The Unmanned Air System Traffic Management (UTM) directory by *www.Unmannedairspace.info*

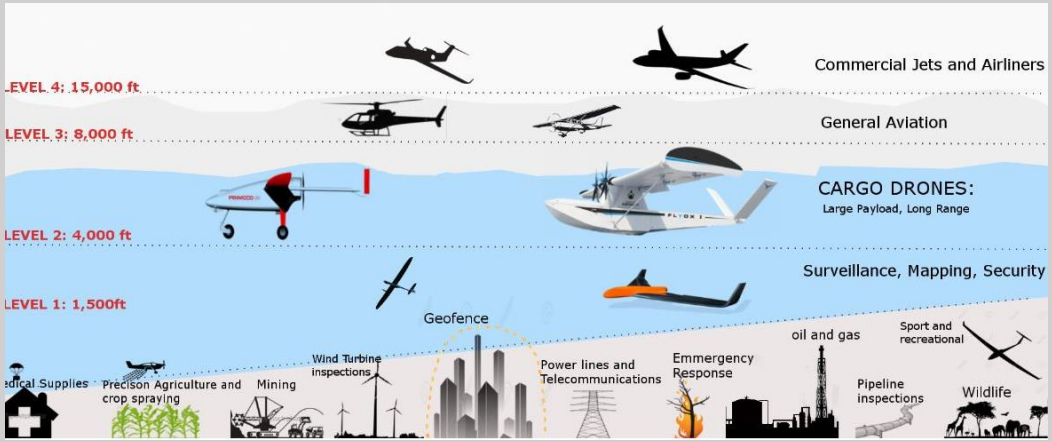
The following directory is a listing of available UTM systems, networks and components and is supplied free of charge to www.unmannedairspace.info website visitors for information purposes only. The directory is under constant review and will be updated and enlarged. Information is supplied directly by suppliers, with data edited to remove unverifiable claims. The publisher accepts no responsibility for the information supplied. Website sources for the data plus further contact information are given alongside product and services descriptions.

Company	Product	Description	Website
Airbus	**Skyways**	In February 2016, Airbus Helicopters signed a contract with the Civil Aviation Authority of Singapore (CAAS) allowing Airbus to test a drone parcel delivery service on the campus of the National University of Singapore (NUS) in mid-2017. For testing and assessing this new concept Airbus is working together with the Airbus Defence and Space team, who created an operation management system which is the base for the overall infrastructure that we have developed. Skyways constitutes a delivery solution that aims to provide efficient delivery of small parcels to students and faculties using drones. After this pilot test, the company is hopeful that commercial projects will be possible to launch in the Asian city and to extend the testing to passenger transport. The Skyways drone is a fully autonomous octocopter that carries air transport containers located on its underside and flies an equally fully automated route called 'aerial corridors' landing on a designated landing pad where it is automatically unloaded. The customer receives a delivery notification on their smartphone saying their parcel is ready for picking up at the parcel station.	http://airbus-xo.com/skyways-urban-last-mile-delivery/

