OBSCURE HOVERING VEHICLE

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Abstract - Stealth technology, most generally attributed so-called LO technology (Low Observable Technology), is a military tactic used in the service of flying without any sign of obvious factors such as RADAR. Flying Saucer designs are examined by researchers throughout the world to be further efficient in aerodynamics and energy consumption, emerging from the riddle after the unidentified vehicles that are usually seen on the air and titled UFO (Unidentified Flying Object). In this project, these two reputable and powerful ideas are combined by applying modified working mechanisms at the scale-down model known as UAV (Unmanned Aerial Vehicle). The OBSCURE HOVERING VEHICLE will be a mechanical or manual control UAV that could be utilized to watch enemy formations externally any detection in Defence areas and also commercially for many surveillances.

Key Words: Design, Flying Saucer, Stealth, Unmanned Aerial Vehicle

1. INTRODUCTION

Stealth aircraft is a uniquely created aircraft with smooth coverings and Keen edges employed in the military according to their purpose and procedures as fighter and Bomber aircraft that cannot be recognized by Radar or any other recognizing Instruments. Airplanes to be stealthier acquire some of the signs that should be involved like Acoustical, Visual, Thermal, IR, and Radar.

The mechanization of stealth prime originated through the world war-2, where Germans are first to act on the stealth project. Following the World War-2, YB-49 flying wing, a bomber aircraft was developed by US Northrop aircraft. The U.S. acquired more about military improvement when it becomes essential during the "cold war" in the old 1950s.

The idea to promote this kind of airplane was to cruise at high elevations without being unsecured. So, the purpose purely depended on the idea of escaping from radar when identified by enemies. Thus, the progress began in California at Lockheed.

The Lockheed created the first stealth aircraft in the year 1981 and termed it as nighthawk. After the resignation of F-117 NIGHTHAWK in 2008, F-22 Raptor and F-35 Lightning 2 arrived which was developed by Lockheed that are yet in service. After this, many stealth aircraft have been developed and utilized. Generally, horizontal aircraft frames are applied in stealth technology. But the disc-shaped structure will be more demanding that could be employed for stealth.

UFO is a mystery flying vehicle and commonly known as flying saucer. The flying saucer is completely fit for stealth design as structurally and aerodynamically. It comprises a disc-like fabrication that provides sufficient structural as in size and providing precise edges. The flying saucer is also aerodynamically suitable for this stealth technology. As their flat exteriors equip them to cruise at high velocities. This can be made and managed for multi-purpose missions. Based on all the peculiarities of UFO and stealth signatures a UAV has been composed with notable exceeding efficiency as long-range and high endurance. It is described as Obscure Hovering Vehicle (OHV).

2. OBJECTIVE

Performing fewer camouflages starts with chameleon concept as soldiers use to protect in jungle battle in the beginning 1930s which came to stealthy airplanes by employing several design plans after the 1940s to leave from Radar. A tremendous change was made on stealth aircraft throughout these years and now it is extending towards its newest technology of employing plasma stealth that uses ionized gas and intense intelligent signal removal by producing negative intervention, where it requires convincing computers and sensible emitter and detector. The concept that is familiar with receiving the radar waves and transmitting to another path lies the same, where the way of technology changes in the upcoming years. Getting this into account, this Obscure Hovering Vehicle is devised grasping Coherent Flying Object as a reference and stealth provisions are made by reshaping its design. It is believed that this OHV will make insight for the future advancement of stealth objects and very much applicable in military plans both for serviceable and for seeing the enemy nations.

3. DESIGN PARAMETERS

3.1 Design Approach

Obscure Hovering Vehicle is a disc-like design that embeds all the parts inside its body casing. The OHV is originated at its miniature level with a diameter of 300mm, which produces it a dense model to take it wherever without any loss. The smooth outline can decrease the form drag which is more hopeful during the high speed of this sort of UAV model.

The body of OHV envelops the impeller, which is furnished with an allowance to revolve and clearing to absorb and release the air. The levitation of the machinery is facilitated by sucking the air from the top and rushed downwards. Thereby the lift can be varied subsequently by varying the speed of the impeller.

Fig – 1: Isometric view of OHV

The demanding aspect of designing a disc-shaped hovering object is maneuvering and control. OHV employs deflectors of the airflow sidelong to likely make movements like Pitch and Roll which operates on the Coanda effect. The nozzle section can be combined up with finned actuators for performing Yaw. The thrust of the nozzle can be different by varying the sectional area of the nozzle.

