By integrating a versatile and adaptable payload into accessible unmanned aerial vehicles (UAVs), solutions to many problems become possible. A weight-optimized modular sensor payload readily integratable into a UAVs flight system would allow the specific user’s needs to be met with minimal development, reducing cost. Payload designs include flight system integration, data management, mounting, balance, aerodynamics, weatherproofing, and component minimization. An undergraduate team is developing a Pixhawk-based UAV, the Intelligent Radiation Awareness Drone (iRAD-Lite), with a payload capacity of 1 kg. This drone will use a unique algorithm for mapping ionizing radiation sources with the goal of optimizing flight paths. This work focuses on a modular payload design for iRad-Lite, deployable on other UAVs. The RaspberryPi 3B was selected as the payload's main computer. This microprocessor is compatible with a variety of sensors and has the processing power to quickly execute algorithms.

A custom mount was designed for the underside of the drone frame. Using a rail system secured with screws, payloads can quickly be installed or removed. Using 3D printing, payload cases can be rapidly fabricated. Initial designs are cubic with fileted edges for better shell adhesion, reduced air resistance, and efficient internal space usage. Balanced weight distribution and landing interference are considered. Clear coating is used for weatherproofing hygroscopic 3D-printed parts. The payload computer, mount, and case will stay consistent for most sensors. Some adjustments in case size and shape could be made compatible with the mounting system, and the mount scaled for different drones. The payload promises to be valuable for a number of situations. One such application is for high school outreach, where students could either design their own or build an existing payload.