

MARS PROBE

UAV copies how insects navigate

An unmanned air vehicle incorporating information-processing technology based on how insects fly and navigate has been demonstrated to NASA as a precursor to a future Mars aerial probe, writes Emma Kelly.

Australia's Defence Science and Technology Organisation (DSTO) and the Australian National University (ANU) flew the UAV in California's Mojave Desert last week, presenting to a team from NASA's Ames Research Center and Jet Propulsion Laboratory.

The demonstrations follow years of research by the DSTO, led by Dr Javan Chahl, into how insects fly and navigate and how to apply the data to autonomous vehicles. In particular the team studied the ocelli – a sensor found on a dragonfly's head that acts as a second set of eyes – and found a complex optical and neural arrangement that helps the insect maintain level flight under adverse conditions.

The research has resulted in a small delta-wing aircraft equipped with an array of simple sensors and cameras, allowing the vehicle to avoid collision with the ground. The UAV also has a sun compass that uses the polarisation pattern of skylight, which the DSTO says would be necessary on Mars, which has no magnetic field.

■ Australia's Commonwealth Scientific and Industrial Research Organisation has developed an airborne surveillance system to check clearance space around powerlines.

The system combines stereo computer vision technology with a geographic information system and software to measure the distance between powerlines and trees. Information is presented as three-dimensional images.

The system, fitted to aircraft wings, allows hundreds of kilometres of powerlines to be checked in one flight.

AERODYNAMICS MICHAEL PHELAN / LONDON

Airbus A340 takes off to test anti-drag technology

A380 likely to be first to benefit from programme to reduce wake vortex and noise

Airbus has begun flight testing its A340-300 testbed as part of the European Awiator aerodynamics demonstration programme, which aims to validate technologies in preparation for application on future aircraft (*Flight International*, 29 April–5 May).

The Awiator (aircraft wing with advanced technology operation) programme is evaluating methods of reducing wake vortices and noise and is investigating the integration of large winglets, new wing deformation measurements and new flight-control laws using existing and new control surfaces.

During the first stage of the flight programme, which runs to December this year, technology ele-

ments will be installed, flight tested and removed during six separate flight-test campaigns. Following flight-test results analysis, the most promising technologies and best component optimisations will be integrated for the final Awiator integration flight test. Airbus hopes to achieve this by mid-2005.

The Awiator aircraft will incorporate sensors to measure turbulence ahead of the aircraft and adaptive elements to increase high lift efficiency. The response of the wing in flight will be measured in detail by inclinometers, Bragg sensors, pressure belts and photogrammetry. Noise and vortices in the far field will be measured by microphone arrays and

lidar laser ranging systems.

The programme began in July last year and with initial applications expected within three to five years, the Airbus A380 could be the first aircraft to benefit. There will also be simulator, ground rig and large-model windtunnel tests throughout Europe. The project's target is to reduce drag by 5-7% while cutting fuel consumption by 2%.

The €80 million (\$88 million) programme is being co-ordinated by Airbus and includes 23 European manufacturers, universities and research institutes. The programme is 50% financed under the European Union's Fifth Framework research funding.

FLIGHT TESTING

SpaceShipOne glides to next stage

Scaled Composites is pushing ahead with flight testing the SpaceShipOne after completing the second manned glide test of its X-Prize contender last month.

The Burt Rutan-led company tested the glide characteristics of the SpaceShipOne second-stage craft in the "feathered" wing configuration that will be used during atmospheric re-entry. The 27 August flight included stall investigations and envelope expansion out to 200kt (370km/h) and 4g manoeuvres.

Following separation of SpaceShipOne from the White Knight carrier aircraft at 48,200ft (14,700m) and 105kt, the aircraft achieved a full stall at 70kt equivalent airspeed at 19° angle of attack (AoA). Then the wing/tail was "jack-knifed" to the 65° feathered position, and the craft performed a stable descent for about 70s, at a 70° AoA and a peak descent rate in excess of 10,000ft/min (51m/s). Envelope expansion and roll characteristics investigation followed,

and the 10min 30s flight concluded with a smooth touchdown at Runway 12 at Mojave, California, following a last-minute runway reselection during descent because of changing winds.

Scaled Composites says the next stage of testing will involve lighting SpaceShipOne's rocket engine for 15-30s, and then gradually increasing the engine firing duration to the 92s required for a suborbital flight to an altitude of 100km. To date, engine contractors Environmental Aeroscience and SpaceDev have demonstrated full-duration, full-thrust firings, says Scaled Composites.

Rutan said in June that he intends to achieve the first privately financed manned spaceflight within 12 months, but will not consider entering the X-Prize private rocket competition until a successful first suborbital flight is completed.

The X-Prize offers \$10 million for two successful three-passenger flights to 100km altitude in a two-week period.



The SpaceShipOne will be released by the White Knight at 50,000ft