機械與機電系統研究所 MECHANICAL AND MECHATRONICS SYSTEMS

# UNMANNED AERIAL VEHICLE(UAV)



# **Redundant Flight Control System Technology**

The majority of drones currently employ a single-controller flight control hardware architecture, which poses a significant threat to flight safety in the event of a flight control system malfunction. To address this issue, MMSL has developed a redundant flight controller to enhance mission reliability.

### Technical Advantages and Features



- Equipped with a redundancy mechanism, the parallel flight controllers can switch to the backup module in real-time.
- A built-in triple redundancy sensor system, which uses data from three or more sensors to compute and feedback to the core flight control, enhancing the reliability of the aircraft's attitude and positional status.

Highly Compatible and Easily Development

- Based on the open-source Pixhawk system, this platform is optimized for cybersecurity and compatible with commonly used flight controller software like PX4 and Ardupilot.
- Supporting the Robot Operating System (ROS/ROS2) for developing intelligent payloads and integrated applications.



- An all-in-one military-grade connector that can be quickly assembled in 5 minutes and effectively prevents cable disconnection.
- Enclosed case design with a waterproof and dustproof rating of IP65 or higher.

# Industrial Benefits and Business Opportunities

#### • Industry Applications:

Unmanned Vehicles Industry, such as UAVs, USVs, UGVs.

#### • Application Examples:

This technology's flight control module has been integrated into ITRI's large 8-axis drone, designed for cleaning systems such as insulators, electric towers, and building facade cleaning. It is currently undergoing field validation in Taiwan.



Redundant Flight Controller



Redundant Flight Controller Applied to Insulator Cleaning



# **Insulator Cleaning Drone**

In the electric power transmission system, the insulators on high-voltage electric towers require cleaning and maintenance to reduce the risk of arcing or erosion, thereby ensuring the stability of the power supply. Whether performed through manual climbing or by using helicopters equipped with water guns, cleaning remains a high-risk and costly operation. The insulator cleaning drone significantly reduces the risk exposure to personnel and offers a more competitive model for maintaining the transmission network.

## Technical Advantages and Features



# Industrial Benefits and Business Opportunities

#### • Industry Applications:

Operation and Maintenance of Electric Power Infrastructure and Industries Requiring High–Altitude Cleaning Services (such as Insulator Cleaning and Building Cleaning).

#### • Application Examples:

Obtained the first-phase test flight certificate for high-voltage electric tower sites and is currently verifying cleaning performance in the field. Derivative applications include horizontal spraying on large fruit trees, demonstrating effective penetration through large tree canopies.



Drone-Based Insulator Cleaning Operation



# Customized Technology for High-Efficiency Drone Motors and Smart Electronic Speed Controller

For military or commercial drones, the motors and electronic speed controllers directly affect the dynamic performance of the flight. These components need to be developed based on the overall takeoff weight and power configuration of the drone and must be matched with the propeller output settings to optimize the drone's durability and controllability. This technology addresses the domestic shortage of high-thrust electric propulsion modules for medium to large drones, thereby accelerating the development of the entire power system and enhancing flight reliability.

# Technical Advantages and Features



# Industrial Benefits and Business Opportunities

#### • Industry Applications:

Related to Unmanned Vehicles, Including Drones, Unmanned Boats, and Autonomous Vehicles.

#### • Application Examples:

The drone motors and electronic speed controllers developed through this technology are suitable for medium to large multi–rotor drones. Specifications have been adjusted according to manufacturer demands. The technology has been transferred to two domestic manufacturers, who will establish production lines and become parts of the drone supply chain.

