Small Remotely Piloted Aircraft Systems

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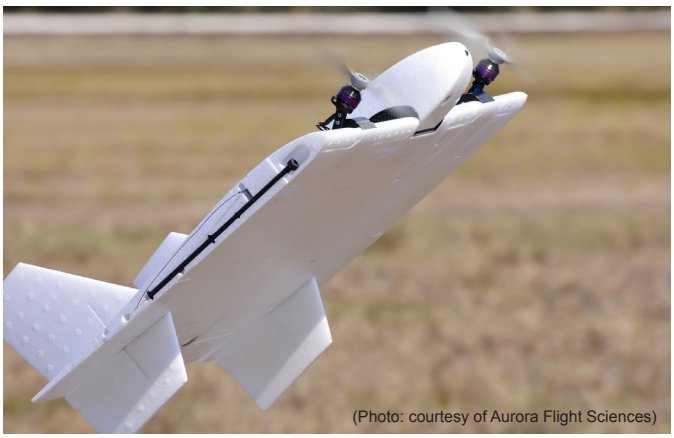
Remotely Piloted Aircraft (RPA) (also known as Unmanned Aerial Vehicles (UAVs) or Drones) are a disruptive technology that has permeated across the military-civilian divide. The worldwide market for these devices over the period (2012-2022) has been forecast by the Teal Group to be worth £55bn.[1] The fastest growing segment within this market is small RPAs, which consists of systems typically less than 2.5 kg, such as the new Aeryon 'SkyRanger' and the Aurora Flight Sciences 'Skate'.



Skate (1 kg) UAV

A new category in this crowded field, are the so-called Nano Unmanned Aircraft Systems (NUAS), these can be as small as 120 mm in length and have a mass of only 16 g, such as the Black Hornet from Prox Dynamics of Norway, which secured a £20m contract to supply 100 of these systems to the UK MoD in 2012.[2]

What characterizes these systems and sets them apart from their rivals is the quality of their performance (mass, size, endurance and portability), their attention to detail and their understanding of the user in the context of operation in the field.

Of particular interest to operators are multi-rotor platforms, capable of Vertical Take-Off and Landing (VTOL), due to their inherent ability to be launched and recovered from confined locations, together with their ability to perch and stare for extended periods of time. However, the major drawback of most multi-rotor aircraft is their inability to cope with even moderate gusts of wind i.e. greater than about 6-8 m/s. This limitation prevents their more widespread use and deployment for civilian tasks in the UK and elsewhere, where flight path control, safety and station keeping are likely to be mandatory operational requirements. This is now a pressing issue, since the US and the UK will have an open skies policy towards civilian use of unmanned aircraft from 2015 and 2016 respectively.[3]

The Civil Aviation Authority (CAA) in the UK has stated that they will only allow RPA to enter the unsegregated national airspace if they possess the appropriate sense and avoid (detect and avoid) capability, together with an assurance of safe operation and control. I quote "*...it is imperative that the capability of taking immediate active control of the aircraft exists at all times.*"[4] To date, the CAA does not know of any such system which meets this requirement.

Examples of commercial private sector beneficiaries of this type of technology can be found in the offshore industries, such as those within the Gas Exploration and Wind Generation industries. These two examples have a requirement for safety inspections of equipment and structures, which exist in hostile environments containing unpredictable weather patterns and high winds. The gas exploration industry is a multi-billion pound business which operates 24-7, all year around.

Any downtime, which requires a shutdown of the pipeline operation, can run into millions of pounds of costs within hours. Regular maintenance is essential to safe operations; however, the normal methods deployed to date involve scaffolding and skilled riggers. This is both time consuming and dangerous work which requires a pipeline shutdown.

The use of a small remotely piloted aircraft would enable a fast remote inspection to take place in a short period of time thus reducing downtime to a minimum. However, the prerequisite for such an operation would be an exceptionally stable air platform that could cope with high winds and unpredictable wind gusts in the order of 15-25 m/s. In this respect the Aeryon 'Scout' and 'SkyRanger' are in a class of their own, with wind gust capability up to 22 m/s and 25 m/s respectively.

