

DAIR Green Fund Project Descriptions (Second Round)

1. Advanced Mobility Products Inc. (<https://www.advancedmobilityproducts.com/>)

Project Title: Development of Safe and Reliable Rechargeable Energy Storage System (RESS) for a Solar Battery Electric UAS

Project Description: The project is to develop Safe and Reliable RESS for Superwake's Unmanned Aerial Vehicles (UAV) commercial applications. As Superwake begins its drive towards commercialization of its product, the need for conformity to regulatory standards is critical to the success of the product. This project focuses on a product conformity related to a regulatory framework such as Transport Canada Advisory Circular (AC) No. 922-001 – Remotely Piloted Aircraft Systems Safety Assurance. More specifically, a more complex RESS is required in advanced operations such as beyond visual line of sight (BVLOS), flying in controlled airspace and near people.

Environmental Impact: Low carbon footprint and replacement of aero vehicles that run on fossil fuels. The use of smaller solar battery electric drones can replace some applications of small, manned utility aircraft used in commercial applications. The cost to operate these drones would be substantially lower using solar battery electric drones.

2. Columbiad Launch Services Inc. (<https://www.columbiad.ca/research/>)

Project Title: High Altitude Platforms –Autonomous Flight Powered Using Wireless Power Transmission

Project Description: The project is part of a feasibility study to fly an uninhabited aircraft for very long, multiday missions by providing it with power using a mix of wireless power transmission and solar power. Power is transmitted as microwave energy from a ground-based transmitter and sent to a receiver that is attached to the lower surface of the aircraft wing, which converts it to DC power. The DC power will be used to drive electric motors on the airplane for propulsion, to power the payload and control systems and to charge standby energy-storage units. The project includes modelling, wireless power transmission flight testing using small uninhabited aircraft and performing a life-cycle assessment of high-altitude platforms.

Environmental Impact: Reduced emissions using alternate clean power source.

3. Plan de Vol International Inc. (FliteX) (<https://flitex.net/>)

Project Title: Airline Fuel Efficiency using Predictive Analytics

Project Description: In this project, use of flight time metrics will in turn develop efficient fuel- consumption prediction models using the advances in data training & machine learning historical data sets, while also applying external variables such as winds, precipitation and traffic congestion.

Environmental Impact: The development of optimal flight paths will enable fuel savings, reduce emissions and carbon footprint of the industry.

4. Promation Engineering Ltd. (<https://promation.com/>)

Project Title: Enabling Circular Economy through Autonomous Repair and Remanufacturing of High-Value Gas Turbine Blades using Intelligent Laser Directed Energy Deposition

Project Description: The project focuses on the repair and restoration process of high-value turbine blades by combining the principles of Industry 4.0 through intelligent LDED-PF based AM. Material characterization work in this project includes feedstock analysis, microstructural analysis, mechanical testing and Non Destructive Testing (NDT).

Environmental Impact: The energy consumption and carbon footprint of using LDED to repair and remanufacture a turbine blade is substantially lower than manufacturing a new turbine blade.

5. RAMPF Composite Solutions Inc. (<https://www.rampf-group.com/>)

Project Title: Developing Ultra-lightweight Composite Propeller for Aerospace Applications

Project Description: The purpose of this project is to develop a low rotational mass moment of inertia propeller, which takes advantage of composite Tailored Fibre Placement (TFP) technology in conjunction with flexible tooling. Such a propeller will reduce the loads and stresses experienced by the aircraft powertrain – thereby extending the life of the powertrain components.

Environmental Impact: Lightweighting will create a reduction in greenhouse gases as we enable the reduction of weights and electrification of various transportation industries including aerospace, defence, Urban Air Mobility, UAVs and space vehicles.

6. Superwake (<https://www.superwake.ca/>)

Project Title: Arctic Shoreline Mapping Pilot

Project Description: The purpose of this project is to supply the Department of Environment and Climate Change Canada (ECCC) with high-definition aerial imagery and video of shoreline regions in the Canadian Arctic, which will be used to segment the shoreline into a digital model. Superwake will join a team from ECCC in the Arctic in Summer 2023 to test the effectiveness of their long-endurance solar-powered remotely piloted aerial systems (RPAS) for this application. This project is part of a larger effort by ECCC to evaluate various coastal mapping methodologies, comparing satellite imagery and RPAS to helicopter-based operations, which form the baseline.

Environmental Impact: Superwake RPAS offers a reduced fuel consumption in the operations, versus the current helicopter option.

7. Tristar Coatings Ltd. (<https://tristarcoatings.ca/>)

Project Title: Chromate-free, Solvent & Water Based Primers and Integral Fuel Tank Coating for the Aerospace Market

Project Description: This project will allow testing and certification steps to commence on Tristar Coatings blends of chrome-free water and solvent-borne products.

Environmental Impact: This project aims to eliminate the chromates in the primers which will greatly reduce the exposure of all workers involved in the manufacturing, spraying as well as in the shipping and repair processes. Water-based primers greatly reduce VOCs at the manufacturing and end-use points.

8. Zentek Ltd. (<https://www.zentek.com/>)

Project Title: Developing a Passive Icephobic Coating for Dash 8-400 Propellers

Project Description: Ice is one of the significant challenges that the aviation industry faces. Ice increases the weight of planes, but more importantly changes the aerodynamic profile of wings and propellers. There are two main pathways to reduce the effects of ice: to actively control the ice through heat or mechanical energy during flights, or to provide a passive coating that will allow ice to shed at low kPa. Zentek has developed a patent-pending passive icephobic coating that will be assessed and optimized for the Dash 8-400 propellers.

Environmental Impact: A passive icephobic coating on a propeller will improve safety, reduce the energy of in-flight de-icing and reduce the complexity of the current active systems that require regular maintenance.