Chapter 5

Design and Analysis of Sustainable Combat UAV

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Abstract

War has played a significant role in human history. Knife or swords are thought to be the main weapons used by humans to engage in a war at first. Following that, the rifle was introduced, and weapons played a significant role in the victory of those who utilized them. Following the introduction of firearms, missiles were introduced in 1944, and the year 1944 was known as The Dawn of Missile. These missiles had a significant impact on wars and are still in use today. However, when look at all of the conflicts that have occurred on our globe**, can** see the enormous loss of life and riches. Wealth cannot be protected in a conflict, but lives can. War must be avoided at all costs, but in the event of an emergency, will require new technology to protect and attack. The UAV is used for the following reasons. The term unmanned aerial vehicle refers to a vehicle that can be used for both warfare and surveillance. UAV's use cutting-edge technology to attack with pinpoint accuracy in combat, avoiding unnecessary casualties.

Keywords: UAV, missile, modern technology, aerial vehicle, FEA.

1. Introduction

UAV stands for the unmanned aerial vehicle which is used for both combat and surveillance. UAV uses modern technology to attack in a combat with a high amount of precision and avoids unwanted life loss. UAV's are the future of defence and attack technologies of the world. One of the most highly advanced **technologies which provide** the human to control the UVA from our place [1-3]. An unmanned aerial vehicle (UAV), commonly known as a drone is an aircraft without any human

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pilot, crew, or passengers on board. Unmanned aerial vehicles (UAVs) are part of an unmanned aircraft system, which includes a ground-based controller and a communications system with the UAV. UAV flight can be controlled remotely by a human operator, as with remotely piloted aircraft, or with varying degrees of autonomy, such as autopilot help, up to fully autonomous aircraft with no human interaction [4-5]. UAVs were first created for military tasks in the twentieth century, and they have since become indispensable assets for most militaries.

Figure.1: Combat UAV

Control technology developed and costs decreased, allowing them to be used in a variety of non-military applications. Forest fire monitoring, aerial photography, product deliveries, agriculture, policing and surveillance, infrastructure inspections, science, smuggling, and drone racing are just a few of the possibilities.

A powered, aerial vehicle that does not have a human operator, employs aerodynamic forces to create vehicle lift, may fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload is characterised as an unmanned aerial vehicle (UAV). However, because the vehicle is a munition, missiles with warheads are not called UAVs. The first offensive use of air power in naval aviation happened in July 1849, with a balloon carrier (the forerunner to the aircraft carrier) in the first known use of an unmanned aerial vehicle for war-fighting. During the siege of Venice, Austrian forces attempted to fire 200 incendiary balloons against the city. The balloons were mostly launched

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from land, although some were launched from the Austrian cruiser SMS Vulcano as well. At least one bomb landed in the city, but most of the balloons missed their aim because the wind changed after launch, and some drifted back over Austrian lines.

2. Modern Weaponry

UAV is one of the modern technologies evolved from an aircraft which has an advantage of human less transportation. In 1935 the first modern drone is developed. There are many types of UAV's, which got its name according to its number of rotor, flying style and by usage [6-8]. These are the modern types of weapons which plays a major role in war nowadays. These are considering being one of the deadliest weapons in the history of mankind, due to its high amount of damage and easy to control from a remote place. UAV's are not only weapons; they are also used for surveillance, target acquisition, intelligence and reconnaissance, and also can carry bombs and missiles [9-10].

3. Methodology

3.1 Design Process

The combat UAV in historical aspects got many inspirations for our designs. According to the usage of these UAVs they are classified into many types surveillance UAV, combat UAV, UAVs for transporting cargo where any other vehicle can't go, target acquiring UAVs etc. In this work focused on the design aspects of our UAV to stand out unique from other UAV in a futuristic and innovative way. This design helps us to disassemble and reassemble the UAV quick and easy while in maintenance. Brainstorming is the starting process of any design concept development to get the new concept. Sharks have a sharp looking attributes which can suit our designs. Then extracted the attributes of hawk to create an organic design which are called as speed forms. Speed forms helps us to develop a concept based on its form.

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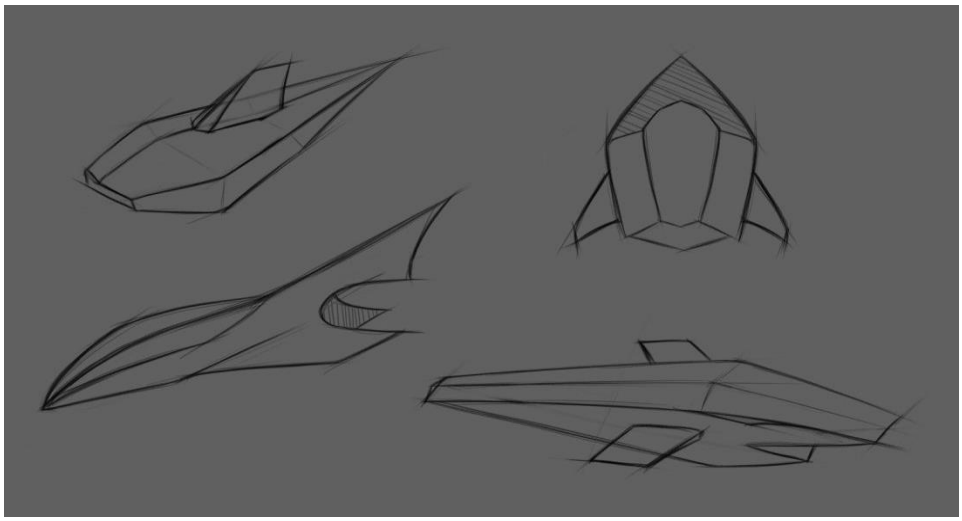

