From ATM to UTM... and back again

Philip Butterworth-Hayes, Editor of the unmannedairspace.info website, says the fog is starting to clear around the challenge of UAS traffic management (UTM).

If you believe the market forecasts, no matter where you are in the world the skies will soon be covered with drones. The picture these forecasts paint is of a global drone market poised like a greyhound waiting to run.

According to Goldman Sachs, $100 billion will be spent on drones between now and 2020 – and that is before it is certain that any commercial beyond-visual-line-of-sight (BVLOS) flights will be allowed by any regulator. The US Federal Aviation Administration (FAA) is predicting US drone numbers will rise 400% over the next five years.

Drones will not just be more numerous; they will be bigger. According to the US Aerospace Industries Association (AIA), spending on large unmanned aircraft systems (UAS) – weighing more than 55lb – is expected to rise from the low hundreds of millions today to $30 billion annually by 2036, driven by demand for long-haul cargo aircraft.

Mastering technology

For many ANSPs around the world, UAS traffic management (UTM) is more of a threat than an opportunity. They find themselves having to devise a UTM programme with no clear budget or timeline.

Politicians and industry leaders want to fast-track drone delivery services because of the huge economic and technological benefits they will bring. Regulators on the other hand have seen nothing like this before. Their concern is with the growing prospect of a drone colliding with an aircraft or falling out of the sky on to a bus queue, with fatal consequences.

And trying to understand how some of the fundamental technology building blocks of a future UTM system will fit together – 5G mobile phone networks for surveillance and communications, blockchain for tracking and registration, artificial intelligence algorithms for collision avoidance – requires a mastery of concepts and systems.

The roadmaps provided by the SESAR JU and the FAA provide a blueprint for the evolution of UTM services over the next 20 years but they do not say how to involve all stakeholders – including local authorities, regulators, lawyers, drone operators, standards agencies, insurance companies, environmental protection agencies, emergency services, security and law enforcement organisations – in developing a UTM management system that will take account of all the legitimate, and sometimes contradictory, viewpoints.

Making drones pay

Until recently, ANSPs have been caught in the middle of this conundrum, having to develop a UTM concept of operations and business case without even a clear legal mandate for drone safety at very low-level airspace.
One way to overcome the stakeholder involvement challenge has been to set up national drone councils involving all interested parties, with links to local, national and international research bodies and initiatives.

But in the last few months the fog has started to lift. Next year will see some pioneering ANSPs provide the first paid-for UTM services for commercial drone flights. According to the European SESAR JU U-Space roadmap, UTM foundation services (e-registration, e-identification and geo-fencing) are due to be delivered by SESAR JU by the end of 2019 and flight approval for BVLOS drone operations from 2022.

But some European ANSPs – notably those in Poland, Switzerland and the UK – are racing ahead of this schedule and are on track to provide automated authorisation of BVLOS flights around 2020 or shortly thereafter.

Popping up all over the world are UTM centres of excellence where ANSPs have forged partnerships with regulators, operators and others to give a clear insight into how the technical, institutional and financial building blocks of UTM will need to be organised if increasingly complex commercial drone operations are to be safely managed in low level and controlled airspace.

One way to overcome the stakeholder involvement challenge has been to set up national drone councils involving all interested parties, with links to local, national and international research bodies and initiatives. France has been a pioneer of the concept and the Direction Générale de l’Aviation Civile (DGAC) is hoping to authorise its first long-range drone operations by the end of the year.

In Japan, a similar public-private council has been set up to realise Prime Minister Shinzo Abe’s vision for UAS, with a strategic vision for UTM to be delivered via the ‘Roadmap for the Aerial Industrial Revolution’. The aim is to make parcel delivery by drones a reality by 2020.

Following on from the success of the Low Altitude Authorization and Notification Capability (LAANC) programme, the US Department of Transportation announced the first 10 participants in its drone integration pilot programme in May 2018. Meanwhile, Dubai’s Civil Aviation Authority and the Civil Aviation Authority of Singapore are researching UTM concepts to support autonomous air taxi operations, with Christchurch in New Zealand not far behind.

Business plan

Some of the business case uncertainties are starting to become clearer too. ANSPs have developed a range of partnerships with flight planning software suppliers to ensure drones stay out of sensitive areas and that operators have access to airspace authorisation tools and the latest aeronautical data.

This is predominantly a free service. Most ANSPs recognise that UTM services will have to be paid for by commercial operators and there will be no government support available. They will also not be able to charge for services they provide freely today, so income from drone operations will only start with the introduction of BVLOS flights by commercial operators.

At World ATM Congress 2018 in March, Italy’s air navigation service provider, ENAV, became the world’s first ANSP to produce a public version of its UTM business plan – subject to regulatory approval – with proposed charging scales for UTM services for both recreational and professional drone operators.

Key elements from the business plan suggest investment and running costs sustainable in the mid-term with a return on investment of between the third and fifth year of operations, requiring a potential €50-60 million of operational costs to 2028 for revenues of €70-75 million.

Globally, UTM service income will be worth $517 million between 2018 and 2022, according to a study published by Unmanned Airspace, with income levels rising rapidly after that as drone flights become longer and cross more classes of airspace.

But all UTM models are vulnerable to the advance of technology. UTM is not ATM and technology providers will soon be able to provide their own autonomous, self-organising UTM systems.

Terra Drone Co. Ltd., a Japanese commercial drone service company, has already launched a fully commercialised UTM system in South Korea along with mobile phone company LG U+ to support disaster monitoring and commercial BVLOS operations.

Operators can connect to the UTM system via various portable devices, such as PC, tablet and mobile phone, and plan drone flights just by entering the destination; the drone autonomously stops flying when it recognises other drones, aircraft and birds. In an emergency, the drone deploys a parachute designed to allow it to land in a safe area.

Meanwhile, a NATS tool to allow drone operators automatic authorisation (or refusal) to controlled airspace is now used for similar requests by general aviation pilots; in the NATS concept of operations UTM means ‘unified traffic management’, rather than UAS traffic management. Within a single system of air traffic management for low level and high-level airspace, it is more than likely that many systems developed for autonomous low-level operations will soon migrate to higher levels.