(Picture: Volocopter and Frankfurt Airport are now working on airport-city centre air taxi concepts)

The Global Urban Air Mobility project report

7 March, 2019

Europe

Belgium

Antwerp joined the UAM Initiative (EIP-SCC) in September 2018. According to a press release: "Antwerp has stated its ambition to explore the potential of drones in an urban context. As a starting point, the feasibility of using drones for observation tasks by the local police will be studied. Specifically, the city of Antwerp and its local police will initiate a project definition aimed at developing an autonomous aerial imaging system with the ability to cover the territory of the city. In the development of the project, the city will also closely involve its quadruple helix partners (universities-businesses-citizens) and embed the initiative in its wider Smart City strategy."

"The feasibility of implementing this solution will be studied in close collaboration with institutional partners such as Belgocontrol, Eurocontrol and the European Aviation Safety Agency (EASA). Among other partners who have signed and support the Manifesto of Intent are the Antwerp Fire Department, the Federal Ministry of Transport, the Belgian Civil Aviation Authority, the Federal Police (Air Support), the Port of Antwerp, iMec, University of Antwerp, Drone Think Do, Droneport, EUKA, Helicus and Unifly.

Meanwhile in October 2018 it was announced that the Helicus Aero Initiative (HAI) will put in place a system to transport medical supplies by drones between hospitals and laboratories/pharmacies. The project, named MEDRONA, was selected for funding by the federal government. Inter hospital test flights will take place during the second part of 2019 in Antwerp urban airspace.

The aim of MEDRONA is to demonstrate a system that is able to transport medical parcels (e.g. human tissue, blood & urine samples and pharmacy preparations) in a reliable, ecological and efficient way. Five companies have joined forces in this project: Belgocontrol, SABCA, Unifly, NSX and Helicus. Each company will focus on a specific part of the overall solution.

The project was selected out of 136 candidate projects within the frame of Smart Mobility Belgium (SMB). SMB is a joint initiative of the Belgian federal minsters of Transport and Communication for projects aiming at smart and innovative mobility applications. It has a budget of 4 million euro. SMB will provide support to MEDRONA which constitutes the second phase of the Helicus Aero Initiative (HAI). This phase aims to build safety assessments for specific inter hospital flight corridors. A series of test flights in 2019 should allow to obtain the regulatory approval for the future exploitation of the medical drone transport system in Antwerp.

In October 2018 the SAFIR consortium, a group of 13 public and private organisations, was selected by Single European Sky ATM Research Joint Undertaking (SESAR JU) to demonstrate integrated Drone Traffic Management for a broad range of drone operations in Belgium. The goal of the SAFIR project is to contribute to the EU regulatory process for drones and drive forward the deployment of interoperable, harmonised and standardised drone services across Europe. SAFIR will carry out multiple studies and demonstrations for drone operations including surveillance flights (including container terminal inspection, oil spill inspection) in the Port of Antwerp, parcel delivery, medical inter-hospital transport, high voltage line mapping and pylon inspection. Further the use of telecommunication network technology for data communication with both manned aircraft and other unmanned aircraft will be assessed. Finally, a radar system will be deployed capable of monitoring cooperative and non-cooperative drones.

Brussels is part of the European Union's Urban Air Mobility (UAM) initiative and is examining the setting up of a drone-based emergency services network.

Ghent is part of the European Union's Urban Air Mobility (UAM) initiative. The city is examining the setting up of a prototype ambulance drone application and is part of the multi-stakeholder group. Partners include: the Department of Emergency Medicine Ghent University Hospital, Emergency Medical Services Dispatch Centre 112 East Flanders, Ghent University i-Know, Belgocontrol, Unifly, Euka, TomorrowLab, Drone Think Do, European Aviation Safety Agency, BRC Belgian Resuscitation Council, Ghent Fire Zone Central HQ.

Kortrijk The Marketplace of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) announced in February 2019 on Linkedin that the Eurometropolis cities of Lille, Kortrijk and Tournai, a cross-border region bringing together 2.1 million Belgian and French inhabitants have joined the association's urban air mobility initiative. This is the third trans-border partner, joining Euregio (Enchende of the Netherlands-Munster in Germany) and MAHHL (Maastricht, Aachen, Herlen and Liege, cities in Germany, the Netherlands and Belgium).

St Truiden is the location of a "drone port", located at the former military airport of Brustem, Sint-Truiden. Besides acting as an incubator for start-up companies, Droneport Sint-Truiden provides test facilities to drone operators, allowing them to conduct test flights in dedicated (segregated) airspace.

Tournai The Marketplace of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) announced in February 2019 on Linkedin that the Eurometropolis cities of Lille, Kortrijk and Tournai, a cross-border region bringing together 2.1 million Belgian and French inhabitants have joined the association's urban air mobility initiative. This is the third trans-border partner, joining Euregio (Enchende of the Netherlands-Munster in Germany) and MAHHL (Maastricht, Aachen, Herlen and Liege, cities in Germany, the Netherlands and Belgium).

Estonia

As part of the SESAR U Space trial programme, an international parcel delivery between Helsinki and **Tallinn** is planned, followed by simulations of dense urban drone fleet operations in Tallinn in controlled airspace.

Finland

Wing, an Alphabet company, announced in December 2018 it will launch a drone delivery service in Finland in spring of 2019, the first Wing operation in Europe. According to the company: "We have spent the last six years developing a fleet of small aircraft and an automated navigation system that can deliver food, medicine and other items just minutes after they are requested. Drone delivery is not only safer, faster and more environmentally friendly than ground delivery, it can also radically improve our quality of life. Wing has spent the past 18 months trialling the customer experience of drone delivery with thousands of deliveries in south-eastern Australia, partnering with local businesses to deliver a range of food and drinks, medicine and household items….we're looking forward to working with the community and local businesses to find the best way to implement our services in the Helsinki area. Based on what we know about the winter weather in Finland, we're pretty confident that if our drones can deliver here, they can deliver anywhere!"

An international parcel delivery between **Helsinki** and Tallinn is planned[i] as part of the SESAR U Space trial programme, followed by initial work to plan dense urban drone fleet operations in Helsinki with police intervention. Other programmes underway include maritime traffic surveillance combined with search-and rescue over Gulf of Finland and, in co-operation with Urban Air Mobility initiative, the Consortium plans to demonstrate the use of UTM for controlling drone taxi traffic by demonstrating a live drone taxi flight from Helsinki-Vantaa airport to downtown Helsinki.

France

Bordeaux is part of the Nouvelle-Aquitaine initiative**,** a European Innovation Partnership on Smart Cities and Communities (EIP-SCC) programme. "(The Nouvelle-Aquitaine project propose to study the implementation of innovative mobility solutions using the aerial dimension to improve the urban and inter-urban mobility. The objective is to build starting from on-going experiences such as autonomous delivery of products and then to imagine, for example, the tourist transport from a liner docked in Bordeaux quays towards tourist areas, or to allow the transport of goods or isolated people towards health or economic centres. The tourist angle of the Nouvelle-Aquitaine project is also one of the differentiation factor compared to other territories which have joint the UAM initiative."

The feasibility of implementing these solutions will be studied in close collaboration with institutional partners such as the French Civil Aviation Authorities (DGAC). Other signatory partners include the AETOS and TOPOS clusters, Aerospace Valley competitiveness cluster, Thales, Airbus and Bordeaux Technowest and two project leader of the regional Drone City call of interest (AirMarine and Betomorrow, 33).

Lille The Marketplace of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) announced in February 2019 on Linkedin that the Eurometropolis cities of Lille, Kortrijk and Tournai, a cross-border region bringing together 2.1 million Belgian and French inhabitants have joined the association's urban air mobility initiative. This is the third trans-border partner, joining Euregio (Enchende of the Netherlands-Munster in Germany) and MAHHL (Maastricht, Aachen, Herlen and Liege, cities in Germany, the Netherlands and Belgium).

Toulouse Métropole has joined the UAM Initiative of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC). According to a September 2018 press release "Alongside the "Projet Mobilités 2030" led by Tisséo-Collectivités, a structuring programme representing nearly EUR 4 billion, the objective is therefore to encourage the implementation of new mobility services for which the UAM is a high-stakes lever, and this in a global approach for responsible and sustainable urban development…Toulouse Métropole has set the following priorities, by adopting a step-by-step approach, for the sustainable integration of air mobility in its territories:

- Remote sensing: use of drones for environmental monitoring applications or urban services (traffic management, air quality, infrastructure monitoring …), to meet the needs of supervision for the territory
- Emergency and rapid response services (health, medical, security),
- Urban logistics: to experiment with the support of specific products & services for which the drone technology could complete the already existing value chain, in a logic of the first / last kilometre.

