


UAV show outshines weather




Despite wet and windy weather that curtailed flying, this year's ParcAberporth Unmanned Systems (PAUS 2008) exhibition, held on 25 - 26 June in Aberporth, Wales, was bigger than ever, with an increased emphasis on civil applications. **TIM ROBINSON** reports on the latest trends in unmanned systems.


 With Thales Watchkeeper to begin flight testing at ParcAberporth in November there was a surprise piece of publicity for its predecessor, the Hermes 450, now being used by UK forces in Afghanistan, when TV news footage of Prince Harry acting as a forward air controller showed he was using Hermes imagery to talk fast jets on to a target. Briefing the Duke of Edinburgh on Watchkeeper at ParcAberporth, Business director, UAV systems, at Thales, Nick Miller, was able show His Royal Highness "and here is one of our typical operators" much to the Duke's surprise. So should Hermes/Watchkeeper be branded a UAV system: 'By Royal Appointment'?

 On a more serious note delegates were able to see for themselves Hermes 450 footage from ongoing operations in

Afghanistan. Particularly interesting was the camera's ability to lock-on and follow moving targets, with a suspect car being tracked through undisclosed city streets in heavy traffic, before arriving outside a house. Another useful capability, which the Army now says is 'essential' for any UAV is the laser target designator. This, while it can be used to target LGBs or other precision air-dropped munitions, is also extremely useful as a target indication device for ground troops too. Footage from a night battle in Afghanistan, viewed using NVGs, showed the Hermes direct its 'War of the Worlds' style laser at unseen enemy positions, allowing soldiers to engage with heavy machine guns, grenade launchers and mortars at these hidden Taliban fighters now marked by a green line from the sky by the UAV operator.

 Although ParcAberporth is ideally located for access to overwater restricted airspace for UAV testing it was announced there are now plans to extend the airspace to provide additional testing over land. Creating a permanent segregated airspace for testing would be extremely beneficial as "industry needs to get flying." Losing expensive sensor payloads or one-off prototype UAVs is also a good reason why a land range is needed. Officials from the Welsh Assembly Government say that this proposal may take a good 18 months to go through the CAA, with a public consultation set for this month. Carl David from the West Wales UAV Centre, which manages the restricted airspace near ParcAberporth, pointed out that, despite the remote location and ideal site for experimental work, it is not a 'free for all' for exotic

UAV prototypes. He noted that access was provided on a 'safe and controlled basis' and that they would effectively vet operators and flyers to weed out cowboys. In fact, he said he had already turned people away from using the airspace. Uniquely Aberporth is the first airport in the world to have a UAV operations manual which has been approved by the CAA. Meanwhile, elsewhere in the UK, BAE also has access to restricted airspace for testing its own UAVs out to sea from its Warton facility.

 One important theme to emerge from the conference was that work towards the UK's pioneering ASTRAEA (Autonomous Systems Technology Related Airborne Evaluation & Assessment) initiative to integrate UAVs routinely into civil airspace is gathering

Left: Despite wet and windy conditions on the two public days, the FanWing had flown earlier in the week, controlled by a QinetiQ-trained test pilot who praised its flying qualities.

momentum with a number of different practical demonstrations. Phase 1 is now almost complete with Phase 2 to start early next year. To give an example of the sort of work undertaken, EADS UK is responsible for modelling the communication links which it has been doing with its NetCOS synthetic environment. The company is using this to simulate where to place aerials on the UAV (a more difficult task, the smaller the UAV as the aerials may be blanked by parts of the airframe) as well as line of sight (LOS) and non-line of sight (NLOS) control protocols. What, should happen if a UAV loses communication links *en route*? Should it orbit until the link is resumed, continue on its mission or return to base? These simulations, (which not only model terrain, but aerials, tall buildings and even satellite coverage) says Tony Bagnall from EADS UK will provide a 'derisking technology' prior to any real flights of UAVs in controlled UK airspace and will be the focus of a demonstration at ParcAberporth in October.

