AEROSPACE TRENDS

AND NEW TECHNOLOGY DEVELOPMENTS

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We Manufacture Innovation

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INTRODUCTION

By Brian Bishop

Following years of decreased defense revenues, the aerospace industry is poised for positive growth. Due to rising passenger traffic, accelerated equipment replacement cycles, decreasing crude oil prices, and an increase in defense spending, aerospace manufacturers are on pace for record production levels of next-generation aircraft.

3.0%

Global aerospace and defense industry revenues are expected to grow at 3.0% in 2016.[1]

2.1%

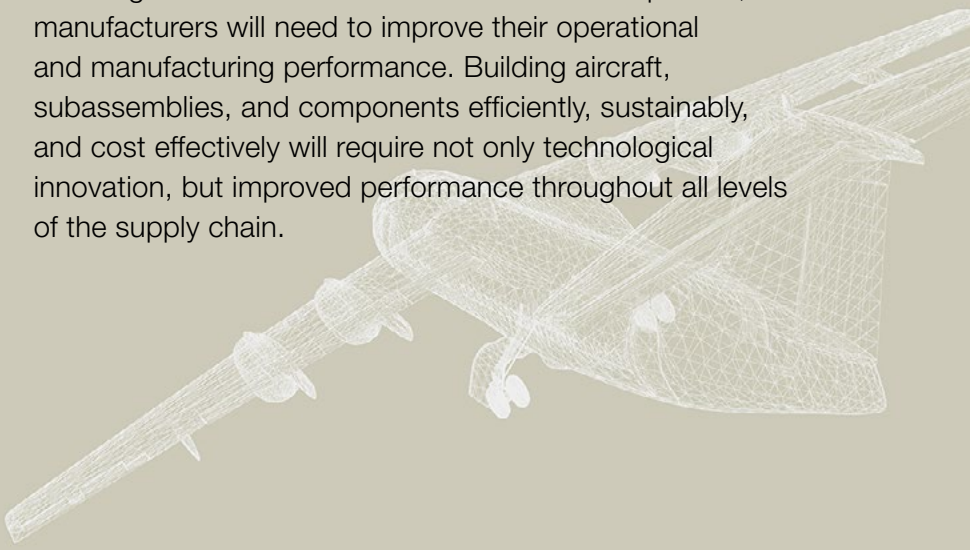
The 2016 FAA forecast predicts that U.S. carrier passenger growth will average 2.1% per year for the next 20 years.[2]

40.5%

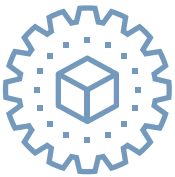
In 2016, an estimated 1,420 large commercial aircraft will be produced—40.5% more than five years ago.[3]

INCREASING PRODUCTION RATES

Intense competition drives the pace of technological innovation. This is especially true in the current aerospace manufacturing landscape. To increase production rates to meet high demand from OEMs and remain competitive, manufacturers will need to improve their operational and manufacturing performance. Building aircraft, subassemblies, and components efficiently, sustainably, and cost effectively will require not only technological innovation, but improved performance throughout all levels of the supply chain.



TRENDS AND DEVELOPMENTS



This overview will examine some of the major trends and drivers currently shaping the aerospace industry. It will also spotlight three new technological developments that can enable aerospace manufacturers to increase productivity, efficiency, and quality while meeting heavy demand.

Trends:

- Automation
- Lightweighting
- New, Advanced Materials
- Additive Manufacturing
- Streamlining Assembly Processes
- Nondestructive Evaluation
- Next-generation Repair Technologies
- Experienced Skilled Labor

New Technology Developments:

- Laser Coating Removal for Aircraft, Parts, and Dies
- Low-cost Honeycomb Panels
- High Power Ultrasonics

AUTOMATION

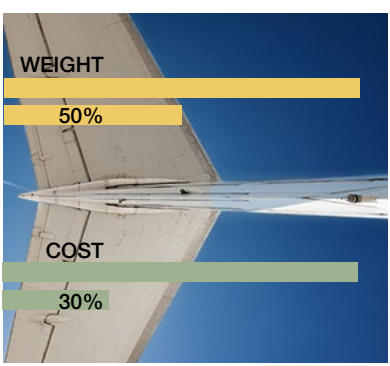
In comparison to the automotive industry, in which automated processes are ubiquitous, the aerospace industry has much lower production volumes, higher tolerances, and larger subassemblies. Additionally, certain materials used in aircraft manufacturing can make automation more challenging. Challenges aside, automation presents the promise of addressing constraints in capacity and greatly increasing productivity. Aerospace manufacturers are investing accordingly.

- Boeing plans to invest more than **$1 billion** in automation over the next few years to boost production at its assembly plants.[4]

LIGHTWEIGHTING

Replacing traditional materials with new lightweight, high-strength materials is an effective path toward meeting the industry's ever-present goal of increasing fuel efficiency, decreasing emissions, and reducing material usage. Incorporating lightweight materials into the manufacturing process allows manufacturers to reduce weight while enabling new functionalities and innovations.

