successes in space that these principles have realized domestically.

Fourth, the Committee should take note of the strong international competition China has created in their quest to develop their own national space program – a program that is not disconnected from its own military. As I understand it, the Chinese seek to develop their own commercial space industry – I assume commercial with Chinese characteristics. The Chinese government has made it known that it wants to offer “free access” to other countries to utilize their national space station in the near future. To that end, the Chinese and ISS partner states have discussed international space cooperation and partnerships. Among others, I am aware that the governments of China and Italy have signed a memorandum of understanding regarding space cooperation, and that many pressurized space modules are manufactured in Italy. As a successful businessman, I know nothing is free. And while our allies consider partnering with China, we should be mindful of the strategic consequences that an engaged China could have on the future of American enterprise in space. I urge the Committee to consider the disruptive strategic role China will likely play as NASA and the commercial space sector expand beyond low Earth orbit especially in light of the Chinese launch of its first cargo spacecraft to its unmanned space station to conduct a refueling mission last week.

I have had innumerable discussions about the future of space exploration with many Americans, foreign officials, and business people. One thing I think is clear, is that NASA is too focused on just transportation systems to the ISS. Everyone wants to know: what are NASA’s plans to transition out of the ISS? Whether the ISS continues or not, additional destinations besides the ISS are vital to sustain a viable space crew and cargo enterprise with new markets that eventually replace the ISS. NASA must transition out of low Earth orbit and into deep space. I therefore urge the Committee to acknowledge that developing new habitat systems that can carry humans, experiments, cargo, and other technologies for the exploration of the Moon, Mars, and other destinations must begin in low Earth orbit and then proceed to cislunar space. Moreover, I believe that if initiated soon, Bigelow Aerospace and other companies could provide a lunar depot using a B330 habitat station that would enable NASA and commercial entities access to the Moon and cislunar space in a four year program. If we truly commit to an initial destination in low Earth orbit then following quickly to cislunar space, I

believe that expandable habitats can offer NASA and others the ability to test and gain experience for future missions to the Moon and Mars.

I believe that this country has an opportunity in the very near term to re-inspire our citizens and begin developing and marketing new innovative space products and services to the American people and the world. I believe that the next five years will be consequential to the future success and health of a commercial space industry in LEO and beyond LEO. I am eager to work with the Congress to find ways in which we can ensure cost-effective, robust, and safe habitation systems that will enable America to lead space exploration and commercialization to make America great again in space!

This concludes my written remarks. Thank you and I look forward to your questions.