

LATEST TRENDS IN AEROSPACE ENGINEERING

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Abstract: -

The aerospace sector is set for expansion. Because to increased passenger volume, rapid equipment replacement cycles, and decreased costs for crude oil, as well as a surge in defense spending, aerospace Manufacturers are on track to set new records for next-generation aircraft manufacturing. With the involvement of new technologies like IoT can improve the efficiency of systems. There is little question that developing technologies, electric propulsion, and new materials will create new possibilities, changes, and difficulties. So, it's critical that we comprehend the magnitude of these issues not just to efficiently manage existing fleets, but also - given the number of aircraft still to be delivered and future demand – to capitalize on the possibilities that are undoubtedly headed our way.

Introduction: -

Aerospace refers to the atmosphere and outer space as a whole; it is a broad business with a wide range of commercial, industrial, and military uses. Aeronautics and astronautics are two branches of aerospace engineering, and the study, design, manufacture, operation, and maintenance of airplanes and spacecraft requires the collaboration of multiple companies. The building, testing, and maintenance of airplanes and space vehicles is thus referred to as aerospace technology. Technicians may work on the assembly, servicing, testing, operation, and

repair of systems connected with reliable and reusable space launch vehicles and related ground support equipment. This review will look at some of the significant trends and factors that are driving the aerospace sector right now. It will also highlight three new technical advances that can help aerospace firms boost productivity, efficiency, and quality while meeting high demand.

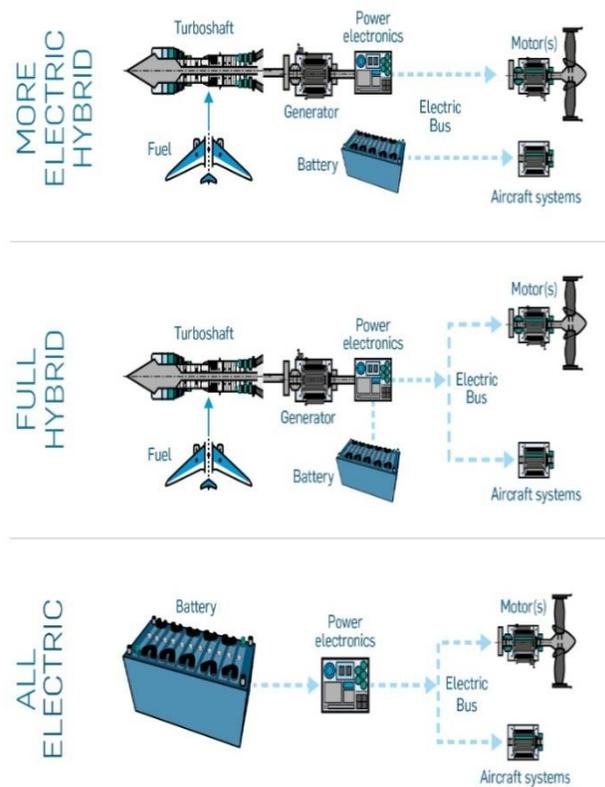


Fig.1

Trends:

- Automation
- Light weighting
- New, Advanced Materials
- Additive Manufacturing
- Streamlining Assembly Processes
- Non-destructive Evaluation
- Next-generation Repair Technologies
- Experienced Skilled Labour

New Technology Developments:

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

TRENDS:

Automation: -

In comparison to the automobile sector, which is heavily reliant on automated processes, the aerospace business has far smaller production numbers, greater tolerances, and bigger subassemblies. Furthermore, specific materials used in aero plane manufacture might make automation more difficult. Aside from the challenges, automation has the possibility of alleviating capacity limits while significantly enhancing productivity. Aerospace firms are making the necessary investments.

Light Weighting: -

Replacing conventional materials with new lightweight, high-strength materials is an efficient way to satisfy the industry's constant objective of enhancing fuel economy, lowering emissions, and reducing material use. Manufacturers can reduce weight while enabling new functionality and innovations by using lightweight materials into the production process.

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

New advance material: -

Materials improvements are crucial to enhancing aircraft performance, whether the aim is to reduce weight, enhance fatigue life, or permit greater heat resistance. The aerospace sector has historically been eager to embrace cutting-edge technology design options such as improved Al alloys, titanium, and panels designed by engineers. However, new materials bring with them a plethora of advantages. of new difficulties. Manufacturers of aero planes must be able to successful machining of a wider range of materials and incorporation. Fabrication technology must be integrated into future aircraft designs. Continue to grow.

Additive manufacturing: -

The aircraft sector was a pioneer in the use of additive manufacturing. Aerospace firms are engaging in additive technologies to save weight, optimise structure and space, and minimise

part count and joining. 3D-printed components are now being created for end use in aircraft production, rather than only as a quick prototyping approach.

Reducing waste: -

Consolidating processes whenever feasible enables manufacturers to save money while increasing efficiency. Many approaches, including automation and additive manufacturing, are being investigated and used in order to minimise processes in the aircraft manufacturing process.

