

AEROSPACE INDUSTRY REVIEW OF 2022 & PROJECTIONS FOR 2023



To understand the outlook and perspectives of organizations across the aerospace and defence industry, Deloitte (an international professional services network) undertook a survey of nearly 50 US executives and other senior leaders in August 2022. The survey captured insights from respondents in four specific industry segments: commercial aerospace; defence and military; space; advanced air mobility. The following is the introduction to the report that resulted from that survey entitled ‘Deloitte: 2023 aerospace and defense industry outlook.’

With the global economy gradually recovering from the COVID-19 pandemic, the aerospace and defense (A&D) industry has shown signs of a strong rebound in 2022, but supply chain and talent issues continue to limit the industry’s growth. According to Deloitte’s outlook survey, supply chain disruptions and talent shortages may be the biggest risks or challenges for A&D organizations in 2023. Furthermore, the Russian invasion of Ukraine (the invasion) disrupted global supply chains, especially for critical metals and rare earth elements, and exacerbated fuel price volatility. Inflation remains a challenge for the entire industry - 54% of respondents in Deloitte’s outlook survey report that price increases are one of the key risks in 2023.

As demand for passenger travel is correlated to ticket prices which, in turn, depend on jet fuel prices, a quick and sustained rise in jet fuel prices can affect traffic and increase market volatility. To address this challenge, aircraft manufacturers are investing in aircraft and engine design to make them more fuel-efficient, lower operating costs, and explore lower- and zero-emissions commercial aircraft for the future. The strong recovery in air travel is leading to increased aircraft orders and aftermarket activity. Domestic traffic levels registered about 81% of the pre-pandemic 2019 levels (in September 2022), and international traffic levels have shown strong growth with easing travel restrictions worldwide. Leading global commercial aerospace original equipment manufacturers (OEMs) estimate that global passenger traffic will return to 2019 levels by the end of 2023 or early 2024. This could, in turn, result in production ramp-ups to remediate the growing backlog and drive industry revenue in 2023

The defense segment remained stable through 2022 and is expected to outperform the commercial aerospace segment as an increase in defense budgets in the wake of the invasion is boosting demand for military equipment globally. The US defense budget for FY2023 emphasizes perceived strategic threats from China and Russia, with a key focus on electronic warfare and cybersecurity. European nations are modernizing armed forces with a planned increased budget to address rising geopolitical

tensions. These nations have announced an increase of about \$204 billion in the defense budget in the first three months of the invasion focusing primarily on future military technologies.

Emerging markets such as space and advanced air mobility (AAM) gained further traction in 2022 with more electric vertical take-off and landing (eVTOL) flight tests, and aircraft and pilot certification. Worldwide, 347 entities are currently working on more than 700 eVTOL aircraft concepts and designs, highlighting the industry's focus on the future of mobility. Meanwhile, private participation in space resulted in solid growth in the space economy in recent years. The segment witnessed 72 rockets launching 1,022 spacecraft into space in H1 2022, with the commercial sector accounting for about 94% of the launches.

According to Deloitte's outlook survey, 88% of surveyed senior executives indicated that they believe the general business outlook for the A&D industry for the next year is "somewhat to very positive." There are more reasons for this optimistic outlook. These include growth in new technologies and segments such as AAM, evolving business models in areas such as space, and the use of digital thread and smart factories. All these factors should help the industry grow and create new markets in the coming year. A&D companies focused on innovation and prepared to capitalize on new emerging opportunities could outperform their peers in 2023.

In conclusion, the report states that business agility and digital transformation will be key to staying ahead. It suggests that 2023 could see increased competition in three areas in particular:

- Digitally skilled talent (from other industries).
- Material (due to the shift of supply chains through nearshoring).
- Customers (from new players entering the AAM and space markets).

And that some of the top signposts for A&D companies to watch will be:

- *Business agility.* Achieving agility could be critical for A&D companies seeking to operate through turbulence and compete in the next growth period.
- *Emerging technologies.* Investing in emerging technologies and smart factory solutions can help companies address supply chain challenges, optimize production capacity, progress towards sustainability goals, and improve employee retention.
- *Emissions reduction.* A&D companies can further reduce emissions in 2023 across the value chain, specifically by helping ramp-up the production capability of SAF.
- *Developing business areas.* The growing interest in space, supersonics, hypersonics, and AAM will likely generate more business and employment opportunities, and the value chain may further expand in 2023.

To conclude this article we turn to BENCHMARK's 'Aerospace and Defense 2023 Industry Trends: The age of advanced digitization' by Rick Gronemeyer.

The Age of Advanced Digitization

The 2023 Aerospace and Defense (A&D) industry's shared goals focus on agility, productivity, growth, and sustainability. In order to meet these goals, however, the industry must focus squarely on digitization. To put this into perspective, for original electronic manufacturers (OEMs) to remain competitive within the A&D playground now and well into the future, digitalization is no longer an option - it's a requirement. Welcome to a reimagined 2023 where digital advancements and technical innovation generate economic growth, strengthen productivity, and help to protect our global citizens and our shared environment for generations to come. To that end, here is a look at Benchmark's top three A&D trends we see continuing to unfold in 2023 and beyond.