The Aeryon SkyRanger (2.4 kg) in operation

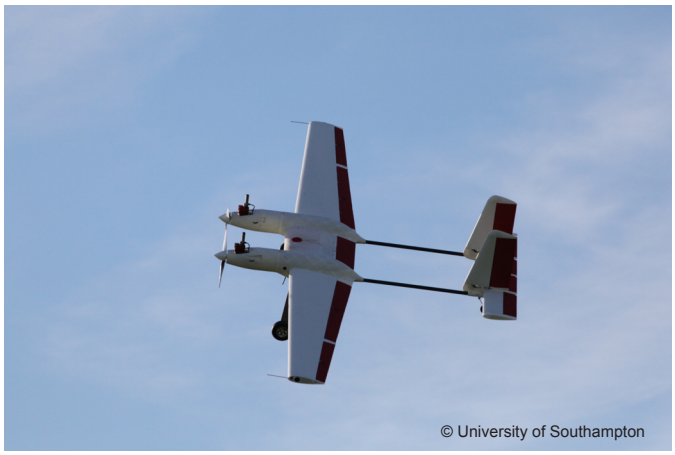
Likewise, the offshore Wind Generation industry has a similar requirement for inspection and maintenance, as any downtime in the power generation can be expensive. As wind generation systems become larger, producing more electric energy per system, so does the problem of inspection with traditional methods, similar to those stated above.

Small remotely piloted aircraft also have a great potential for assisting in safety, security, and rescue missions. They can for example provide an "eye in the sky" overview to guide operations or search and locate victims and other targets of interest at locations that are hard to reach on the ground. A typical application example is a building collapse, where it is dangerous for humans to access the rubble pile for mapping and planning the search and rescue effort. Also, where decisions about prioritization of the usage of heavy equipment have to be taken in an efficient manner.

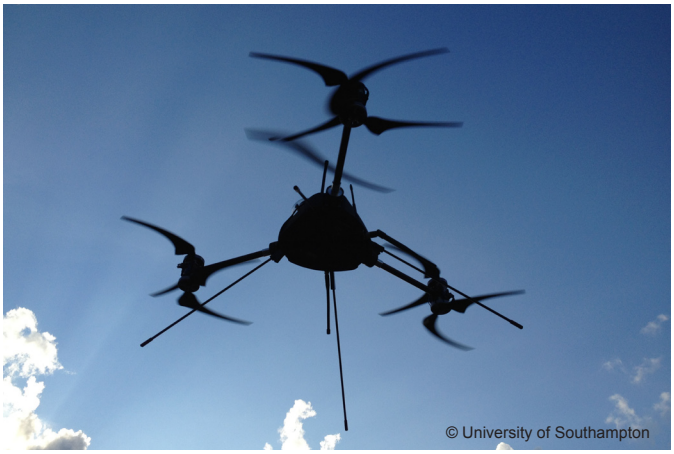
The application of small remotely piloted aircraft to demining is another area of interest which could make a significant impact. According to the United Nations, it has been estimated that there are more than 110 million landmines scattered in 70 countries and that it would take more than 1100 years and cost more than US$33 billion to clear them using the current technologies.[5] A small remotely piloted aircraft that could hover above a minefield and move very accurately, carrying a suitable sensor package would be very useful to specific charitable organisations working within this area.

The global outlook for small remotely piloted aircraft is strong and growing rapidly. The UK is well placed to benefit from this growth, having a mature aero-space sector employing many thousands of skilled workers.

These new industries could spur further employment opportunities within the UK, Europe and worldwide. However, to date the UK has been slow to develop such small RPAS, with the exception of some research organisations, such as the University of Southampton, with their 2SEAS long-range fixed-wing maritime surveillance UAS and their HALO co-axial Y6 rotorcraft UAS.



The 2SEAS (20 kg) long-range fixed-wing maritime surveillance aircraft



The HALO (2.5 kg) Co-Axial Y6 UAS

A recent study in the US has predicted that the unmanned aircraft industry is poised to create more than 70,000 new American jobs in the first three years following the integration of unmanned aircraft systems (UAS) into the U.S. National Airspace System (NAS). The economic impact stemming from this is projected to surpass US$13.6 billion within three years.[6] In the US, the progress of integration of civilian RPA into the NAS has been held back by FAA delays and concerns over privacy issues, which are undermining their lead in this area of technology.[7]

There is now an opportunity for the UK to take the lead in the area of small remotely piloted aircraft design and optimisation. One hopes that together we can rise to meet this challenge!

References

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