ENGINEERING

L3 VALKYRIE AUTOGYRO

The L3 Valkyrie Auto-Gyro System is an unmanned elevated aerial sensor platform designed to be towed behind most ships to increase maritime situational awareness.

Mentis was contracted to develop the airborne electronics enclosures and airframe for the L3 Valkyrie Auto-Gyro System after problems with the previous design threatened the success of the program. The Mentis design was able to reduce overall weight significantly, as well as aid in stability of the autogyro during low speed flight from towed operation.

The airframe included main structure, integration with the electronics pods, rotor head including integration with actuators, control surfaces and flight control actuators.

DESIGN

- Components consisted of all carbon fiber frame including landing gear. Aluminum hardware used as appropriate
- Water tight upon loss of power, easily field serviceable
- Electronics enclosure consisted of component layout, mounting structures, and thermal management components (heat generation and appropriate forced cooling)
- Carbon fiber pod with aluminum space frame, carbon fiber end caps with integrated ventilation including active vent doors and fans
- Additional carbon fiber bulkheads were designed for electrical termination to external components
- Rotor head used aluminum components
- Rotor head had pre-spin mechanism which used a gear reduced chain and sprocket as well as cable actuated disc brakes for slowing/stopping the rotor
- Airframe excluding rotor blades and electronics payload was <90 lbs, less than half the weight of original airframe

ANALYSIS

- Analysis consisted of calculating flight and landing loads based on payload and operational speeds as well as landing loads based on FAA specifications then creating finite element models of airframe under these applied loads
- Fabricated 2 full scale airframes as well as 1 full set of spare parts
- Autogyro was successfully flown in 40 test and demo flights for military VIPs

FABRICATION

- All components with the exception of carbon fiber tubes and end caps were fabricated at Mentis.
- Mentis also fabricated 2 x ¼ scale models for trade show displays

TESTING

- Tested service ceiling was in excess of 400 ft, with the goal of extending to over 1,000 ft
- Successfully carries 50+ lbm payloads
- Design/analysis was completed in about 6 weeks, fabrication was completed in an additional 8 weeks

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