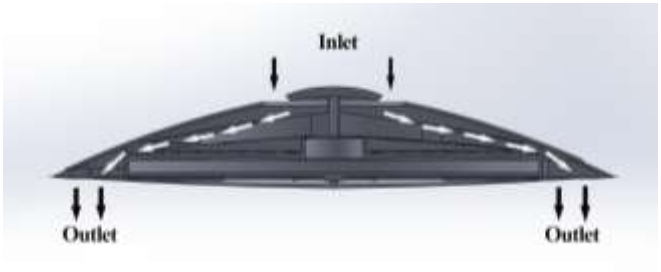

Fig – 2: Cross sectional view of OHV

3.2 Material

Beneficial improvements in additive manufacturing furnish more hope on performing this critical design into a real-life design. The entire body can be insisted on Carbon fiber Hexcel as4C which is also combined with RAM coating to make stealthy possibilities described following in this journal. The impeller fan segment can be done with a PVC grid, bearing structural stability at maximum RPM.

3.3 Components

The better section of OHV holds the confined portions of the UAV body like actuators and impeller blade. The actuators are embedded inside the casing below the impeller structure. Sufficient space is designated under the impeller assembly for electrical onboard accessories.

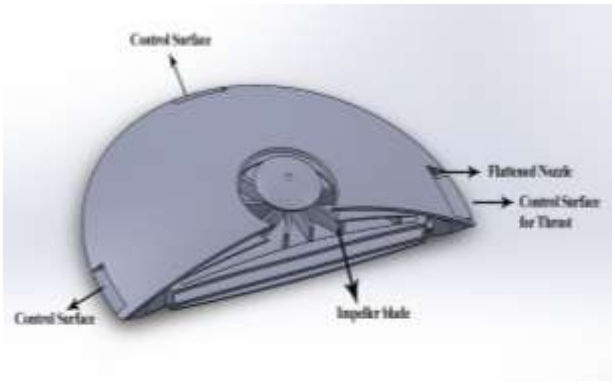

Fig- 3: Components of OHV

The choice of machine depends on its electrical components to produce the desired task probably. Besides, OHV includes a power source, motor, servos, and sensors depending on the necessities of the mission. Lipo battery is the consistent solution for a UAV that has diminished weight and a high life cycle as a power source. Brushless motor is chosen to run the impeller. Gyro piezo is adopted to produce the anti-torque to eliminate the impact generated by impeller rotation, consequently making the vehicle further steady. Sensing components like altitude hold, Barometric sensors and so on, can be performed onboard as per the purpose of the utilization.

3.4 Stealth Accomplishment

Stealthy is a way of creating the Obscure Hovering Vehicle less noticeable. Moreover, this less noticeable doesn't signify making hidden but making partially hidden. As discussed earlier, these are applied before the 1930's called the camouflages. This approach is similar to a chameleon, which is competent in changing its appearance as stated by the circumstances. Towards the successive days, these camouflages continued to be performed by further requirements of leaving away from detector signals, which are used in nowadays advanced military airplanes and ships.

- Flattened fuselages

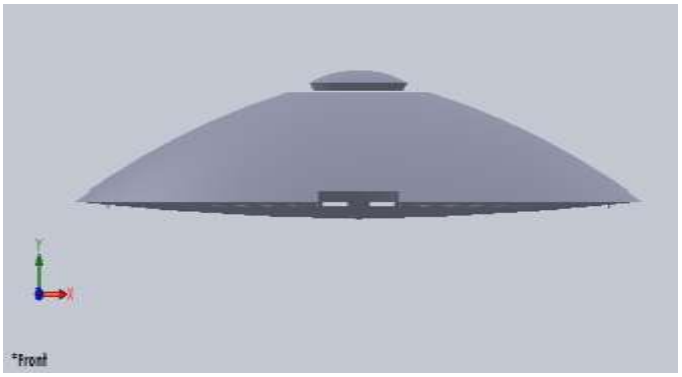

Fig- 4: OHV sleek structured body

Many circular cross-sections are seen in normal airplanes and only flat patterns in stealth planes to simply disappear from the radar. While considering a circular object from which we can execute the photons, they revert to the radar detection system, but not for all situations. OHV is designed with a flattened structure, where the deflection of photons is not achievable except, we are right on top or beneath it. Therefore, the photons leap off and move to another path apart from the radar. So, the design prevents the leap-off of the object back to the source.

