Flying Forever

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Unmanned Aerial Vehicles (UAVs) can be used for aerial mapping, surveillance, atmospheric observation, communication relays, search and rescue and natural disaster response. Many of these tasks would benefit from the ongoing or even persistent presence of a UAV, or one with a practically limitless range.

Aircraft have the ability to harvest solar and wind energy during flight to give them more speed, altitude or stored electrical energy. By managing these energies and balancing resources against mission objectives, aircraft can benefit from substantially increased performance and the possibility of *persistent flight*.

This research will focus on demonstrating that the most efficient behavior for a fixed wing aircraft is not necessarily a straight line.

Autonomy

An aircraft that is not tethered by a bulky or ranged communications link is free to roam the sky as it needs. Being fully autonomous allows an UAV to complete tasks in its own time and adjust to changing conditions. It also alleviates the need for any human operator to participate in long and tedious tasks.

Efficiency

Understanding the flow of energy through a system allows it to be completely managed and accounted for, leading to system optimization and increased performance.

Long Endurance

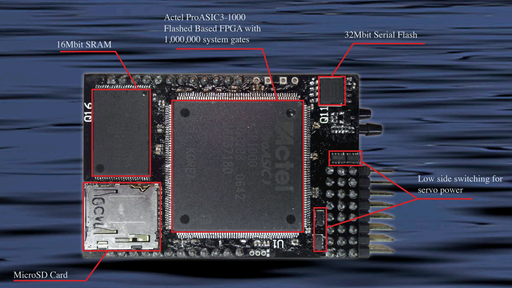
With a low energy consumption, the potential to harvest energy from the environment and efficient use of available resources, UAVs will benefit from improved endurance and the possibility of persistent flight.

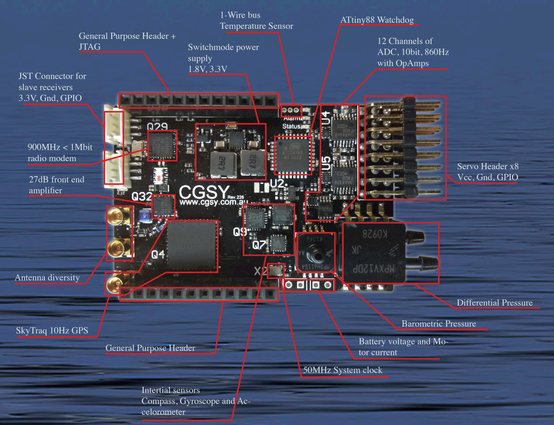
Capability

An aircraft platform with an exceptional endurance is capable of flying great distances to remote locations. It can loiter for extended periods of time to provide relay or surveillance over a specific area. It could also cover vast areas while searching or mapping.

Asity - Custom Avionics

Asity is an avionics platform built specifically for small, high performance aircraft. It contains a complete sensor suite to gather data about the aircraft's attitude and position as well as monitor energy consumption of the control surfaces and motor.





At only 40x60mm in size, Asity has been designed to fit into the cramped narrow fuselage of efficient, scale gliders, while still containing all components required to operate and communicate with an autonomous UAV.

Asity features a Field Programmable Gate Array (FPGA) as its main processor instead of a more conventional CPU/Micro-Processor. This allows for the separation of software components that can run completely in parallel providing greater reliability and potentially more processing power.

Energy Efficient Behavior in Autonomous Aircraft

By building a framework to assess all potential maneuvers for an aircraft and compare them against each other, it will be possible maximize the resources available during a mission.

This includes maneuvers such as dynamic soaring, thermalling, solar harvesting or just rushing towards a goal. They each have outcomes in terms of energy used or mission goals achieved. By balancing these against each other, an aircraft can achieve its objectives in the most efficient way possible.

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