Airbus	**Altiscope**	The Airbus A3 Altiscope future ATM framework simulator allows ANSPs and other ATM stakeholders to plan for future mixes of manned and unmanned aircraft. Altiscope uses a simulator built for evaluating ATM policy options and operational models that can enable all forms of airborne traffic in a wide range of geographies and jurisdictions. For example, it allows airspace planners to evaluate how urban air mobility vehicles, cargo drones, and commercial aircraft interact in the vicinity of shipping and logistics hubs or explore rules demonstrating the safety and feasibility of utilizing UAS in rural areas for transporting medical aid. The tool allows airspace planners to focus on evaluating different options for the new rules of the air and aren't specifically tied to any particular ATM architecture.	https://www.airbus-sv.com/
AirMap	**Airspace information and services**	The AirMap platform powers the vast majority of the world's drones, providing a comprehensive, reliable, and real-time airspace information and services. Millions of drones and hundreds of drone manufacturers and developers rely on the platform to access and share the data they need to fly safely in low-altitude airspace. AirMap's data and services are embedded into drones, ground control stations, and flight apps by top drone makers, such as DJI, Intel, senseFly, 3DR, and Aeryon Labs – expanding the reach of AirMap's technology and solutions throughout the entire drone ecosystem. AirMap has also emerged as a leader in worldwide efforts to build technologies for UTM, the regulatory and technological framework that will facilitate data exchange and air traffic control for drones, and eventually, flying cars. More than 125 airports use AirMap's airspace management dashboard to open surrounding airspace to drones, view past and current drone flights, accept digital flight notices, and communicate with drone operators. The AirMap platform also provides solutions for geofencing, remote identification of drones, and sophisticated in-flight de-confliction.	https://www.airmap.com/
Alphabet X Lab	**Project Wing**	Google's Alphabet X Lab's Project Wing is building the next generation of delivery drones and developing an unmanned airspace traffic management platform that will enable its fleet of drones to safely share the sky with other operators. The aircraft can fly pre-planned routes on demand using sensors and software to detect and avoid one another in real time. They fly up to 400 feet above the ground and safely deliver fragile packages to a spot the size of a doorstep. In September 2016, Project Wing tested its aerial delivery system and more recently its unmanned air traffic management platform at an FAA-approved test site run by the Virginia Tech Mid-Atlantic Aviation Partnership.+5	https://x.company/projects/wing/

Altitude Angel	**Guardian UTM**	GuardianUTM uses cloud technologies to provide secure, robust unmanned aerial system traffic management (UTM) capabilities to any drone, anywhere at any time. It supports both recreational and professional drone operators, while being built for internet-scale secure operations. GuardianUTM incorporates dynamic airspace management to provide safe integration for all airspace users, and works both with - and crucially, without - the need for filing flight plans in advance. Built using open standards and protocols, GuardianUTM supports the integration of unmanned systems into the airspace today, tomorrow and well into the future of fully automated flight. It is customisable and modular with modules available to track manned aviation, cooperative and non-cooperative drones as well as mix in individual sensor data such as radar.	https://www.altitudeangel.com/GuardianUTM
Amazon Prime Air	**UTM system - best equipped, best served**	Access for manned aircraft is determined by capabilities. For example, communication and navigation equipage is required for transit through controlled airspace and to gain access to certain airports. Amazon believes a similar model of determining access—one focused on Determining Safe Access with a Best-Equipped, Best-Served Model for sUAS, segregated blocks of airspace below 500 feet and away from most manned aviation operations—is the best pathway for safe and scalable sUAS operations. Once performance levels have been established, the operator's ConOps requirements will determine whether or not the operator is granted airspace access and can safely perform the designated mission. Four Classes for Safe Operations Operators seeking broad airspace access in multiple environments will need to have highly equipped vehicles. They will also need to minimize interaction with lesser-equipped small unmanned aerial vehicles, as well as the occasional manned aircraft flying at low altitude.	https://www.amazon.com/Amazon-Prime-Air/b?node=8037720011
Analytical Graphics Inc	**UTM system**	AGI develops commercial modelling and analysis software for land, sea, air and space systems which is used by more than 50,000 engineers, operators and analysts worldwide. AGI is leveraging almost 30 years of situational awareness software development to expand its foray into UTM services. AGI's UTM services address the needs of commercial and beyond line-of-sight UAS operators by providing air navigation services including airspace management, real-time flight monitoring, and de-confliction.	http://www.agi.com

