AREND: A sensor aircraft to support wildlife rangers

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An international student team AREND (Aircraft for Rhino and ENvironmental Defense) is collaborating to design, build and fly an electric unmanned aerial system (UAS) in support of anti-poaching operations conducted by rangers in South Africa. The solution shall constitute, but not be limited to, an unmanned fixed-wing aircraft capable of conducting remote surveillance of large park areas with diverse intelligence gathering sensors, along with a network of ground sensors. The primary challenge in the poaching problem is to develop a proactive technological solution to prevent the poachers and rhinos from ever meeting. Multiple requirements and challenges are derived from this strategy in order to develop a comprehensive design. The AREND electric aircraft system is capable of quickly delivering selected payloads to any location within a 30 km radius, silently performing a search pattern, returning to a landing area and landing safely within the park or reserve. The aircraft system has been designed from ground up around selected sensor requirements. The aircraft structure and volume are designed to accept a variety of payload modules and particularly sized to support the largest expected payload. It is made of advanced composite materials and has a highly efficient aerodynamic shape to remain airborne for at least 90 minutes. The standard payload includes a gimbal-stabilized visual camera system, capable of capturing high-resolution image data throughout the search pattern of the flight mission. Visual cameras help with surveillance of the area for poachers and rhinos during the day. The GPS location data informs the rangers about the exact location of observed rhinos and poachers so they can pursue and intercept an encounter between them. A ground sensor network capable of gathering data relevant to the anti-poaching effort and remotely transmitting data to other ground systems, air systems and a central command center is included. Several subsystems have been tested individually and integrated into the prototype airframe which successfully passed initial structural and flight mechanical testing. Making use of the different Universities complimentary technical skills, subsystems were divided amongst the students internationally and weekly meetings ensure alignment between designs. Independent global team organization requires a global project manager with excellent personal skills and understanding of the system engineering process to develop a successful collaborative work environment. Experience gained by students was not limited to systems engineering design of a small aircraft, but also provided an opportunity for the students to learn skills in global research and development collaboration, which is of interest to global technology corporations.

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