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INTRODUCTION TO AEROSPACE

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ABSTRACT

Aerospace collectively refers to both the atmosphere and the outer space (Universe). This field comprises a lot of applications in commercial (aircrafts, helicopters and much more.), industrial, military contexts the Aerospace Engineering. Aeronautics and Astronautics are two main areas of it. Aeronautics speaks of dealing with the aircrafts. Whereas the Astronautics speaks of the space crafts and the space exploration. Aerospace engineering deals with the design and optimization, simulation and development, production of the aircrafts, helicopters, drones, spacecrafts like missiles, rockets etc. It also includes the understanding of flight mechanics, fluid dynamics, thermodynamics, avionics, material science, propulsion and much more, which makes it more interesting field to work.

Since last few years, the aerospace industry has expanded dramatically this is due to the improved performance in the aerospace industry which has inspired the research and development. The expansion of the industry leads to the increase in the opportunities in the sector, with the rapid growth the competition in the society. The aerospace industry offers diverse career paths, which includes pilot, an aerospace or an aeronautical engineer, aircraft mechanic, ATC (Air Traffic Controller) and a lot more to explore.

The future aspects of aerospace/aviation involve a lot of question which are waiting for being researched like AI in aviation, Electric aircrafts etc.

Aerospace industry is very important part of the modern society. It allows us to explore and travel our planet and beyond our planet. This is not where it ends, it also allows to improve the communication, connectivity and national security. Working on these things and generating a great amount of income is a great opportunity. (1)

INTRODUCTION

The term aerospace is derived from two words aeronautics and spaceflight (astronautics). The Aerospace industry play's an important role in the advancement of science and technology. Research, development, testing, operating, maintaining and manufacturing of the flight vehicles which includes unpowered gliders, unmanned arial vehicles (UAV's), lighter than air vehicles (airships, air-balloons), heavier than air vehicles(aircrafts), missiles, rockets, spacecrafts, avionics (communication, navigation and flight control systems) etc. (3)

The origin of the aerospace industry can be dated back at the era of the wright brothers their dream to fly an aircraft. The role of the aerospace industry is to promote the innovation and set new challenges for the development of materials and technologies, it can be regarded as one of the industries that have shaped the twentieth century. (4)

Aerospace industry is symbol of a nation's economic prosperity and supports the country's security by augmenting Defense capabilities. (2) Over the last decade the aviation industry has grown up to 16% annually. On top of that in last three years the civil aviation industry has become the country's fastest growing industry.

The industry of aerospace is a vast industry to work in, as it has a lot of opportunities already and plus the upcoming one's. some of them are follows: -

- Aviation/Aerospace systems designing and optimization
- Aerospace modeling and simulation
- Aviation Safety
- Flight Training
- Aerospace Maintenance and overhaul
- Aerospace Education Department
- Aviation Business
- Data Analytics and statistical Analysis
- Space Exploration
- Commercial Space Operations
- Social and Legal issues in Aviation

AEROSPACE/AVIAATION:

AERONAUTICS

The Aeronautics is all about researching, designing, developing vehicles crewed and uncrewed within the earth's atmosphere like aircrafts, helicopters, drones etc. The advancements in the aeronautical sector leads to the faster, safer and easier air travel with more efficiency. This field also encloses the advancements in the aerodynamics, thermodynamics, propulsion systems and material science.

ASTRONAUTICS

The Astronautics is the about the researching, designing, developing vehicles crewed and uncrewed outside the earth's atmosphere like spacecrafts. This field enables space exploration, which leads to many scientific space discoveries and advancements like satellites, GPS technology, navigation, landing on moon, researching on the universe.


(5)

(6)

OPPERTUNITIES AND CAREER PATHS:

1) ENGINEERING

The Aerospace Engineering is a branch of engineering which includes the designing and development of machines of flight. This includes both the aeronautical (within the earth's atmosphere) and astronautical (outside the earth's atmosphere). It involves the understanding of introduction to aviation/aerospace, fluid dynamics, aerodynamics, thermodynamics of engines, propulsion system, material science (strength of material), light-weight materials, aircraft structure (designing), control systems, navigation systems etc. Pursuing an engineering degree in the aerospace/aeronautical department can open the arms of opportunities in the research, designing and innovation. Which is a dream of many people among us. Getting the opportunities on an easy approach can be done by: -

- ✓ Developing strong skills in technology, designing, computing.
- ✓ Gaining practical knowledge and working with the system and learn from real life professionals by internships and research projects.
- ✓ Attending the industry seminars, workshops and conferences.

✓ Obtain relevant certifications, such as **EIT/FE** (Engineer in Training/Fundamentals of Engineering) or **PE** (Professional Engineer).