Aeronyde	**UTM system**	Aeronyde is developing a complete system of hardware and software for self-flying vehicles to work safely and autonomously in urban areas. The system makes autonomous flight safe, secure, and scalable by giving unmanned aerial vehicles (UAVs) the intelligence to make the right choice in the right moment. • Real-time data analysis to contextually apply sequencing, tasking, local environment, and weather. • Machine learning to build situational awareness. • Live flight and testing in our research and development centres. The company builds, maintains and operate an end-to-end system of hardware and software, and offer customized access to public and private groups. • Autonomous flying vehicles and processors • Airspace and flight path management • Unmanned traffic management (UTM) system • User interface and training programmes	https://www.aeronyde.com/system/
ANRA	**DroneOSS™**	ANRA provide operators with the DroneOSS™ operational platform which is fully functional and compliant with FAA and other applicable regulations for drone flight management and their mobile applications. This includes flight planning, airspace management, data analytics, compliance, drone management, resource management, maintenance information and much more. The solution provides operators and analysts access to the Command and Control for one or multiple UAV operations at any given time. The control can be delegated to users at multiple geographical locations using the Cloud based Control Station. An on-board module enables analysts to get access to the EO/IR or other sensors in real time over the encrypted links coming down to local or cloud based control station. The data also gets archived in the secure cloud for additional post processing and analytics. This can be used for simultaneous command and control functionality as well as communications for line of sight (LOS) and beyond line of sight (BLOS) operations. The system supports complete autonomous flight operations including auto takeoff and landing as well as camera and sensor control. The integrated flight planning feature supports both fixed wing and multi-rotor aircraft. If the drone based radar is enabled, ANRA can enable all of the subscribers to use Over The Horizon radar ("OTH" or "BTH") to 'view' what is in range.	http://www.anratechnologies.com/home/service-view/
Ariascend	**Remote identification system**	The company has proposed a remote identification technology and framework to allow authorities and citizens to identify drones in air. In November of 2015, AriAscend shared documents and e-mails that outlined a proposal for in-air identification of unmanned aircraft systems ("UAS") with the Federal Aviation Administration, EPIC, DJI, the University of Southern Denmark, Loretta Alkalay, and others.	http://www.ariascend.com

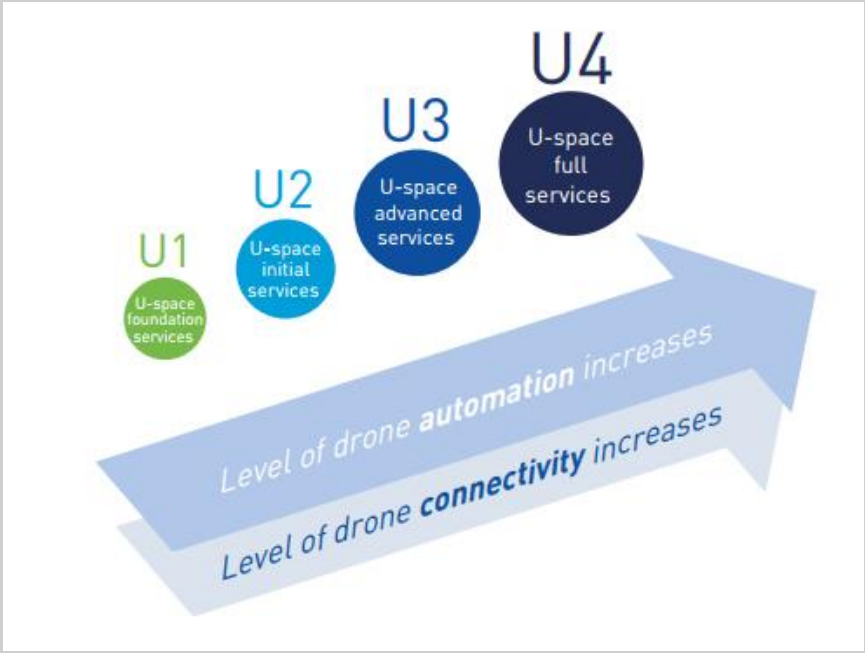
Astral Aerial	**UTM system for Africa**	 Astral Aerial's UTM system seeks to provide safe UAV operations in Africa by creating virtual highways and routes for drones of different sizes and missions to safely operate while providing pilots with information such as airspace restrictions, NOTAMs and weather. Most importantly, its ultimate objective is to be integrated into the national airspace and provide better oversight for regulators to facilitate ease of growing the UAV industry. Initially, the company is rolling out a Low Altitude Authorization and Notification Capability (LAANC) version of the UTM. The low altitude authorizations will integrate drone registrations with the Kenya Civil Aviation Authority (KCAA), handle licensing of pilots and most importantly perform airspace authorisation for drone missions. The application will enable pilots to reserve airspace and interact with maps to know geo-fenced areas, obstacles/terrain and other drone activities. KCAA and relevant airport authorities will then be able to approve the applied flight plans. As the company iterates the LAANC, it is prototyping the use of GSM technology for live tracking.	https://www.expouav.com/news/latest/astral-aerial-solutions-developing-utm-system-africa/
Colibrex	**Drone-Flight-Check**	Based on the company's expertise towards dynamic databases and licensing processes, together with LS telcom, Colibrex has launched Drone-Flight-Check, a drone information and drone traffic management database & app for enhanced safety and regulation. Further services and products from technology partners in the field of drone identification and drone surveillance round up the company's activities towards drone management.	http://www.colibrex.com/en/drone-management/
DFS	**UTM**	Germany's air navigation service provider, DFS, and Deutsche Telekom have jointly developed a system to enable the safe and fair integration of unmanned aircraft systems into lower airspace. The system locates drones using the mobile telecommunications network and incorporates them into an air situation display. The technology has been developed especially for drones flown beyond their operators' visual line of sight – for example, for control flights along pipelines, or for	https://www.dfs.de/dfs_homepage/en/Press/Press%20releases/2018/05.03.2018.-