The feasibility of implementing these solutions will be studied in close collaboration with institutional partners such as DGAC, Eurocontrol and the European Aviation Safety Agency (EASA). Amongst other partners who have signed and support the Manifesto of Intent are public authorities, industrials, startups, research laboratories and clusters. Partners with an interest to support the UAM project in Toulouse include, amongst others, the Prefecture of the Occitanie Region and Prefecture of the Haute-Garonne, Tisséo Collectivités, Direction Générale de l'Aviation Civile (DGAC/DSAC and DGAC/DSNA), Aéroport Toulouse Blagnac, Caisse des Dépôts et des Consignations, Centre d'Etudes et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement (CEREMA), Groupement d'Intérêt Scientifique Micro-drones, Centre Hospitalier Universitaire de Toulouse (CHU), Ecole Nationale de l'Aviation Civile (ENAC), Fédération de Recherche ONERA ENAC ISAE-SUPAERO, Airbus, Aerospace Valley, AirMap, Delair, EDEIS, ESSP, Electric Visionary Aircrafts (EVA), Institut Aéronautique et Spatial (IAS), Involi, IRT Saint-Exupéry, ISAE-Supaero, LAAS-CNRS, M3 Systems, ONERA, Oppidea, Safran, Sopra Steria, Telespazio France, Thales, Unifly, VIPAIR-e.

Bulgaria

Plovdiv is part of the European Union's Urban Air Mobility (UAM) initiative. A consortium, with national and international partners, will be developed under the UAM Initiative of the EIP-SCC to develop a solid feasibility study and will initiate a fundraising actions; at a later stage, and upon approval of the defined project by the City, the realization of the UAMP project concept will be pursued in the wider region of Plovdiv. Supported by the Ministry of Bulgarian Ministry of Transport, Information Technology and Communications, the City of Plovdiv will be exploring:

- The synergistic use of new mobility services (including air mobility) integrated in public transport with a focus at connecting Plovdiv to other metropolitan areas at regional and national level;
- The effective use for ambulance services and the use for public safety;

- Cargo needs for small rapid deliveries. As a starting point, the focus will be given to introducing innovative goods transportation system in Plovdiv and the region, including the strategically highly important economic area of the TEZ. In the context of the EIP-SCC Marketplace, efforts will concentrate on raising investment for improving the accessibility of Plovdiv and its region as well as addressing its emerging mobility needs.

Other partners are the Bulgarian Civil Aviation Administration, the Space Research and Technology Institute – Bulgarian Academy of Sciences and the Trakia Economic Zone.

Germany

Wurzburg (Germany)-based drone-technology company Emqopter has announced it has made the first food delivery by drone in Germany. According to the company's website: "After an extensive phase of development our delivery drone was the first to be used for autonomous food delivery in urban environment in Germany. The flight route of 600m in **Bad Neustadt** took the drone only three minutes of total flight time. Of course, the pizza was still hot! With a maximum lift of weight of 11 kg and a payload of 2kg the drone is perfect for transport of small parts and house post."

On October 1 2018 cities and towns of Northern Hesse joined the UAM initiative of the EIP-SCC. The Manifesto of Intent was formally signed in Wiesbaden. The city of **Bad Hersfeld** and the region of Northern Hesse expressed their willingness to define a UAM Initiative demonstration project for addressing the mobility needs of the region, with an initial focus on logistics across the airports chain of **Kassel Calden** and **Frankfurt am Main**. Bad Hersfeld has been developed as one of the most important logistics locations in Germany. The feasibility of implementing these solutions will be studied in close collaboration with institutional partners such as DLR, Eurocontrol and the European Aviation Safety Agency (EASA). Amongst other partners who have signed and support the Manifesto of Intent are Bernhard Kempen Urban Mobility Innovations, B2M Software GmbH), Dietmar Höhn (ZF Luftfahrttechnik GmbH) and Dieter Klein (Wingcopter). Other supporters are the five districts of Northern Hesse - Hersfeld-Rotenburg, Kassel, Schwalm-Eder, Waldeck-Frankenberg and Werra-Meißner, the city of Kassel, the Chamber of Crafts Kassel, the Chamber of Industry and Commerce Kassel-Marburg, the Regional Council Kassel, the trade association of Hesse e.V., the business development agencies of the region, the Fraunhofer Institute for Energy Economics and Energy System Technology and other public authorities, industrials, startups, research laboratories and clusters.

The Euregio, a cross border region spanning Germany and the Netherlands around Twente and bordering parts of Niedersachsen and Nordrhein-Westfalia, has become the first Urban Air Mobility (UAM) Initiative demonstration project featuring cross-border regional cooperation between European countries. In September a Manifesto of Intent signal the start of a project definition phase in which Enschede and **Münster**, two of the biggest cities in the area, together with Euregio will explore opportunities of UAM in the field of emergency services for public safety, with the aim to delivering these services with faster response times, lower costs and less noise disturbance.

In **Frankfurt** Fraport AG and Volocopter GmbH reported in February 2019 they are developing concepts for ground infrastructure and operations required for air taxi services at airports. "This cooperation focuses on smooth passenger handling and efficient integration into existing transport infrastructure," says a 12 February press release. "This will be examined using a so-called Volocopter Port. In the future, Volocopter Ports could link existing urban transportation junctions with one another and provide connections to and from Frankfurt Airport (FRA)." Via its FraDrones program, Fraport has already tested various scenarios for using drones for operational purposes.

Hamburg is part of the European Union's Urban Air Mobility (UAM) initiative. In close cooperation with industry, universities, authorities and the public, feasibility studies for the systematic deployment of air mobility solutions in Hamburg's urban areas will be developed. Targeted solutions will explore, for example, the time-sensitive transport of medical goods or the inspection and maintenance of large infrastructure facilities such as port bridges and wind turbines. The initiative is

led by Airbus, while institutional partners include Eurocontrol and the European Aviation Safety Agency (EASA). Hamburg supporters and partners include the Ministry of Economic Affairs, Transport and Innovation, Lufthansa Technik, several universities, and the ZAL Center for Applied Aeronautical Research.

Ingolstadt is part of the European Union's Urban Air Mobility (UAM) initiative and has launched air taxi and organ transport pilot programmes. Partners include the European Commission, the Ministry of Economy, various local authorities, Eurocontrol, Airbus, the German Aerospace Centre (DLR), Audi, Munich Airport, the Fraunhofer-Anwendungszentrum, Bauhaus Luftfahrt, the Ingolstadt Klinikum, the Technical University Ingolstadt and the Catholic University of Eichstätt-Ingolstadt.

Munich In the "Simply Move" exhibition staged by bayern design, the Center of Excellence for Design of the State of Bavaria and Munich Airport, the airport's LabCampus, a 100% subsidiary of Munich Airport.is demonstrating air taxi concepts to link the airport to the city centre.

Greece

Messolonghi, a municipality of 34,416 people in western Greece, will place host to the EuroDrone U-space testbed, The demonstration will test U-space functionalities up to U3; the architecture is made up of cloud software (DroNav) and hardware (transponder) to be installed on drones. It is a sophisticated self-learning system based on software and hardware elements, operating in a distributed computing environment, offering multiple levels of redundancy, fail-safe algorithms for conflict prevention/resolution and assets management. Partners include: Aslogic, Cranfield University, Dronsystems Limited, Hellenic Civil Aviation Authority (HCAA), Hellenic Post S.A. (ELTA), University of Patras (UPAT), Romanian Post (CNPR).

Iceland

Aha, one of Iceland's largest eCommerce companies, has partnered with Israel's Flytrex to develop and now expand its food delivery service by drone around the city of **Reykjavik.** Aha has been given permission to fly 13 routes around Reykjavik, and its drones can make detours of up to 700m in order to reach customers. This gives them effective coverage of around half the city. Flytrex's system operates alongside Aha's existing vehicle-based delivery network, increasing its daily deliveries capacity, without increasing manpower. Starting August 2018 the two companies became the first in the world to drone-deliver directly to customers' backyards.

