



STATE OF THE SPACE INDUSTRIAL BASE

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INTRODUCTION

In the decades following the lunar landings and the U.S. victory in the space race, the American space sector was largely dominated by government investment in large and well-known aerospace companies. While this period yielded several groundbreaking advancements in space technology, including the launch of the Hubble Space Telescope, the International Space Station and Space Shuttle program, and the first Mars rover landings, it was also characterized by exorbitant costs and difficulties obtaining the funding necessary to wholeheartedly pursue many worthwhile space ambitions. However, the United States is on the verge of a new space age, one seeing the infusion of provost investment, the opening of opportunities to smaller, more agile companies, the growth of new players, and, with lower barriers to entry, the participation of many more nations.

In this new space age, the United States can once again solidify its continued leadership in an innovative and exciting era of space technology, exploration, and security. To do this, policymakers must grapple with the realities of competition with China and pursue advanced degrees of public-private sector integration to ensure cost-effective and innovative solutions to the most challenging space complexities. The *State of the Space Industrial Base Webinar*, co-hosted by the Emerging Technologies Institute

(ETI) and the National Defense Industrial Association (NDIA) Space Division on January 11, 2023, addressed these concerns.

This webinar brought together the authors of the recent *State of the Space Industrial Base 2022* report, published by the Defense Innovation Unit (DIU), and leading industry experts, to discuss critical steps the United States must take to maintain its leadership position in space vis-à-vis China. Specifically, the authors provided an in-depth look at key issues covered in the report that are essential to the ongoing success of the space industrial base and to the future of U.S. leadership in space. Topics included the need for the U.S. government to articulate a national vision for space; ways that the U.S. can accelerate domestic manufacturing and strengthen supply chains for the space industry; given increased Chinese investment in science and technology (“S&T”), steps the U.S. must take to maintain its leadership in global research and development and to transition innovative products and services into operational use; and industry perspectives on the health of the space industrial base and how the government and industry can work together to promote innovation, strengthen the sector, and ensure that the U.S. is the technological leader in this critical area. This report outlines some of the key observations and recommendations derived from the webinar panels.

PANEL 1 KEY POINTS

The first panel consisted of key government authors of the *State of the Space Industrial Base 2022* report who provided the following observations and recommendations:

America has entered a decisive decade in space. The space sector shows enormous economic potential and is expanding into a highly profitable investment domain while also demonstrating a profound ability to influence the security environment. Advanced space capabilities supplemented by the private sector can be used to both achieve substantial advantages on the battlefield, and to deter conflict from erupting altogether. This is particularly important given the ongoing U.S.-China technological competition. Because of the complex and intertwined ecosystem of the space industry, policymakers must provide a “North Star” style of leadership. This leadership requires a cohesive vision to unify the many disparate public and private sector elements necessary for sustained success, and must include a clear roadmap to the future of American space policy. A shared understanding of aspirations and anticipated limitations is vital to a successful partnership, and allows industry to plan, invest, and build for the future. The current approach has proved to be insufficient and lacks the unifying clarity that would draw together all levels of development.

Space initiatives can lead not only to success in strategic competition, but also to groundbreaking advancements in economic, health, and national security sectors. Space has long been a source of growth and innovation, and this trend will likely continue for decades to come. To facilitate these advancements, an adequate and well-equipped workforce is vital. The United States is currently underperforming in the production of both engineering and science talent, and STEM-related fields are likely unable to handle the demand necessary to facilitate a well-functioning space industrial base. Without increased numbers of STEM graduates, the space industrial base will continue to experience shortages of much-needed talent.

While bureaucratic limitations and processes have historically created substantial barriers to technological innovation, existing laws and processes in the space sector provide an adequate foundation for advancing the capabilities of the space industrial base. However, bureaucratic limitations may eventually become a factor after successful technological advancements push the boundaries of existing processes and practices beyond their original scope. This may be particularly evident in workforce limitations and the frequent over-classification of important data. Efforts to future-proof these areas will ensure the success of the rapid space acquisition efforts that are necessary to better synchronize government objectives with emerging capabilities and technologies.

