Aerospace

The aerospace sector plays a pivotal role in shaping global transportation, defense, and technological advancements. The aerospace sector, one of the largest and most powerful industries in the United States, supplies five markets: military aircraft, missiles, space, commercial airliners, and general aviation. The U.S. aerospace sector is considered the largest in the world and is the main supplier of both military and civil aerospace hardware to the rest of the world. This report provides an overview of the current state of the aerospace industry, key trends, challenges, and what it is expected of the industry in the future.

Definition and Scope

The aerospace industry encompasses the design, manufacturing, and maintenance of aircraft, spacecraft, and related components and includes commercial aviation, defense, and space exploration. The aerospace sector is comprised of several subsectors, including unmanned aircraft systems (UAS), commercial space, airport infrastructure, and aviation security.

- Companies in the commercial space subsector design, manufacture, and launch advanced rockets and spacecraft. These companies are expected to see revenue growth as interest and spending increases in space tourism, space exploration, improved satellite communications, and laboratories in space. SpaceX, Boeing, and Virgin Galactic are a few of the companies competing in the commercial space subsector.
- Another subsector is UAS, commonly referred to as drones, is an aircraft without any human pilot, crew, or passengers on board. While drones are primarily used for military, research, and recreational uses, the main growth segment for UAS comes from drone delivery systems implemented by retail giants such as Amazon and Walmart.
- Airport infrastructure and aviation security is another aerospace subsector that continues to grow both in the United States and globally. Companies in this subsector focus on protecting the airline industry from terrorism threats, along with the identification and containment of cybersecurity threats.
- Alternative aviation fuel is an aerospace industry subsector that researches and develops alternatives fuels. Companies in this subsector develop alternatives that are environmentally sustainable and protect the airline industry from the price volatility of traditional jet fuel.

Market Size and Growth

Overall, 2023 was a year of continuous recovery for the industry, two years after the pandemic and in the wake of the Ukraine war. Revenue passenger kilometers (RPKs) increased by 64% in 2023compared to 2021 but were still only 69% of 2019's pre-pandemic record[1]. Meanwhile, many

[1] Aviation Week. "Aerospace & Defense Outlook Improving For 2024" (December 2023).

countries invested substantially in increasing their deterrence capabilities. However, as with commercial aviation, the industry suffered from supply chain disruptions caused by the pandemic and workforce shortages, resulting in similar constraints on production and margins. The space sector is also experiencing heightened demand as the number of small satellite networks and frequency of launches is growing. The space industry's value is forecast to triple to around $1.5 trillion over the next decade.

As the global economy steadily recovers from the impact of the COVID-19 pandemic, the industry experienced a strong rebound during the first half of 2023 . The aerospace sector is expected to report revenues of $741 billion for 2023 (up just 3% from 2021) and $67 billion in operating profit (up 8%), according to a PwC analysis[2]. The modest improvement in revenue fell short of expectations as surging demand in end markets experienced production constraints due to supply chain and labor challenges.

Positive free cash flow generation and financial flexibility are expected to off-set obstacles like reduced aircraft deliveries in 2023. The industry has improved fuel efficiency by around 39% from 2005 to 2019 to achieve decarbonized aviation with net-zero emissions by 2050, according to a McKinsey analysis[3]. Commercial aerospace revenues were projected to grow at 14% year over year in 2023, reaching pre-pandemic levels by 2024. Despite risks such as an economic slowdown, the occurrence of a new COVID variant, elevated jet fuel prices and geopolitical tensions, the ongoing recovery in the aerospace sector is expected to drive a 21% year over year increase in Revenue per Kilometer (RPK) in 2023. The IATA forecasts a $5 billion airline profitability in 2023, reversing the $7 billion loss in 2022. Boeing predicts a global demand for 42,595 new commercial jets by 2042, valued at $8 trillion, with the Asia-Pacific markets stimulating over 40% of the demand.

Key Players

Prominent companies in the aerospace sector include Boeing, Airbus, Lockheed Martin, Northrop Grumman, and others. The commercial aftermarket leads a continuing industry recovery. The best-performing companies in 2023 were generally those with significant commercial aftermarket exposure. Despite surging demand, the overall industry revenue increased by 3% but was less than expected due to production constraints caused by supply chain disruptions and labor shortages. Raytheon Technologies became the industry's largest company at $67 billion in revenue, surpassing Lockheed Martin, which reported a 1.6% dip. Lockheed Martin remained the most profitable company despite an 8.3% decline, reporting $8.3 billion in profit. This performance was nearly 50% above that of the second-most profitable company, Airbus, with $5.6 billion in profits. GE Aerospace reported the best profit improvement - a 66% increase to $4.8 billion.