Italy

DIODE – D-flight internet of drones environment U-Space demonstration project - aims to demonstrate how the implementation of the full set of the U-space services up to U3 ensures a safe flow of drones that pursue specific business or recreational intents, fully integrated with manned aviation, and in all types of environment. Live demonstrations will take place in **Rieti**, a small province, close to Rome, known as "umbilicus italiae" with several different geographical situations, including rural, mountain and remote territories, industrial, urban and semiurban. These demonstrations will cover a wide range of operations: parcel delivery; road traffic patrol; professional photography; railway and power lines surveillance; search and rescue, airport operations; interaction with general aviation; and firefighting. Partners include: ENAV, Leonardo, Telespazio, IDS Ingegneria Dei Sistemi e-GEOS, Nextant Applications & Innovative Solution (NAIS), AiviewGroup, Poste Italiane, EuroUSC Italia, Techno Sky

Poland

Poland's DroneRadar (https://droneradar.eu/blog/2018/05/30/another-airport-connected-to-the-polish-utm-via-droneradar/) reports that **Warsaw** Babice airport has been connected to DroneRadar UTM. The agreement regarding access to the system has been signed between Polish Air Navigation Services Agency (PANSA) and manager of the airport, Logistics Services Center (CUL) belonging to the Ministry of Interior and Administration. Babice airport handles approximately 40,000 operations

yearly. Main users are Polish Medical Air Rescue, Police, Aeroclub and private general aviation schools and companies. Obtaining permission for drone flights in the Northern part of Warsaw (ATZ EPBC) has been simplified, and digitalised. Procedural control over flights – approval and modification – is possible using the DroneRadar system via twoway, non-verbal communication. All flights are now visible to EPBC AFIS and FIS at PANSA.

Spain

The Smart Cities Council Europe reports the first trials of a Radio Positioning System (RPS) for drones, allowing air traffic control to track drones in real time, has taken place in **Isla Mayor** –a municipality located in the province of **Seville**. "Working with European regula(to)rs, telecommunications company Vodafone has developed the first RPS for authorized bodies like air traffic control to track drones in real-time, with up to a 50-meter accuracy," says the council. "The system works with a 4G network SIM card that makes previously invisible drones now visible on air traffic control systems, with the power to make a drone land or return to its operator if it enters unauthorized territory like airports and prisons. Vodafone has also combined the RPS with Artificial Intelligence algorithms so that a large number of drones can be remotely tracked and controlled." The municipality has been a testing ground for 2 kg X-UAV drone with a 1.3-metre wingspan, which followed a 32-kilometer course around town recording HD video and flight data in real time."[ii]

Sweden

Kista Science City AB, IQ Samhällsbyggna to develop urban air mobility roadmap for **Stockholm.** Kista Science City AB and IQ Samhällsbyggnad have received the green light from Vinnova to conduct a feasibility study for an open testbed – the Urban Drone Testbed – which will lay down the blueprint for an infrastructure and regulatory framework large-scale, regular and secure drone traffic in the urban environment of Sweden's capital Stockholm. The two organisations are collaborating on the study with the public sector, industry, academia and civil society, which gives them the opportunity to influence what the testbed may include and how it will work.

The goal of the Urban Drone Testbed is to contribute to sustainable and connected city development by creating the conditions for new, secure services and business sectors where drones are made a natural part of the urban environment. The feasibility study will be completed on 30 June 2019, where the results will then be incorporated into an application for full-scale implementation.

Switzerland

Swiss Railways, or Schweizerische Bundesbahnen (SBB) is in talks with electric air taxi manufacturer Lilium GmbH to develop air taxis to transport customers from rail stations to their destinations, according to newspaper reports in January 2019. The flying taxis could provide fast links between major train stations and destinations such as airports, congress venues or outlying city suburbs, according to Swiss weekly *SonntagsZeitung.*

The Canton of **Geneva** is part of the European Union's Urban Air Mobility (UAM) initiative.

In **Berne** in June 2018 Swiss Post (https://www.post.ch/en/about-us/company/media/press-releases/2018/swiss-post-begins-transporting-laboratory-samples-for-insel-gruppe) reported it was working together with drone manufacturer Matternet to evaluate the link between the Tiefenau hospital and University Hospital Insel. The pilot programme is reported to be the first instance of routine BVLOS operations supported by Swiss U-space, Switzerland's nationwide integrated airspace system from skyguide and AirMap. In the pilot project in Berne, the drone connects the central laboratory at the Inselspital hospital with the hospital in Tiefenau. To ensure that the results are as informative as possible, the drone is being deployed on at least ten effective flight days over two

weeks. The flights will then be jointly evaluated and Insel Gruppe will decide whether to use drones for day-to-day transportation of lab samples in the future. Following the evaluation of the route in Berne (Insel Gruppe), Swiss Post will look into a further route between the main laboratory, ZLZ Zentrallabor Zürich, and the ZLZ emergency laboratory at the Hirslanden Klinik Im Park.

In March 2017 the Swiss Federal Office for Civil Aviation (FOCA) granted Matternet a certification allowing their delivery drones to fly autonomously over cities at any time of day or night. Clearing this regulatory hurdle means that by early 2018, Matternet partner Swiss Post plans to use the drones to deliver blood samples and other small parcels between hospitals in **Lugano**, a smaller city with a population of about 56,000.

In November 2017 Mercedes-Benz Vans, Matternet and Swiss online marketplace Siroop announced they had completed 100 flights during their pilot project in **Zurich** to test an efficient van and drone-based system for on-demand delivery of e-commerce goods. The pilot project, which started with first trials on September 25 2017, "is the first time that extensive beyond line-of sight drone operations with the use of vans as landing platforms are taking place in a major urban area to test a fully-automated e-commerce drone network", according to pilot company Daimler.[1]

From 10 December, drones will transport laboratory samples on behalf of Swiss Post from University Hospital **Zurich** (USZ) to the Irchel campus at the University of Zurich (UZH). The project is envisaged to last one year. During this time USZ, UZH, Swiss Post and the drone logistics systems provider Matternet will gather experience in long-term autonomous drone operation. The laboratory samples can reach their destination twice as quickly by air than by road in Zurich.

The Netherlands

In December 2018 **Amsterdam** became the latest city to join the European Union's European Innovation Partnership on Smart Cities and Communities (EIP-SCC) initiative (https://eu-smartcities.eu/initiatives/840/description). The agreement to participate was signed at the first UIC[2] Forum, organised by EIP-SCC members, which took place during Amsterdam Drone week (28-30 November 2018.)

The Euregio, a cross border region spanning Germany and the Netherlands around **Twente** and bordering parts of Niedersachsen and Nordrhein-Westfalia, has become the first Urban Air Mobility (UAM) Initiative demonstration project featuring cross-border regional cooperation between European countries. In September a Manifesto of Intent signal the start of a project definition phase in which **Enschede** and Münste**r**, two of the biggest cities in the area, together with Euregio will explore opportunities of UAM in the field of emergency services for public safety, with the aim to delivering these services with faster response times, lower costs and less noise disturbance.

United Kingdom

County Durham in the North East of the UK, has joined the Urban Air Mobility (UAM) Initiative, part of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC), supported by the European Commission.

Participation in the UAM Initiative comes under the banner of the North East Satellite Applications Centre of Excellence, managed by Business Durham, the economic development organisation for County Durham, and supported by the UK Space Agency and the Satellite Applications Catapult.
As a Fellow Region of the UAM Initiative, County Durham, will engage with public and private sector organisations at a regional and national level to promote the development of innovative solutions to

[1] See: (http://media.daimler.com/marsMediaSite/en/instance/ko/Vans–Drones-in-Zurich-Mercedes-Benz-Vans-Matternet-and-siroop-start-pilot-project-for-on-demand-delivery-of-e-commerce-goods.xhtml?oid=29659139).

urban mobility challenges by the drone, transport and urban planning communities. NESTA, the global innovation foundation, is supporting this activity as the UK Ambassador for the UAM initiative.

Bradford is a NESTA Flying High pioneering project centre.

Some of the earliest drone testing happened in Bradford, a district with a population of over half a million across an area that is two thirds rural and includes densely populated urban areas, moorland, farmland and woodland. The project will be looking at how drones can support district priorities such as disaster response, digital health, surveying and community safety.

London is a NESTA Flying High pioneering project centre.

The capital has the busiest and most heavily regulated airspace in the UK, and the Flying High Challenge will allow the city to have serious conversations about if, how and where drones could safely be used in future for the benefit of the city. London has already experienced initial use of drones for safer infrastructure inspections and helping the capital's emergency services, and now needs to identify what steps are needed to ensure the use of drones benefits the city and support its 'Healthy Streets' approach for London's future.

Oxford Direct Services (ODS)[iii], the service delivery and commercial arm of Oxford City Council, has announced that it is to start providing drone-based services to include roof and building surveying, land mapping, aerial photography and filming. Initially, ODS will focus on surveying the roofs of 7,800 properties it maintains on behalf of Oxford City Council.

Preston is a NESTA Flying High pioneering project centre.

The main urban centre in a wider Lancashire city region that is the location of the largest cluster of aerospace activity in the UK. The city is at the forefront of identifying and developing civic drone applications, and is home to the 'Civic Drone Centre' – established by the University of Central Lancashire (UCLan) in 2014 to bring together local authorities, communities and businesses to support novel drone solutions. Drones are already being used in Preston in inspections of utilities and council buildings, supporting fire and rescue services and to assist the Environment Agency. Through the Flying High Challenge, the city council, in partnership with UCLan, will be exploring other areas of city need where drones could play a role, including flood management, assisting police helicopters, and upgrading road networks. The city is developing an approach to local economic development known as the 'Preston Model' that seeks to ensure local economic, social and environmental benefits are at the forefront of new developments.

