



Written Testimony of Dr. Mary Lynne Dittmar
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Re: House Science Space and Technology Committee, Space and Aeronautics Subcommittee
Hearing – “ISS and Beyond: The Present and Future of American Low-Earth Orbit Activities”

Good morning, Chairman Lucas, Ranking Member Lofgren, Chairman Babin, and Ranking Member Sorensen. I appreciate very much the invitation to appear before you today. It is particularly an honor to do so with such esteemed panel members as Mr. Ken Bowersox, Mr. Dylan Taylor, and Dr. Rob Ferl.

My name is Dr. Mary Lynne Dittmar and I lead both Government and External Relations alongside 850 outstanding colleagues at Axiom Space, located in Houston, Texas. Axiom Space is organized around three main lines of business, each of which support and advance U.S. national objectives in space. In partnership with NASA, we operate Private Astronaut Missions, or PAMs as we call them, to the International Space Station (ISS). These missions are expanding the number of countries that can access space and promote opportunities for international collaboration. For example, less than a week ago, we successfully completed Axiom Mission 3 (Ax-3), which was the first all-European commercial astronaut mission to the ISS and saw astronauts from Italy, Türkiye, and Sweden conduct more than 150 hours of science and outreach.¹ This included 56 research-associated activities around the mission – on the ground and on the ISS – 39 on-orbit experiments, tech demos and research facility maintenance activities, 7 life science projects, 23 human research projects (11 both on the ground and on orbit), 2 plant projects, 9 physical and Earth sciences projects, 6 technology demonstrations (this list is not all-inclusive). The crew also conducted 28 media and outreach engagements with news outlets, government officials, organizations and important stakeholders from their countries. Of those, 9 engagements focused on educating and inspiring hundreds of students from around the world.

To date, Axiom Space has shouldered a considerable portion of the costs for these missions, reflecting our commitment to and investment in the development of low-Earth orbit. Of particular relevance to this hearing, Axiom Space’s Private Astronaut Missions have fulfilled a critical role in the evolution of NASA’s commercial LEO plan by providing both the opportunity for NASA and a private space company to learn how to operate together through training, on-orbit activities and science, and by providing critical market information regarding the demand for on-orbit services. Axiom Space is proud to be the leader in these pioneering efforts and is grateful for our partnership with NASA.

Our second line of business is focused on building the lunar spacesuits for NASA’s Extravehicular Activity and Human Surface Mobility Program (as part of the Exploration

¹ <https://www.axiomspace.com/missions/ax3>



Extravehicular Activity Services (xEVAS) contract). This effort will provide NASA Astronauts the lunar spacesuits they will wear on the surface of the Moon during the Artemis III mission. We are also working on the next generation suits for low-Earth orbit.²

Our flagship program, and the one most pertinent to the topic of the hearing today, is the construction of Axiom Station, the world's first commercial space station. As part of NASA's Commercial LEO Destination Program, construction of Axiom Station is well underway. Our first module will be arriving in Houston later this year for outfitting and is scheduled to launch into orbit, where it will connect to the ISS in late 2026. An additional module will be flown into orbit next, after which Axiom Station will become free flight capable prior to the arrival of the ISS deorbit vehicle.

It is important to note that connecting our station to the ISS was a purposeful decision by NASA in 2020.³ The agency conducted a free and open competition for access to an available port on the ISS and Axiom Space won that competition. Connecting our station to ISS is important for transferring facilities and equipment from the ISS directly to a commercial platform so that taxpayers do not lose the investments made on these critical capabilities when the ISS retires.

The International Space Station has been the crown jewel of American soft power for more than two decades. It stands as a shining example of what we can achieve together with our international partners and demonstrates the will of the American people to lead a community of nations with shared values and ideals. The ISS cannot last forever, and like everything in the harsh environment of space, it is starting to show its age. A transition is coming in which we will say goodbye to that incredible spacecraft and usher in a new age of commerce with at least one commercially owned and operated space station.

At least, that is the plan. As we talk this morning about the future of the Commercial LEO Ecosystem, I think it is important that we also discuss, in some detail, the significant challenges that lay before us. This is the fifth time I have testified before Congress over the past decade, and at no other time have I felt the sense of urgency that I do now.

On the one hand, we are standing at the precipice of achieving one of the most audacious goals humanity has dared to reach for since we built the International Space Station: Fulfilling the vision of humans living and working in space in an ecosystem of economic expansion, marking the best of American industry and innovation.

On the other hand, without clear guidance, direction, and funding from Congress, continuity in American presence in LEO is under threat. The likelihood of a "gap" in LEO following the decommissioning of the ISS has never been greater. The consequences of such a gap cannot be

² <https://www.axiomspace.com/axiom-suit>

³ <https://www.nasa.gov/news-release/nasa-selects-first-commercial-destination-module-for-international-space-station/>



overstated; it will result in ceding our role and position as a leader to China, a role that – once lost - we may never get back.

