

The Intelligent Radiation Awareness Drone (iRAD-Lite) is an affordable copter drone with a radiation sensor payload made for high school students for learning about robotics, instrumentation, mapping, fabrication, and radiation. The entire iRAD-Lite system is being designed by an interdisciplinary undergraduate team with the goal of creating an affordable and simple drone. Minimizing damage to the drone is critical for lowering costs both during the design-build-test cycle and the final deployment. Because iRAD-Lite will not incorporate state-of-the-art collision avoidance instrumentation and software, coupled with the inexperience of its youthful end-users, it is likely that crashes will be frequent. This paper will focus on damage-reducing strategies that were adopted during the design-build-test process and incorporated into the final design. One key action is the redesign of parts that are susceptible to damage discovered during various phases of the testing process. Sometimes parts may be intentionally designed to fail to protect more expensive components, while at other times parts break because of flawed design or poor fabrication method choices. Knowledge of weaknesses in the final design allows informed production of spare parts. Three-dimensional (3D) printing enables rapid fabrication of parts as flaws are revealed during the design and testing phases. Some items may also be more affordably mass-produced than through purchase. Different filaments, settings, and 3D printer characteristics will be compared with each other and more traditional fabrication methods for all iRAD-Lite components. The results of the findings from this investigation will primarily help keep costs low for iRAD-Lite and its users and by minimizing the damage the drone encounters over its lifetime. Future plans are that high schools will receive a kit containing all components, accompanied by assembly and operational manuals. The design-build-test experience of the undergraduate iRAD-Lite team, including details about damage-reduction strategies, will also be produced.