

2021 AIAA STATE OF THE INDUSTRY REPORT

The Health and Future Outlook of the Aerospace Industry

EXECUTIVE SUMMARY

This report summarizes the findings from a survey of approximately 1,000 people conducted by Edge Research on behalf of AIAA in April 2021. Respondents were from across the United States and 37 other countries. Respondents included AIAA members – current aerospace professionals, academics, students (master’s and Ph.D.) – and nonmembers.

EXECUTIVE SUMMARY

Commissioned by the American Institute of Aeronautics and Astronautics (AIAA), the “2021 AIAA State of the Industry Report” captures insights from a survey of AIAA members and stakeholders across the global aerospace industry. AIAA is the world’s largest technical society dedicated to the aerospace profession. AIAA membership comprises nearly 30,000 professional and student members from 91 countries and 100 corporate members who are shaping the future of aerospace.

The findings reveal top-line perspectives on the future outlook of the aerospace industry overall, which sectors are promising and which are challenged, the impact of COVID-19, where policymakers should focus, and how employers are demonstrating a commitment to diversity, equity, and inclusion. The data spans the three AIAA domains – Aeronautics, Aerospace Research and Development (R&D) and Space.

This Executive Summary provides the initial insights included in the “2021 AIAA State of the Industry Report.” The full report will be published in September and accessible online for all AIAA members.

“The advances in aerospace technology and the capabilities over the last century have been essential to economic growth. The sector is integral to accelerate innovation in the 21st century.”

DAN DUMBACHER, Executive Director, AIAA

KEY FINDINGS



Industry outlook cautiously optimistic

The outlook on the aerospace industry is cautiously optimistic. The mood varies widely between professionals in the United States versus those in other countries. The mood in the space sector is 82% positive, while it is only 75% positive in the aviation sector.



Career outlook promising

Current professionals in the industry would recommend a career in aerospace to a young person right now – with a net promoter score (NPS) of 29.



Promising sectors

There are many areas of opportunity in space, artificial intelligence, advanced manufacturing, and autonomous flight – but space has the momentum at this time.



Challenged sectors

Cybersecurity stands out among the most significant challenges – those in the United States place it as one of the top two priorities for their organizations.



Public policy priorities are clear

Stable funding, research investments, technology infrastructure, and an educated workforce pipeline are seen as priorities for congressional and executive branch action, cutting across industry sectors.



Diversity, equity, and inclusion (DEI)

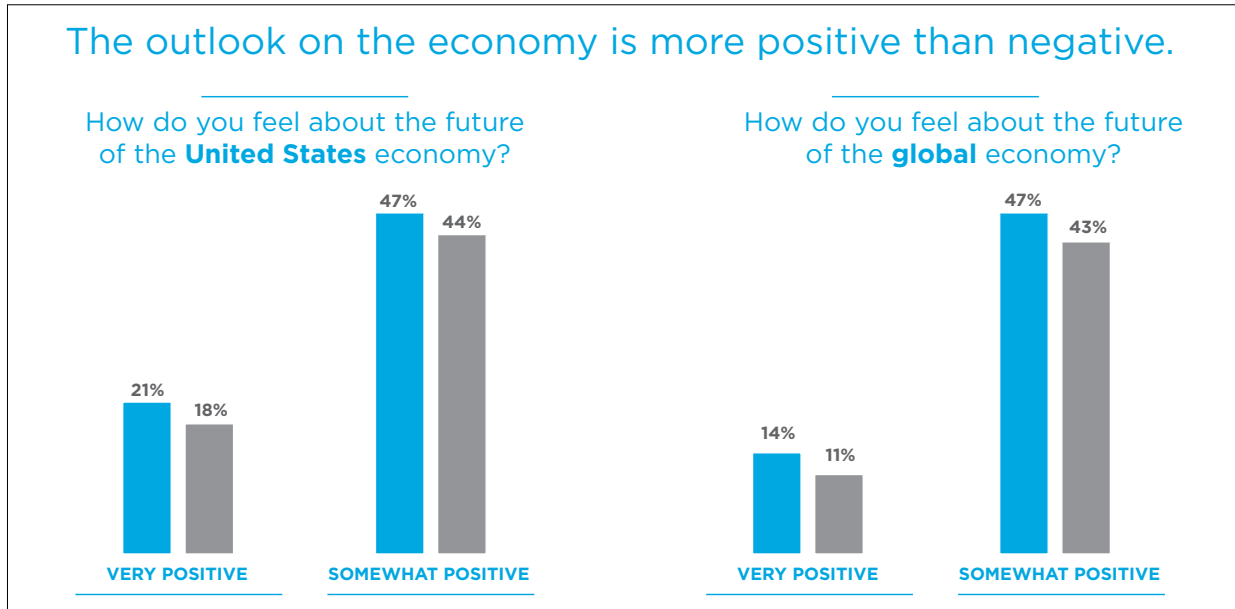
DEI is revealed as a priority and is tied to workforce development. Despite the focus, workers are not sure employers are focused on making the most meaningful changes.