- Inlet Design

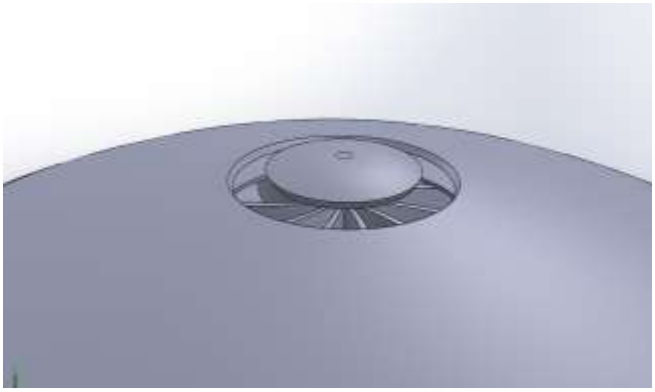

Fig- 5: Inlet section of OHV

The body of OHV must be designed in such an approach that no development of bump occurs (i.e.) intake design has not too bulged outside and the first opinion is the propulsion source is concealed inside the aircraft body.

Inlet designs are hidden and it is not possible to see the parametric impeller but only the inlet duct and its curves.

- Flattened Nozzles

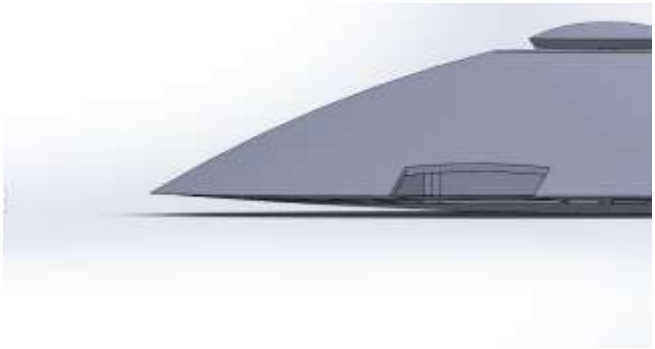

Fig- 6: Nozzle section of OHV

The corresponding design standards as followed for the inlet is relevant for flattened nozzles by limiting bump development and set near to the body of the aircraft. This prevents the OHV from FLIR (Forward Looking Infra-Red) detection.

- Toothpick Leading Edges

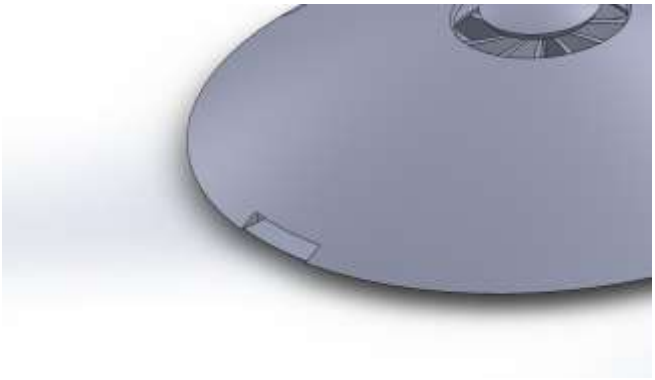

Fig- 7: Sharp edges of OHV

The front sides of maximum stealth airplanes determine the equivalence within the radar reflectivity and the aircraft dynamics. Indeed, if rounded leading edges are availed to generate more lift, they bounce radar waves to more ways which make the situation go worse and persists a concern for keeping stealthier.

Also, the adverse place for reflectivity ever takes place near the edge of the airplane (i.e.) Control surface edges, tips and also in slats/flaps.

To overcome this challenge, OHV is designed in such a way, where the front edges are made thinner, approximately near the middle of the leading edge and then sharper near corners, which was often known by the name "toothpick" leading edges.

- Use of Radar Absorbent Material (RAM)

RAM lessens the magnitude of the reflection of the waves. During this mission, bits of ferrite are immersed in paint or epoxy. Incident radar is scattered across a large surface section by decreasing RCS without addition in the infrared signature. This is known as Non-resonant magnetic RAM, which is one among three generally used RAMs of stealth and valid across extensive frequencies. Such specific paint of iron forms a magnetic field that receives the waves and disappears as heat.

4. RESULT AND DISCUSSION

The determination in the model is improved when it is analyzed, as the outcomes are as demanded. A 3-D is enriched with an appropriate dimension held in a rigid control volume, which is accomplished through SOLIDWORKS version 2018.