		drones used in agriculture or in search and rescue missions. Unmanned aircraft systems transmit their position data to the UTM system over the mobile network. For this, they are equipped with an LTE modem, a GPS module and a mobile transmitter. The UTM system creates an air situation display from these position data. The display shows any surrounding traffic and warns of conflicts. Prohibited areas, around airports for example, can also be included in the system. The system can detect unmanned aircraft systems up to a height of 100 metres. An advantage of using telecommunication is that the mobile network provides complete geographical coverage. The UTM system is based on the DFS multi-sensor tracker Phoenix, which was developed by DFS and is in use to display radar data for air traffic control. DFS adapted the tracker to correctly display the movement patterns of drones, which are significantly different to those of conventional aircraft. The system can be linked to existing air traffic control systems and warn air traffic controllers of conflicts. The system's capabilities go beyond simply locating unmanned aircraft systems, however. Chart material, prohibited areas and meteorological information are also integrated. Data from detection systems can be added, too, meaning the system could be used as the basis for counteracting intrusive drones	%20Drones%20as%20flying%20smartphones/
DJI	**Decentralised UTM, drone identification systems**	At the International Civil Aviation Organization (ICAO) Drone Enable conference in Montreal DJI announced a new approach to developing first generation UAS traffic management (UTM) systems relying on current technologies and local communications protocols. In a whitepaper launched at the event the drone maker outlined its vision of a future UTM system without many of the central control functions featured in other UTM concepts. "UAS are also moving at far slower speeds in their typical operations, allowing time for collision avoiding courses to be exchanged among them locally," says the paper. "In addition, multi-rotor drones, which currently account for the vast majority of civilian UAS operations, have the ability to stop forward motion and hover, if necessary. These unique characteristics of UAS weigh in favour of on-board anti-collision technologies (OATS) as the primary mechanism for collision avoidance, with network traffic planning only required in areas of high congestion." In another whitepaper on the electronic identification framework for small drones, DJI argued that rather than force drones to transmit identification information over wireless networks to a centralized server…. "an identifier, such as a registration number, together with position information about the drone, and perhaps some voluntary information if the operator wishes, is transmitted from the drone, and is available to all receivers that are within range…This localized approach is preferred to networked solutions, which raise a number of concerns. A networked solution requires network connectivity, most typically via mobile phone. There are various locations that lack reliable data signals, which would thwart the ID system, as well as provide an excuse to a non-compliant operator. A networked solution also inherently raises the possibility	

