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Construct, Aviate, Navigate- Aerospace

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ABSTRACT

Aerospace Engineering is a discrete branch of engineering that has a huge effect on everyday life. The process of designing aircraft is a very complex and intricate art that involves a wealth of knowledge and skills. In the current scenario, the topic is vital and interesting for investigation, because space exploration has always attracted people. We are striving everything and bring light upon the mysteries of the world around, that is why so much efforts is devoted to the development and improvement of aerospace field. People have always dreamt to go into space and due to aerospace the humanity managed to achieve this goal. This paper conveys the integration between two different departments – Mechanical and Computer sciences, to join hands in hands and make a team of unity.

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I. INTRODUCTION

Aerospace is a major part of daily part, even though you may not notice it. The engineers develop and test various aircraft, as well as missiles, and space shuttles. Aerospace engineering is one of the key divisions of engineering, which works out, researches and constructs space rockets, aircraft for different purposes. Scientists need the development of this kind of stream to broaden the knowledge about space and its phenomenon. Aerospace is the human effort in science, engineering and business to fly in the atmosphere of Earth (aeronautics) and surrounding space (astronautics).

Aerospace activity is very diverse, with a multitude of commercial, industrial and military applications.

II. HISTORY

The first planning for “flying machines” began in the 18th and 19th century. Modern aerospace began with George Cayley in 1799. He proposed an aircraft with “a fixed wing and a horizontal and vertical tail”, defining the characteristics of the modern airplane. Airmen like Otto Lilienthal, used gliders to calculate the aerodynamic forces. The Wright Brothers first flight in 1903 sparked interest in aerospace engineering on a whole different level [1].

Aerospace technology advanced rapidly during both World Wars. The launch of Sputnik 1 in 1957 and Apollo 11 in 1969 achieved the first manned moon landing. Wars and science fiction inspired great minds to achieve flight beyond the atmosphere.

III. ELEMENTS OF AEROSPACE

Some of the elements of Aerospace are:

1. Radar cross-section
2. Fluid mechanics and Propulsion
3. Statics and Dynamics
4. Mathematics
5. Control engineering
6. Material Science
7. Avionics and Software

The basis of most of these elements lies in theoretical physics, such as fluid dynamics or equations of motions for flight dynamics. More recently, advances in computing have enabled the use of computational fluid dynamics to simulate the behavior of fluid on testing. This field addresses the integration of all components that constitute an aerospace vehicle and its life cycle (design, temperature, radiation, lifetime etc.).

Figure 1: Parts of an aero plane.

IV. ADVANTAGES AND DISADVANTAGES

Defense and NASA are the two largest consumers of aerospace technology and products. If we analyze the wars in the recent past, two 'Gospel Truths' have emerged. The first is "Aerospace Power by itself cannot win a war. The contradiction is that no major war has been won without the use of Aerospace power." Because of its inherent flexibility and rapid response, it will become the preferred tool of many contingencies. Revolution in engine design, faster propulsion has already reached maximum and hence is an advantage to this field. Emergence of drones has changed the scenario of this vast field. Eco-friendly solutions of aerospace cleaning have been used which do not impact the environment [5].

Low cost, rugged plastic encapsulated microcircuits have long been used in the harsh automotive environment and recent investigations indicate that they may be suitable for use in extreme aerospace environments.

Today, aerospace industry faces the challenge of realizing even more sophisticated avionic systems. The biggest disadvantage is that the number of companies in this field is getting smaller (lots of mergers between big companies). Highly qualified employees are required in such complex field. [3]

Improvements in aerospace can be as –

1. Policy – The need to institutionalize the process so there are minimum charges.
2. Technological Base – Enhance technical training by having more IT companies, institutions which access for deserving students.
3. Industrial Base – Empower the private sector by encouraging Joint ventures and ensuring suitable and stable policies.
4. Research and Development – Both public and private sectors need to boost this.

