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Unmanned Vehicles

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SPECIAL REPORT

CIVIL RIGHTS FOR UAVS

In May, an historic series of NASA test flights will open a new chapter in the evolving story of commercial usage of unmanned vehicles *writes David S Harvey*.

The flights, involving a Freewing Aerial Robotics/Matra Scorpion, are being used to test new ways of collecting and disseminating 'vegetation indexing' data to corn growers.

But a secondary – and highly compelling – motive for the flights is driven by the need to provide demonstration data on the operational aspects of UAVs to the FAA.

Says Patrick Coronado, Chief Engineer on the project at NASA's Goddard Space Flight Center, Greenbelt, MD, 'we're currently devoting about 70% of our time, to the control and guidance issues concerning the air vehicle side.

Coronado's unit at NASA Goddard is part of an innovative 'outreach' effort by the agency which seeks to involve an array of academic and corporate interests in the output from the 'pure' science it generates, much of it fall-out from the 'Mission to Planet Earth,' project.

Internally, managers want to see it handed over to a wider audience in the commercial world.

'The problem,' he explains, 'is that today when you say remote sensing, you also say satellites. But they tend not to be set up either technically or logistically to be attractive to a wider customer base, if you like, consumers of the product.'

Coronado settled on the Scorpion as the 'optimum platform out there', for carrying a new generation of hyperspectral imaging sensors. NASA would adapt Scorpion to become,

possibly, the first autonomously-guided civil-mission UAV acceptable to the FAA for flight in controlled airspace. 'I personally believe the market for civilian applications of UAVs is potentially much, much, bigger than that of the military,' he explained.

GUIDING THE SCORPION

Coronado – by profession a mechanical engineer – showed *Unmanned Vehicles* the autonomous guidance system being assembled for use in the upcoming Scorpion trials. 'Basically, it has two types of attitude reference system,' he explained.

'One uses ring-laser gyro technology – solid state – but the other is based on a way of summing GPS inputs to turn them into attitude cues. The idea is to offer two completely redundant, flight qualified systems that can be evaluated separately.' Packaged together with the flight computer, the whole guidance system will, he says, weigh about 24 lb.

'We've also had to perform a total system failure analysis as part of the process of beginning to convince the FAA these things can ultimately fly safely by themselves,' he says, 'which, by the way, I believe they can.'

Coronado and his team have access to an instrumented four mile radius UAV operational range on the Wallops Island facility in Virginia. 'I can't – really can't – tell you when, or even if, FAA will move forward on, say, granting an autonomous UAV some kind of FAA regulatory certification, so I can't tell you whether we can eventually get the Freewing out of Wallops and on to a piece of actual farmland somewhere, which is what we'd like to do.'

POSSIBLE PROCESSES UNDER WAY

'But what we can say is that we've got a process under way, under controlled experimental conditions, and it's actually very exciting because of the real possibilities involved.' Regardless of the certification issue, both Coronado and Schmittle agree that UAVs have plenty of potential value for remote sensing applications.

One of Coronado's associated tasks, for instance, is to use Freewing as a kind of satellite 'simulator', to test out technology that could be flown in space. Remote vehicles carrying spectral imagers – or any kind of sensor, in fact – have an inherent problem in being able to correct for the temporal effects of changing sunlight angles falling on earthly objects.

All the science, all the technology, and the aviation know-how involved in getting a UAV to gather such data can be reduced to something coherent, reliable and therefore commercially useful.

'And that's the point,' says Coronado. 'That's what makes it worth it.'

Above: *Patrick Coronado, chief engineer on the project, hosted* Unmanned Vehicles *at NASA's Goddard Space Flight Centre.*
Right: *Freewing Aerial Robotics recently sold distribution rights for the Scorpion UAV to Matra BAe Dynamics. The two companies already have a strategic alliance agreement to use the airframe for the Marvel UAV system (France, UK and Germany).*