Over the past three decades, private companies have become key players in the space economy. Corporations like SpaceX, Blue Origin, and Planet Labs, along with numerous startups, are involved in a broad range of activities. These include launching satellites, offering launch services, developing innovative technologies for space travel, and even planning for commercial space tourism. New

[2] PwC's Global Aerospace and Defense: Annual Performance and Outlook (December 2023).
[3] Corporate Finance Associates. "M&A Report In The Aerospace, Defense & Government Industry Sector (September 2023).

entrants like Astra, Blue Origin, Relativity, Rocket Labs, SpaceX, and Virgin Orbit are driving transformation in the space industry. With over 10,000 firms, 5,000 investors, and an expected 100,000 jobs by 2030, the sector is diversifying and expanding.

Top Trends for 2024

- **Technological Advancements –** Advances in blockchain technology, artificial intelligence (AI), 3D printing, materials science, nanotechnology, and biotechnology have led to decreasing launch costs and increasing capabilities of smaller satellites. Lower costs have also opened the door for new start-ups and encouraged established aerospace companies to explore novel opportunities that once seemed too expensive or difficult. The technological improvements have also intrigued investors, resulting in a surge of space funding over the past five years (find example). Relativity Space, for instance, plans to use 3-D printing, artificial intelligence, and autonomous robotics to build a fleet of fully reusable, low-cost rockets. The first launch for these vehicles is planned for 2024 at Cape Canaveral, Florida. Similarly, SpaceX plans to conduct a full-scale, orbital test flight for its reusable Starship launch vehicle in late 2022. Additionally, AI and Machine Learning (ML) are transforming the aerospace industry in areas such as autonomous systems, predictive maintenance, and advanced manufacturing techniques. By leveraging data analytics and automation, companies can optimize operations, reduce costs, and improve safety. For instance, AI algorithms can help detect anomalies in aircraft performance data, enabling preventative maintenance before any issues arise. As AI and ML advance, sophisticated applications in 2024 are expected such as autonomous decision-making systems and intelligent supply chain management. Lastly, reusability, in-orbit assembly, and lunar landings are new developments. NASA's Artemis program aims to send humans back to the moon by 2025, paving the way for future manned missions to Mars and beyond. Advancements in space technology promise not only to expand human knowledge but also to create new business opportunities and inspire future generations of innovators.

- **Space Exploration**: Growing interest in space exploration, satellite deployment, and space tourism is driving investments in the space segment with companies like SpaceX and Blue Origin leading the way. These companies are able to launch their own rockets and deploy satellite constellations because of recent technological advances in manufacturing, propulsion, and launch. Space tech companies have showcased a remarkable resilience amid macroeconomic uncertainty, bucking trends in the broader venture capital tech market. Approximately $4.8 billion was invested into space tech by the end of the third quarter of 2023, with growth-stage investment activity increasing.

  Space has been a potent incubator for innovation, first from governments and now from multiple private companies as well. From the launch of Sputnik 1 in 1957 through today, the space economy has delivered most of its value through satellite services, including communications and data and image collection and analysis. Satellites help large companies with multiple tasks, including inventory monitoring at distant locations, instant authorization of credit-card transactions, and international videoconferencing. According to the not-for-profit Space Foundation, the space economy was valued at $469 billion in 2022, up 9 percent from 2020, the highest recorded growth since 2014. Although the space economy now generates most value by enabling or enhancing activities on Earth, significant future value

could arise from functions that occur entirely in space such as in-orbit servicing, research and development, and manufacturing.

- **Commercial Aviation Growth**

  By the beginning of 2023, global commercial aviation had recovered much of the territory it lost to the COVID-19 pandemic, despite 2022's widespread labor shortages, the Russian invasion of Ukraine, COVID-19 lockdowns in China, inflation, and problematic supply chains[4]. The global fleet is at 98% of where it was pre-pandemic, airlines are returning to profitability, and aerospace manufacturers are gearing up for their most productive years yet. Oliver Wyman's Global Fleet and MRO Market Forecast report projects the worldwide commercial fleet to expand 33% to over 36,000 aircraft by 2033, a compound annual growth rate of 2.9%. Aviation's global aftermarket, which provides the maintenance, repair, and overhaul (MRO) services to keep the fleet flying, expanded 18% in 2022. It is anticipated to grow 22% this year, to $94 billion, which is 2% below its 2019 peak. By 2033, commercial aviation will reach $125 billion, a compound annual growth rate of 2.9%[4]. The increasing demand for air travel, specifically in emerging markets, the expansion of low-cost carriers, and the development of next-generation aircraft are notable trends contributing to the growth of the commercial aviation segment.