THE ECONOMY AND THE AEROSPACE INDUSTRY

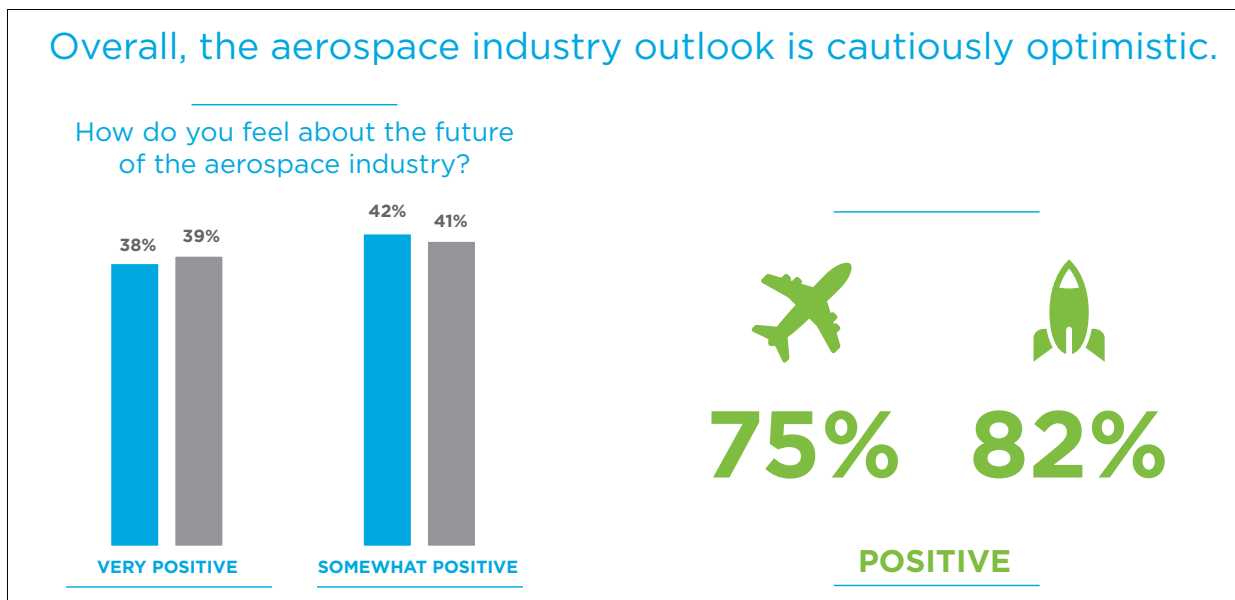
The multi-trillion-dollar aerospace enterprise in the United States includes major corporations, small businesses, federally-funded laboratories, and research universities, as well as airports and military installations. Its extensive presence includes a vast global supply chain. All these stakeholders are focused on innovation and implementation to stay on the cutting edge of research and development, production, and operations.

The overall mood from respondents shows they believe the U.S. economy is moving in the right direction, with only slightly lower expectations

about the global economy. Respondents from the United States are more optimistic in general, with international colleagues less optimistic.



When asked how they felt about the future of the aerospace industry, not surprisingly, members of the aviation sector are more subdued than those in the space sector.