Southampton is a NESTA Flying High pioneering project centre.

One of the UK's major port cities, a global gateway and regional transport hub. Southampton City Council has a vision to accelerate the safe delivery of public services and commercial activity using remotely piloted and autonomous drone systems, notably around port safety, blue light services and offshore logistics. The council is working in collaboration with the University of Southampton, which has very strong drone and autonomous systems expertise as the leader of a large consortium project, CASCADE, looking at implementation of drones in civil airspace. Southampton University also participates in the EPSRC Future Cities project from a drone perspective; and the Airstart project with the Royal National Lifeboat Institute (RNLI) investigating safe routine operation of small UAS' Beyond Visual Line of Sight (BVLOS).

The **West Midlands** area is a NESTA Flying High pioneering project centre.

A large region and strategic centre for the country encompassing the cities of **Birmingham, Coventry** and **Wolverhampton**. The West Midlands boasts two international airports, several universities, multiple collaborating local authorities and 2.8 million residents. The region is interested in UAV use cases surrounding the 'UK City of Culture 2021' and Commonwealth Games events. Innovative R&D across the region offers other potential areas of synergy with Flying High, including the construction of a cutting-edge testbed for Connected and Autonomous Vehicles. The West Midlands brings a

diverse and expansive consortium which is united by the ambition to realise drone use, not just as a strategic exercise, but a deliverable reality, hoping to strike the necessary balance between ambition and regulation.

Far East and Australasia

Australia

In November 2018 Project Wing, which is trialling drone deliveries of food and chemist supplies in Tuggeranong, Australia, secured a warehouse in Mitchell, **Canberra**, as a full-time base for its drone delivery service, reports the *Canberra Times*. The paper quoted Wing as saying it will be "the first location of its kind with the world's most advanced drone delivery service". The *Times* says Wing plans to initially offer deliveries to homes and businesses in nearby Gunghalin, Palmerston, Harrison, Crace and Franklin, with a long-term view of operating flights throughout Canberra, as well as other cities and towns across Australia.

According to an October 2018 statement from the Australian Civil Aviation Safety Authority (https://www.casa.gov.au/aircraft/standard-page/trial-drone-delivery-systems)

"We have approved Unmanned Systems Australia to operate Wing drones in Bonython, a suburb in Canberra's south. Unmanned Systems Australia is a licensed and certified drone operator. They have been testing drone delivery with Wing in Australia over the past several years, refining their aircraft and systems.They have satisfied us that their operation meets an acceptable level of safety. As a result, we have permitted Unmanned Systems Australia to operate over Bonython and in closer proximity to a person, than our regulations would normally permit. As the safety regulator, the issue of privacy and noise is not in our remit. The system is automated—however a licensed drone pilot is always at the helm. Wing works within our current guidelines for commercial drone operators flying over 2kg and these approvals are aligned with regulations and in accordance with similar instruments issued to other operators.

"Wing drones currently fly only during daylight hours. Flights are permitted in the following hours:- Monday to Saturday from 07:00 to 20:00, Sunday from 08:00 to 20:00. While an accident is unlikely to occur, pilots will know instantly if any of their drones operate outside of a standard mission. If this happens, the operator will decide if the safest course of action is to the land the aircraft, rather than continue the flight. In the unlikely event the drone encounters a problem, it is designed to automatically land very slowly. The aircraft are equipped with flashing strobe lights."

According to the C*anberra Times*: plans for the permanent delivery service – which Wing is spruiking (sic) as a world first – come after the ACT Assembly last week agreed to launch an inquiry into the Bonython trial, "which has been plagued by community angst over noise, privacy concerns and a perceived lack of government and regulatory oversight

China

In **Shanghai** the Alibaba-owned Ele.me food delivery company has been given permission to deliver food to residents of Shanghai's Jinshan Industrial Park. According to the government news service "Approval to deliver food by drones on 17 different routes from over 100 local restaurants was received by Ele.me, allowing them to cover an area of 58 square kilometres." The move marks the first known commercial use of drones in China to deliver food; drones are used for approximately 70% of the total delivery distance, with one employee packing the food at one end of the route, then another employee receiving the food to complete the delivery manually by driving to the final destination, according to the news service. Although the top payload capacity of the drone is 6kg, the food box in which the food is placed weighs 485 grams.

Airbus inaugurated its Innovation Centre in China at an official opening ceremony in **Shenzhen** in February 2019. According to a press statement: "Airbus China Innovation Centre (ACIC) has been operating since early 2018 and currently focuses on designing, testing, and certifying new technologies relating to five areas: Hardware Lab, Cabin Experience, Connectivity, Manufacturing Innovation and Urban Air Mobility (UAM)."

Japan

In February 2019 Rakuten, Inc., an e-commerce, communications and fintech company, and JD.com, China's largest retailer, have signed an agreement that will see JD.com's drones and unmanned ground vehicles (UGVs) utilized in Rakuten's unmanned delivery solutions in Japan. In January 2019 Rakuten announced plans to deliver packages by drones in rural Japan (https://www.unmannedairspace.info/uncat).egorized/rakuten-start-drone-package-deliveries-rural-japan-april-news-report). Under the new agreement, Rakuten will combine its experience in drone delivery service operations in Japan and IT solutions, such as its dedicated shopping apps, with JD.com's expertise in drones and unmanned ground vehicles (UGVs), which have a proven track record in China. The two companies will collaborate on Rakuten's lineup of unmanned delivery services to suit a wide range of applications and situations. In 2018, Rakuten's first delivery trial was conducted using a combination of drones and UGVs, a step toward solving the last mile challenge for the logistics sector in Japan.

Chiba City is the first city in Japan to deploy the Airspace Management Dashboard. Designated as a National Strategic Special Zone for developing delivery drones, Chiba City has established three drone test sites to support the development of technology solutions for drone delivery and other complex use cases. Drone innovators who wish to fly at these test sites can register and receive authorisation from Chiba City with the mobile apps.

In **Kanagawa** prefecture NEDO (The New Energy and Industrial Technology Development Organization), KDDI (a telecommunications operator), Terra Drone (a Japanese industrial drone service provider) and SECOM (a Japanese security company) have developed a network for controlling multiple autonomous drones carrying out security surveillance operations at a wide-area facility using a 4G LTE mobile communication network.

In line with Japan's "Roadmap for the Aerial Industrial Revolution" in March 2017 a large-scale drone operation demonstration was organised incorporating multiple operators in **Minamisoma City**, Fukushima Prefecture.

Malaysia

Entrepreneur Development Minister Datuk Seri Mohd Redzuan Md Yusof said at a press conference on 26 February 2019 that the government had built an urban air taxi prototype which would be put on public display later in the year.

New Zealand

Airways New Zealand is working with Zephyr Airworks to integrate air taxis into the air navigation service provider's developing UTM network. Zephyr Airworks is developing its Cora air taxi in New Zealand. The trial of the AirMap drone traffic management platform currently underway in **Canterbury** and **Queenstown** is the first step in this development. AirMap allows drone pilots to plan their flights, seek authorisations and get information about the areas they're operating in. In the next phase Airways is planning is to develop tracking tools that allow UAVs to be accurately monitored once they are beyond the pilot's line of site and detect and avoidance capability to keep them safely separated from other aircraft. Airways also intends to test the capabilty of New Zealand's existing

telecommunications network to track the likes of Zephyr Airworks' autonomous vehicle Cora and UAVs in uncontrolled airspace and enable better telemetry for drone pilots.

In February 2018 Land Information New Zealand reported that the Residential Red Zone in Christchurch had become a test centre for flight planning for commercial and recreational users of drones.

"Land Information New Zealand has been working closely with air traffic agency Airways to provide this unique 600 hectare testing ground in an urban environment in the Avon Corridor for drone users to trial the UAV Traffic Management (UTM) software without any inconvenience to home owners," said the organization. "Airways partnered with global airspace management provider AirMap to develop a free iOS and Android app, which drone users can access to seek necessary airspace and public landowner approvals to fly, file flight plans, and access real–time information about other aircraft in the area, allowing them to stay safely separated."

As part of that role, LINZ and the Christchurch City Council provided detailed land data for the AirMap app developers and the terms and conditions for accessing the Crown land. Drone use in the Residential Red Zone must comply with Civil Aviation Rules.

Tararua District Council[iv] is now using drones to capture images of slips in the district's network of rural roads and where streams have scoured their banks to threatening roads, allowing transport issues to be resolved faster, with post-processing software used during emergencies and in responding to disasters such as floods or earthquakes. The council has created a permanent drone operator position.

