The InView in flight. Photo courtesy Barnard Microsystems.

- Careful recording during testing is essential. All the flights have been recorded using video cameras to allow for subsequent flight test analysis. A logbook is used to record all comments at the time of the flight test. We did crash the aircraft during some of the test flights, and a review of the video footage helped us to understand the reasons for the crash.
- Rapid progress resulted from following a "test early and test often" approach.

The Importance of Being Safe

The paramount importance of safety became increasingly clear as we discussed the use of unmanned aircraft with oil, gas and mineral exploration and production companies.

The staff in one mineral exploration company required that the plane be able to fly on one engine.

"When is the last time you flew across the Atlantic in an aircraft with a single engine?" a staff member asked. The ability to fly even with the failure of one aileron, servo or elevator was also key.

When flying beyond line of sight, the command uplink and the telemetry downlink for InView is via a low bandwidth satellite link, such as a low earth orbit satellite network. If the link is lost for a significant period of time, such as 30 seconds, the aircraft returns to base.

A flight termination signal can be transmitted via a radio link from a ground-based transmitter to the onboard flight termination receiver, which is connected to the PC interface card, to cut the engine power. The flight termination signal can also be canceled, and the aircraft can be switched into manual flight mode.

The InView aircraft is constructed using plywood and carbon fiber, which will disintegrate should the aircraft fly into a structure, thus minimizing damage.

Distributed sensors provide an early warning of system failure, allowing the autopilot to fly the aircraft back to base before the system degradation becomes too serious. This work was performed as part of the STUAC Project and was partially supported by the U.K. Technology Strategy Board.

We decided on more powerful engines to help with the safety aspects of the aircraft (to be able to fly with just one), and provide a short takeoff capability. The use of efficient flaps, in this case Fowler flaps, also help with this, in addition to enabling the plane to fly slowly for surveillance, aerial photography and sensor measurement purposes.

The InView is assembled from modules that can be packed in three boxes which are readily transported in a small vehicle. The aircraft can easily be assembled by two people in less than an hour. Individual sections can be upgraded to suit a particular mission or replaced as part of routine maintenance or as a result of damage sustained.

Our strategy is to test early and test often. We perform test flights nearly every week and at times introduce significant modifications to the air frame. These modifications are relatively quick, easy and inexpensive to make due to the modular nature of the InView.

Aside from operating from an unprepared grass field, which makes vehicle operation more flexible, we wanted InView to be able to operate from the deck of a ship or from a Forward Operating Base with high surrounding walls.

The use of four-stroke engines also aids with reducing the acoustic signature of the aircraft, and InView also is equipped with overwing silencers, which deflect some engine sounds up and away from ground-based observers.

In the end, the development of InView met the design goals we set for ourselves. It has a long range, can fly on one or two engines, meets our range and payload parameters, and just squeaks in under our planned price tag: It's 99,500 euros. What's next? On the technical front, work continues on a detect-and-avoid system and a satellite data communications link for use on a small unmanned aircraft.

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For More Information:

www.barnardmicrosystems.com