Quadrotor And Fixed-wing UAV

**UAV Transforms between Fixed-wing and Quad-rotor Mid-flight**

Technology #20170091

**Quad-rotor Maneuverability with Fixed-wing**

**Endurance**

A small-scale, hybrid unmanned aerial vehicle (UAV) augments quad-rotor maneuverability with solar-powered fixed-wing energy collection and supply capabilities. Selecting an aerial platform often requires choosing between the flight time and long-range capabilities of a fixed-wing aircraft or the maneuverability and stationary characteristics of a multi-rotor platform. This reconfigurable solar UAV is capable of transforming between fixed-wing and quad-rotor states, thus mitigating the individual limitations of each state while combining the strengths of both systems. In quad-rotor state, the aircraft cannot supply enough energy from solar power alone and must rely on stored energy. When stored energy is nearly depleted, the aircraft will transition into a fixed-wing state where the on-board batteries can recharge, allowing the process to repeat. Combining this functionality with a solar-powered system makes multi-day operation feasible at very small scales. In addition, vertical takeoff and landing require minimal take-off and landing space and allow the aircraft to wait on the ground for suitable solar conditions and land in the absence of them.

**Large Payloads over Long Distances**

No mechanism or design currently allows mid-flight transformation between fixed-wing or multi-rotor states, especially when doing so compromises the center of mass, causing the UAV to crash. This UAV design not only allows such a transformation but does so safely, without affecting the center of mass. In addition, while several solar-powered flight systems exist, they require relatively high aspect ratio wings and correspondingly long wingspans, which compromise maneuverability. This technology provides micro to macro air-to-ground coverage in a platform that supports numerous sensors and can autonomously carry large payloads over long distances. Furthermore, its design dramatically reduces aircraft size and relieves constraints of large batteries (previously required to store enough energy to supply power through the night).

Learn about more groundbreaking discoveries at [www.research.umn.edu/techcomm](http://www.research.umn.edu/techcomm)
BENEFITS AND FEATURES:

- Transforming between fixed-wing and quad-rotor states
- Optimizes flight maneuverability and endurance
- Solar-powered system, collects solar power
- Autonomously carries large payloads over long distances
- Can cover large distances in fixed-wing form and convert to a rotorcraft at its destination
- Center of mass preserved
- Reduced aircraft size
- Relieves constraints of large batteries
- Multi-day operation
- Vertical takeoff and landing

APPLICATIONS:

- Commercial and recreational UAV market
- Platform technology to compete with existing fixed wing and rotorcraft UAVs
- Precision agriculture
- Package delivery
- Multi-day surveillance
- Ultra-long distance flight
- Search and rescue

Phase of Development - Working prototype

Inventors

Nikolaos Papanikolopoulos, PhD

Professor, Computer Science & Engineering, College of Science and Technology

Learn about more groundbreaking discoveries at www.research.umn.edu/techcomm
IP: UM Docket 20170091

For additional information, contact

Doug Franz
Technology Licensing Officer
exprlic@umn.edu
612-624-0869

Learn about more groundbreaking discoveries at www.research.umn.edu/techcomm