



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &

Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)

COIMBATORE-641 035, TAMIL NADU



DEPARTMENT OF AEROSPACE ENGINEERING

Faculty Name : **Dr.M.Subramanian,** Academic Year : **2024-2025 (Odd)**
Prof & Head/ Aerospace
Year & Branch : **IV Aerospace** Semester : **VII**
Course : **19ASZ401-3D Printing for Space Components**

Unit II

DESIGN FOR ADDITIVE MANUFACTURING

Case Study: Design and Processing in Drone Components

Introduction

Drones, or Unmanned Aerial Vehicles (UAVs), have become integral in various industries, including aerospace, agriculture, surveillance, and delivery services. This case study explores the design and processing of drone components, focusing on the challenges and solutions in manufacturing high-quality, precisely machined parts.

Design Considerations

- 1. Structural Integrity:**
 - **Material Selection:** Lightweight yet strong materials like carbon fiber and aluminum are commonly used to ensure durability without compromising on weight.
 - **Aerodynamics:** The design must minimize air resistance to enhance flight efficiency. This involves optimizing the shape and surface finish of the drone components
- 2. Component Integration:**
 - **Modularity:** Designing components that can be easily assembled and replaced improves maintenance and scalability.
 - **Compatibility:** Ensuring that all parts, such as motors, propellers, and sensors, work seamlessly together is crucial for optimal performance

Dr. M. Subramanian/Professor & Head Aerospace Engineering/19ASZ401-3D Printing for Space Components

Processing Techniques

1. Additive Manufacturing (3D Printing):

- **Prototyping:** Rapid prototyping using 3D printing allows for quick iterations and testing of designs.
- **Complex Geometries:** Enables the creation of intricate parts that are difficult to produce with traditional methods

2. CNC Machining:

- **Precision:** CNC machining provides high precision and repeatability, essential for critical components like motor mounts and gimbals.
- **Material Versatility:** Capable of working with a wide range of materials, including metals and composites

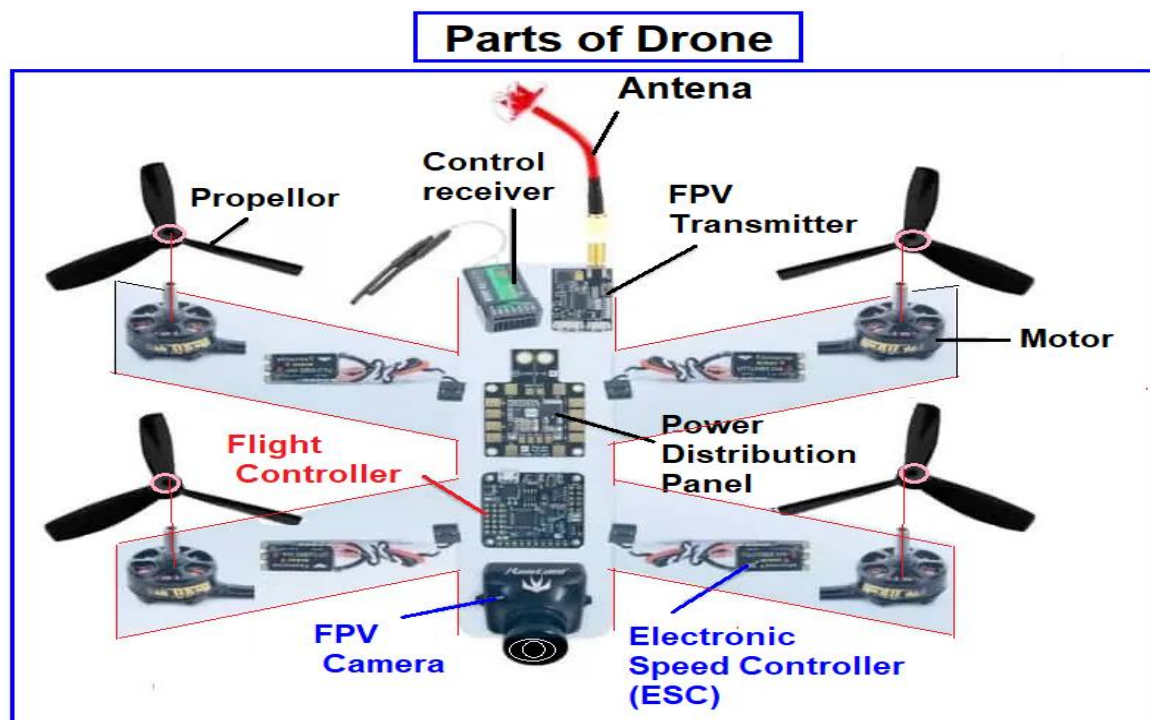
Challenges

1. Vibration and Noise Mitigation:

- **Bearings and Dampers:** High-quality bearings and vibration dampers are used to reduce noise and improve stability.
- **Structural Design:** Optimizing the frame design to minimize vibrations during flight

2. Environmental Impact:

- **Sustainable Materials:** Using recyclable and biodegradable materials to reduce environmental footprint.
- **Energy Efficiency:** Designing components that consume less power, thereby extending flight time and reducing energy consumption



Dr. M. Subramanian/Professor & Head Aerospace Engineering/19ASZ401-3D Printing for Space Components

Applications

1. **Aerospace:**
 - **Surveillance and Reconnaissance:** Drones equipped with high-resolution cameras and sensors for military and civilian surveillance.
 - **Delivery Systems:** UAVs designed for delivering packages, especially in remote or hard-to-reach areas
2. **Agriculture:**
 - **Crop Monitoring:** Drones with multispectral sensors to monitor crop health and optimize farming practices.
 - **Precision Agriculture:** Using drones for targeted spraying of fertilizers and pesticides
3. **Public Safety:**
 - **Disaster Management:** Drones used for search and rescue operations, providing real-time data and imagery.
 - **Law Enforcement:** UAVs for monitoring and managing public events and emergencies