EADS are also working on endowing the UAV's autopilot or its AI (artificial intelligence) with the beginnings of a pilot's 'airmindedness'. For example, a UAV could be constantly looking for a field, water or open area away from populated areas to perform a forced landing – exactly as a real life PPL is taught. Acoustic sensors, too, could 'tell' the UAV's 'artificial airmanship' that its engine was running rough and it should return to base. Or the sound of an impact, followed by



Ultra Electronics brought this Sparrow-N UAV which it is using to support work done as part of the UK MoD's loitering weapons demonstration.

degraded flight controls on one wing, could tell the 'brain' it had probably hit a bird and to adjust its flight control software and look for a place to land. It is thus these 'common sense' rules of flying incorporated into UAVs which will make them more predictable and increase their acceptance in civil airspace.

Another company involved in ASTRAEA is Cobham's Flight Refuelling which is laying the foundations for air-to-air refuelling by working with Warrior Aeromarine to fly two Gull 36 UAVs in close proximity and have them formate on each other. This breakthrough will be the first steps towards allowing

autonomous air-to-air refuelling which, not only by allowing UAVs to refuel each other, might allow for aerial surveillance systems with 'unlimited' endurance but also, by 'de-skilling' the AAR task, could benefit military aviation in the same way as the autopilot did in the last century.

A new entrant to the UAV scene was the UK's Fibreflight, a specialist in composite structures. Having worked through improving racecar aerodynamics through composite spoilers and wings the company has now turned its attention to UAVs with its MARAC flying-wing design.

Will the MQ-9 Reaper need a manned escort in the future? That was a question posed by a briefing in the PAUS conference session by an RAF speaker. He noted that the RAF now considers Reaper a 'high value asset' because of its sensors and persistence. In fact, he said, if the UAV was deployed into a 'less benign' air environment than Afghanistan, it would probably mean that the Reaper would need a manned fighter escort. It was also revealed that, while the USAF was using its Reapers exclusively for Close Air Support (CAS), the RAF was being more creative in developing new roles and missions for the asset, including combat search and rescue (CSAR) support.

As well as larger UAVs like the Reaper and Herti, it was revealed at the conference that the RAF's Air Warfare Centre is also experimenting with smaller tactical UAVs such as Sonic Communications Casper 250 UAV. An RAF source denied it was 'treading on the Army's toes' in evaluating these smaller



A speeding ticket from above? BAE Systems displayed this model of its Herti UAV in police colours. The company is part of the South Coast Partnership launched last year, which could see UAVs augment police, border and coastguard agencies over the UK's south east by 2012.

UAVs, but insisted that it was interested in understanding the full spectrum of UAV operations and how they relate to each other. Sonic Communications, meanwhile, revealed it had conducted trials of its mini Casper 250 UAV with UK Special Forces who were impressed with its backpack portability and its highly capable sensor system, which uses GPS to derive coordinates from its camera. The Casper 250 has been recently improved with the addition of underwing flaps/spoilers which provide for a more accurate recovery for the glider-like UAV. Sonic says that the Casper, now in service in seven countries, has also had interest from the civil sector from police forces, oil pipeline inspection and for managing wildlife reserves.

As well as briefings on current UAV operations in conflict

zones, the conference and exhibition as a whole had a definite civil theme, as new, exciting uses are envisaged for unmanned systems. One initiative is the South Coast Partnership, which sees industry, maritime agencies, border patrol and police forces working together to see what UAVs could offer by patrolling the English Channel. Noting that helicopters were expensive, sometimes had to be shared between forces and had limited endurance, this initiative foresees a UAV such as BAE System's Herti searching for smugglers, illegal immigrants and check on fishing boats as well as search and rescue. However, while the SAR role can be easily appreciated it remains to be seen how big the illegal immigrant arriving in rubber dinghies problem is. When challenged that most



The show included live demonstrations such as an urban assault/hostage rescue scenario by Special Forces, who were assisted by this Microdrones mini VTOL UAV.

illegal immigrants are arriving in the UK via 'legal channels' (airports, ports) and then disappearing, the police spokesman said while there were no figures on the numbers, they were 'significant'.

This aspect of the UK's 'surveillance culture' taking to the skies is likely to become more high profile as civil UAV usage increases but agencies interested in UAVs will need to be careful not to overstate threats or issues, to avoid the inevitable media backlash about more 'big brother' style snooping — especially given recent cases in the UK of anti-terror surveillance legislation being used to check dustbin recycling and school catchment zones by over-eager councils. However, one non-controversial requirement that is likely to need extra 'eyes in the sky' is London's 2012 Olympics and it is here, that UAVs like Herti, by taking pressure off overworked police helicopters, could really prove their worth.