Singapore

The Civil Aviation Authority of Singapore (CAAS) and the Ministry of Transport have announced up to SD6 million to four consortia who submitted proposals to CAAS' UAS Call-For Proposal (CFP) in November 2017 to develop and test UAS working prototypes. The selected proposals explore solutions in areas such as surveillance, inspection, package and maritime delivery, and the effective and safe use of airspace for UAS. The CFP enables collaboration with industry players to trial innovative drone operations, while ensuring safety objectives are met. The CFP will provide up to 50% funding for each successful proposal, with the funding amount capped at SD1.5 million dollars. Successful proposals will be given a period of two years to complete their proposed solutions.

The lead applicants to be awarded and their proposed solutions are: Avetics, Garuda Robotics, Nova Systems, Wilhelmsen.

In February 2018 Airbus Helicopters' Skyways unmanned air vehicle successfully completed its first flight demonstration at the National University of Singapore (NUS), says the company. The drone took off from its dedicated maintenance centre and landed on the roof of a specially designed parcel station where a parcel was automatically loaded via a robotic arm. Once successfully loaded with the parcel, the Skyways drone took off again and returned to land, demonstrating its automatic unloading capability.

During the 2018 Singapore Air Show in February[v], Airbus made the first demonstration of a new parcel-delivery drone service which will begin trial commercial operations later this year, based on the Airbus Skyways octo-copter designed to carry parcels inside its chassis. Six Skyways drones will be used for the pilot project, based at the campus of the National University of Singapore (NUS).

In February 2019 ST Engineering became the first in Singapore to receive authorisation from CAAS to conduct Beyond Visual Line of Sight (BVLOS) trials over the Lower Seletar reservoir. The BVLOS trial is for demonstrating ST Engineering's latest UAS solution, DroNet.

South Korea

In December 2017 Terra Drone, a Japanese commercial drone service company, launched a commercialised UTM system in collaboration with LG U+, a South Korean cellular carrier owned by LG Corporation. According to LG U+ CEO Kwon Young-Soo the "U+ Smart Drone UTM System," is now operational, enabling disaster monitoring and logistic transport drone operations BVLOS (beyond visual line- of-sight) and at night. Operators can connect to the UTM system via various portable devices such as PC/tablet/mobile and confirm the position of a drone through the UTM system in BVLOS operations.

Latin America

Brazil

Voom, the world's premier on-demand helicopter booking platform, launched commercial operations in April 2017 in **Sao Paulo**, flying thousands of passengers. In 2018 Airbus Helicopters joined the programme. The platform connects travellers with trusted and licensed helicopter operator partners, providing a new escape to urban congestion by taking to the skies. Voom air taxi flights can be booked on their website in as little as 60 minutes in advance.

Middle East

Jordan

In March of 2017, Cape[vi] was contracted by the Jordanian government to provide aerial observation technology utilizing drones for the Arab League Summit. Cape's operations staff deployed to Jordan several weeks in advance of the event and worked directly with the Jordanian Royal Guard to develop safe standard operating procedures for flight over people, BVLOS, and night flight. Using these operational techniques and utilizing Cape's Aerial Telepresence Technology, the Royal Guard was able to safely provide around the clock security for the summit ensuring the security of the hundreds of participants and dozens of world leaders in attendance.

United Arab Emirates

The General Civil Aviation Authority, the Dubai Air Navigation Services, the Police, Exponent Technology Services and the Dubai Civil Aviation Authority (DCAA) are working together to provide the UTM and regulatory background to launch air taxi services and BVLOS drone delivery flights by 2020 in **Dubai**. Already developed is a registry, a database of pilots and drones and a module for flight application management. Flying vehicles carry a 58 gram tracking box for all commercial UAS operations and flight validation. The box is able to transmit over the GSM-network every two seconds reporting the position, altitude, speed, heading, pitch, roll and yaw of the drone as well as the distance it has covered during the flight

BVLOS flights have already been tested in Dubai for a period of four months in 2017 with the Roads and Transport Authority (RTA). They conducted traffic surveillance over one of the main arterial highways in Dubai, focusing on incident detection.

North America

Canada

In October 2018 Canadian commercial drone operator IN-FLIGHT Data and senseFly, a provider of fixed-wing drone solutions, have completed North America's first urban BVLOS UAS (drone) project, in **Calgary**.

"The project, carried out in the city of Calgary, Alberta, was commissioned to collect mapping data to support the development of a new graveyard site, the city's first new cemetery since 1940. The mapping of the area, completed using a senseFly eBee Plus fixed-wing drone, saw IN-FLIGHT Data's team conduct a total of 414 km (257 mi) BVLOS operations at an average distance of 2.35 km (1.46

mi) from the pilot, and began as part of IN-FLIGHT Data's wider BVLOS UAS operations trial earlier this year. The aim of the trial was to demonstrate the safety and effectiveness of BVLOS UAS flights and the cost and efficiency benefits they can provide to citizens and governments alike," said a press release.

On 19 October 2018 Calgary opened its Point Trotter Autonomous Systems Testing Area (Point Trotter ASTA), provide Calgary businesses, industry and researchers with a low cost and accessible place to test drones, autonomous vehicles or the next big innovation.

"Calgary is one of the first major cities in North America to offer airspace for the mass testing of commercial drones on municipal-owned land," according to the city's media relations department. "Point Trotter ASTA, located in the South East, has approximately 125 acres of land available to meet the increasing demand from companies and educational institutions wanting to test aerial drones, including SAIT, the partner that hosted today's announcement. Point Trotter ASTA is part of the Living Lab strategy where The City of Calgary and Calgary Economic Development are working with the community to make public spaces, transportation corridors and land more accessible for the testing of technological innovation.

"The idea of providing City-owned space for aerial drone testing started in 2017 when City staff looked at many emerging technologies, related societal trends, and what they could mean for the future of Calgary. They identified that autonomous vehicle technology and aerial delivery drones would have a significant impact on the future. Putting theory into practice, The City began offering businesses airspace to test drones at Shepard Landfill, when the facility was closed on Monday. Soon the demand grew and a new location was needed, one that was available throughout the week. Point Trotter Autonomous Systems Testing Area was developed to support Calgary businesses, which is one of the ways The City of Calgary is delivering on its business-friendly promise.

The requirements for companies who want to test technology on the site are:

- Licencing fees: CD250 fee for one week or less; CD500 fee for a maximum of six months (interim insurance checks may be required);
- Insurance: Proof of CD2 million corporate liability insurance; and
- Certificate (if required): A Special Flight Operations Certificate is also required for drone technology.

Mexico

Ensenada

In the summer of 2017, Cape (https://www.cape.com/blog/2018/8/8/capes-ipp-integration-pilot-program-selection-and-the-future-of-bvlos) partnered with the City of Ensenada, Mexico, to deploy Cape's Aerial Telepresence™ into daily police dispatch. Utilizing a single DJI Inspire and Cape's technology, the city of Ensenada reported a 10% drop in city wide crime and a 30% reduction in home burglary after a six-month pilot project.

Mexico

Urban air helicopter booker Voom plans to develop operations in Mexico City in 2019.

USA

Bismarck, ND

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with the North Dakota Department of Transportation.

PROPOSAL DESCRIPTION: The proposal includes a wide variety of diverse operations that incorporate advanced technologies that seek to expand UAS operations at night and Beyond Visual Line of Sight. The proposal will focus on data from four criteria: external systems, aircraft system technologies, training requirements, and processes and procedures.

PROJECT HIGHLIGHTS AND BENEFITS: Operations will be in multiple types of airspaces ranging from rural to urban areas. Working with experienced UAS research partners will lead to scalable operations for a multitude of UAS industries including linear infrastructure inspections, crop health monitoring, and media reporting and emergency response.

The Northern Plains UAS Test Site (NPUAS) and the North Dakota Department of Transportation (NDDOT) (https://www.dot.nd.gov/dotnet/news/Public/View/8056) have announced the successful completion of testing Unmanned Aircraft Systems (UAS) in Fargo, including the demonstration of a parachute recovery system Working in partnership with CNN, Botlink and ParaZero, the NDDOT and NPUASTS performed its first series of flight tests of Unmanned Aircraft Systems for potential flight over a group of people in controlled airspace.

Boston, MA

The Federal Aviation Administration (FAA) has awarded Daedalus Drone Services with unprecedented approval to fly in and around Boston. With the waiver, Daedalus Drone Services now offers on-demand commercial drone services throughout the greater Boston area. Federal law prohibits commercial unmanned aircraft operations in Boston Logan's Class B (restricted) airspace without prior authorization (see 14 CFR 107.41). The restricted airspace encompasses an 18 mile wide circle surrounding Boston's Logan airport; expanding into Saugus, Brighton, and Quincy. To operate in the restricted airspace, the FAA requires that authorization requests be made at least 90 days prior to the anticipated operation. This prohibits routine and on-demand commercial drone services in much of the greater Boston area.