The CFD software ANSYS version 2019R2 is applied to analyze ANSYS FLUENT FLOW. The analysis is brought out by performing separate initial boundary condition values. The lift coefficient, the Drag coefficient together with pressure and velocity changes are assumed by diversifying velocity values as 25m/s, 250m/s, and 500m/s and are

depicted as graphs for clear perception. The repetition was carried up to 100 to gain more exact outcomes.

4.1 Coefficient of Lift

The resulting graphs show Lift coefficient values for the three different Mach i.e. Subsonic, Transonic, and Hypersonic.

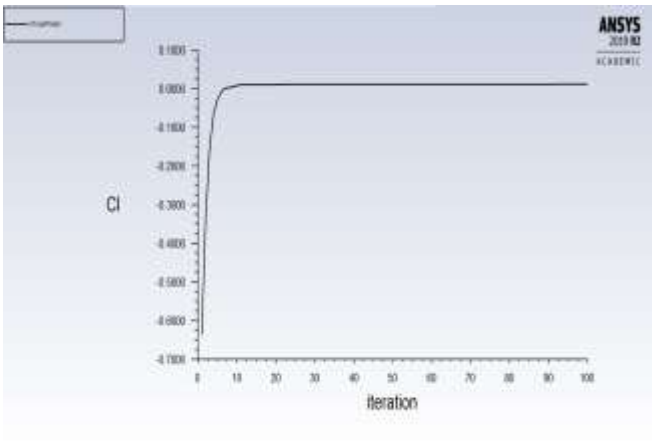

Fig- 8: C_L values for velocity of 25m/s

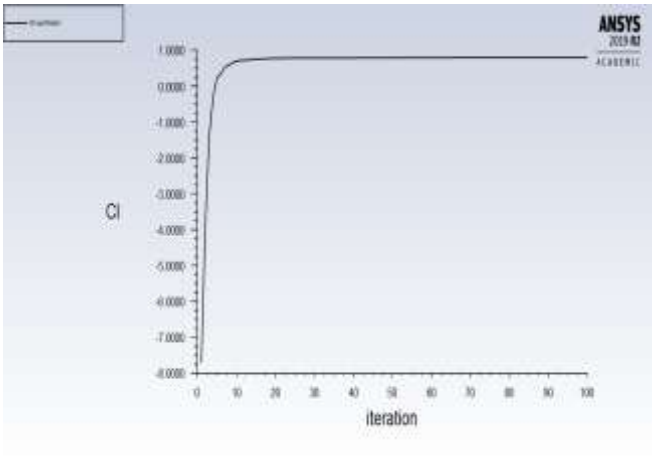

Fig- 9: C_L values for velocity of 250m/s

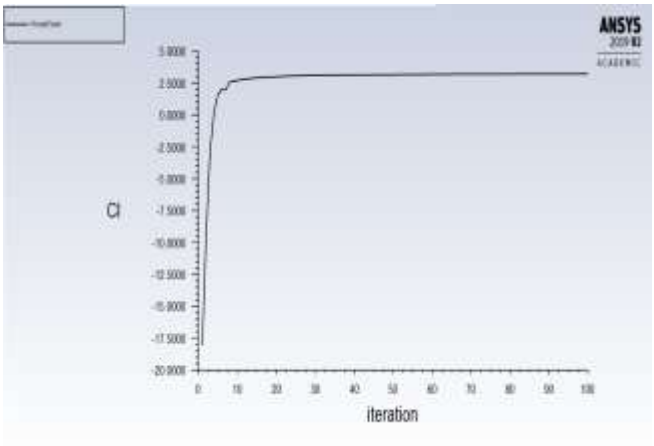

Fig- 10: C_L values for velocity of 500m/s

4.2 Coefficient of Drag

The Drag coefficient continues further declining in values which may be the result of the disc-shaped configuration. Thus, the OHV is assumed to work with minor induced drag also in hypersonic speeds of the machine.

