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MICRO CLASS TRAINER AIRPLANE

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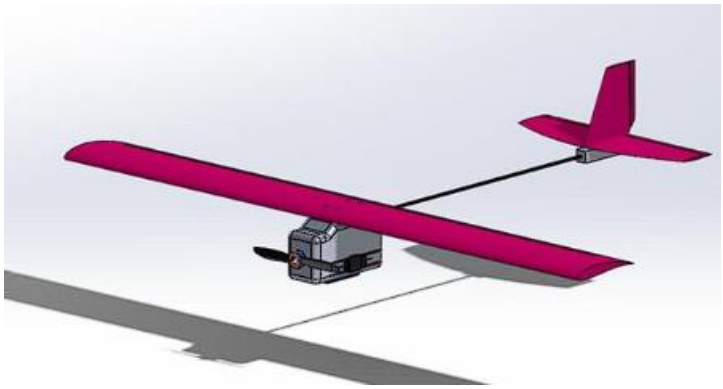
Purpose of the project:

The purpose of this project is to build a micro class trainer aircraft based on a very basic design. Key objectives are to create a fly worthy model with all components enabling the model to fly without any difficulties and in a safe manner. We will be building an UAV for this purpose.

Micro Class Aircraft or UAV:

A UAV basically stands for Unmanned Aerial Vehicle. So basically, A micro class aircraft is a tiny, lightweight (under 1.5 kg) remote-controlled airplane, typically used in competitions. They're hand-launched and electric-powered, with limited wingspans and specific construction rules. These miniature models are often used to test design and engineering skills, focusing on efficient flight and payload capacity.



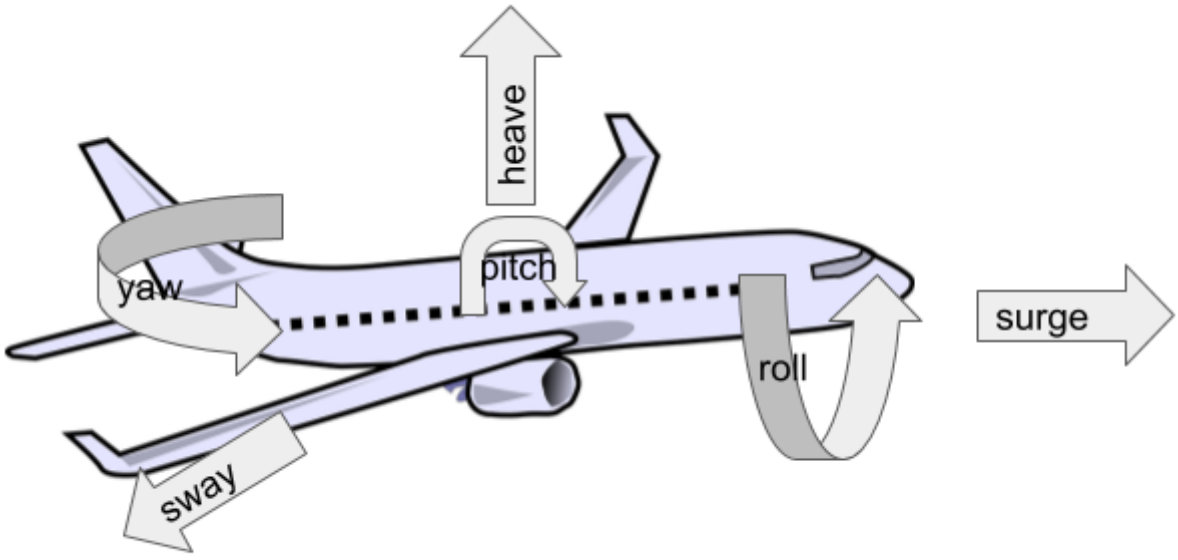
Design:

For this project we will be using a trainer design, and it will be as the name suggest not having a lot of components instead a model with all the basic components to make sure the aircraft flies safely and in a convenient way. This model will be used for pilot training using the transmitter as in case something goes wrong there is not a lot of components to be damaged.

Micro class airplane design balances weight minimization and aerodynamic efficiency. Balsa wood or similar lightweight materials are meticulously shaped to form a strong, yet feathery airframe. For the current design we will be using **Styrofoam** due to its lightweight property. Wings are optimized for low drag and weight, often employing simple shapes like straight or slightly tapered designs. Precise wing placement and tail design ensure stability and control. The miniature electric motor and battery are carefully chosen for maximum power within weight constraints. Every element, from construction methods to control throws, is meticulously considered to achieve the perfect balance of performance and portability.

Controls:

An aircraft basically has 3 degrees of motion. Rotate, yaw and pitch. The rotate movement helps the plane turn left or right, same applies to yaw but in a different manner and using a different set of components. This is illustrated below. Now pitch as the name suggests helps the model go up or down.



Components being used:

1. **Motor:**

The type of motor used in a model airplane depends on the size, complexity, and desired performance characteristics of the aircraft. However, the two most common types are:

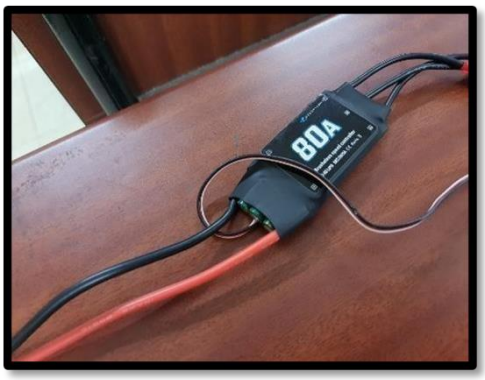
Electric motors: These are the most popular choice for model airplanes, especially smaller ones. They are quiet, clean, and efficient, and they come in a variety of sizes and power ratings. Electric motors typically power the propeller directly or through a gearbox.

Small internal combustion engines: These are used in some larger model airplanes, especially those that require more power for things like aerobatics or long-range flights. They are typically gasoline-powered and require more maintenance than electric motors.

For this project we will be using an **electric motor** as understood from the above description.

2. ESC:

An Electronic Speed Control (ESC), also known as a motor controller, is a crucial component in a micro class aircraft, just like in any other electric remote-controlled airplane. It acts as the brain between the battery, motor, and receiver, regulating the power delivered to the motor and ultimately controlling the speed of the propeller.



Here's a breakdown of the ESC's role in a micro class aircraft:

Receives control signals: The ESC receives signals from the receiver, which translates the pilot's control inputs (throttle stick movement) into electrical signals.
Regulates power: Based on the received signal, the ESC controls the amount of power delivered to the motor, determining the propeller's speed and, consequently, the thrust generated.
Protects the system: Modern ESCs are equipped with various protection features, safeguarding the motor, battery, and itself from potential damage caused by overheating, overloading, or low battery voltage.

3. **Battery:**

Micro class aircraft, due to their small size and weight limitations, rely on **Lithium Polymer (LiPo)** batteries as their primary power source.

4. **Servos:**

The term "servomechanism" (servo) can be used to describe a wide variety of moving devices that have been in use for longer than most people may think. A servo is essentially any motor-driven system that has an integrated feedback mechanism. Servos are used in robotics, a wide range of electronics, heavy machinery, and power steering in automobiles. The servos are being used here to control the elevator, flaps, rudder, and other various mechanisms.

Current Update:

As of now we have finalised the design and researched on the components to be ordered and are still looking for the other leftover components. Once all the components are collected, we

will be moving to the manufacturing phase where will be using Styrofoam and making the frame and then connect all the electrical components and calibrate and configure them as per the need. After this stage we will be performing a small test using all the components.