

# Implementing Digital Engineering to Thrive



By **Paolo Colombo**  
Global Industry Director  
Aerospace & Defense, ANSYS

**T**he aerospace and defense (A&D) industry is at a pivotal crossroads with rising operating costs, an exponential number of new technologies and a growing skills gap.

Strategic documents such as “Flightpath 2050” by the EU commission and “Destination 2025” by the U.S. Federal Aviation Administration assert the need for breakthrough technologies to improve fuel efficiency and reduce emissions. Geopolitics is driving an increase in defense spending as nations seek to maintain their technological edge. A new space race has begun with emerging nations and disruptors challenging the status quo. In an era of fewer new aircraft programs, companies are seeking to optimize maintenance, repair and overhaul (MRO) and sustainment operations. And with an eye to the future, next-generation autonomous and highly connected urban air mobility solutions are beginning to emerge.

It is therefore no surprise that Accenture research found that 90% of aerospace and defense companies believe they have entered an era of exponential change [1].

All these factors present the industry with a mind-boggling level of complexity that must be delivered without compromising the industry’s incredible record on safety. In the face of this increasingly challenging and competitive environment, the industry must digitally transform to deliver the unprecedented level of innovation needed.

Indeed, “97% of aerospace and defense executives say they are willing to digitally reinvent their business and industry” [2]. However, “just 7% of A&D companies have fully integrated

testing, production, training, sustainment and acquisition that delivers innovative technology faster and at substantially lower cost. We call this pervasive simulation.

This special edition of *ANSYS Advantage* shows how companies, from innovative startups to the established giants, apply pervasive engineering simulation solutions so they can succeed in their key business initiatives and thrive in the market.

Avio Aero (a GE Aviation business) demonstrates the impact of digitalization of engineering processes by revealing how it applies the concept of the “digital thread” to follow designs from their earliest ideation through real-world operation. A digital thread

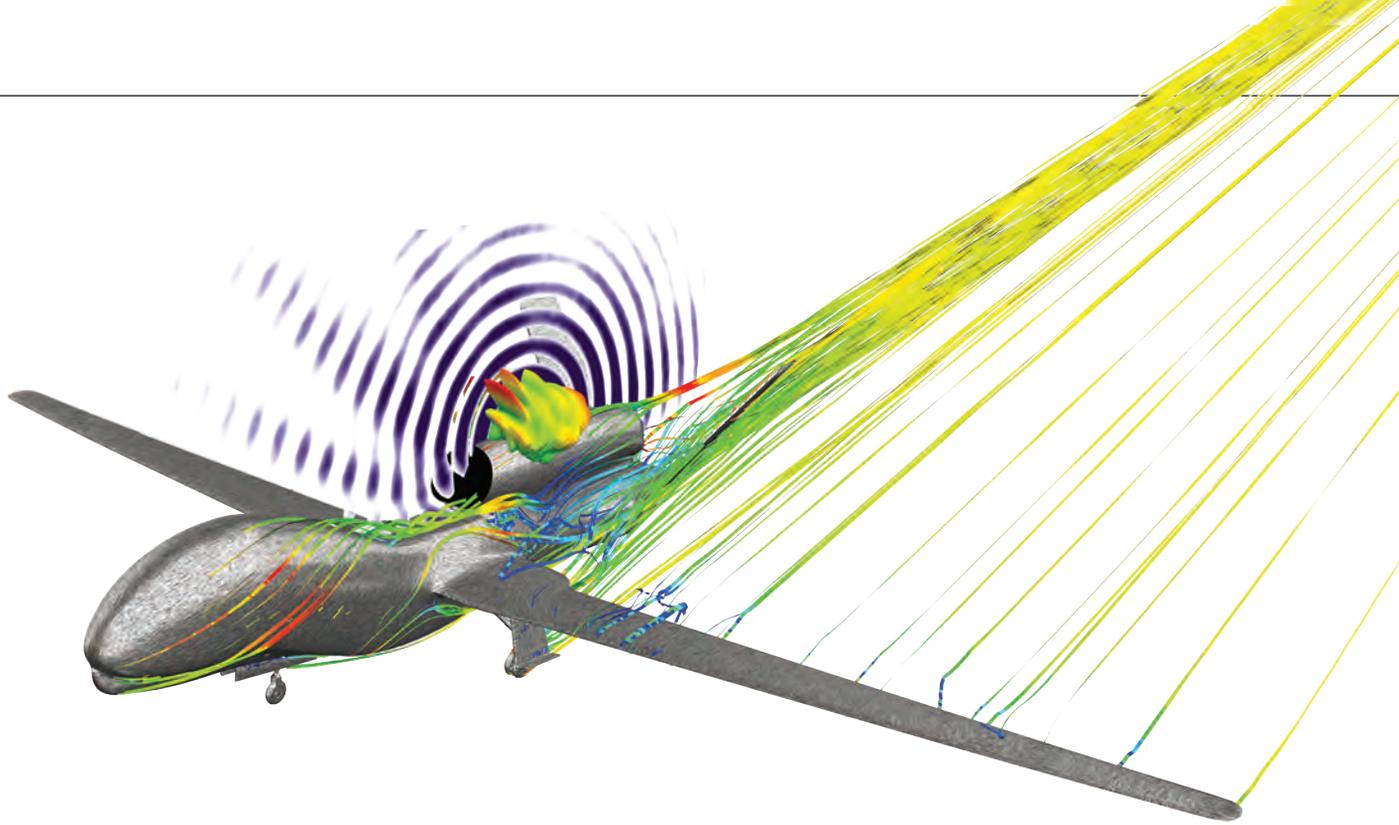
**“The only way to stay competitive is to embrace the exponential innovation rate and the changes that accompany it.”**