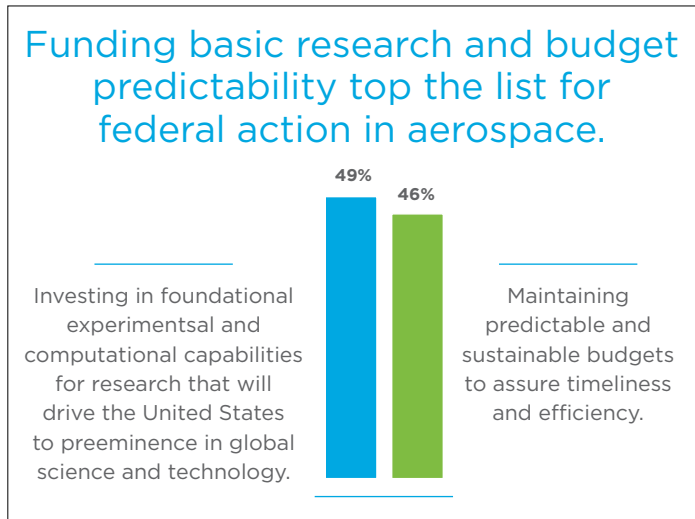


PUBLIC POLICY PRIORITIES

AIAA is the voice of the aerospace profession, giving its members an effective say in policy decisions affecting aerospace. Since 1972, AIAA has contributed technical expertise to Congress and the executive branch, providing accurate information to decision makers and highlighting the crucial role aerospace plays in economic and national security and in our technological future.

Based on this survey, the top priorities for attention by the current U.S. Congress and administration must be:

- › Investment in foundational experimental and computational capabilities for research
- › Maintaining predictable and sustainable budgets to assure timeliness and efficiency
- › Enhancing the pipeline of STEM-competent workers from within the United States



“It is imperative that Congress make investments in U.S. aerospace R&D. The result will be innovation that leads to new and better products that will create additional jobs, while providing economic and physical security. The Institute’s members agree.”

DAN DUMBACHER, Executive Director, AIAA

Making the Case for R&D Investment

While there has been a recent uptick in federal R&D funding and the United States still represents nearly half of global aerospace R&D spending, other nations continue to close the gap by investing significantly in technologies critical to aerospace and defense. According to analysis from the American Association for the Advancement of Science, federal R&D spending as a percentage of gross domestic product (GDP) had dropped from 1.9% in the mid-1960s, at the height of the Apollo program, to less than 0.7% in 2018. In comparison, China’s research intensity has increased sharply, with spending climbing 10.3% to 2.44 trillion Chinese yuan (\$378 billion) and accounting for 2.4% of its GDP in 2020.

AIAA established funding stability and competitiveness as one of its 2021 Key Issues because a predictable funding environment and long-term authorizations ensure stability and are foundational for successful research and development. The technologies and products developed for aerospace and defense applications have been at the heart of the technology boom and will continue to be at the forefront of rebuilding and growing the economy while providing security from global economic, military, and health threats. Maintaining near-term business health, coupled with a long-term perspective, will drive the difficult choices needed so the nation can best plan for and execute initiatives critical to a secure and economically robust future.

Maintaining Stable Funding

The aerospace industry has experienced growth in recent years because of a strong commercial market and increased government investment, but major challenges have emerged that have been compounded by the pandemic. These challenges include mounting budget deficits, trade policy uncertainties, supply chain disruptions, and global competitors investing heavily in military modernization, commercial development, and scientific research.


This study confirms what the Institute already advocates for – the need for lawmakers to continue funding stability, the need for continued investments in R&D, and legislation that will continue to enhance diversity in the workforce and educate the next generation of aerospace engineers. Across academia, government, military, and the space and aviation sectors, stable funding is critical to the work they are doing, and this budget predictability is key for all three of the AIAA domains – Aeronautics, Space, and Aerospace Research and Development.

AIAA encourages stable and dependable government budgets that align with clear and achievable goals to provide the means to conquer the technological challenges we face across the industry. This is particularly important as government budgets are stressed with the pandemic response and addressing the needed public health and economic priorities. The technologies and products developed for aerospace and defense applications have been at the heart of the American technology boom and will continue to be at the forefront of rebuilding and growing the economy while providing security from global economic, military, and health threats.

