SkyTech 2016 Post-Event Report

With SkyTech wrapped up again for another year take a look at the highlights from this year's conference.

RUSTA was in a brilliant position to kick-start the main industry conference. As one of the Civil Aviation Authority's approved National Qualified Entity (NQE), it addressed the question on everyone's lips: how deeply are we involved in drones compared to the rest of the world? Representative Sion Roberts said the disparity between EU member states is notable. While our national government is proactive about the development of UAVs as a widespread commercial tool, the European Commission only made its aims for standardised regulatory enforcement clear last year in public. The UK has recently experienced a huge growth in the number of drone operators, but a spike in incidents has trailed them, a pattern to be repeated ad infinitum if blanket policies aren't rolled out soon. Geoff Pegman from **UKTI** (UK Trade & Investment) took the baton and reminded us of the glut of new pilots hitting the scene in the short-to-mid-term. He spoke on behalf of a government organisation set up to help British companies succeed in the global market – drones are one of the eight technologies identified by George Osbourne as having substantial investment value for these shores, and there is a push for new products to be tested in realistic environments. Apparently we're reckoned to be "the most entrepreneurial country in Europe", so market opportunities in this sector, with the right hand to steer the ship, are expected to pay dividends. Some of Pegman's work involves encouraging overseas trade, and he's currently organising a trip to Japan with money from the Northern Powerhouse scheme. Grants are available for small-to-medium companies to the tune of £700, so it's by no means an exclusive club to enter.

Gold sponsor **Unifly** later came to the podium to showcase their far-reaching fly zone software. Their speaker, Jürgen Verstaen, told us that the European public has cast off its suspicions about non-military UAVs and is finally ready to engage and accept the technology on its own terms. This means a certain level of democratisation has occurred, which has its negative effects. Unifly's SKYBRIDGE app connects to ATM systems through the Cloud to display the airspace regulations of any given country to trainee pilots. When the product is launched, operators will be able to find out where and when they can fly, even receiving a digital document that can be signed and returned for approval. Regulators like the CAA can update SKYBRIDGE to their specifications, ensuring no-one is excused by misguided information. The company has only been trading as its own entity since August 2015 – it is heartening to hear such pragmatic ideas about manned/unmanned symbiosis from a relative newcomer.

Jumbled knots of red tape is a theme that cropped up in the morning panel discussion with Tracy Lamb (**SGS**), Dave Pearcey (**RPS Group**), and John Hanslip (**Marsh**). Pearcey argued all operators, commercial and recreational, must understand basic set-up procedures like home-lock and compass calibration. A point of responsibility is key: RPS recognises 12 and above as the mental age to which responsibility is attributed. Lamb, meanwhile, asked the

room for feedback on whether we truly understood the reality of a risk assessment. "What criteria are we using? What statistics do we have, that we can use?" SGS, an aviation consultancy firm, are trying to redress the focus on high consequence, low probability accidents (a drone flying into the engine of a 737, for instance). She exclaimed that it's not all about the size, shape, weight, and speed of aircraft – it's about what they are doing, and when they're doing it. From the table, the overall feeling was one of practicality, that the hordes of incompetent pilots out there (and their everyday mistakes) must impress upon the weight of new policy more than any cataclysmic disaster risks.

NoFlyZone's John Tansley expressed fears that the industry will become too regulated, stymying market growth. He collates data where private requests for a no-fly zone are submitted to see if there's a trend growing in certain areas. The company then talks to the authorities to educate drone pilots on where they can and can't fly. "Public perception," he said, "should not therefore be of irritating drone geeks flying over their property at all hours." He cited a case of residents in Tipperary claiming burglars are sending drones equipped with night-vision cameras over their houses – Tansley believes this is a typical case of media panic, assuming bad intent when it fact none may exist. James Dunthorne (**Remote Aerial Surveys**), who closed the first day, chose to outline the three basic categories of drone flights. Interestingly, lightweight platforms running in a low-risk environment dictate the first of these, while a pilot's ability and destabilising external factors only arise in the latter two. Should size and a loose interpretation of "low-risk" decide flight standards? An earlier presentation showed a photo taken as a publicity stunt by an anti-snooping organisation in Germany: you can see Angela Merkel and a group of increasingly worried ministers evading a quadcopter at a press conference. By this standard, there is an argument for strict monitoring of even the smallest machine, in any situation.