Daedalus Drone Services filed a special petition with the FAA requesting blanket permission to offer on-demand commercial drone services in Boston's restricted airspace. In support of their decision, the FAA considered Daedalus Drone Services' safety record, safety management and flight operations manuals, training programmes, and experience offering commercial drone services across the country. The FAA concluded that the operations and procedures proposed by Daedalus Drone Services met or exceeded the equivalent level of safety necessary.
As a result, the FAA issued Daedalus Drone Services a Certificate of Waiver or Authorization: 2017-P107-ESA-16746. This waiver allows Daedalus Drone Services to bring widespread commercial drone services to the greater Boston area.

Corpus Christi, TX

NASA's Unmanned Aircraft Systems Traffic Management (UTM) project has selected the Lone Star UAS Center of Excellence & Innovation at Texas A&M University. NASA's UTM project works closely with the Federal Aviation Administration to conduct field demonstrations of small unmanned aircraft systems to fully and safely access low-altitude airspace in support of civil and business opportunities. The UTM project is under the Airspace Operations and Safety Program within the Aeronautics Research Mission Directorate, with researchers at NASA's Ames, Glenn, and Langley research centers.

Durant, OK

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with the Choctaw Nation of Oklahoma

PROPOSAL DESCRIPTION: The proposal focuses on agricultural, public safety and infrastructure inspections, with planned Beyond Visual Line of Sight (BVLOS) operations over people and nighttime operations.

PROJECT HIGHLIGHTS AND BENEFITS: The proposal highlights plans to invest in mobile ground-based detect and avoid radars and advanced weather infrastructure. The awardee, along with partners CNN and the Green Valley Farms Living Laboratory, has an aggressive 90-day schedule for high-profile Extended Visual Line of Sight (EVLOS) and night operations. The data obtained from these operations will be broadly applicable, and could extend to a wide range of operations and geographical locations.

Dallas, TX

Uber plans to launch air taxi services in Dallas and Los Angeles in 2023. At the May 2018 Uber Elevate conference the company announced it plans to have its prototype UberAIR electrically-powered air taxis flying in 2020, with commercial operations starting in 2023. Uber, quoted in numerous news reports, says it plans to start its four-seat taxi services in Dallas and Los Angeles. The autonomous air taxis (piloted by humans in the early versions) will operate vertical takeoffs and landings from dedicated rooftop “skyports” and at a costs affordable to the general public.
The prototype versions will have wing-mounted rotors and fly at altitudes 1,000 to 2,000 feet above the ground. Uber is also teaming with Fort Worth-based Hillwood Properties to develop skyports, called vertiports, with plans to create two to five ports in NorthTexas within the year.

Fairbanks, AK

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with the University of Alaska-Fairbanks, Fairbanks, AK

PROPOSAL DESCRIPTION: The proposal's primary focus is pipeline inspection and surveying in remote areas and harsh climatic conditions, but it has proposed a broad range of other types of operations in urban and rural areas, ranging from public safety to UAS detection.

PROJECT HIGHLIGHTS AND BENEFITS: The awardee uses enabling technologies that include collision avoidance, detect and avoid day and night, ADS-B, differential GPS, satellite services, infrared imaging and UTM. Operations in remote areas provide a unique opportunity to evaluate data on several advanced technologies. The unique climate and operating environment also provide an opportunity not available to other awardees.

Fort Myers FL

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with Lee County Mosquito Control District

PROPOSAL DESCRIPTION: The proposal focuses on low-altitude aerial applications to control/survey the mosquito population using a 1500-lb. UAS.

PROJECT HIGHLIGHTS AND BENEFITS: The proposal includes scalable solutions that take into account a broad range of current and future technologies that include ground-based detect and avoid radar systems that would integrate ADS-B, infrared imaging and satellite technology. The proposal includes night operations, BVLOS and operations over people.

Herndon, VA

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project.

PROPOSAL DESCRIPTION: The proposal seeks to facilitate package delivery in rural and urban settings. Its includes the use of enabling technologies such as detect and avoid, Identification and tracking, radar systems, and mapping tools.

PROJECT HIGHLIGHTS AND BENEFITS: The awardee seeks to leverage existing expertise through partnerships with the Virginia Tech UAS Test Site, NASA, and stakeholders with cyber security expertise. Data obtained through these diverse operations and varied operating environments will provide significant, scalable benefits to the agency and industry.

Loveland, OH

Workhorse Group Inc (http://workhorse.com/newsroom/2018/05/workhorse-horsefly-autonomous-drone-package-delivery-pilot-underway-cincinnati) reports that its HorseFly truck-launched Autonomous Drone Package Delivery System is now making package deliveries to homes in the Cincinnati area in a pilot programme with the City of Loveland and the Federal Aviation Administration. Consumers in select Cincinnati zip codes opted-in to accept packages from Horsefly via the Workhorse Ares Drone Package Delivery App, which is designed to seamlessly integrate with existing online e-commerce platforms. Each package is delivered within the delivery driver's line of sight, says the company. "Data from the pilot will provide essential insights into consumer preferences, as well as real-world evidence to support expanded use cases with the FAA. To date, the system has been successfully tested with UPS and an undisclosed large retailer, and aims to provide significant cost savings by eliminating extra miles of driving to deliver packages."

Los Angeles, CA

Uber plans to launch air taxi services in Dallas and Los Angeles in 2023. At the May 2018 Uber Elevate conference the company announced it plans to have its prototype UberAIR electrically-powered air taxis flying in 2020, with commercial operations starting in 2023. Uber, quoted in numerous news reports, says it plans to start its four-seat taxi services in Dallas and Los Angeles. The autonomous air taxis (piloted by humans in the early versions) will operate vertical takeoffs and landings from dedicated rooftop "skyports" and at a costs affordable to the general public.
The prototype versions will have wing-mounted rotors and fly at altitudes 1,000 to 2,000 feet above the ground.

Memphis-Shelby County Airport Authority, Memphis, TN

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project.

PROPOSAL DESCRIPTION: The proposal focuses on the inspection of FedEx aircraft and autonomous operations that support airport operations such as perimeter security surveillance and package delivery. Proposed operations include working with a UTM concept that would also work with manned air traffic.

PROJECT HIGHLIGHTS AND BENEFITS: Teaming with FedEx and Agricenter International, the awardee would support an integrated environment of urban, airport, private property and farmland that would yield an estimated $500 million annual benefit to the economy. Data collected would not only serve UAS, but work with normal air traffic truly advancing integration.

New York, NY

The New York Police Department in December 2018 announced it was adding a fleet of 14 Unmanned Aerial Vehicles to its portfolio, to be used for large-scale city events, in hazmat investigations, search-and-rescue operations, as well as hostage situations and for accessing hard-to-reach crime scenes, press reports say.

Pensacola, FL

According to the Pensacola News Journal (http://www.pnj.com) in January 2018 local start-up AAA Air Taxi (https://aaaflyingtaxi.com/) – a subsidiary of Brock Auto Sales – Is planning a 24-hour, seven-days-a-week service featuring autonomous air taxis that fly from port to port, picking up passengers and dropping them off throughout Pensacola. The newspaper reports the company has signed a letter of intent to place an order for and a deposit on one flying taxi that its plans to use to conduct test flights. “AAA Air Taxi has narrowed down the field to three manufacturing companies — whose names they did not want to disclose — from whom to buy their desired 10 vehicles,” reports the journal, and each vehicle costs about USD250,000, depending on state and city requirements.

Raleigh, NC

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with the North Carolina Department of Transportation.

PROPOSAL DESCRIPTION: The proposal seeks to test localized package delivery within a defined airspace by establishing drone delivery stations in local communities. This approach enables small businesses to utilize this delivery platform for commercial purposes.

PROJECT HIGHLIGHTS AND BENEFITS: The proposal seeks to operate over human beings, beyond visual line of sight and at night, and seeks to use a variety of technological tools to enable these advanced operations. Tools include ADS-B, detect and avoid technologies, UTM and radar technologies. The data collected from these diverse operations will significantly enhance safe UAS integration into the National Airspace System.

Reno, NV

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project.

PROPOSAL DESCRIPTION: The proposal focuses on the time-sensitive delivery of life-saving medical equipment, such as medical defibrillators in emergency situations in both urban and rural environments.

PROJECT HIGHLIGHTS AND BENEFITS: The awardee will integrate additional infrastructure such as radar and weather data in order to expand the UAS capability so it could save up to 28-34 lives per year, using one drone in a three-mile city radius. This proposal considers a nationwide scalable model for medical delivery operations and has several commercial medical partners.