Let me be clear that Axiom Space is working as quickly and diligently as possible to build our space station to provide a safe and very capable destination for NASA and our commercial customers. We have a plan to build our station on the open port and to detach from the ISS in time to enable the arrival of a U.S. deorbit vehicle designed to ensure the safe decommissioning of the ISS. I have included some recommendations at the end of this testimony offering as many options as possible to hedge against a gap in LEO. The remainder of my testimony will discuss both the threats and the mitigations Congress should take note of immediately.

First, NASA is currently pursuing a CLD strategy based on the Commercial Cargo and Crew programs. These programs used government resources and investment to fund multiple space companies' development efforts. The policy objective was to create and maintain redundancy in both cargo and crew access to the ISS at reduced cost to NASA relative to traditional acquisition approaches, while helping to develop a commercial market for transportation services in the belief that reduced prices for services would help spur commercial development of low-Earth orbit as a key policy outcome. With the benefit of hindsight, while some of these objectives were met by the program, others were not. More than ten years on, transportation costs are rising and, while greater frequency of flights to orbit have spurred new business cases, the LEO market itself is still emerging.

Now NASA is repeating history with the CLD program, providing very little funding across four (now three) companies with the ultimate objective of eventually awarding a services contract to one or more firms once their platforms are operational. Much more is needed. As an example, Axiom Space's contract with NASA provides ~5% of the funding needed to build Axiom Station; the rest must come from financing and revenue. By pursuing the procurement in this manner, NASA is violating several of the conditions that contributed to the partial success of the earlier programs: (1) unlike the transportation demand associated with the ISS, NASA does not have a large enough demand to sustain even one commercial station; (2) it is diluting an emerging market; (3) it is waiting too long to understand both cost of services and establishment of contracts, raising concerns among investors; and (4) it is investing a pittance of the required dollars (NASA's investment in commercial crew was between 80% and 90% of the cost of developing the vehicles).⁴ While doing all of these things it is wasting money on companies that it will never select.

Axiom Space believes the deficits in this approach are working directly against the stated objective of Congress that there be continuous American presence in LEO – in other words, that the ISS transition must occur without a gap – by artificially interfering in the investment and

⁴ U.S Government Printing Office. "Recent developments in NASA's Commercial Crew Acquisition Strategy". Hearing before the Committee on Science, Space and Technology, Friday, Sept 14, 2012. Accessed on February 8, 2024 at <https://www.govinfo.gov/content/pkg/CHRG-112hrg76234/html/CHRG-112hrg76234.htm>



customer markets for these services and by delaying the start of follow-on contracts. For these reasons, among others, it has been our position for some time that NASA must down-select to at least two companies immediately and invest its resources in ensuring at least one is operational in time for the ISS to be retired by the end of the decade, beginning by awarding contracts to providers sooner rather than later. Doing so will help support investor certainty and provide focus for market demand upon which commercial platforms depend.

Very recently, an attempt was made to include funding for a U.S. Deorbit Vehicle in the National Security Supplemental, to ensure that the ISS could be deorbited safely. However, neither the House nor the Senate version of the bill includes this language. If history is any guide, given the budgetary outlook – which includes a continuing resolution and disparate markups for 2024 between the House and Senate – the Administration will try to solve the problem based on budgetary constraints alone. To be sure, the staff at the Office of Management and Budget (OMB) have been given budget targets to meet, and they are exceptionally skilled at meeting those targets, but it is in moments such as these that it is incumbent upon the elected leaders of Congress to step in to take ownership of U.S. space policy and preserve our leadership position.

An immediate course correction by Congress is needed.

Let us be clear about the situation we are facing. The budget for the Space Operations Mission Directorate includes monies to fund the purchase of cargo flights that provision the consumables needed to keep crew alive and conduct critical maintenance onboard the ISS, as well as the supplies and payloads necessary to carry out research, advance technology development, and provide for the greatest possible commercial use of space – a policy initiative of the U.S. Congress that has been reinforced over numerous NASA Authorization Acts and commercial space legislation.⁵ These same scientific and research programs also produce key scientific and technology development results needed to ensure the success of the Moon to Mars enterprise upon which NASA has embarked, at the direction of this Committee.⁶

If ISS funding is not maintained at least the 2023 level, together with funding for the deorbit vehicle made available through a supplemental or added to the NASA budget through appropriations, it is not hard to see that the United States will be forced to begin stepping down ISS operations because it simply cannot afford to provision a full crew complement, or cannot afford to conduct science at capacity (as it is doing now) – or cannot afford to support commercial activities, including Private Astronaut Missions, which have been so critical in

⁵ “The Congress declares that a priority goal of constructing the International Space Station is the economic development of Earth orbital space.” Section 101(a) of the Commercial Space Act of 1998.

