NASA ARMD Design Challenge
2020 E-GA (Electric - General Aviation)
SCUBA Stingray

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Abstract

The SCUBA STINGRAY was designed for the NASA ARMD Design Challenge in an attempt to address the major challenges facing the future of electric aviation. The aircraft was designed to meet the flight parameters specified by NASA. The parameters include a 4 passenger capacity, a range of at least 500 nm, a payload of over 400 lbs, and a cruise speed higher than 130 knots. The aircraft was also designed for the year 2020 due to the fact that there are no battery technologies at this time that can make this type of aircraft feasible. The STINGRAY was designed to be a first major step towards bringing electric propulsion to general aviation aircraft. In order to accomplish this, large amounts of research was performed to find experimental batteries that could possibly be sufficient for an aircraft such as this. In the end a hybrid battery system consisting of Lithium Ion and Aluminum Air cells was chosen as the power source due to its current promise and proven functionality. The aircraft itself was designed to meet Federal Acquisition Regulations (FAR) and was based off several aerodynamic methods described in texts such as Roskam and Sadraey. Other methods were used throughout the design process, including blade momentum theory and basic aerodynamic analysis. Key design features of the STINGRAY include a tapered primary and horizontal wings, a front mounted engine, fixed tricycle landing gear, as well as a T-tail empennage. The final revision of the SCUBA STINGRAY proved to be effective and successfully met the specified criteria. Although the design is currently out of reach, it is hoped that a design such as this could serve as a basis for the future of electric general aviation transportation.