Ensuring a STEM Workforce Pipeline

All sectors agreed that enhancing the pipeline of STEM-competent workers from within the United States is extremely important to the health and well-being of the aerospace industry.

AIAA established workforce development as one of its 2021 Key Issues because the United States faces a skills gap in this future workforce due to significant hiring and retention challenges. These include achieving greater workforce participation by women and ethnic minorities, retaining qualified and trained personnel because of recruitment by other industries, processing background checks without long delays for classified work, losing knowledge from early retirements, and hiring well-qualified international workers without impediment. A sizeable percentage of the workforce is approaching retirement eligibility, and the skills gap will be exacerbated by mass layoffs and career switches as a result of the pandemic. AIAA believes industry leaders and policymakers must work together on an urgent basis to address the forecasted demand for highly skilled workers.



2021 AIAA KEY ISSUES

AIAA urges decision makers to enact and support policies that will allow sustainment of the vital aerospace and defense (A&D) industry each year and result in a robust and world-leading A&D sector. Actions taken (or missed) now for the industry will affect it for many years to come. Read the [2021 AIAA Key Issues](#).

“We face a skills gap in this future group of dreamers and leaders. AIAA believes we must enable a diverse and robust STEM workforce pipeline, and support workforce development for all skill types and career stages to advance learning commensurate with technology and product advancement. It is essential to continue attracting and retaining the skilled, diverse 21st-century workforce who will lead our industry into the future.”

DAN DUMBACHER, Executive Director, AIAA

COVID-19 IMPACT

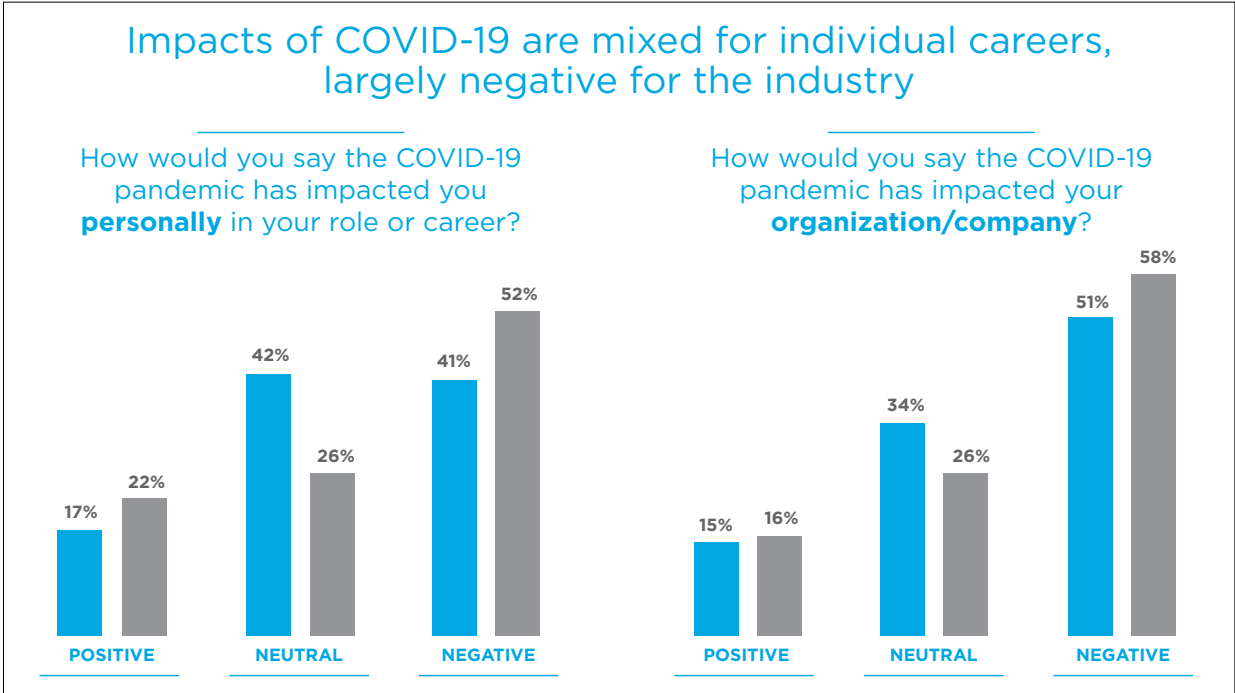
Well over a year into the pandemic, the challenges of COVID-19 need little introduction. As one of the areas most directly and dramatically affected by its economic impacts, the aerospace industry has quickly pivoted to change how it operates, while simultaneously leveraging the talents of its community - to make and transport PPE for medical personnel, rapidly design new ventilator solutions and donate component parts to ventilator manufacturers, assist with supply chain and global sourcing needs, donate meals to help combat food insecurity, and accelerate hundreds of millions of dollars' worth of payments to small business suppliers.