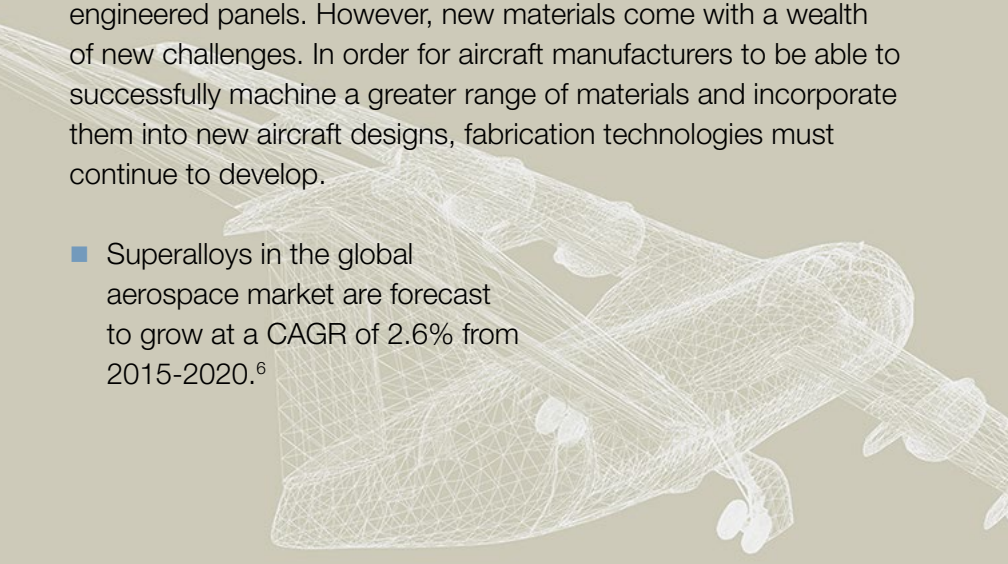
- Carbon fiber bearings are used in the Airbus A340's horizontal tail to reduce its weight by 50% and cost by 30%.[5]



NEW, ADVANCED MATERIALS

Whether the goal is to achieve lower weight, increase fatigue life, or enable higher heat resistance, materials advancements are critical to increasing aircraft performance. The aerospace industry has traditionally been quick to incorporate advanced material solutions into design including advanced Al alloys, titanium, and engineered panels. However, new materials come with a wealth of new challenges. In order for aircraft manufacturers to be able to successfully machine a greater range of materials and incorporate them into new aircraft designs, fabrication technologies must continue to develop.

- Superalloys in the global aerospace market are forecast to grow at a CAGR of 2.6% from 2015-2020.[6]



ADDITIVE MANUFACTURING

The aerospace industry has been an early adopter of additive manufacturing. Aerospace companies are investing in additive technology in order to achieve weight savings, structural and space optimization, and reduce part count and joining. More than just a technique for rapid prototyping, 3D-printed components are now being produced for end use in aircraft manufacturing.

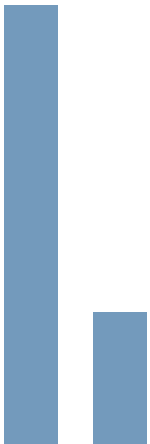
- Global additive manufacturing in the aerospace and defense markets is projected to exceed $325 mil by 2022.[7]

For more on additive manufacturing technology development in the Aerospace industry, check out EWI's eguide, Advancing Additive Manufacturing in Aerospace

REDUCING WASTE

Consolidating processes where possible allows manufacturers to reduce costs and greatly enhance productivity. Many avenues, including automation and additive manufacturing, are being explored and employed to eliminate steps in the aircraft manufacturing process.

- Streamlining the assembly process for the A350 XWB allowed Airbus to reduce the time from start of final assembly to aircraft delivery by **30%**.[8]



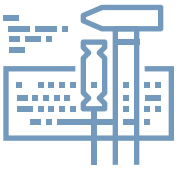
NONDESTRUCTIVE EVALUATION

Because aerospace components are high-cost and low-volume, destructive testing methods are not a viable solution. As such, the industry makes extensive use of nondestructive evaluation (NDE) and inspection techniques. NDE is a cost-effective way to measure the quality of components and inspect welds.

EWI continually develops new NDE techniques and capabilities to ensure the highest standards of quality. One such innovation is EWI's use of ultrasonic matrix phased array-technology to assess welds made on aerospace-grade metals. In addition, automated advanced NDE capabilities and inspection techniques are currently in development.

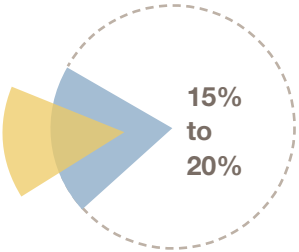
Read the article here.

NEXT-GENERATION REPAIR TECHNOLOGIES



A new generation of aircraft means a dramatic change in maintenance and repair technologies. Aircraft built with advanced materials require a different approach than those built with traditional materials. Even more challenging is the need to develop repair techniques for materials and parts that have not yet reached market, but are on the near horizon.