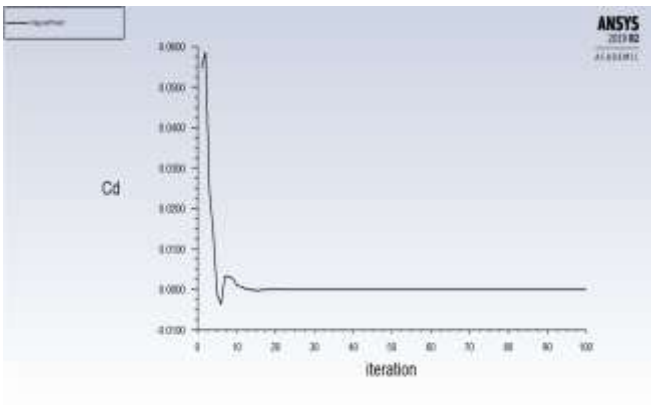

Fig- 11: C_D values for velocity of 25m/s

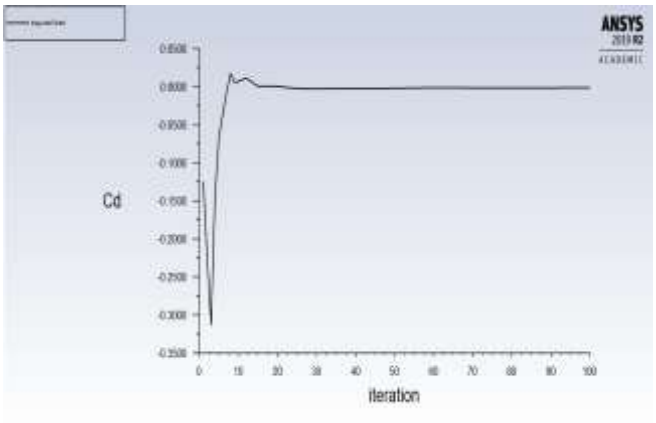

Fig- 12: C_D values for velocity of 250m/s

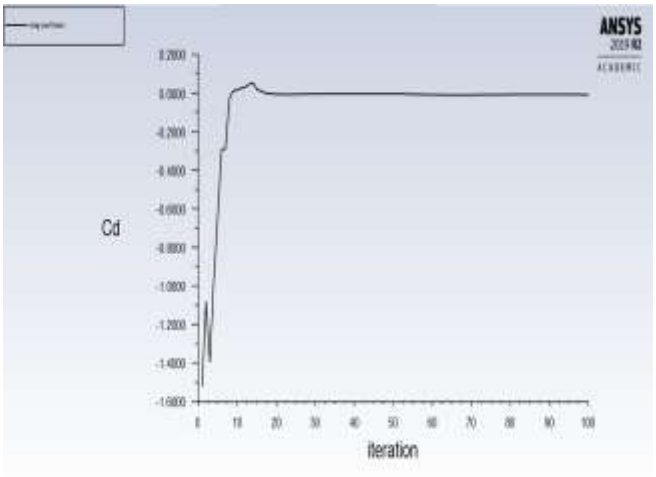

Fig- 13: C_D values for velocity of 500m/s

4.3 C_L and C_D values

The numerical values obtained from the graphs plotted as C_L and C_D are tabulated below

Table- I: C_L vs C_D values

Velocity (m/s)	Coefficient of Lift (C_L)	Coefficient of Drag (C_D)
25	6.9294688e-14	-1.031171e-14
250	0.79645514	-0.0015356519
500	3.2120824	-0.0082008205

4.4 Pressure variation

Lift generation which is evident in an airfoil also seen in the OHV design and the following images shows the pressure difference well in all the three kind of velocities.