		that all UAS operations will be tracked and recorded for future unknown exploitation, including enforcement quotas or business espionage. A networked system is also susceptible to system-wide hacking, or the creation by detractors of false entries of drone operations that do not exist."	
DLR	Blueprint Concept for Urban Airspace Integration	The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) has developed a concept that brings unmanned aircraft of all classes together with conventional aeroplanes and helicopters within urban airspace. The DLR concept, in the form of the Blueprint Concept for Urban Airspace Integration, addresses this very issue. "At the heart of the concept is the versatile assessment of every single aircraft according to its technical equipment and dimensions," says Dagi Geister, who leads the Unmanned Aircraft Systems expert group at the DLR Institute of Flight Guidance. "Drones that are well equipped in terms of navigational systems, Detect-and-Avoid sensors and communications and monitoring capabilities could fly in great numbers within a specific airspace segment. But if drones with inferior technology start to be used elsewhere, only a few flights will be permitted within a large area." In principle, however, the new concept allows all airspace users to fly, regardless of how technically sophisticated they are. As part of the concept, the versatile classification of technical and aeronautical features is visually represented in an easy-to-grasp way using multidimensional polygons that provide an individual overview of each aircraft. The bigger the aircraft and the more restricted its technical equipment in terms of navigation, communications and the ability to detect other airspace users (whether cooperative or not), the larger the polygon. The better the aircraft's overall performance, the smaller the resulting polygon. All aircraft are assigned a risk-minimised flight path. According to the concept, flight paths within the 'U-Space', as airspace close to the ground will be called, will be assigned via a central U-Space service. Aircraft that register prior to taking off will receive a full simulated and risk-minimised flight path in advance via this service, taking into account airspace users that are already airborne. Critical areas on the ground, such as those with large gatherings of people, will be avoided. This will result in a flight route with as few deviations as possible from the ideal path	http://www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10204/296_read-25547/#/gallery/29441
Drone Aviator	**Openskkye**	Drone Aviator is a software development firm that develops security technology solutions for the drone industry. Drone Aviator offers OpenSkkye, an application that enables drone pilots to find places to fly and connect with the other pilots.	http://openskkye.com/

DroneLogbook	**DroneLogbook**	The platform integrates business operations with regulatory obligations. DroneLogbook reduces the burden by automating many of these tasks: • Generate compliance (FAA, CAA, CASA, CAD, EASA, DGAC, TBST) reports in seconds. • Create documentation electronically (Authorization Forms, POA etc) • Create custom checklist and risk assessment forms • Map flight areas and check safety status with Airmap Airspace Intelligence • Import flight log files or automatically push your flight data from 3rd party apps. Show exactly where, when and how the mission was executed • Attach documentation to flights to track compliance • Project folders with all flights & documentation in a single folder to better manage operations and compliance • Notification and tracking of maintenance tasks • Create custom reports in seconds • Operate offline and sync when online	https://www.dronelogbook.com
Drone Radar	**DAMS**	Around 1,100 drone operators are daily using DroneRadar's airspace status and flight authorisation tool; the DAMS (Drone Awareness and Monitoring System) is now fully integrated within the airspace planning system of the national air navigation service provider, the Polish Air Navigation Services Agency (PANSA). The smart phone/tablet based tool has three major functions: • It analyzes the airspace environment based on aeronautical data supplied by AIP Poland, airspace use plan and NOTAMs illustrating the airspace situation with three green, yellow, red lights to show the availability of airspace in terms of time and place. • Second, it offers the possibility of two-way non-verbal communication between air traffic services (ATS) and the drone operator, providing exchange of information on flight approvals and updates. • Third, it provides an automated, bi-directional emergency response service where the air traffic service operators can inform drone users about a requirement for immediate landing – where emergency helicopter operations are required, for example, or where the drone operator can report a loss of control over the drone. This information is transmitted electronically to the PAZP services At the start of 2018 the tool was processing around 60,000 airspace availability checks a month.	https://droneradar.eu