<https://www.congress.gov/bill/105th-congress/house-bill/1702/text>

⁶National Academies of Sciences, Engineering & Medicine, Space Studies Board, Committee on Biological and Physical Sciences in Space (2023). “Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research – Decadal Survey for 2023-2032.”



establishing market demand in low-Earth orbit – and on which a successful ISS transition depends.

Without Congressional action, these impacts may begin as early as *next year (2025)*, in effect beginning the end of the ISS program 5 years earlier than mandated by Congress. This in turn will make it much more difficult to establish and build the markets necessary for commercial space stations to develop and succeed, putting even more pressure on ISS transition. With regard to the “commercial element” – Axiom Station – this funding is important to ensure that the ISS can complete the modifications necessary to accept the module. Without this, the ability to transfer critical research facilities representing millions of dollars of U.S. investment from the ISS to the Axiom module – literally over the threshold – will be lost.

This would be a national embarrassment.

One additional, little-discussed consequence of a gap in LEO is that it will decimate the commercial transportation industry that has been built up over more than 15 years, an industry that governments across the globe are now trying to emulate. To date, Congress has funded crew and cargo transportation from development and across multiple NASA contracts to the tune of more than \$14B of taxpayer dollars.^{7 8} This investment has created the underpinnings of a true space infrastructure, and helped further U.S. leadership in space – but transportation in space, as on Earth, requires a destination. With nowhere to go, it is unclear if any company will be able to afford to maintain this capability on the part of the United States with the exception of SpaceX – though it too will suffer losses. Most of the capability – and billions in investment – will be lost.

This outcome – entirely foreseeable as of this moment – would be nothing less than a tragedy of failed American leadership, with reverberations across the globe. This is not how national policy should be made nor how it should be implemented. With rare exception (defined in Article II of the U.S. Constitution), U.S. national objectives should be set by the people’s elected representatives and implemented by the executive agencies. By starting the decision-making process with a budget priority and then flowing down strategic objectives, our country is giving up on our global leadership in favor of short-term tactical budget prerogatives, and Congress is surrendering its policy-making role.

Congress was clear in the NASA Authorization Act of 2005, which it reinforced in the NASA Authorization Act of 2010; “it is the policy of the United States to possess the capability for human access to space on a continuous basis.”⁹ In the 2010 NASA Authorization Act, Congress

⁷ National Aeronautics and Space Administration. “Commercial Crew Program Essentials.” Accessed February 7, 2024 at <https://www.nasa.gov/humans-in-space/commercial-space/commercial-crew-program/commercial-crew-program-essentials/>

⁸ Foust, J. (2023). “NASA proposes final extension of ISS cargo contracts”. Space News, March 5. Accessed February 7, 2024 at <https://spacenews.com/nasa-proposes-final-extension-of-iss-cargo-contracts/>

⁹ Section 501(a) of the National Aeronautics and Space Administration Authorization Act of 2005 <https://www.congress.gov/bill/109th-congress/senate-bill/1281/text>



reinforced and built upon this policy; “the long term goal of the human space flight and exploration efforts of NASA shall be to expand permanent human presence beyond low-Earth orbit and to do so, where practical, in a manner involving international partners.”¹⁰ One of the key objectives of this Policy is “... to sustain the capability for long-duration presence in low-Earth orbit, initially through continuation of the ISS and full utilization of the United States segment of the ISS as a National Laboratory, and through assisting and enabling an expanded commercial presence in, and access to, low-Earth orbit, as elements of a low-Earth orbit infrastructure.”¹¹

With these requirements, Congress set a vision for the future of low-Earth orbit that has guided this nation for almost 20 years, and yet, decisions are being made to trade away this critical goal in favor of short-term budget priorities to the detriment of our international competitiveness. For evidence that commercial entities can build upon the legacy of the ISS as a potent instrument of American soft power, look no further than the Private Astronaut Missions we at Axiom Space have flown over the past 2 years. To date, we have flown crews hailing from 8 nations in just three flights including the first Arab woman in space and the first all-European commercial astronaut mission just completed on Ax-3 last week, where first-time nation Türkiye joined Italy, Sweden and the U.S. to expand human presence in low-Earth orbit. These missions are helping to increase U.S. leadership in space, as new countries follow the U.S. into space exploration in low-Earth orbit.