On 15 February 2019, the National Aeronautics and Space Administration (NASA) publicly announced the State of Nevada as an award recipient for the Unmanned Aircraft Systems Traffic Management (UTM) Technical Capability Level (TCL) 4 operation. This involves Unmanned Aerial Systems (UAS) flying in higher-density urban areas for tasks such as newsgathering, package delivery, and large-scale contingency mitigation. For the first time in U.S. aviation history in a metropolitan area under beyond visual line of sight conditions, Nevada will conduct this NASA demonstration over several months in downtown Reno, Nevada. The State of Nevada UAS Test Site, under the leadership of the NIAS, was selected to execute the NASA UTM TCL 4 operation through an intensely competitive process with six other states.

San Diego, CA

An Unmanned Aerial Systems (UAS) Integrated Pilot Program (IPP).

In February 2019 the city of San Diego and the US Marine Corps signed a Memorandum of Understanding to work together on "Smart City" technologies such as unmanned aircraft systems (UAS) traffic management. The two organizations are reported to be working together to develop action plans for security, mobility and public works.

In October 2018 the Federal Aviation Administration, City of Chula Vista, City of San Diego, San Diego Regional EDC and Cape announced the launch of a test program to deploy drones for proactive public safety operations by the Chula Vista Police Department.

As part of the IPP, drones equipped with Cape Aerial Telepresence software will be deployed to a scene within two minutes from Chula Vista Police Department headquarters, to provide police with video and decision quality data. These drones will serve as first responders, assisting in incidents such as life safety, crime in progress, fleeing subjects, fire and more. The drone program is an element of the Chula Vista Smart City Action Plan to implement technology and data tools to enhance city services, advance public safety, promote the efficient use of taxpayer dollars, engage residents, and encourage growth in the local economy.

St Louis, MI

In November 2018 the St. Louis County Board of Police Commissioners in Missouri approved the use of four drones for limited law enforcement operations in the city.

Topeka, KS

An Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) project in association with the Kansas Department of Transportation

PROPOSAL DESCRIPTION: The proposal deploys UAS to support beyond visual line of sight (BVLOS) operations in rural communities. It seeks to leverage a statewide unmanned traffic management system to facilitate precision agriculture operations.

PROJECT HIGHLIGHTS AND BENEFITS: Operations will use a range of technologies, such as detect and avoid, ADS-B, satellite communications and geo-fencing. The program will use existing in-state

resources such as fiber optic networks and UAS Traffic Management (UTM). The awardee has a robust community involvement plan that supports the diverse operations that are planned.

Part two: Governmental and inter-governmental urban air transport research and collaborative programmes

Europe

The European Union's Urban Air Mobility (UAM) Initiative

The European Union's Urban Air Mobility (UAM) Initiative that is part of the European Innovation Partnership in Smart Cities and Communities (EIP-SCC). This Partnership, which is supported by the European Commission, brings together cities and regions, citizens, industries, SMEs, investors, researchers and other smart city actors.

Under the umbrella of the Urban Air Mobility initiative, the setup of a number of demonstrator projects in cities across Europe will be studied and evaluated in the coming 18 months, which will bring urban mobility into the third dimension in Europe. This work is aligned with ongoing and future SESAR Joint Undertaking (SESAR JU) funded studies, including demonstrations, on drone traffic management in Europe moving one step closer towards the European Commission's U-space vision for ensuring safe and secure access to airspace for drones. With demonstrable benefits to citizens and their approval, developing a market for drones and drone services will create jobs and growth in Europe. Particularly in urban areas, civil drones could be a way to address mobility needs such as emergency needs and traffic congestion; the latter currently costs more than €100 billion a year in the EU alone.

The UAM Initiative will steer its activities on smart mobility initiatives interfacing, or enabling UAM by addressing topics around the following four (initially, and not limited to) parallel thematic pillars:
1. UAM interfaces with public transport (incl. existing and future setups)

2. Mobility as a Service (e.g. mobility platforms, seamless mobility, cybersecurity, insurance, legal, transport operations)

3. Ground infrastructure for UAM (e.g. real estate stakes and initiatives to support UAM such as dedicated UAM landing pads and integration to multimodal networks hubs, advanced communications-IoT)

4. ATM/UTM concepts for UAM and its integration in view of single sky operations

First Phase (Q4, 2017 – Q2, 2018)	Inform about & Engage on demonstration projects Create and involve a multi-stakeholder community around each committed city to define a demonstration project for smart mobility featuring UAM
Second Phase (Q2, 2018 – Q1, 2019)	Define & Prepare demonstration projects Develop, qualify and articulate UAM business and service concepts towards integrated urban mobility solutions as part of a detailed demonstration project proposal. Decide on GO – NoGO based on partners' commitment, project attractiveness and financing raised and secured.

Third Phase (Q1-Q4, 2019)	Run & Conclude demonstration projects Organise execution of the actual demonstration projects across cities/regions. Derive lessons learnt from each demonstration project and make recommendations for a UAM deployment strategy and roadmap. UAM Initiative Dissemination Events (in Q1, 2020)

The EIP-SCC Marketplace

The EIP-SCC Marketplace plays a distinctive and new role compared to other European Commission platforms. Engaging cities, industry and financiers in interest matching activities, leading to project design and delivery shall be the Marketplace's team objective. Building solutions and facilitation are the two main tasks of the Marketplace to help deliver investments.

EASA

In June 2018 the Council of the European Union (EU) gave the European Aviation Safety Agency (EASA) new powers to set EU-wide rules for urban air mobility.

According to EASA: "The so-called new Basic Regulation formalises EASA's role in the domain of drones and urban air mobility, enabling the Agency to prepare rules for all sizes of civil drones and harmonize standards for the commercial market across Europe. The regulation enlarges the Agency's role in areas such as in environmental protection, research and development, or international cooperation. The new mandate also gives EASA a coordinating role in cybersecurity in aviation."

"This new mandate consolidates EASA's scope to cover the full spectrum of the aviation landscape and reinforces the European aviation system as a whole, with the possibility for EASA and European Member States to work closer together in a flexible way."

NESTA

In the UK, five cities and districts spanning the country will be the first to design how drone technology could be used to support their local needs. The announcement in February 2018 follows an open call in November, where over a third of UK cities bid for a place on the Flying High Challenge, run by Nesta's Challenge Prize Centre in partnership with Innovate UK. Bradford, London, Preston, Southampton and the West Midlands will now work with the Flying High team to look at how drones could be used in their communities. From using drones to support public services to the commercial opportunities that might exist, they'll explore the public attitudes, environmental impact, logistics and safety of drones operating in complex urban environments.

Far East

Japan's Roadmap for the Aerial Industrial Revolution

A Public-Private Council has been set up to realize 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. The Japanese UTM consortium has been set up to deliver this. It is a conglomeration of companies and agencies which aims to create a new industrial "drone innovation space". High-level aims are the safe operation and implementation of the technology required to promote development and environmental development of drones. Activities include organising meetings, developing field tests and research for UTM, communications

and collision avoidance technologies and other related activities. It has developed a roadmap of technologies and in March 2017 carried out a large-scale drone operation demonstration of multiple operators in Minamisoma City, Fukushima Prefecture. The aim is to incorporate Japanese systems and technologies into "international standards" targeted by NASA's UTM.

CAAS, EASA, Airbus agreement on urban UAS safety standards

The Civil Aviation Authority of Singapore (CAAS), the European Aviation Safety Agency (EASA) and Airbus have agreed to collaborate in the development of safety standards and regulatory requirements for unmanned aircraft systems (UAS) in urban environments. The tripartite *Project Document,* which lays out the areas of collaboration, was signed by representatives from CAAS, EASA and Airbus. The *Project Document* establishes a framework for the exchange of information and technical expertise among the three parties, to facilitate the development of safety standards and regulatory requirements, as well as operational and technological assessments for the deployment of UAS in urban environments, such as last-mile deliveries, leveraging Airbus' experience with the ongoing Skyways project. The Skyways Project is an experimentation which aims to establish seamless multi-modal transportation networks in smart cities. Through Skyways, Airbus aims to develop an airborne infrastructure solution to address the sustainability and efficiency of parcel delivery businesses in large urban environments.

The parties will also share safety information and learning outcomes from the urban UAS trials. The parties also agreed to jointly organise UAS-themed activities such as educational workshops and seminars.

Singapore's urban UTM research centre

In February 2018 a government press statement announced: "The Government is actively facilitating the use of UAS by both the private and the public sectors. We will be designating One-North, an active R&D hub in Singapore, as Singapore's first drone estate. The drone estate will provide companies and research institutions with an urban environment for test-bedding innovative UAS technologies. This will help the growth of high-tech companies with UAS capabilities, and spur meaningful commercial partnerships. I am glad to note that Airbus, ST Aerospace and NTU's Air Traffic Management Research Institute have come on board as pioneer users of the One-North drone estate."