Dronsystems	**DroNav**	DroNav by DronSystems is a Highly Automated Air Traffic Management System for Small UAVs Operating at Low Altitudes. The platform is a self-learning complex, based on software and hardware elements, operating in distributed computing environment, offering multiple levels of redundancy, fail-safe algorithms for conflict prevention/resolution and assets management. The system is easily deployable, scalable, and allows safe management of concurrent operations of a large number of UAVs in the same airspace. DroNav is being designed as a universal platform, connecting various stakeholders (operators, regulators, law enforcement agencies, product developers) and capable of providing interoperability of different systems and airspace users in a unified environment	https://www.dronsystems.com/
European Commission	**U-Space**	Following a request by the European Commission, the Single European Sky Air traffic management Research Joint Undertaking – whose role is to develop the new generation European air traffic management system – has unveiled its blueprint to make drone use in low-level airspace safe, secure and environmentally friendly. This "U-Space" covers altitudes of up to 150 metres. Registration of drones and drone operators, their e-identification and geo-fencing should be in place by 2019. The U-Space should be: • Safe: safety at low altitude levels will be just as good as that for traditional manned aviation. The concept is to develop a system similar to that of Air Traffic Management for manned aviation. • Automated: the system will provide information for highly automated or autonomous drones to fly safely and avoid obstacles or collisions. • Up and running by 2019: for the basic services like registration, e-identification and geo-fencing. However, further U-Space services and their corresponding standards will need to be developed in the future. The European Aviation Safety Agency (EASA) is working with Member States and industry to produce effective EU-wide safety rules that are proportionate to the risk of the operation. These rules will implement the EU's basic aviation safety regulation which the European Parliament and the Council (i.e. the EU Member States) are expected to adopt in the coming months. The Commission, through the SESAR Joint Undertaking, will finance a range of drone projects, focusing on the integration of drones into the aviation system. Finally, an expert group will be established to act as a sounding board for the further development of European drone policy.	http://europa.eu/rapid/press-release_IP-17-1605_en.htm

		Delivering services in urban areas, collection of data for a wide range of industries, infrastructure inspections, precision agriculture, transportation and logistics are just some of the possible applications of this technology. Current common European rules only cover drones weighing above 150 kilograms. Below this threshold, Member States are responsible to regulate. While national rules allow expertise to grow, they often diverge and cause a fragmentation of the EU internal market. Such fragmentation hampers the development of new products, the swift introduction of technologies and may also create safety risks. In December 2015, the Commission therefore proposed to create an EU-wide framework for drones as part of its Aviation Strategy. This requires the establishment of a regulatory framework, including standards, and the safe integration of drones into the airspace, on which today's blueprint delivers.  The progressive deployment of U-space is linked to the increasing availability of blocks of services and enabling technologies. Over time, U-space services will evolve as the level of automation of the drone increases, and advanced forms of interaction with the environment are enabled (including manned and unmanned aircraft) mainly through digital information and data exchange.	