While the commercial air travel industry dropped significantly in 2020, innovation in mobility did not. The data show how those challenges impacted business operations across sectors, the industry's recovery since the pandemic's onset in the United States, future projections, and opportunity ahead.

- › Aviation industry recovery will first occur within domestic markets and eventually spread to international travel. While domestic travel within the United States and within China have nearly recovered to pre-pandemic levels, recovery of this magnitude is a long way off in other parts of the world. The reasons are varied, but access to the vaccine is key.
- › The aviation industry has or will regain the trust of the flying public because of numerous risk mitigation initiatives introduced into airport operations and in airplane cabins. A large-scale shift away from physical air travel driven by permanent telework and shrinking travel budgets is unlikely, as customer-facing business will eventually drive

increased demand. However, the sector should prepare for some degree of structural change in travel within companies.

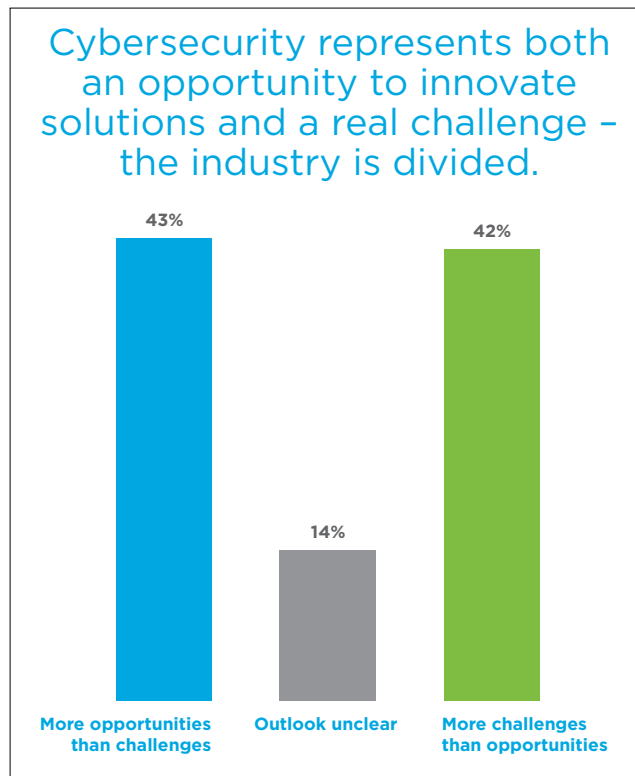
- › Sustainability, the transition to carbon neutral aviation, and the electrification of aircraft propulsion systems are high priorities for the industry - and should be. However, new levels of interdisciplinary collaboration are required for long-term success. If we are to make the needed progress, we must shorten product development cycles and make full use of tools such as model-based systems engineering.
- › Over 40% of U.S. aviation and aeronautics professionals surveyed said COVID-19 had a negative impact on their careers and them personally, while more than half said the pandemic negatively impacted their organization. Drilling down into the numbers we see that COVID-19's level of impact on industry professionals varies by individual career.



UNITED STATES INTERNATIONAL

AEROSPACE CYBERSECURITY CHALLENGES AND OPPORTUNITIES

This survey affirms the concerns of the aerospace community around cybersecurity. In fact, cybersecurity was viewed as an increasing concern with 18% of respondents saying cybersecurity was the most concerning area of emerging technologies. Many respondents feel cybersecurity threats are difficult to understand.