Trend #1: Defense Digital Twinning

In the commercial space, digital twinning is hardly a new concept. In fact, the commercial industry's ability to digitally twin electronics has been around for at least 20 years allowing OEMs to test, debug, and refine their products well ahead of manufacturing. In the defense industry, while digital twinning has several roadblocks to overcome, it is gaining traction. Defense digital twinning even appeared in the United States' 2018 National Defense Strategy. As we move forward, we expect to see demand pick up for defense digital twinning implementation as more defense primes roll up their pilot projects using digital twin strategies.

However, along with regulations requiring digital twins for all new engineering undertakings - like many other U.S. Defense Procurement reforms - there come several challenges, including the ongoing debates over defense spending. Perhaps RealClearDefense (RCD), a reputable news outlet for military and defense professionals, puts it best, stating "congressional oversight needs to focus on incentivizing efficiency and sustainability at all levels of lifecycle costs. Industry has responsibility also to help government clearly appreciate practices over buzz words, results over rhetoric."

The Department of Defense (DoD) must also overcome additional organizational and technological obstacles. At the very basic level, digital twins require specialized sensors that support the virtual twin's ability to simulate the attributes of its physical counterpart. And, if electricity allows the product to function, these specialized digital twin sensors must also be able "to accurately detect and represent the product's electricity circuits." (RCD) The main driver will be efforts on the part of defense companies toward efficiency and reduced time to market. The question for many primes will be whether to invest in sizable in-house digital twin capabilities, develop partnerships, or consortia.

Trend #2: Digitization of Training

In the coming years, specialized robotics used to train soldiers will only increase in number and advance in capabilities. One clear example is the application of robotics that do not require a rail system and the accompanying infrastructure to operate target dummies. This advanced technology offers realistic combat training opportunities in which soldiers are presented with real-life battle scenarios and aggressive human and vehicular robotic targets.

Since the training robots are not confined to a rail system, the training sessions are no longer highly repetitive and, therefore, are less predictable, strengthening a soldier's preparedness. Among the many sophisticated components these training robots require (control systems, actuators, power supply, etc.), sensors are of particular importance. Beyond acting as the robot's eyes and ears, some of the sensors control the robot's sense of touch and its movements. These specialized sensors quickly take in the robot's surroundings and swiftly process the most critical data, allowing the control system to send commands to all other components.

Outside of the training environment, AI-controlled robots can now autonomously negotiate a wide range of real-life combat environments. These advanced robots are fully aware of their surroundings and can effectively communicate with each other to successfully navigate and conquer complex tactical terrains. Overall, these advancements help to reduce risk, decrease costs, and increase combat success rate.

Trend #3: Sustainability and Resilience

The more the world learns about the looming effects of climate change, the more ubiquitous - and the more stringent - green regulations will become. In fact, since the 2015 White House publication of "The National Security Implications of a Changing Climate" report, the Federal Government's involvement in resilience measures has only intensified. As the United States Secretary of Defense, Lloyd J. Austin III puts it: "No country can find lasting security without tackling the climate crisis. Climate change will continue to shape the context for military operations -for the United States and for our competitors -which is why we must ensure that our combat forces are ready to respond to future risks and equipped to operate superbly no matter the changing conditions." Climate Adaptation Plan 2022 Progress Report.

Sea levels continue to rise, storm surges are becoming more frequent, and flooding is intensifying, all impacting the security of our critical infrastructure and military installations along our coastal areas. The effects of climate change also impact arctic regions, limiting the nation's ability to advance national security interests, pursue responsible stewardship of the land, protect local communities, and strengthen international cooperation.

As electricity consumption increases, energy production, transportation, transmission, and distribution will also be negatively impacted. Now, more than ever before, we need to embrace innovative, sustainable alternatives and execute effective action plans to directly address the growing energy crisis. Some of these promising innovations and action plans include:

Alternative Fuels. *Sustainable aviation fuels (SAFs) at scale, and new propulsion technologies such as electric, hydrogen, and hybrid, can all lead to - at minimum -viable net-zero solutions (if not eventually, zero-emission solutions). "Electric propulsion could [also] be a potential zero-emission propulsion solution for decarbonization in the long term, particularly for short-haul flights and urban air mobility." (Deloitte).*

Advanced Air Mobility (AAM). Another growth industry gaining considerable attention involves Advanced Air Mobility (AAM) - fully electric, commercial air travel. Since these specialized aircraft can be manufactured much smaller - and cleaner - than traditional commercial aircraft, AAM technology will provide a more inclusive experience for commuters at large.

Sustainable Energy for Defense Facilities. Through its efforts in building effective partnerships and incorporating environmental justice into their recent initiatives, the DoD provides a clear example of how to develop and execute an effective sustainability strategy. In their 2022 Sustainability Plan, the DoD sets some impressive goals, including 100% carbon pollution-free electricity (CFE), 100% zero-emission vehicle (ZEV) fleet acquisition, and net-zero emissions buildings, campuses, and installations.

Urban Air Vehicles (UAVs). For cargo, UAVs offer a greener, safer, and more efficient commercial delivery alternative to delivery vehicles on the world's increasingly congested roads and highways. The application of UAVs for inspection and surveillance projects also continue to increase. While these growing technologies and initiatives are indeed promising, they do come with their own set of challenges. The cost of bio-SAFs, alone, can be as much as ten times that of conventional jet fuel.

Consumer acceptance also remains a significant challenge, especially in the areas of alternative air travel. However, with increased awareness, public perception is starting to shift across geographies. A&D OEMs all need to keep their end customers' sustainability goals in mind when setting strategies and developing new productions. The real trick to overcoming challenges lies in critical partnerships with key players within the A&D industry.

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