- Survey of airlines predicts that by 2020, 15-20% of the projected $83.2 billion MRO aftermarket spend for that year could be affected by new technology.[9]



EXPERIENCED SKILLED LABOR

As a greater number of aerospace workers reach retirement age, the industry finds itself facing a shortage of skilled workers. As demand continues to rise, this situation will only be exacerbated. Recruiting, training, and retaining young qualified individuals has proven challenging, and some companies are partnering with external organizations to expand their capabilities in the face of this shortage.

- The average age of aerospace workers is 47.[10]

NEW TECHNOLOGY DEVELOPMENTS

EWI has developed and demonstrated an array of new and enhanced technological capabilities that are particularly relevant to aerospace manufacturers in their pursuit of quality, performance, and innovation.

THE NEXT THREE PAGES SPOTLIGHT THESE TECHNOLOGIES:

Laser Coating Removal for Aircraft, Parts, and Dies
EWI's innovative laser paint stripping technology

Low-cost Honeycomb Panels
EWI's fabrication technology for low-cost acreage thermal protection panels made from bimetallic honeycomb

High-power Ultrasonics
EWI-developed ultrasonic machining technology for increasing throughput and quality

NEW
TECHNOLOGY
DEVELOPMENTS

Laser Coating Removal for Aircraft, Parts, and Dies

Current methods of removing coatings or contaminants include hazardous processes such as chemical stripping and plastic media blast, or time consuming processes like sanding. EWI's innovative laser paint stripping technology:

- Reduces hazardous waste products
- Reduces de-paint time
- Reduces costs
- Has the precision to stop at primer or completely strip to the substrate

NEW
TECHNOLOGY
DEVELOPMENTS

Low-Cost Honeycomb Panels

Sandwich panels are critical components in aircraft interiors due to their lightweight nature and the high mechanical performance they provide. The aerospace industry commonly uses honeycomb sandwich panels; however, producing these structures is costly.

EWI has developed preliminary fabrication technology for low-cost acreage thermal protection panels made from bimetallic honeycomb. The structure consists of a bimetallic core with thin face sheets, protected by oxidation-resistant coatings. The developed product has passed NASA burner rig testing. This method of manufacturing and choice of materials is expected to significantly reduce costs and simplify construction for hypersonic vehicles.

NEW
TECHNOLOGY
DEVELOPMENTS

High-Power Ultrasonics

Ultrasonic assisted machining applies intense vibrations to conventional metalworking tools for altering the frictional characteristics of the cutter and material being removed. Aerospace manufacturers have found this technology to offer significant reductions in heat generated by the cutting process, greatly enhancing the machinability of advanced aerospace materials. Aerospace components prone to work hardening or undergoing microstructure transformations during the manufacturing process can be produced faster with higher quality.

EWI developed an innovative system that is now being taken to market by Acoustech Systems for installation on new or existing machines. The reductions in heat and cutting forces offered by ultrasonic assisted machining provides significant benefits to manufacturers in the form of:

- Higher production rates (2-10x)
- Increased tool life (2-10x)
- Superior surface finishes
- Improved dimensional stability

CONCLUSION

The road ahead for the aerospace industry is one of continued growth and innovation. With the number of passengers increasing and fuel prices decreasing in the near term, the competition will be intense. Additional factors like unmanned aerial vehicles and space travel add an additional layer of complexity and competitiveness. Being first to market with next-generation aircraft will require aerospace companies to partner with engineering experts to apply emerging technologies, incorporate advanced materials, and implement both.

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[7]Global Additive Manufacturing in Space & Defense Aerospace Markets Report 2015 - Analysis, Prospects & Technologies - Key Vendors: Honeywell Aerospace, Rocket Lab, Sigma Labs (2016, March 14). Retrieved from http://www.prnewswire.com/news-releases/global-additive-manufacturing-in-space--defense-aerospace-markets-report-2015---analysis-prospects--technologies---key-vendors-honeywell-aerospace-rocket-lab-si

[8]Final Assembly and Tests (n.d.). In Airbus. Retrieved from http://www.airbus.com/company/aircraft-manufacture/how-is-an-aircraft-built/final-assembly-and-tests/

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[10]Aviation Week 2015 Workforce Study: A Reality Check as Competition for Talent Increases (2015, July). Retrieved from http://www.aerospace.georgiainnovation.org/images/public/reports/Aviation_Week_WorkForce2015.pdf

ABOUT EWI

EWI helps aerospace manufacturers reduce the risks associated with innovation by applying advanced technologies to improve the performance, quality, and manufacturability of aircraft components while reducing life-cycle costs. Our extensive work with advanced welding and materials joining technologies, additive manufacturing, advanced non-destructive evaluation (NDE), computational modeling and simulation, and aerospace technologies gives our customers a definitive advantage.

To learn more about EWI's experience helping aerospace manufacturers and suppliers use technology innovation to become more competitive, contact **Brian Bishop, Aerospace Business Development Director, at bbishop@ewi.org or 614.270.7052.**

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