RECOMMENDATIONS

With these key points in mind, the government panel put forth the following recommendations to ensure the ongoing success of the space industrial base and the solidification of American leadership in the space sector:

Relevant officials in the U.S. government should clearly articulate a unifying and cohesive “North Star” vision. This vision will serve to guide future development of the space industrial sector and will bring together traditionally disparate interagency and institutional elements. By emphasizing an ardent desire to expand into space, this vision will allow government and industry to plan, invest, and build for sustained future success. This success will be foundational to continued American leadership in the space sector.

Throughout the development cycle, the U.S. government must reassure the commercial sector that capabilities developed during the initial investment period will be transferred into meaningful contracts. Agencies should better utilize existing rapid acquisition authorities to provide industry with an opportunity to secure funding on an efficient and cost-effective timeline. This incentive is vital to ensure partners take the necessary risks to reach truly innovative capabilities. As meaningful contracts become more common, trust and comfort will expand and ensure a healthy and productive long-term partnership.

The U.S. government must emphasize initiatives that get the public excited about space. There are ample opportunities to advance the economy, security, health, and survivability of the human race by continuing to expand in space, and it is vital that the public be made aware of the substantial returns on investment that are possible in the space sector. Relevant agencies should send representatives to encourage key professions in both primary and secondary schools, and future opportunities within STEM fields should be widely disseminated. Social media and other widely available content consumption platforms should be

leveraged to promote space-related content and opportunities. Space exploration, particularly regarding efforts to probe other worlds and the deepest recesses of the universe, has long been a topic that has exhilarated and intrigued the American public, and considerable effort should be dedicated to reigniting this interest.

The U.S. government should begin to address any current or future bureaucratic limitations that may hamper the success of the space industrial base. Relevant officials should ensure that government components of the space industry are adequately staffed and trained to ensure future innovation is not stagnated by backlogs of paperwork or other bureaucratic obstacles that arise from perennial understaffing. Models should be created to predict future staffing needs based on the intended growth of the space sector and future budget requests should incorporate this data to secure funds necessary for staff expansion. If launches increase, officials handling the necessary bureaucratic processes should also increase. Further, U.S. officials must begin to consider the issue of over-classification and the barriers it poses to establishing relationships with partners, allies, and like-minded thinkers.

The U.S. government should encourage commercial vendors to build smaller systems that take less time to deploy than their larger counterparts to better facilitate the rapid acquisition process. The industry should be encouraged to prioritize a three-year development-to-launch cycle and build modular systems that can be easily improved as new technologies become available. Firm, fixed-price contracts should be used where possible to manage the risks of development. These efforts would greatly reduce acquisition timelines.

The observations and recommendations put forth by the authors of the *State of the Space Industrial Base 2022* report provide a deeply insightful path forward for the space industrial base. The remainder of this report will provide key points and recommendations from a second panel of key industry leaders from the space industrial base.

PANEL 2

KEY POINTS

The commercial sector of the space industry has evolved into an enormous enterprise, providing innovative approaches and ideas that can be a tremendous asset to a host of American space initiatives. While government programs are often inhibited by the realities of bureaucratic processes and restrictions, the commercial sector has substantial propensity for risk, innovation, and creativity if given the right circumstances. Despite these advantages, the space industry has long been associated with prohibitively high costs. While profit is necessary, it should not be excessive and should not flow regardless of performance. By analyzing and moderating the relationship between realistic profit, efficiency, and performance, the public and private sectors should be able to build effective and lasting relationships that enable the level of risk-taking necessary to innovate.