Challenges

The industry is a complex network of suppliers, manufacturers, distributors, and service providers that operate across multiple continents and countries. During the past few years, the aerospace supply chain faced unprecedented challenges due to the COVID-19 pandemic, geopolitical tensions, and natural disasters. According to a report by Deloitte, the global aerospace and defense industry experienced a decline of 2.2% in 2020 due to the pandemic[5]. The decline was primarily due to reduced demand for air travel, defense spending, and space exploration. The pandemic also disrupted global supply chains, causing delays, cancellations, and shortages of critical components.

The aerospace industry faces a myriad of regulatory hurdles that significantly impact its operations. Stringent regulatory frameworks are imposed to ensure the safety, reliability, and compliance of aircraft and spacecraft. Regulatory authorities, such as the Federal Aviation Administration (FAA) in the United States and the European Union Aviation Safety Agency (EASA) in Europe, set rigorous standards for design, manufacturing, and operational practices. Obtaining certification for new aircraft models or implementing technological innovations often involves a lengthy and intricate process, requiring extensive testing, documentation, and adherence to complex guidelines.

Additionally, geopolitical considerations and changing international regulations add another layer of complexity, impacting the global nature of the aerospace industry. Navigating through these regulatory hurdles requires significant investments in compliance measures and close collaboration between industry stakeholders and regulatory bodies.

[4] Wyman, Oliver. "Global Fleet and MRO Market Forecast 2023–2033"(March 2023).

[5] Deloitte. "2024 Aerospace and Defense Industry Outlook" (November 2023).

Moreover, environmental challenges significantly impact the industry as it strives to balance technological advancements with sustainability concerns. One of the primary challenges is the environmental impact of aviation emissions, particularly carbon dioxide (CO2) released during the combustion of traditional jet fuels. The industry is under increasing pressure to reduce its carbon footprint, spurred by global concerns about climate change. Innovations in propulsion technologies, such as electric and hybrid systems, are being explored to mitigate these environmental effects. Additionally, the production and disposal of aerospace materials contribute to ecological challenges. The aerospace sector is responding with initiatives to develop lighter and more fuel-efficient aircraft, adopt sustainable manufacturing practices, and invest in alternative fuels.

Outlook

The industry is poised for continued growth and is shaping up to be better than 2023, with both cash flow and profitability looking robust, according to the Fitch Ratings' outlook report[6]. The aerospace sector is expected to witness growth opportunities in areas such as electric aviation, urban air mobility, and satellite technology. Original equipment manufacturers (OEM) are expected to benefit from large order books and revenue visibility, planned production rate increases and inventory reduction. Commercial aviation is expected to rebound as global travel resumes post-pandemic, with increasing orders for more fuel-efficient and technologically advanced aircraft. Profitability and cash flows will remain robust in the aerospace industry particularly as supply chain and labor-related headwinds dissipate. Fitch forecasts steady revenue and FCF growth for many aerospace companies driven by sustained demand by airlines replacing or expanding capacity. Aerospace should be highly correlated with production and delivery increases over the next 12–24 months.

Robust activity in mergers and acquisitions is also anticipated in 2024 with a continuation of strategic moves from incumbents, new space leaders, and private equity players. The commercial satellite subsector is poised for further consolidation as operators proactively fortify their defenses against the "mega constellations" of Starlink, OneWeb, and Amazon Kuiper. The persistent price dislocation of publicly traded space stocks is likely to attract private equity buyers seeking potential price arbitrage opportunities, such as privatizing some of these companies. While a certain degree of positive sentiment is anticipated to return to public markets, it is not foreseeable that certain aerospace companies will go public, with the exception of the IPO of Starlink.

Conclusion

The aerospace economy has reached a turning point in terms of both access and opportunity. This new aerospace age offers a launch window for pioneering companies of all sizes, and in all sectors, to establish sustainable competitive advantages by reimagining themselves, for the first time, as space companies and an intentional extension of their core business models. The growth in the aerospace sector is creating opportunities for new players and new offerings for incumbent ones. Public companies, such as Raytheon and Lockheed Martin, are playing a pivotal role within the industry by driving innovation, exploration, and commercialization. As public companies continue to navigate the

[6] Fitch Ratings. "Global Aerospace & Defense Outlook 2024" (December 2023).

challenges and opportunities in the space sector, their contributions not only propel space exploration but also foster economic development and global collaboration. 2024 is predicted to be another year of record numbers of aerospace companies, specifically, space tech companies, funded with both early and growth stage investment. The full potential for companies operating in the space ecosystem is yet to be realized. Recent advances in technology, rapidly increasing private sector investment, and rising demand for space data and related products and services are propelling growth in the sector. The top three areas for likely investment in the short term include national security, satellite communications, and edge computing and artificial intelligence.

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