Reliable methods of radiation detection are crucial for many applications, including nuclear emergency response, proliferation detection and environmental assessment. However, measurements taken in person yield the potential risk of radiological damage from hazardous sources. By eliminating the need for in-person survey, we can therefore remove the additional risk from conducting measurements. Our team has designed a radiation detection system that will be incorporated into an unmanned aerial vehicle (UAV), allowing users to measure areas of interest from a safe distance. Our system will use a new plastic scintillator material, which will enable the UAV to distinguish between neutrons and gamma-rays, while maintaining its light weight and structural integrity.

Our detection system will replace the landing feet of a Matrice 600 drone, enabling users to take measurements from a safe distance. This project proved the feasibility of using a novel plastic scintillator material simultaneously as a radiation detector and a UAV structural component.

**Major Chemical Components of PSD Plastics**

- **Primary Dye**: 2,5-Diphenyloxazole (PPO)
- **Secondary Dye**: 1,4-bis(2-(2-methylphenyl)ethenyl)benzene (Bis-MSB)

**Scintillator Synthesis and Processing**

Preparation of Chemicals → Synthesis of Scintillating Polymers → Cutting and Polishing the Scintillating Plastics

**Radiation Detection System**

- Plastic scintillator material
- Photo-multipliers
- Radiation
- Light
- Counter electronics

**Structural Design and Analysis Using SOLIDWORKS**

SOLIDWORKS simulations were created to ensure that our UAV would maintain structural integrity. Stresses and bending were examined for both the drone leg (right) and the detection system (below).

**Light Transport Modelling Using Particle Simulation Software (GEANT4)**

GEANT4 simulations were performed to obtain optimum scintillator size for our detection system.