		• U1 U-space foundation services provide e-registration, e-identification and geofencing. • U2 U-space initial services support the management of drone operations and may include flight planning, flight approval, tracking, airspace dynamic information, and procedural interfaces with air traffic control. • U3 U-space advanced services support more complex operations in dense areas and may include capacity management and assistance for conflict detection. Indeed, the availability of automated 'detect and avoid' (DAA) functionalities, in addition to more reliable means of communication, will lead to a significant increase of operations in all environments. • U4 U-space full services, particularly services offering integrated interfaces with manned aviation, support the full operational capability of U-space and will rely on very high level of automation, connectivity and digitalisation for both the drone and the U-space system Three services have already been identified as "foundation services": electronic registration (e-registration), electronic identification (e-identification) and geofencing. Current initiatives envisage that electronic registration is mandatory for drone operators (except operators of drones weighing below 250 grams), as well as some classes of drones used in the open category, and all drones used in the specific category. Electronic identification will allow authorities to identify a drone flying and link it to information stored in the registry; the identification supports safety and security requirements, as well as law-enforcement procedures.	
Exponent	**UTM portal**	The Exponent UTM portal caters to aviation regulator's need to integrate drones within civilian approved airspace. Coupled with Exponent's SkyCommander Tracker, the portal allows authorities to manage a host of UAV/RPAS flight operation functions such as UAV/RPAS, Pilot, NOC management & Billing from a single operational console. Overlaid with dedicated ADS-B civil air traffic data – UAV/RPAS separation data can be monitored in near real time, with automated alerts generated based upon customizable metrics as defined by the regulator. Data is stored and available for audit as a flight replay or as a data export for integration with 3rd party tools. Reports can be generated at the flight level or aggregated over time, pilot, RPAS, alert type or any combination of the above to provide a comprehensive analytical tool to study RPAS/UAV and ultimately pilot behaviours. The portal has built in extensibility to allow enterprise deploy their own applications via API to enable payload data visualization and analytics.	http://exponent-ts.com/expertise/

GLVI	**UrbanATM**	UrbanATM is a modular, redundant and expandable system. Services can be implemented gradually - depending on traffic density and following demand. UrbanATM is designed for urban environments - for areas without clear lines-of-sight, and with atmospheric disturbances e.g. fog, rain, or dust. The system is particularly designed to work with high traffic densities. It does not distinguish between remotely piloted and software-in-control unmanned aircraft. It takes into account both airspace users that cooperate with the system, and such that don't - like pedestrians, leisure drones, or birds.	http://www.urbanatm.de/
Gryphon Sensors	**Skylight, Mobile Skylight, R1400 3-D Active Electronically Scanned Array (AESA) air surveillance radar, S1200 2-D Active Electronically Scanned Array (AESA) direction finder, Skylight Airspace Monitor Interface**	Gryphon Sensors Skylight system uses multiple ground-based sensors to detect cooperative and non-cooperative targets in the airspace, providing intelligent situational awareness for integration and security. Mobile Skylight is a new standard in drone security and unmanned aircraft system (UAS) traffic management. Featuring an array of self-contained sensors, it serves as a complete mobile command centre for many applications. Contained in a van, Mobile Skylight features 4×4 off-road capability and can be taken anywhere without a commercial driver's license. Gryphon Sensors R1400 is a 3-D Active Electronically Scanned Array (AESA) air surveillance radar designed specifically for the detection of small, low-flying targets. The R1400 provides rapid, precise detection and tracking of airborne targets, including small unmanned aircraft systems (UAS), general aviation, birds and other cooperative or non-cooperative targets of interest. It provides accurate target position and velocity in a configurable hemispherical volume of coverage: 360 degrees in azimuth and 90 degrees in elevation. The S1200 is a 2-D Active Electronically Scanned Array (AESA) direction finder that monitors the signals in the relevant frequency bands for the rapid and precise detection and tracking of small unmanned aircraft systems (sUAS). It uses an extensive library of drone control signal profiles in order to detect and classify these types of signals. This passive sensor reliably and automatically detects the remote control of a commercial microdrone within a 5 km radius. The company also offers a variety of high-resolution, slew-to-cue, optical tracking cameras used to get eyes on the target. Used for visual identification and optical tracking, this sensor is especially useful in the classification of non-cooperative targets like birds, general aviation, etc. It uses both thermal and EO lenses to view airborne targets up to 3km in range — with 360° pan and 180° tilt rotations. The SAMI (Skylight Airspace Monitor Interface) gives a complete airspace picture.	http://gryphonsensors.com/
Hionos	**SignalPack, Pulsar**	SignalPack is a component aimed at drone manufacturers. It solves international regulatory compliance issues by managing positioning, signalling and performance restrictions. SignalPack features automatic identification and fly zones restriction. It is compatible with all drones, either already on the market or soon to be released. Identification, signalling and capacity limitation: SignalPack meets France's news safety laws pertaining to civilian drones.	https://www.hionos.com/#home1