 (7)

2) PILOT

Becoming a pilot and flying a big machines like aircrafts is a dream of many aviation enthusiast. Acquiring high quality knowledge and gaining good experience to make a dream of flying for money often takes a lot of money, time and dedication. While being on a safe side it's good to know that at least for next two decades the professional pilots are in very high demand for the growth of the industry.

Desire of flying commercial airlines, major and regional airlines, cargo planes, private jets, military planes, helicopters even UAV's necessitate meticulous training and obtaining licenses such as private pilot licenses or airline transport pilot licenses and also accumulating the flying hours.

 (8)

3) MAINTAINCE AND OVERHAUL PROFESSIONALS

A critical role is played by the maintenance and overhaul professionals in the aviation industry in ensuring the ability of functioning and safety.

It is very essential for everyone's safety that the equipment's or the aircrafts, spacecrafts which are getting used are 100% safe as they have the human lives in their bare hands. They keep ensuring, repairing, maintaining the aircraft systems, engines and the structure.

They help in diagnosing malfunctions, inspecting mechanical, hydraulic and structural systems, repairing fixed parts using power and hand tools, ensuring aviation safety and ensuring that all requirements, standards and important procedures are fulfilled properly before and after the flight. (10)

A massive boost in the industry is leading to very complex designs of the modern aircrafts and spacecrafts which is great but all along it needs more skilled mechanics.

4) GROUND LEVEL MAINTAINCE PROFESSIONALS

The professionals maintaining the ground level duties is a major part of the Aviation Industry. These professionals also help in customer care services (ticketing, baggage handling and check-in, help desk, lost & found), special needs handling (helping the disabled people, wheelchairs and unaccompanied minors in every aspect), irregular operations support (rebooking, meal vouchers, ticket cancellation), aircraft boarding and disembarkation. (10)

5) AVIONICS TECHINICIAN

The Avionics technicians are the people who have specialization in electronic systems which are within the aircrafts.

These people help in installation, repairing and testing in aircrafts, autopilot, instrumentation systems, troubleshoot and repair the navigation and radar systems for better communication experiences.

These people need specialized skills and training in the avionics and aircraft maintenance, they can be certified by passing the specific exams and gaining the skills and experience. All this is important because they ensure the safety of human lives.

6) AVIATION MANAGER / AVIATION SAFETY MANAGER

The Aviation safety is all about the protection of the human lives above the ground, in the earth's atmosphere and beyond the atmosphere of earth.

Managing, developing, improving and operating safety of the human lives is a big task which should be performed very efficiently. They should identify hazards, assess risks and take actions accordingly.

Safety managers not only ensure these things but also provide training to the fresh employees, tell them about the emergency protocols and regulations. (11)

Safety is not the one thing these managers involves overseeing operations, logistics within the airlines, airports or the aerospace/aviation companies.

7) SALES AND BUSSINESS PROFESSIONALS

Every business requires sales professional experts to manage the contacts, deals, negotiate with the customers and promote the services so that the business grow faster.

8) LINE SERVICE TECHINICIAN

The line service professional's handle the basic level maintenance, handle the aircrafts on the ground level like fueling the aircrafts and towing them for making them ready for the takeoff or

towing them back after the flight landing. These technicians basically work at the airport for different airlines or some fixed basic operators (FBO's).

9) DISPATCHERS

Dispatchers are also known as the flight dispatchers or the flight operator officers. They plan the flights, considering the factors like weather conditions, aircraft performance and loading, calculate fuel loads, ensure legal compliance with federal regulations.

They also keep an eye on turbulence forecasts, the weather conditions during flight, endurance of flight, fuel consumptions during flight, coordinating with pilots and provide them the necessary information regarding every aspect for the alternative airports. (12)

AEROSPACE SAFETY:

Every Airlines should stand on the air travel safety standards. Lack of safety and security lead the way to mishaps like crash, injuries, emotional traumas or even death of the passengers, crew members and their families. These accidents result in financial losses of airlines. The cost related the damage, repair or investigation, legal proceedings etc.

The tourism and trade usually get disturbed in accidents or crash of the aircrafts or spacecrafts. Which somehow disturbs the financial condition of the airlines or government if the flight is related to the government through purpose and the public confidence suffer as the reputation get influenced.

Ensuring public safety will build a trust of air travel in the public. Passengers opt those airlines who have good safety records. Which will automatically increase the reputation of airlines and decreases the competitiveness.

The safe industry attracts the investments, encourages the advancements in the technology, improve design and structure. This results in faster growth and economic development of industry.