With the price of crops and basic foodstuffs now causing concern, there is fresh interest in innovative new tools to help farmers manage their crops. One idea being developed by the University of Aberystwyth's IGER (Institute of Grassland and Environmental Research) is to use UAVs to scan crops using hyperspectral imaging under the U-MAP (UAVs for Managing Agricultural Practice) project.

This shows up nitrogen and fertiliser levels in crops and can distinguish between old and new crops, aiding farm planning and land management and enabling 'precision agriculture'. The initiative last year was involved with Boeing which had pitched its Scan Eagle as the ideal 'agri-UAV'. However, Boeing has since dropped out — a relief in one sense, according to one source, who said that, ITAR technology transfer issues would have meant that even if the Scan Eagle had been used, farmers would have had to deploy guards on the air vehicle overnight or if it were parked in laybys.


With Boeing out, QinetiQ stepped in with a specially adapted UAV as the systems integrator for the tests. Thus using UAVs to spot irregularities early would allow diseases to be literally nipped in the bud, boosting yields for farmers. Indeed with agricultural UAVs such the RMax already in use in Japan, there is the possibility of one day automating the process completely with a UAV discovering early stages of disease and autonomously calling for spraying UAVs to destroy the pests — saving time and valuable food sources.

Also present at the show was the unique FanWing design, the brainchild of inventor Pat Peebles. With other UAVs, the FanWing flew successfully




Immersing the operator in the flying experience is the idea of Swiss-based UASystems, which brought along a concept for a remote 'virtual cockpit'. The concept is that the operator would wear the headset, which features a head-tracking system, which would show images from the UAV's cameras and allow the 'pilot' to react much faster. UASystems say its communications link has low latency — less than 20m/s — key in enabling this sort of remote piloting system to work.

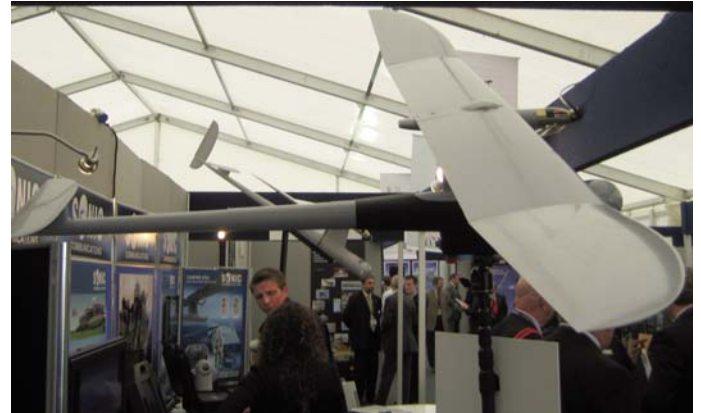
earlier in the week with an experienced QinetiQ-trained UAV operator, who commented on its benign handling characteristics and ability to ride out gusty conditions — a key advantage in urban UAV operations where buildings can disrupt or channel airflow. FanWing reports there is now substantial interest in the concept, from both a large US concern and even from China.

 Coming all the way from Arizona was Advanced Ceramics Research, which has developed UAVs for both civil and military missions. Its Silver Fox UAV is being used in Iraq for anti-IED missions and by US Navy special forces for littoral reconnaissance. In the anti-IED role it has been fitted with special sensors that can detect underground tunnels and command wires to detona-

endurance of 90mins and would allow a high-flying maritime patrol aircraft to check suspect vessels below the clouds, or conduct reconnaissance of a hostile coastline or the littorals.


The company's UAVs have also been used for scientific research tasks. Its 'pusher' Manta UAV was used in the Maldives in 2006 to collect atmospheric data in a stack of three UAVs flying at different heights to sample the atmosphere – the first time this had been done. Another research project in 2007 saw its UAV fitted with a mini-SAR radar and used for environmental science in Greenland. These are just two examples of how potential uses for UAVs are now expanding at a furious speed as word spreads about their capabilities.