Figure.2: Speed form sketches

The design is developed as hand sketch is then developed as 3D CAD model in the CAD software. Autodesk Alias for surface modelling to get the outer skin of our UAV. The final model of our UAV is then tested in ANSYS to get the result of our design.

3.2 Materials Used

Composites made of carbon fibre Carbon-fiber reinforced thermoplastics (CFRTs), often known as carbon fibre, carbon composite, or just carbon, are very strong and light fiber-reinforced polymers containing carbon fibres. CFRPs can be costly to manufacture, but they are widely utilised in industries that demand a high strength-to-weight ratio and stiffness (rigidity), such as aerospace, ship superstructures, automotive, civil engineering, sports equipment, and a growing variety of consumer and technical applications.

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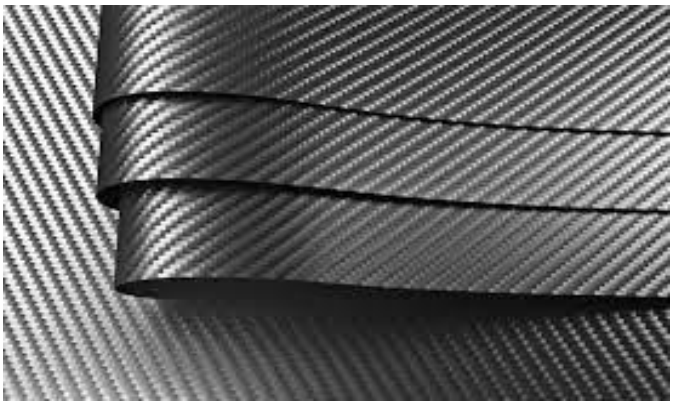

Figur**e. 3**: Carbon fiber reinforced sheets

A thermoset resin, such as epoxy, is frequently employed as the binding polymer, but other thermoset or thermoplastic polymers, such as polyester, vinyl ester, or nylon, are also occasionally used. The type of additives used in the binding matrix can alter the qualities of the final CFRP product (resin). Silica is the most common addition; however other materials like rubber and carbon nanotubes can also be employed. CFRP stands for carbon fibre reinforced plastic. The composite in this scenario is made up of two parts: a matrix and reinforcement. Carbon fibre is used as reinforcement in CFRP, which gives it its strength. To bind the reinforcements together, the matrix is commonly a polymer resin, such as epoxy. The material properties of CFRP are dependent on these two aspects because it is made up of two separate constituents.

3.3 CAD Modelling

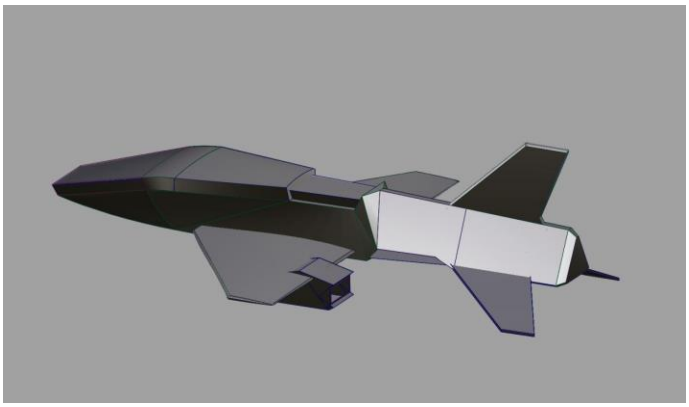

Figure.4: Rear isometric view

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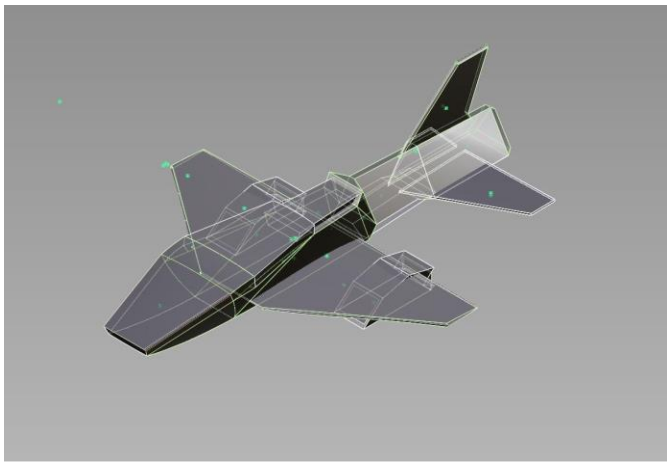