Singapore Transport Minister Khaw Boon Wan laid out a new urban UTM research initiative at the sixth Singapore Airshow Aviation Leadership Summit (SAALS) on 5 February. The objective is to provide industries and research organisations with an urban testing environment in which to trial commercial drone operations. According to a 7 February press release from the Civil Aviation Authority of Singapore:

"The Ministry of Transport (MOT), the Civil Aviation Authority of Singapore (CAAS) and JTC will designate one-north as a drone estate to facilitate the trial of innovative UAS (unmanned aircraft systems) technologies and commercial use-cases in a controlled urban environment. Master-planned and developed by JTC, one-north is a 200ha business park that offers an ideal location to test varying urban environment complexities for UAS operations. These comprise various typologies ranging from high-rise to low-rise buildings, as well as public spaces like parks. one-north is also a fertile ground for research and innovation, where a vibrant community of start-ups, technology owners and research institutions test-bed their latest urban solutions.

"Under the drone estate initiative, approved operators and research users can carry out their trials and operations at one-north without compromising safety and security. For a start, CAAS will be

working with companies which intend to conduct trials and other development activities in the drone estate for a variety of potential use cases."

The organisations involved include:

- Singtel, which will be looking at testing a drone delivery network
- Nanyang Technological University's Air Traffic Management Research Institute plans to conduct trials on how to manage multiple drone operations in low-altitude airspace.
- ST Aerospace will be researching whether drones can take over hazardous operations performed by humans
- JTC and H3 Dynamics are collaborating to enhance the quality and productivity of building inspections.

North America

The Unmanned Aircraft System (UAS) Integration Pilot Program (IPP)

The Unmanned Aircraft System (UAS) Integration Pilot Program (IPP) is an opportunity for state, local, and tribal governments to partner with private sector entities, such as UAS operators or manufacturers, to accelerate safe UAS integration. The program will help the U.S. Department of Transportation (USDOT) and Federal Aviation Administration (FAA) craft new enabling rules that allow more complex low-altitude operations by

- Identifying ways to balance local and national interests related to UAS integration
- Improving communications with local, state and tribal jurisdictions
- Addressing security and privacy risks
- Accelerating the approval of operations that currently require special authorizations.

The Program is expected foster a meaningful dialogue on the balance between local and national interests related to UAS integration, and provide actionable information to the USDOT on expanded and universal integration of UAS into the National Airspace System. The final awardees will evaluate a host of operational concepts, including night operations, flights over people and beyond the pilot's line of sight, package delivery, detect-and-avoid technologies and the reliability and security of data links between pilot and aircraft. Fields that could see immediate opportunities from the program include commerce, photography, emergency management, agricultural support and infrastructure inspections.

DriveOhio

The DriveOhio research programme (http://drive.ohio.gov/news/Ohio-Research-Project-Will-Monitor-Traffic-With-Unmanned-Aircraft/) has announced its 33 Smart Mobility Corridor participants will study the use of drones to monitor traffic and roadway conditions from the air along the corridor. The three-year study is a partnership between DriveOhio's UAS Center and The Ohio State University College of Engineering. Ensuring the safe separation of drones and other aircraft will be a central part of the research. "At DriveOhio, we are looking for innovative ways to integrate technology into our transportation systems. This project will help us explore the intersection between autonomous and connected vehicles on land and in the air. The goal is to understand how we can better manage traffic, roadway incidents, and roadway conditions using advanced technology and data analysis," said Jim Barna, Executive Director of DriveOhio. This research will include both air and ground vehicles and will complement ongoing work to test autonomous and connected vehicles along the 33 Smart Mobility Corridor, a 35-mile stretch of U.S. 33 between Dublin and East Liberty. Unmanned aircraft will monitor traffic and incident response along the corridor in conjunction with the state's current fixed-location traffic camera system. The aircraft will

interact with sensors and communication equipment along the corridor to feed data into the state's Traffic Management Center.

NASA and urban UTM

NASA's Aeronautics Research Mission Directorate (ARMD) has updated its strategic implementation plan to include research into Urban Air Mobility, or UAM. According to the agency:

"Our definition for UAM is a safe and efficient system for air passenger and cargo transportation within an urban area, inclusive of small package delivery and other urban Unmanned Aerial Systems (UAS) services, which supports a mix of onboard/ground-piloted and increasingly autonomous operations. Several companies, both large and small, are starting to develop the infrastructure to make UAM a reality, and they are planning to do this much sooner than you think. "Community acceptance of UAM operations is another challenge. While demonstrating safe and reliable operations is critically important, it is equally important that vehicle operations don't create unacceptable community noise impacts, and that they fit into the urban land and skyscape.

"NASA won't have a direct hand in providing design input for these vehicles, but we can provide technical leadership in areas that require the UAM community to work together, such as the safety, operational integration, and community noise challenges. For example, we and our industry partners can conduct joint flight tests to generate data that drive analyses to support the creation of industry standards, FAA rules and procedures, and even city ordinances.

ARMD recently awarded contracts to Booz Allen Hamilton of McLean, Virginia and Crown Consulting, Inc., of Arlington, Virginia to conduct thorough UAM market studies. These studies will spell out the policy, economic, social, environmental, and legal barriers to enabling UAM; and estimate how much potential demand there is for UAM now and in the future.

Commercial company research programmes

Airbus commercial drone research centre in Singapore

Airbus announced at the Singapore Air Show on 7 February 2018 that is has launched the Asia-Pacific operations of its "Airbus Aerial" commercial drone services in Singapore. "The first target of the Singapore team will be to explore potential within the Asian regional insurance market and extend Airbus Aerial's footprint from the U.S. and Europe to the Asia-Pacific region," according to the company. "It will gather information to provide relief and recovery in disaster prone regions with dedicated disaster management support, and also identify local possibilities including agriculture, critical infrastructure monitoring like power lines and railroad, and oil and gas mining where the business model may fit. Airbus Aerial Asia also aims in the next years to offer cargo drone services with autonomous logistic systems, applying the principle of supporting an open ecosystem while seeking strong partnerships with technology providers and drone operators in the Asian region."

Uber Elevate

The company launched its Elevate program in 2016 to build a network of all-electric, vertical takeoff and landing (VTOL) aircraft powered by distributed electric propulsion, with a target of achieving demonstration flights in Dallas, Los Angeles and Paris in 2020.

Uber and NASA

NASA has signed a second space act agreement with Uber Technologies to further explore concepts and technologies related to urban air mobility (UAM) to ensure a safe and efficient system for future

air transportation in populated areas, according to NASA. Under this agreement, Uber will share its plans for implementing an urban aviation rideshare network. NASA will use the latest in airspace management computer modelling and simulation to assess the impacts of small aircraft – from delivery drones to passenger aircraft with vertical take-off and landing capability – in crowded environments.

This is NASA's first such agreement specifically focused on modelling and simulation for UAM operations.

"NASA is excited to be partnering with Uber and others in the community to identify the key challenges facing the UAM market, and explore necessary research, development and testing requirements to address those challenges," said Jaiwon Shin, associate administrator for NASA's Aeronautics Research Mission Directorate. "Urban air mobility could revolutionize the way people and cargo move in our cities and fundamentally change our lifestyle much like smart phones have."

At its research facility at the Dallas Fort Worth (DFW) International Airport, NASA will use the data supplied by Uber to simulate a small passenger-carrying aircraft as it flies through DFW airspace during peak scheduled air traffic. Analysis of these simulations will identify safety issues as these new aircraft take to the air in an already crowded air traffic control system.

"The new space act agreement broadening Uber's partnership with NASA is exciting, because it allows us to combine Uber's massive-scale engineering expertise with NASA's decades of subject matter experience across multiple domains that are key to enabling urban air mobility, starting with airspace systems," said Jeff Holden, Uber's chief product officer.

Uber and Paris

Uber (https://www.uber.com/newsroom/building-ubers-future-in-france/) has announced it will build a EUR 20 million Advanced Technologies Centre in Paris, its first research and development hub outside of North America, to developing new technologies in artificial intelligence and airspace management systems to support its uberAIR project. The company has announced a five-year research partnership with École polytechnique and a commitment to endow the first International Academic and Research Chair of "Integrated Urban Mobility". The Chair will collaborate with ATCP on research across artificial intelligence, aviation and all-electric transport. Initial projects will include: machine learning-based transport demand modelling, high-density low-altitude air traffic management simulations, integration of innovative airspace transport solutions with European aviation regulators such as EASA, and the development of smart grids to support future fleets of electric transport on the ground and in the air.

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