 On display at the show was Blue Bear Systems Research. Well known for its software and simulation capabilities, Blue Bear is now taking the leap into hardware, with UAVs. It is one of the entrants in the MoD's Grand Challenge which challenges





Sonic Communications' Israeli-designed Casper 250 UAV can call in highly accurate artillery fire without using a laser designator by using its camera and GPS system to work out target co-ordinates.

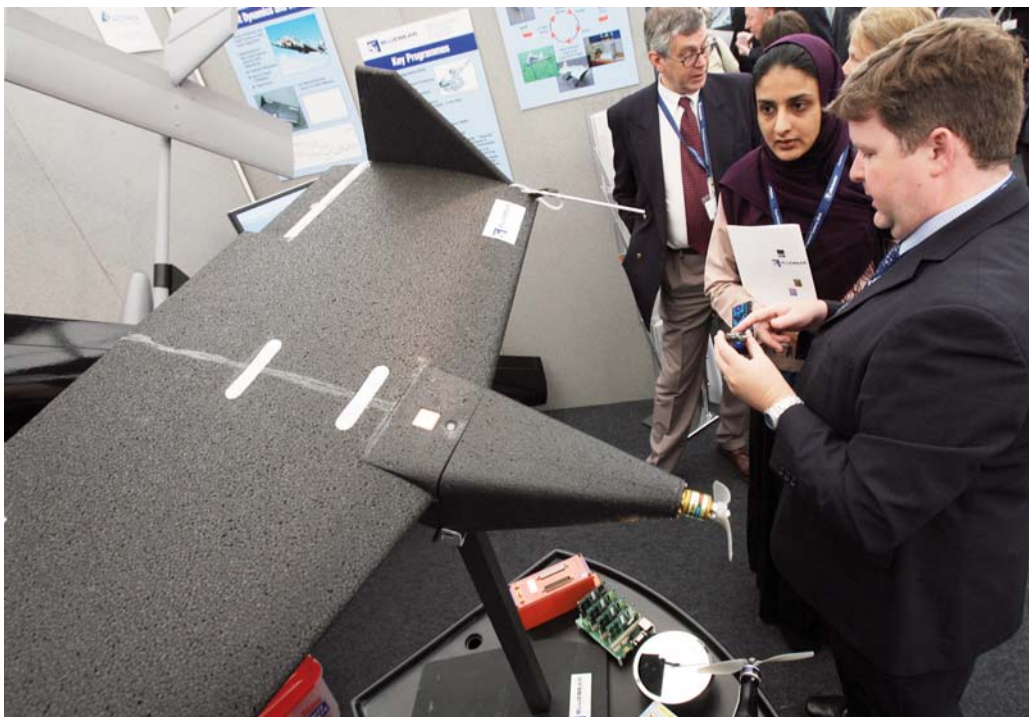
companies to use unmanned systems to scout out a hostile urban scenario. Blue Bears' director, Dr Phill Smith, explained to *Aerospace International* that he believed there was a real niche that Blue Bear was aiming for, an ultra low cost, rapid prototyped, disposable UAV that could be used in these sorts of dangerous situations, both military and civil.

 Want to learn to 'fly' a UAV? That is a new course being offered by QinetiQ's Empire Test

Pilots School. The idea is to train UAV operators to a certain standard and looks set to become a growth area as more and more non-pilots become UAV operators. Already this sort of training that ETPS provides has paid dividends with the UK MoD's CATS (Combined Aerial Target Service) reducing operator error and leading to a massive drop in accidents.

 In summary, then, the ParcAberporth UAV exhibition and conference is growing every year with a sector that is bursting with innovation and energy. Though there is still a long way to go, and numerous obstacles still remain, there is a sense that the civil opportunities are now beginning to start opening up. Progress on the inclusion of UAVs regularly in civil airspace is now accelerating and all stakeholders have a definite deadline to work to in the shape of the 2012 London Olympics which will require a massive surveillance and homeland security effort that will be difficult, if not impossible, to meet without using some unmanned systems.

The field for new entrants to this industry is still, however, wide open and ParcAberporth seems set to continue to be an important and vital showcase for the rapidly expanding UAV segment. 



Interest in exhibition stands was high - seen here Blue Bear Research Systems' low-cost UAV.