V. FUTURE OF AEROSPACE

Concepts introduced by the theories of relativity include space-time as a unified entity of space and time, relativity of simultaneity, kinematic and gravitational time dilation, and length contraction. The theory of relativity transformed theoretical physics and astronomy during the 20th century. With relativity, cosmology and astrophysics predicted extraordinary astronomical phenomenon such as neutron stars, black holes and gravitational waves.

NASA scientists including one of Indian origin, are studying the aerodynamics involved in sports balls moving through the air in order to learn how to make aircraft more Earth-friendly or help a spacecraft take the more efficient route to Mars.

The newest flying machines are only the most visible part of what goes on in the air. From pilotless cargo copters to air pressure suits that can fly from the edge of space, is all a part of aerospace. Passenger jets and drones are not the only vehicles that will need to talk to each other in the none-too-far-off-future. Flying cars, hybrid vehicles, massive jets, sleek new fighters, and Mars-bound rockets are the kinds of things we consider when we think of our latest heights in the endless evolution of human flight.

Today's use of structural materials in drones and unmanned vehicles will expand demand, competition and markets, and accelerate the integration of new technology.

Figure 2: Martin Jetpack, the future of Aerospace.

VI. INTEGRATION BETWEEN DIFFERENT FIELDS OF ENGINEERING

This paper mainly focuses on the integration between computer sciences and mechanical fields of engineering. For aircraft control systems, we speak of integrated avionics or computer airborne systems in general. The use of computer networks allows aerospace engineers to communicate and access locations. Mechanical focuses on the framework of a particular aero plane, calculates the required forces on different parts, measures density and checks the quality control. But the brain of aerospace lies in computer sciences.

Computer networks play a vital role in aerospace that support control engineering and avionics. The network

includes softwares to be used for communication. For spacecraft C and C++ are still dominant, generally running VxWorks. Infrared emissions from aircraft are used to detect, track, and lock-on to a target [2].

Avionics is important in aerospace field that includes design and programming of computer systems on board an aircraft or spacecraft and the simulation of systems.

Drafting or technical drawings of a particular component are made which are followed by designing and calculating forces to a minimal value.

In near future, there must be a team in which both these departments must work together in order to develop the economy of a country forgetting the clashes and joining hands with each other.

Figure 3: Space Shuttle Station at NASA

VII. APPLICATIONS

In India, Bangalore is the major centre of aerospace industry, where HAL, National Aerospace Laboratories and ISRO are headquartered. Applications include in commercial, industrial and military fields. Commercial and industrial uses encompass cargo flights, space crafts, helicopters and airplanes carrying passengers and loads. Military uses include jets, helicopters for protection purposes.

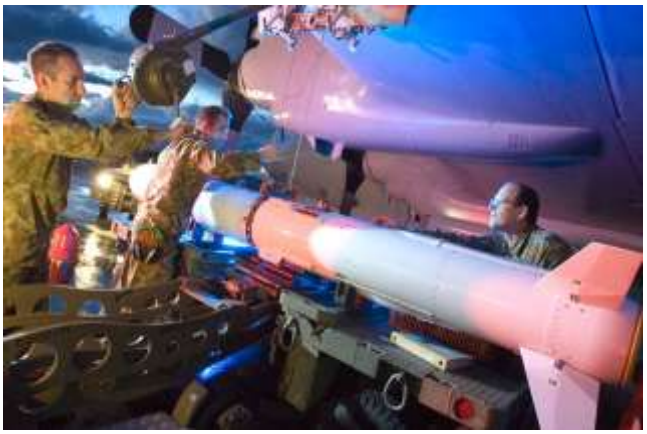

Figure 4: Military applications of aerospace

VIII. CONCLUSION

This field is the place where latest advances are occurring. Aerospace affects by making advancements in flight technology. The field helps make the world run smoother by designing new and safe technology. Today, we are at the cusp of our capabilities. If we use resources wisely, we will be there, right near the top, in a strong position to exploit the great medium of aerospace.

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