Most urgently and importantly, all of this is taking place against the backdrop of an intense and highly focused competitive space program funded by China. The issues I have described above are not only threats to the ISS transition, they are threats to U.S. national security. In written testimony I provided to the Senate in 2021, I described China’s strategic application of military-civil fusion (MCF) to the space sector since 2013, with the goal of increasing the flow of information, technology and expertise between China’s growing defense industrial base and the commercial space sector. At that time, there was virtually no commercial space sector; however, in 2014 the government opened the financial pipeline to commercial companies and allowed private capital to enter alongside government funding. By 2018, *over \$58B* had entered MCF-targeted sectors, including commercial space.¹²

Fast forward to 2023. In the past year, China conducted 66 orbital launches of which 64 were successful. With 12 launches, China’s Chang Zheng 2D was the second most-flown orbital rocket in 2023, behind Falcon 9 which flew 92 times. China Landscape, a private company, launched the world’s first methane-based rocket twice in 2023. And the Chinese company, i-space,

¹⁰ Sec. 201(a) of the National Aeronautics and Space Administration Authorization Act of 2010
<https://www.congress.gov/bill/111th-congress/senate-bill/3729/text>

¹¹ Sec. 202(b)(1) of the National Aeronautics and Space Administration Authorization Act of 2010
<https://www.congress.gov/bill/111th-congress/senate-bill/3729/text>

¹² Dittmar, M. L. (2021). Testimony before the U.S. Senate Committee on Commerce, Science and Transportation Subcommittee on Space and Science. Accessed February 8, 2024 at
<https://www.commerce.senate.gov/services/files/06C46EFB-D05F-4440-AA5F-7128ADBC5F43>



completed two hop tests in preparation for its new reusable rocket, Hyperbola-3 rocket, planned for 2025.

This pace is breathtaking. None of these capabilities existed 5 years ago. Year by year the funding pouring into the space sector in China far eclipses that of the United States. The results are plain to see to anyone who is looking. And there is more to come: Just last week the Beijing municipal government released a commercial space industry plan intended to stimulate the sector over the next five years (2024-2028).¹³

In low-Earth orbit, meanwhile, the Chinese have established Tiangong, an orbital space station that continues to grow in size and capability. China recognizes and exploits the power of utilizing low-Earth orbit to extend their influence, elevate national prestige and deploy soft power. China's plan to deploy over 1,000 payloads on Tiangong, and their partnership with the U.N. to select and operate international payloads has garnered worldwide attention. American companies preparing to operate commercial platforms in LEO are keenly aware of the threat posed by the Chinese station to their business models as China subsidizes flights, payload development, and science.

A gap in American presence in low-Earth orbit will enhance China's position globally, cement their "business case", and place American orbital platforms in a position where they must fight to regain lost market share on an uneven playing field with an entrenched competitor. In the face of uncertainty and an absence of American capability, international industry and scientific institutions will be forced to partner with the Chinese in order to ensure their ability to continue to operate in low-Earth orbit. The impact on the new economy being developed in space will be significant, causing a decline in the number of companies trying to utilize the microgravity environment. We have seen this pattern before, where the United States develops a capability and then China steps in to advance it and compete head-to-head. In low-Earth orbit, a gap will set up the same situation, with the U.S. falling behind China and once again importing rather than exporting technology and expertise to the rest of the world.

This future cannot be permitted. We must act to preserve our ability to have an orderly transition for the ISS and to ensure that there is no gap of American presence in LEO. Axiom Space believes that this issue is too important and the stakes are too high not to be as clear as possible: If we have a gap of American presence in low-Earth orbit, the only winner will be China. They are investing mightily in their space power, and they will eclipse us if we do not transition correctly (effectively?). We offer the following recommendations:

- 1) Include language in a new NASA Authorization Act that reinforces and makes crystal clear that it is the policy of the United States to maintain continuous American human presence in low-Earth orbit – in perpetuity.

¹³ Jones, A. (2024). Beijing government releases commercial space action plan. [Space News](#), Feb 9.



- 2) Reinforce that it is the policy of the United States to encourage and enable the fullest commercial use of space – a policy first put forth by Congress in 1990¹⁴.
- 3) Ensure that the ISS program remains at capacity through its end of life in 2030, supporting the fullest use of the ISS for exploration, science, technology development, and commercial activity.¹⁵
- 4) To enable that goal, authorize the ISS program funding at the 2023 level at minimum in 2025, and authorize funding for the U.S. Deorbit vehicle *in addition*.
- 5) Authorize the flight of the ISS through 2030 with the possibility of extension until one commercial station is operational
- 6) Direct NASA to accelerate contracts to CLD providers – for example, technology development contracts for proposed capabilities on orbit.
- 7) Authorize funding of the CLD program at \$295 million.
- 8) Proceed with a down-select, as described.
- 9) Appropriate funds for the CLD program commensurate with authorization.

The elected representatives of the people have the authority and the responsibility to ensure that U.S. national objectives are met and that our global competitors and adversaries do not outpace us in this strategic domain. If we leave the decision to unelected budget officials in our government, we will never reach your goal of the “fullest commercial use of space.”

Thank you for your time and attention, and I look forward to your questions.

¹⁴ 15 USC 20102(c)

¹⁵ Sec. 502. National Aeronautics and Space Administration Authorization Act of 2010