The Voice of the Community

“WE’RE BEHIND, AND IT WILL BE HARD TO CATCH UP.”

“CENTRAL TO MOST AEROSPACE SYSTEMS GLOBALLY.”

“THIS CHALLENGE TRANSCENDS THE UNDERSTANDING OF MANY OF US BUT CONTINUES TO EVOLVE/ADVANCE BY THE ACTIVE FEW. THIS THREAT IS NOT REGIONALIZED NOR IS IT RESTRICTED BY RESOURCES MAKING IT THE MOST UNPREDICTABLE.”

AIAA has made a long-term commitment to bringing aerospace cybersecurity front and center. During 2020, AIAA hosted events, technical talks and presentations, and educational opportunities around the topic. Also in 2020, AIAA published a white paper

entitled “Aerospace Cybersecurity: Enduring Challenges, Enduring Solutions, Bringing Cyber Protection to the Heart of the Aerospace Industry,” describing the findings and insights from the 2020 AIAA Aerospace Cybersecurity Market Study.

“It is becoming more and more essential to address cybersecurity on an ongoing basis in the mainstream of our core processes - from the design and development of new space systems to manufacturing and production to operations.”

DAN DUMBACHER, Executive Director, AIAA

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EMERGING TECHNOLOGY TRENDS

Looking ahead, the aerospace community sees a number of exciting technology developments that will be transformational to the industry. While all new technologies come with challenges, four are viewed as having opportunities that far outweigh these challenges: advanced or additive manufacturing, artificial intelligence (AI)/machine learning, space exploration, and autonomous aircraft. These areas strongly align with the AIAA Domain approach, focusing its efforts, activities, and programming around the following three domains:



Aeronautics Domain

Supersonic and hypersonic flight are viewed by the respondents with a mixture of optimism and pessimism. On the one hand, professionals view it in the context of advancements and building on strong knowledge foundation where both the past experience of the Concorde and new learning from hypersonic weapons development can come into play. Challenges in this area center on a combination of perceived technological hurdles and inadequate funding/market support, at least as this time.

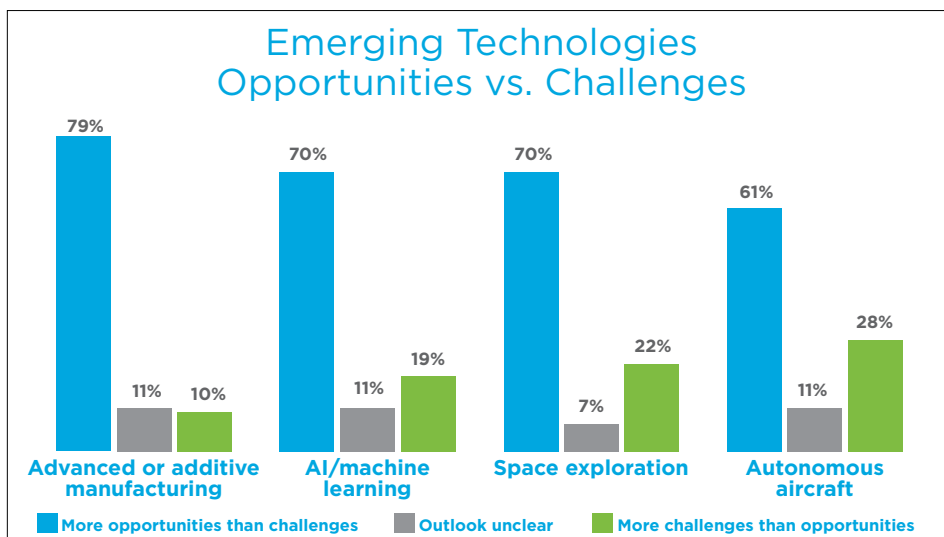
Aerospace R&D Domain

Advanced manufacturing is seen as transformational to current production practices for the aerospace industry and beyond. This view aligns with AIAA's focus on R&D investment, with an emphasis on advanced manufacturing, artificial intelligence, and machine learning to stay on the cutting edge. Excitement about this new technology is not only driven by the possibilities of new products or faster production cycles. Respondents are enthusiastic because of what advanced manufacturing can mean for space exploration and the ability to expand the space economy.

