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RE: Airworthiness Statement for SPAARO UAVs used at Virginia Tech

The purpose of this memorandum is to document the process used to certify the airworthiness of the SPAARO unmanned aerial vehicle (UAV), which is the subject of this COA application. This UAV is to be used solely for research purposes and operated in uninhabited areas at Virginia Tech's Kentland Farm. Each airframe is carefully inspected for airworthiness at multiple stages during the construction and assembly phases, immediately before flight, and immediately following flight. The SPAARO UAV platform was designed by a graduate student in aerospace engineering under the supervision of his faculty advisors. The wings and tail surfaces are constructed using a fiberglass-wrapped vacuum bagging technique, with carbon fiber spars. The fuselage frame is built from right-angle aluminum stock. Where suitable, commercial off-the-shelf (COTS) R/C parts have been used (e.g. the landing gear, common quick-connects, and servo-actuators.)

Before each airframe's first flight, every component is extensively inspected and tested. These inspections are conducted by an R/C pilot with more than five years of experience building and flying R/C aircraft. Each servo is individually tested for performance and range of motion, and the pushrods and control surfaces are individually tested and calibrated in the laboratory during installation. Propellers are balanced to performance standards and each engine is broken-in on the ground using a complete 128 ounce tank of fuel. Immediately prior to flight, the UAV undergoes a thorough pre-flight check, which includes a detailed airworthiness inspection of the engine and fuel level, control surfaces, battery level, and servo functionality using both the primary (900MHz) and secondary (2.4GHz) manual controllers. A full-range radio check is performed for both the primary and secondary controllers. For each flight, a detailed log is maintained that includes the flight time and duration, weather conditions, flight test objectives, and anomalies or performance concerns. Associated documents in this COA application describe the hazard analysis, safety guidelines, and standard operating procedure for the SPAARO UAVs.

This platform was designed as a research device to overcome deficiencies in available commercial off-the shelf R/C airframes (such as structural integrity, robustness, maintainability, payload volume and support, etc.). Since the SPAARO UAV was first developed in 2009, we have invested substantial time, effort, and resources to gain essential experience with this airframe, both in simulation and in practice. In addition to developing a realistic FlightGear simulation for pilot training and mission rehearsal, we have performed several tens of hours of flight tests within restricted airspace at a nearby military installation.

Very respectfully,

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Associate Professor and Assistant Department Head for Graduate Studies

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