There was an exhaustive stable of speakers on offer to shed light on the fantastic survey work that drones are augmenting around the world. Both days of SkyTech hosted survey conferences in recognition of how widespread these applications have become. **Pix4D**, creators of the most acclaimed GIS mapping software on the market, have been leading the charge in this respect for some time. They want to work with every drone manufacturer so that every survey carried out is held to impeccable quality. One project in particular illustrates their commitments: Mapping Nepal, a drone relief mission in the aftermath of the 2015 Nepal Earthquake, proved that integrating UAVs within a desperate country is possible, even necessary, to facilitate the response a disaster calls for. Pix4D's Olivier Küng quoted project leader Patrick Meier, who believed that "local people should be doing local surveying" under the guidance of experts. To this effect, the company's operating system was crucial to producing high-quality photographs of devastated villages and cities. The idea was to show how easy it is to retrieve data this way – it only took half a day for university students at Kathmandu to complete flights successfully and see the results on their smartphones. Kung admits battery life is the major factor holding back the software's large-scale adoption, but it is already so popular, so tried and tested, that the 53-strong team behind it will keep snowballing into great things regardless.

Mining stands to be an industry that will benefit from cost-saving measures associated with drone technology, largely because speed is a commodity valued above most when dealing with rich mounds of earth. **Maptek**'s Joseph Sykes designated that a miner's best friends are swiftness, power and intuition; the "extremely volatile" economic downturns for metals have forced corporations to maximise their capabilities or else risk valuable resources going down the drain. "The cost implications are absolutely huge," he proclaimed, predicting drones will be used to visually recreate the landscape above a closed mine, and that the days of a chartered surveyor making £150-200 thousand a year are numbered as pilots do the same job for lower rates. Gaz Scully (**Alchemy Global**) spoke about the importance of pipeline inspection and reduced man hours for similar tasks, but also highlighted UAVs' ability to monitor organised crime and provide a different kind of surveillance. When the border between Hungary and Croatia, for instance, stretches 175km long, an eye in the sky can only be a good thing, saving border control teams from giving a generic response to every infringement.

Agriculture, the largest forecast area for drone application, was examined by Rocio Ballesteros (**CREA**) and Igno Breukers (**Quest Innovation**), both of whom are heavily involved in producing multispectral images for crop fields, economising water irrigation, and determining where fertiliser can best be used. So much water is used in agronomic appliances that it could fill the Empire State Building 7,305 times. The pressure to save water resources is higher in very hot countries such as Spain, and drones can give farmers a detailed idea of when their crops should be nourished, lessening the chances of a failed yield, and strengthening that of a successful intervention. Breukers gave his preference for Prism based imaging: essentially, light split into spectral bands, with multiple sensors meaning 100% pixel-to-pixel alignment as each sensor gives the same image in a different band. There are no time shifts or motion issues with this method, as opposed to the filter-wheel alternative, prone to time shifts and easy mistakes.

Archaeological and forensic mapping looks to be in good hands after **Routescene** explained their UAV LidarPod's ten-year development cycle. The finished product has GPS, data logging systems, radio telecoms, and weighs just 2kg. Designed as simply as possible, with a carbon fibre casing for light transport, it can scan terrain up to a range of 110 metres for that extra level of information beyond visual line of sight. **Flyability**'s drone-in-a-cage concept treads similar ground, with Patrick Thevoz questioning why everybody is trying to capitalise on outdoor inspections when indoor surveys are mostly ignored. The inaugural task for the company's drone was to fly through a corridor using only video feedback for navigation (the machine has a shock-resistant outer casing, protecting it for this very purpose). Media attention quickly followed, and people approached them to overcome the same limitations in a myriad of markets. Flyability, at one point, were contracted to oil giant Chevron, who want to eliminate human entry in confined spaces by 2020, negating the 98% of inspection time dedicated to preparation. Thevoz's presentation ends with footage of his UAV diving deep down an ice sheet crevasse, a potent symbol of his hopes to corner the indoor survey game.

Further summations came from **Geo-4D**, a service provider involved in detailed project plans for an array of energy clients. Ortho-photographs must be combined with colourisation, digital terrain models and calculated contour lines to form the final picture. Paul Bryan (**Historic England**) emphasised how advanced the technology has become: in 1979, it took a few seconds for a single topographic point to be measured, whereas now hundreds of thousands of points are analysed in the same timeframe. "Think seriously about what it is you're trying to record," he warned. Flat landscapes and ascending terrain have different requirements, and although photogrammetry has been around since the first camera was invented, artistry and care are always needed to make the most of the equipment. Taking a cue from current events, flood plain monitoring will be high on the agenda for upcoming missions in the UK.

Ross Manship from **AECOM** wants to understand the limits of current navigation for survey infrastructure. He spoke about how UAS are special due to their ability to speed up the acquisition of data, the enablement of high resolution and accuracy, and the provision of safe access to dangerous areas. AECOM has in excess of 100,000 employees worldwide, so it's crucial for them to keep structural engineering projects safeguarded from human accident. He hopes that UAVs can sense and avoid within a distance of 2m or less from an object – this will need ultrasonic sensors to be available on the civil market, which may come to pass in the next few years. Basic manpower costs, such as winches and tripods, will be negated. **Ampyx Power**, conversely, are utilising drones for the renewable energy sector, and gave details about their innovative fixed-wing craft, the PowerPlane. Tethered to a rope, it flies in a pre-programmed figure of eight to generate 250kw of electricity, which will increase to 2mw as larger wingspans are developed. This approach allows the UAV to respond to environmental and operational changes while remaining outside of free, unmanned airspace. The rope still needs to be reeled in and set up after each flight, which can drain some of the accrued energy, but this is an inferior amount to the overall yield.

