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Selection of size of battery for solar powered aircraft

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This research work proposes the methodology for the selection of battery and flight trajectory for a solar powered aircraft to achieve the maximum endurance. A mathematical model is developed for the availability of irradiance at a particular geographical location on a given date and time. This work also constitutes the detailed analysis of variation in endurance with geographical location of flight, time of flight (relative position of Earth with respect to Sun), availability of solar irradiance, take-off time, battery size, flight velocity, flight altitude, aerodynamic parameters of the aircraft and aircraft propulsion system. Case study is done for irradiance conditions on March 15 for the UAV MARAAL that is built at UAV laboratory IIT Kanpur. This methodology can be successfully used during all the seasons of the year, for all geographical locations on the Earth and for any solar powered aircraft. We can reduce number of cells to be installed on UAV for similar operation or we can ensure longer endurance for similar UAV if we take care of the proper selection of battery and the flight pattern for the operation to be performed. The objective of this paper is to estimate the battery capacity to be installed and selection of altitude profile during flight for a solar powered aircraft.

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