INDUSTRIAL APPLICATIONS

1. Commercial Aviation (cargo aircrafts and operating passengers)

2. Defense and the Military Aviation (fighter jets, bombers, transport aircrafts, satellites for communication and navigation purposes)

3. General Aviation (light weight aircrafts, helicopter for personal travel or training purpose or transportation or for emergency service)

4. Emerging Technologies (drones used for surveillance, delivery and Advanced Air Mobility {AAM} electric vertical takeoff and landing aircraft for air transportation in the urban areas which is still developing) (13)

GROWTH

The Aviation industry has witnessed remarkable growth in the sector in past few years. But, before the deregulation of the civil sector in 1991, the Indian sky was under the control of two airlines. One was focused on the domestic services (INDIAN AIRLINES) and another provide the international flights (AIR INDIA INTERNATIONAL). Since, then many private airlines have risen. In 2010, sector began to stabilize. But in 2022, after the sale of Air India to the tata group the private providers dominate the civil aviation.

In 2020, the coronavirus pandemic or covid-19 impact's the aviation industry very significantly. Domestic air travel was suspended for several months and the regular international travel came to a halt around over two years. Even after the air travel resume, it will still take some time to bring things back to normal.

Still the Indian Aviation has grown 16% annually in the last decade. The middle-class passengers had started choosing the air travel for better travel experience due to the low-cost of tickets. India is the 3rd largest domestic aviation market globally.

FUTURE ASPECTS

1. The Artificial Intelligence (AI) in the Aerospace Industry
2. The Electric aircraft/ spacecraft design and development
3. Aircrafts with zero fuel
4. Sustainable Aviation Fuels (SAFs)
5. Space Exploration
6. Investigations and advancements in the supersonic and hypersonic aircrafts
7. Investigation of the advance materials and structures
8. Advancements of Digitalization
9. Addictive Manufacturing (like 3D printing enables the complex calculations, geometrics and rapid prototyping lightweight components etc.)

10. Sustainability (Aerospace industry should be more focused on the reducing of the carbon footprints) (13)
11. Immersive Technologies (Technologies like virtual reality {VR} and augmented reality {AR} will intensify the training of pilot, maintenance procedures and the passenger experiences)

CONCLUSION

Aerospace is a vast and dynamic field. The advancements in the technology increases the gate way to new opportunities emerges rapidly, there is always a new opportunity for anyone who is interested in flying, maintenance, management, or engineering.

Aerospace is all about pushing your boundaries, exploring new frontiers for betterment and also contributing to technology. An Aerospace professional doesn't only work for any individual but also support the government by their researches and technology, which helps in upgrading industry and nation altogether.

It is not just a legal requirement of industry but it's a moral obligation to protect human lives, promote confidence of air travel and sustain a thriving industry.

The advancement in the field brings new challenges for the professionals working Research can contribute significantly in the industry by addressing these topics mentioned in the future aspects for new innovations.

The innovations and advancements in the sector is leading to the rapid growth of the industry, which is creating exciting opportunities in the sector for the upcoming freshers.

REFRENCES

(1) www.defensebridge.com / The Impact of Aerospace Engineering on Society Today | Defensebridge

(2) aidat.in / A-Research-Re

(3) britannica.com - Aerospace industry | Definition, Overview, & History | Britannica
(4) link.springer.com - A Brief Introduction to Aerospace Applications | SpringerLink
(5) https://alis.alberta.ca/media/697184/aerospace-engineer-istock-578573130.jpg
(6) https://th.bing.com/th/id/OIP.unLFaP1dRs_kVXrZJYj0sQAAAA?rs=1&pid=ImgDetMain
(7) https://i.guim.co.uk/img/media/d948093b9ea5cc6ac57d68145640f27765ca7711/0_2580_5504_3299/master/5504.jpg?width=465&quality=85&dpr=1&s=none

(8) https://www.euractiv.com/wp-content/uploads/sites/2/2021/09/cockpit.jpg
(9) scied.ucar.edu
(10) skybrary.aero

(11) <https://skybrary.aero/articles/quality-assurance>

asms-pro.com *<https://www.asms-pro.com/SMS/WhatisanAviati*
aviationsafetyblog.asms-pro.com

<https://aviationsafetyblog.asms-pro.com/blog/what-is-an-aviation-safety-manager-in-a-sms-program

(12) flyertalk.com *<https://www.flyertalk.com/articles/aircraft-dispatchers-who-are-they-and-what-do-they-do.html/>*

en.wikipedia.org *<https://en.wikipedia.org/wiki/Flight_dispatcher>*

sheffield.com *<https://www.sheffield.com/articles/how-to-become-an-aircraft-dispatcher-from-start-to-finish>*

usatoday.com *<https://www.usatoday.com/story/travel/columnist/cox/2020/11/26/ask-captain-what-role-do-airline-dispatchers-play-flight/6405693002/>*

(13)

britannica.com
<https://www.britannica.com/technology/aerospace-industry>

aviationoutlook.com
<https://www.aviationoutlook.com/aerospace-industry/>

www2.deloitte.com
<https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/aerospace-and-defense-industry-outlook.html>