Figure.5: Front isometric view

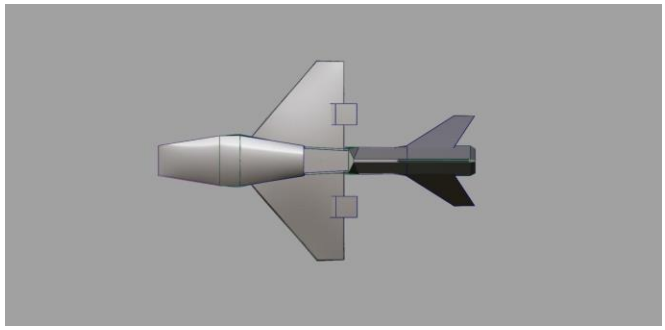

Figure.6: Top view

Computer-aided design, or CAD modelling, is an integral aspect of the design process. CAD brings your vision to life in the digital realm before you spend any actual resources. From 3D printing prototypes to advertising photo-realistic simulations, Computer Aided Designs are utilised for a range of purposes

Designers can use computer-aided design, also known as 3D modelling, to test, enhance, and manipulate virtual items before they go into production. These high-quality 3D drawings are exact replicas of the desired finished product in terms of dimension and detail, ensuring production quality and accuracy. Clients will obtain deliverable 3D files of their product, a Bill of Materials, and a Color Material Finish (CMF) document as part of our 3D Design, CAD modelling services.

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4. Finite Element Analysis

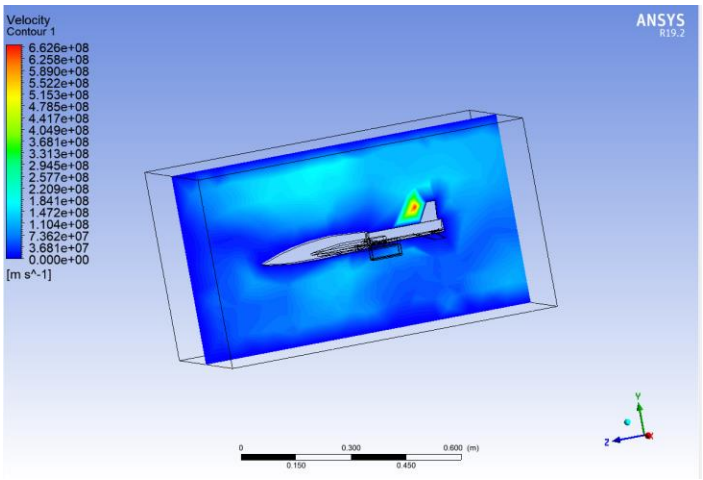

Figure.7: Finite element analysis

The act of modelling the behaviour of a part or assembly under specified conditions in order to examine it using the finite element method is known as finite element analysis (FEA) (FEM). Engineers utilize FEA to mimic physical phenomena and eliminate the requirement for actual prototypes while also allowing for component optimization as part of the project design process. FEA is a method of understanding and quantifying the impacts of real-world conditions on a part or assembly using mathematical models. Engineers can use these simulations, which are run using specialist software, to find possible flaws in a design, such as areas of tension and weak spots. It is possible to comprehend and quantify structural or fluid behaviour, wave propagation, heat transport, and other processes using mathematics. The majority of processes can be represented using partial differential equations; however these difficult equations must be solved in order to determine parameters like stress and strain rates. The use of FEA allows for a rough answer to these issues. FEA is the basis of modern software simulation software, with the results usually shown on a computer-generated colour scale. FEA simulations are made up of a mesh of millions of tiny pieces that combine to form the geometry of the structure under consideration. Each of these minor pieces is calculated separately, with the mesh refinements combining to generate the overall structure's ultimate output.

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These approximation calculations are typically polynomial in nature, with interpolations occuring across the small elements, allowing values to be established at some but not all places. The sites where the values may be determined are known as nodal points, and they are frequently situated near the element's boundary.

5. Conclusion

This study examines a UAV with a futuristic design. UAVS are lethal weapons in today's world; it is our responsibility to use them only when absolutely necessary. In several domains, including the military, unmanned aerial vehicles (UAVs) are still in development. Scientists are working to develop new technology for these UAVs. These are the weapons of the future. They have a high level of precision. The many sorts of UAVs allow us to utilise them more effectively and wisely. Various types of drones and unmanned aerial vehicles (UAVs) are utilised depending on the situation. Nano UAVs are used for observation, big UAVs with missile warheads are utilised for battle, and micro UAVs are used for tracking. Because it is more important to save humanity from these wars than to use more advanced technology like UAVs, our ultimate goal is to avoid wars altogether.

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