digital threads that impact the strategy and/or work of multiple teams” [3].

This is a gap that simulation can help companies overcome. ANSYS is uniquely positioned to help accelerate digital transformation through its comprehensive multidisciplinary simulation solutions, integrated and open platform, ecosystem, and skilled workforce. Building on a 50-year history of delivering customer success, ANSYS solutions allow the creation of a digital thread from program and product concept through development, manufacturing,

is a closed-loop process that feeds operating data back to engineers to accelerate development, increase staff productivity and improve product quality. Learn how Avio Aero uses digital threads on page 2.

The unpredictable cost of fuel and the ambitious emissions and noise reduction targets set by the Clean Sky and CLEEN initiatives are driving the demand for more fuel-efficient and environmentally friendly aircraft. The industry is seeking revolutionary propulsion systems, lightweighting methods and improved aerodynamics.



MagniX (page 8) reveals how the company applied simulation to reach its goals.

Emerging trends in urban air mobility, commercial drones and persistent connectivity are transforming the aerospace industry. The aircraft of the future will be more autonomous, connected and electric. They will require configurations and propulsion systems that are radically different from past versions, with little design precedent. Engineering simulation is the only way to explore these revolutionary design spaces and rapidly innovate with less cost and risk. The success stories of Embraer and Optisys are included on pages 22 and 26.

To capitalize on increasing global defense spending, defense companies must digitally transform to deliver new, advanced warfighter technologies as quickly as possible. Raytheon (page 38) and Kontron (page 34) accomplished this by leveraging the power of multiphysics.

With fewer new aircraft programs, rising operational costs and increasing scrutiny of the efficiency of defense program sustainment, A&D companies are focused on optimizing MRO

## ***“The aerospace and defense industry is at a pivotal crossroads.”***

operations. The prevalence of sensors, connectivity and analytics is enabling the digital transformation of these operations, leading to improved efficiency and direct cost savings through predictive maintenance and analysis of failure during operation. Learn how Lufthansa Technik (page 42) can extend the time before overhauling (TBO) of the engines they maintain, and how the U.S. Air Force (page 46) saves millions of dollars by analyzing operational failures.

The A&D industry also must explore revolutionary ideas in areas where there is no sound experience, while maintaining the highest standard of safety that the industry requires. Vector Space (page 52) and Hindustan Aeronautics Limited (page 49) use simulation to dramatically accelerate their testing and certification phases, reducing the number of expensive and time-consuming physical tests while rapidly gaining experience of the behavior of their complex new systems.

The only way to stay competitive is to embrace the exponential innovation rate and the changes that accompany it, including the increasing complexity of the products being designed. Digitalization of engineering is one way companies can cope with this change. As the global leader in simulation, ANSYS helps A&D companies by deploying simulation-based digital transformation to the most critical operational and technological initiatives within the industry. 

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**References**

- [1] Accenture, Accelerating Through Digital Turbulence: Technology Vision for Aerospace and Defense 2017
- [2] Accenture, Seizing the Digital Opportunity in Aerospace & Defense 2018
- [3] Accenture, The Digital Thread Imperative 2017