Space Domain

AIAA believes the space sector needs strong support for developing the technologies and operations for humanity's return to the moon for the long term, and continuing exploration of the solar system and beyond, among which advanced manufacturing will be foundational. Not surprisingly, aerospace professionals are extremely excited by space exploration and the intersection between growing commercial investment.

Space exploration and the development of the space economy also ties into the excitement for autonomous aircraft, as measured in the survey. AIAA believes autonomy will drive new missions and capabilities otherwise unimaginable, as well as improve performance and lower cost and/or risk for aerospace systems and their missions.



The technology trend analysis and related AIAA initiatives will be included in the "2021 State of the Industry Report."

WORKFORCE INSIGHTS

Respondents gave the aerospace industry a net promoter score (NPS) of 29. As the world's leading metric on loyalty, an NPS score of 29 demonstrates solid confidence and commitment to the aerospace industry by today's aerospace workforce – current aerospace professionals would recommend a career in aerospace to a young person right now. AIAA members scored another point higher. The overall outlook is closely tied to one's perspectives on job security and career advancement.

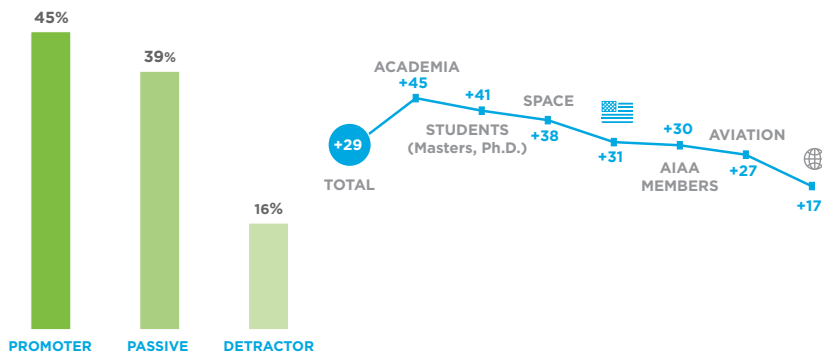
However, a wide gulf exists between U.S. respondents and international respondents. With responses coming from professionals in 37 countries outside the United States, it's difficult to gauge where the reticence is based.

Among those promoting careers in the aerospace industry, they believe current space headlines will keep people engaged and interested and because of that there will be job growth. They believe the growing STEM focus in education will create more

jobs as well, not only because of NASA's programs, but because of the rise of private sector companies working in commercial space.

Others see less opportunity for jobs. Their focus was on the likelihood of cuts to government spending creating cuts in the aerospace job market. They shared skepticism based on the cyclical nature of government funding to contractors that must constantly adjust staffing levels.

The likelihood to recommend a career in aerospace to a young person right now is high with an NPS of 29.



CALCULATING NPS

On a 10-point scale where 10 means "extremely likely" to recommend:

- Promoters= 9, 10
- Passives= 7, 8
- Detractors= 0-6

Net promoter is calculated by subtracting the percentage "detractors" from the percentage "promoters" to obtain an overall "health" score.

What is NPS and why does it matter?

NPS has become the world's leading metric on customer loyalty in the 21st century. Calculating the score is only the first part of why NPS is so valuable. The second part is how an organization uses its score to help refine and target marketing and outreach strategies. It's about improved relationship building with customers and prospects. Organizations can use NPS data to create a customer-driven culture that:

- Focuses on customer service to boost satisfaction and build retention
- Drives continuous improvement within the organization
- Understands changing customer needs leading to new product development
- Creates a responsive feedback loop to communicate with customers

ABOUT AIAA

The American Institute of Aeronautics and Astronautics (AIAA) is the world's largest aerospace technical society. With nearly 30,000 individual members from 91 countries, and 100 corporate members, AIAA brings together industry, academia, and government to advance engineering and science in aviation, space, and defense. For more information, visit www.aiaa.org, or follow AIAA on Twitter, Facebook, LinkedIn, and Instagram.