Sundancer: Solar Powered Autonomous UAV for Natural Disaster Relief

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In natural disaster affected areas, communications infrastructure is often disabled. Without communication systems, search and rescue teams are less able to locate victims and coordinate with each other. To provide a solution, the design goal is to use highly efficient fixed-wing UAVs with communications relay equipment onboard to provide rapidly-deployable emergency communications coverage to a large area. The first projects to this goal developed a zero-runway fixed wing launch & recovery system. Last year, I developed a fixed-wing UAV capable of autonomous flight with a communications relay package providing service to a large ground area. The effectiveness of that system was limited by battery life. This year, I designed a UAV system that is capable of much longer flight durations by using solar cells to provide power during flight. This was done by designing and building a highly-efficient airframe using tools such as Ansys CFD and XFOIL. The airfoil calculated produces 112Cl/Cd. A very efficient propulsion system has been identified as well as the design and build of a power system consisting of solar cells and energy-dense, lightweight batteries to provide power in flight. The power system has been designed to use only 225W average during flight. The solar system has been calculated to provide 160W during average solar activity. This means that, with a 310 Wh battery pack, flight durations in excess of 4.5 hours are now possible, a 6x improvement over my prior research.

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