The Aerosonde Robotic Aircraft: The First Civilian UAV to go fully Operational

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ABSTRACT

After several years of gestation and a concentrated 3-y development program, the Aerosonde Robotic Aircraft moved into operational mode in 1999. This is the first civilian-developed UAV to become operational. Full details on the aircraft may be found at www.aerosonde.com. It is a small, economical UAV that was designed from scratch by a major user community to provide a much needed capacity to undertake observations under all weather conditions and at great ranges over the oceans and remote land areas. This talk will describe both the development program and our move towards a major international facility.

1. THE MOVE TO OPERATIONS

After a 3-y development program lead by Australia, the Aerosonde passed all aspects of a mandated operational trial by the Bureau of Meteorology in January and February 1998. Since then, we have flown from Vancouver Island for the Canadian AES, from Dongsha Island for the South China Sea Monsoon Experiment, from Tasmania for the SOAPEX, and from North Carolina for the US Navy. At the time of the conference, Aerosondes will be operating in the Arctic for the US Department of Energy.

A highlight of 1998 was when Aerosonde "Laima" became the first robotic aircraft (and the smallest) to cross the North Atlantic Ocean.

Our vision for Aerosonde operations has fleets of aircraft providing direct observations for a variety of activities, including:

- *Complementing other observing systems*
- *Matching observations with computer model requirements*
- *Undertaking specialised observations and observing missions*

Our move towards full operations requires careful attention to a range of issues, including:

- *System reliability*
- *Regulatory (Safety)*
- *Communications*
- *International cooperation*
- *Capacity to operate in, e.g., strong winds or icing*

Use of the Aerosonde during the transition therefor requires a certain amount of baby sitting and on-line development to correct faults that develop.

The fault identification and correction are accomplished by a comprehensive reporting and development procedure. Each aircraft and major component has a log book that details all

operations, faults and corrective action. Separate logs are kept because individual components are often mix and matched across aircraft in the fleet.

Based on our experiences during the 1998 trials we have established a development program to remove or re-engineer several high fault items, to prepare for limited production, and to move through a series of field programs in 1999. These programs will be a hybrid of development and full operations. This will enable us to continue the program of establishing a robust facility whilst providing full field observing capacity. During this transition period, aircraft will not be made available for general sales.

2. POTENTIAL DEPLOYMENT STRATEGIES

Two major modes of operation can be envisaged: operation by individuals, or groups who set up their own facility, and operation by a special facility that undertakes required flights on behalf of users.

The advantage of a facility is that it can provide optimal economy and flexibility of operations. The idea is for a centralised command site together with a set of launch recovery sites, either manned by facility staff or operating under contract. Flexibility of operation is achieved by launch and recovery at any of the designated sites. Economy and additional flexibility are provided by the having all aircraft under a central command once they are in the air.

A prototype test of this strategy was undertaken during the operational trial in early 1998. During this trial, aircraft were launched and recovered from Port Hedland on the northwest coast of Australia. Once the aircraft in the air and been passed their mission checks, control was passed to a command centre operating out of the Perth Regional Forecast Centre, around 1300 km away. The launch crew then moved on to other duties, only returning to the site when aircraft were ready to land.

Operation in this mode requires a reliable form of communications, both with the aircraft and with air traffic centres. During the operational trial, communications were maintained by a UHF link from the Aerosonde and a telephone line. Full operations will utilise one of the low earth orbiting satellite systems. Development of this facility is a high priority, but must wait the availability of the satellite systems.

It is easy to conceptualise the extension of this prototype to a full operational system. The command site can be established anywhere that is convenient. Launch and recovery sites are dictated by available infrastructure, air traffic considerations, and the capacity of the Aerosonde.

The presentation will elaborate on these modes of operation.

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