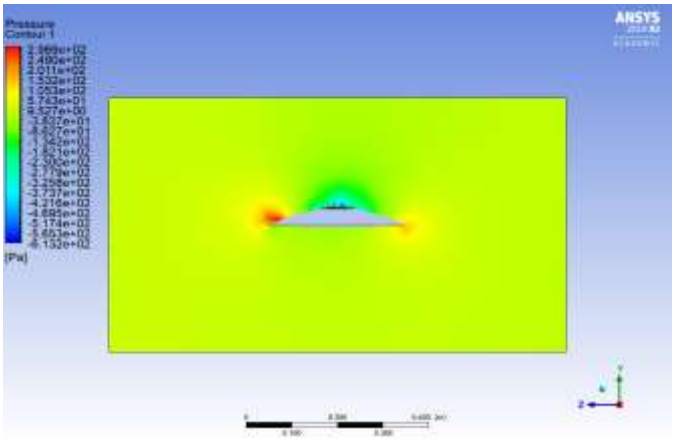

Fig- 14: Pressure variation for velocity of 25m/s

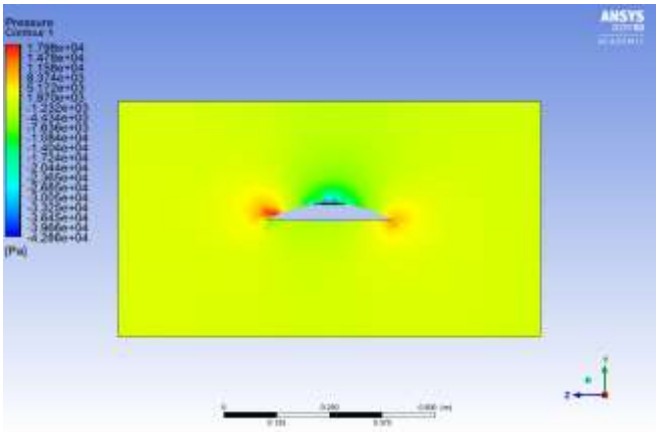

Fig- 15: Pressure variation for velocity of 250m/s

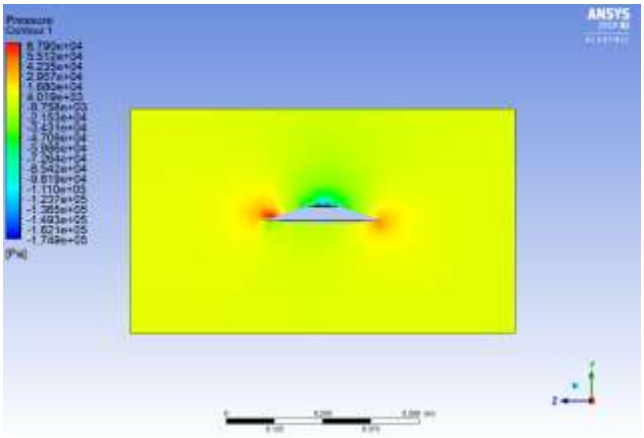

Fig- 16: Pressure variation for velocity of 500m/s

5. FUTURE WORK

This paper shows a more hopeful way of converting fiction into real-time utilization. Obscure Flying Object is in the conceptual stage and it requires added forthcomings like prototype modeling, real-time data monitoring and analyzing, which can correct more variations in the model.

Moreover, the interstellar voyage can be further efficient if distinct ways are developed in the area of rocket science and including space propulsion. The past revealed projects on saucer-like flying machines confirm that the researchers have a powerful foundation on the views correlated to the disc-shaped flying air vehicles. These are supposed to be the most effective way of exploring and are usually assumed as the future aviation means of outer space.

6. CONCLUSIONS

Stealth ability decreases the observability of the flying planes at its best and the mechanism considers promoting more obscure operation. Indeed, maximum countries dropped the projects on Flying saucer, we conclude that those designs with our modified form on the miniature level like UAV will defeat the limitation of development.

Controlled flying off of these machines which is a disadvantage on the old projects are exacted to capture the better in this type of UAVs. By embedded actuators, maneuvering complexity is made easy and the influence of Coanda is utilized at its simplest way of progress that smoothens the flow area decreasing the Obscure Hovering Vehicle signature. Structural concerns are taken into control as the compact configuration and stability can be more accurate than other vehicles indeed at high speeds.

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BIOGRAPHIES

Dinesh Babu V, working as an Assistant Professor of Aeronautical Engineering in Nehru Institute of Engineering and Technology, Coimbatore, Tamil Nadu, INDIA. He completed his B.E. and MTech Degree in Hindustan Institute of Technology. He also applied for patent on FOLDABLE RC POWERED KITE in 2017 and carried out projects on Bearing and Delamination failure analysis of various composite laminate subjected to pin-load and Performance Analysis on High Lifting Devices.

Vaishnavi M, is Currently pursuing the Final year of B.E. Aeronautical Engineering in Nehru institute of Engineering and Technology, Coimbatore, Tamil Nadu, India. She had involved in ASTEROID SEARCH CAMPAIGN conducted by Space India in collaboration with International Astronomical Search Collaboration (IASC). She is certified for Mechanical design at the level of Associate in SOLIDWORKS. Her research interests include Flight Aerodynamics and on flight dynamic behaviors due to Propulsion systems.

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Thamil Selvam K B, is Currently pursuing the Final year of B.E. Aeronautical Engineering in Nehru institute of Engineering and Technology, Coimbatore, Tamil Nadu, India. He undergone one-month internship at Taneja Aerospace and Aviation Limited learning the manufacturing techniques of Aircraft components. His research interests include Flight Dynamics Study and Design and Analysis of air vehicles.