The commercial space industry would benefit enormously from the “North Star” national vision proposed by government officials. An inconsistent demand signal is one of the top barriers preventing the U.S. government from articulating and implementing a national vision. A clear demand signal demonstrates the future of the market and provides stability as the national vision is implemented and expanded. Trust and stability are central elements of removing the demand barrier and should be encouraged during all phases of a partnership. Along with clear demand signals, reliable supply chains are a vital component of the growth and success of the space industrial base. The vulnerability of these supply chains was glaringly obvious throughout the COVID-19 pandemic, and steps must be taken to guarantee continued access to critical raw materials and components. The development of a national vision is central to convincing relevant parties to prepare for future demand, providing stability and guidance for supply chain expansion.

Finally, coordination with allies is key to maintaining the lead over China in research and development efforts. For decades, the United States has fostered reliable and productive relationships with the United Kingdom, Germany, Canada, Australia, Japan, and many others. Given the potentially extreme financial burden of space development, these alliances must be harnessed to rapidly expand the technological advancement of participating nations at a reasonable cost. The alliance system should also be used to diversify resource reliance to prevent dependency on single or sole sources of vital components. Given the significant advantages of the United States' many alliances, there is no need to attempt to outpace China alone.

RECOMMENDATIONS

With these key points in mind, the industry panel put forth the following recommendations to ensure the ongoing success of the space industrial base and the solidification of American leadership in the space sector:

All relevant parties should encourage the creation of positions on both sides of the government-industry partnership to monitor and facilitate ideal profit margins and performance in public-private sector relationships. Analysis will reveal what is working and what changes need to be addressed while simultaneously developing personal relationships between relevant individuals to facilitate an ongoing dialogue. Dynamic conversations with customers regarding risk tolerance should be encouraged.

When articulating a national vision for the future of the space sector, the U.S. government must ensure persistent and reliable communication to generate a compelling demand signal. Timely and efficient interactions with the commercial sector should be emphasized, and the North Star vision should be regularly demonstrated as the focal point of the initiative. This vision will allow

industry leaders to understand the future goals of American space policy and will therefore encourage industrial planning and investment for the future. Any anticipated changes in goals or planning should be immediately communicated with industry to help build a stable, trusting partnership. Once future goals and relevant supply chains are identified and evaluated, industry leaders should take steps to secure alternative sources of vital components to avoid the pitfalls of overreliance on one manufacturer, country, or region.

The U.S. government should increase efforts to collaborate with allies on technology and innovation. Officials should arrange recurring technology-focused summits designed to connect top government and industry representatives. These summits should be leveraged to develop innovative ideas, shared goals, and planning for future collaboration. International partnerships can alleviate development costs and provide a significant competitive edge in the competition with China. Wherever possible, there should be information sharing and the open and frequent exchange of ideas to facilitate trust and relationship building. Finally, efforts to develop resource alternatives should be incorporated into alliance discussions.

The U.S. government should expand efforts to analyze the overclassification of valuable data that is vital to the success of both domestic and international partnerships. Overclassification presents major barriers to rapid innovation and can easily lead to the disintegration of partnerships if not addressed in an efficient and considerate manner.

The success of the space industrial base will provide an enormous advantage to the United States as it attempts to solidify its leadership position in space. While there are some challenges, the combined perspectives of government officials and industry leaders provide an intricate and promising roadmap for the future of America's space ambitions.

CONCLUSION

In what will likely be a decisive decade, the United States again has the opportunity to lead the international community into the next age of space advancement and exploration. As its capabilities expand, the U.S. can shape a new era of international frameworks and standards in space, offering enormous advantages to its allies and industries. While the panelists offered many areas within the American space industrial base that would benefit from a new, improved approach, all agreed that the space

sector is well on its way to a promising future. Innovations in the space industry can have an unrivaled impact on the terrestrial economic, health, and security sectors, and have the potential to propel technological developments to unprecedented heights. If guided by a "North Star" national vision, the space industrial base will be the catalyst that solidifies the American advantage against its competitors for years to come.

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