Justin Pringle's (**Drone Ops**) targets were aimed at the UAV industry as a whole. Manufacturers, in his view, do not listen to the needs of the consumer enough to significantly change their hardware; he also mentioned Big Data, a "good industry, [that] isn't helping us properly in the enterprise market." His company are interested in robustness and tether systems with real-time, 360° analytics. "Ditch cameras," he emphasised, "and start looking at sensors, start looking at the future." Leading by example, they've built a drone that can fly 15cm above the ground to detect IEDs, a feature of modern warfare that has made conventional metal detectors redundant.

NVIDIA outlined the prospects of fully autonomous A.I., of which they are at the forefront, spearheading new frontiers of computer vision, medicine and robotic surveillance. Eddie Seymour proclaimed we are now at the point where computers can recognise images better than a human being, and he is engaged with different innovators in the market for this technology. One of them is Percepto, a small firm that began working with NVIDIA 18 months ago on depth perception for unmanned aircraft. Companies such as Google and Microsoft are racing to capitalise on "deep learning" – a neural network for machines, allowing them to

learn independent of human programming – and drones fall into this category, backed by breakthroughs in video analytics. Seymour positioned his Jetson developer kit as the most affordable way for anyone to unlock the potential of their UAVs, broadening the scope of applications created for and by the public.

The shape of these applications was considered on the second day by Gavin Goudie of Blue Bear Systems Research who utilise UAVs to tackle the challenges of commercial aircraft inspection. Drone use enables accuracy in the recognition and measurement of operational airliners, and even detecting small damage safely and efficiently. **Cranfield University** emphasised the danger of air accident sites and how hard it can be to collect information when evidence is at risk of blowing away. There are multiple hazards (both biological and situational) to contend with in these circumstances, highlighted by the example of a helicopter crash in Hampshire that claimed the lives of three people. Lecturer Pete McCarthy told us investigators noted a piece of the copter was missing at the scene. With the aid of drones, it was found a kilometre away in another field, a discovery that would've normally taken hours of extensive search efforts to reach. McCarthy explained he wants to get into the head of a pilot, to analyse what possible distractions there could have been, and to deduce a crash's velocity (which can be measured with UAVs by photographing strike marks on the ground). 3D imagery, combined with a drone's perspective, makes this possible.

Rounding off the conference were a collection of companies involved in emergency and humanitarian response. **BioCarbon Engineering**'s Lauren Fletcher is concerned about the 15 billion trees lost year on year to deforestation, and revealed the counter-effort usually resorts to basic, heavy equipment. UAVs impart a 5-10cm planting accuracy that, combined with support from the World Research Institute, can accommodate different species of vegetation and quick, accessible replanting. Meanwhile Dr. David Bird (**McGill University**) espoused the usefulness of a drone in observing wildlife, since animals generally don't see them as an immediate danger. This makes drone surveillance ideally suited to capturing footage of nests and adolescents without causing distress to the parents. Drone deployment is a threat to poachers, conserving some wild animals just as they can warn others (such as a select species of bird that pillages rice fields in Africa) away from human contact.

Andrew Stevenson from **Warwickshire Police** gave us an insight into the exchange of piloting experience between regional crime-fighting forces in lieu of nationwide government training initiatives. Budget cuts have forced units to rely on low-cost means of gathering visual data, so drones are growing more essential: a DJI Phantom, for instance, was used as reconnaissance in the apartment siege following the Paris attacks in November. Thermal cameras can scout cannabis farms, crime scenes and suspects on the run, while officers raiding a house can see a real-time feed of the occupants and surrounding area.

Last to speak at the Applications Conference was Colby Howard, a mentoring officer from disaster-response charity **Rescue Global**. He brought up points from earlier presentations – "There are more questions in the softer things, the policy and regulation. These seem to outrun the technology itself" – but gave them an urgent context in relation to

countries hit by destabilising, catastrophic events that outstrip local resources. A larger number of lives are saved in the weeks after a disaster than its initial duration, and rescue teams must be as organised as possible if they want to save lives over ruined, variable landmasses. Practically, it is better to train a country's own emergency units so they are ready when they need to be. Rescue Global co-ordinate teaching centres and political infrastructure to ensure this goal is achieved, utilising UAVs for a far-reaching capacity to do good, spurred on by a technology that's defined by the bigger picture.

Stay up-to-date with news about the next instalment of SkyTech in 2017. Details launching shortly at www.skytechevent.com