Non-Destructive Evolution: -

Due of the high cost and low volume of aerospace components, destructive testing procedures are not a realistic option. As a result, non-destructive evaluation (NDE) and inspection procedures are widely used in the industry. NDE is a low-cost method of measuring component quality and inspecting welds.

EWI is always developing new NDE techniques and capabilities to achieve the highest quality requirements. EWI's use of ultrasonic matrix phased array technology to examine welds done on aerospace-grade metals is one example of such innovation. Furthermore, automated improved NDE capabilities and inspection approaches are being developed.

Next generation repair technologies: -

A new generation of aircraft necessitates a significant shift in maintenance and repair technology. Aircraft constructed using advanced materials need a different strategy than aircraft constructed with standard materials. Even more difficult is the requirement to design repair solutions for materials and parts that have not yet reached the market but are in the horizon.

Experienced skilled labor: -

As an increasing number of aerospace employees near retirement age, the sector faces a skilled labor crisis. This predicament will only worsen as demand continues to climb. Recruiting, developing, and keeping young skilled personnel has proven difficult, and some businesses are collaborating with external groups to increase their skills in the face of this scarcity.

New Technology Developments:

Laser Coating Removal for Aircraft, Parts, and Dies: -

Hazardous operations such as chemical stripping and plastic media blasting, as well as time-consuming processes such as sanding, are now used to remove coatings or impurities. EWI's cutting-edge laser paint peeling technology:

- Reduces the amount of hazardous trash.
- Reduces de-painting time and costs
- Has the ability to precisely stop at the primer or
- totally strip to the substrate

Low-cost Honeycomb Panels: -

Sandwich panels are important components in aeroplane interiors because of their lightweight nature and great mechanical performance. Honeycomb sandwich panels are frequently used in the aerospace sector; nevertheless, constructing these structures is expensive.

EWI has developed preliminary manufacturing technique for low-cost acreage thermal protection panels consisting of bimetallic honeycomb. The structure is made up of a bimetallic core and thin face sheets that are shielded by oxidation-resistant coatings. NASA burner rig testing of the new device was successful. This manufacturing technology and material selection are intended to drastically cut costs and simplify hypersonic vehicle development.

High Power Ultrasonic: -

Ultrasonic assisted machining is the use of high vibrations to traditional metalworking tools in order to change the frictional properties of the cutter and material being removed. This method has been discovered by aerospace producers to give large reductions in heat created by the cutting process, considerably improving the machinability of modern aircraft materials. Aerospace components that are prone to work hardening or microstructure changes removed. This method has been discovered by aerospace producers to give large reductions in heat created by the cutting process, considerably improving the machinability of modern aircraft materials. Aerospace components that are prone to work hardening or microstructure changes during the production process can be manufactured more quickly and with greater quality.

AcoustechSystems is now bringing an innovative solution created by EWI to market for installation on new or existing equipment. The heat and cutting force reductions provided by ultrasonic aided machining give major benefits to producers in the form of:

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

IoT In Aerospace

In the aerospace industry, IoT (Internet of things) has limitless potential. IoT provide wireless connectivity to number of things. The aviation industry can improve passenger and personal data safety by utilizing IOT technology[6][7]. It also focus to improve system maintenance, efficiency, security, and customer experience by effectively utilizing IoT.

The monitoring and management of a number of inter linked and electrically powered cabin equipment/devices and subsystems are part of aircraft cabin electronics. Smart aerospace industry, embedded with IoT and Artificial Intelligence can reduces the manufacturing and maintenance cost. Cabin lighting, passenger service units, window shades, smoke detection, fire extinguishing systems, air conditioning, overhead cabin audio, water systems, waste systems, flight attendant panel, and in-flight entertainment system support are just a few examples of electronic subsystems. OEMs may drastically cut aircraft engineering design, installation, and maintenance costs by utilizing wireless sensors and control mechanisms in the IoT era[8].

Internet-connected network sensors and equipment provides real-time performance information, enhancing transparency and also safety throughout the process. While the aircraft is flying real-time tracking of equipment performance improves operational transparency.

IoT systems that track part deterioration and plane locations have reduced time-consuming resulting in optimised runway management and repair time.

Conclusion: -

The aerospace industry's future will be one of continual expansion and innovation. With the number of passengers growing and gasoline prices expected to fall in the foreseeable future, competition will be fierce. Unmanned aerial vehicles (UAVs) and space flight add another element of complexity and competition. To be the first to market with next-generation aircraft, aerospace businesses will need to collaborate with technical professionals to

use developing technologies, combine sophisticated materials, and deploy both.

IoT and Artificial intelligence embedded in aerospace industry can improve data security, manufacturing and maintenance cost, efficiency of systems. It may also enhance passenger experience. Real-time performance can delivers high transparency and efficiency

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