		Pulsar is a highly reliable autopilot system, compliant with international aeronautical standards. It enables the use of drones in places where safety is critical. Autonomous take off, cruising and landing: Pulsar provides all features necessary for a fully automated flight. It embeds Fail-Safe mechanisms for maximum safety. Pulsar connects to any equipment required for a project: delivery, camera...	
IDS	**DREAMS**	DREAMS is a SWIM compliant, web-based system conceived for low altitude airspace management and for the provision of information services. DREAMS enables Air Navigation Service Providers (ANSP), private VLL airspace service providers and major UAS operators to register, identify, authorize, track, notify and manage UAS flights. DREAMS system implements a large set of capabilities needed to integrate small UAS into low altitude airspace, from strategic planning to post operations analysis. The system acts as a single point of entry for all the stakeholders involved in the management of UAS traffic, such as UAS operators and recreational users, VLL manned airspace users, aviation authorities, ATC, airport operators, local authorities, etc., through the provision of tailored services and interfaces, enabling common situational awareness across multiple domains for the entire UAS aviation community. DREAMS is conceived to cover the complete spectrum of functionalities needed to integrate sUAS into low altitude airspace: • Vehicle Registration & Identification – sUAS registration processes, including automatic unique ID assignment and QR code generation for identification and tracking • No-fly zone and airspace management and reservation – creation and management of no-fly zones; allow “special” users to make requests for airspace/corridors reservations. • Flight planning definition and management – operation planning supported by an interactive 2D/3D map; prompt automatic notification in case of issues impacting planned operations. • Flight validation and scheduling – validation and authorization (where required) of sUAS submitted flights in order to ensure that the mission can be operated in a safe manner. • Flight Awareness, Notification & UAS Tracking – integrated display of UAS mission area/plan, real-time UAV position reports, no-fly zones and other relevant overlays; notification to UTM stakeholders and ATC of potentially dangerous situations in order to allow for timely interventions. • Airspace occupancy prediction & DCB – quantify UAS traffic demand and notify UTM supervisor of potential overload situations that need to be managed. • Recording, playback and investigation – playback of UAS traffic data and statistical report generation for post-operation analysis, anomalous event investigation and verification of regulatory or operational non-compliance events.	https://www.idscorporation.com/news/ids-present-advanced-air-traffic-management-support-systems-world-atm-congress/

Intel	**RealSense and Mission Control**	Intel's advance automation and obstacle avoidance and pilot assistance function software is powered by Intel RealSense™ technology, flight planning automation with Intel Mission Control software and automatic change detection with Intel Insight Platform. These technologies will enhance the abilities of Intel drone solutions for commercial applications. Intel Mission Control software allows Intel to fly the fully-automated mission, assisted by Intel indoor location technology for position. In addition to existing strategic engagements with companies such as Topcon, Airbus and Volocopter, Intel has expanded its ecosystem relationships to include DELAIR, Honeywell, Pix4D, Bentley, Cyberhawk, Aeroprotechnik and HUVRdata among many others, to bring these new platforms to the market.	https://newsroom.intel.com/news/intel-auvsi-xponential-2017-intel-takes-flight-new-capabilities-solutions/
Involi	**Involi.live**	involi.live collects real time LAATD (Low Altitude Air Traffic Data) from ADS-B (Automatic Dependent Surveillance & Broadcast) and aircraft transponders, processes it and transmits it to the UTM system so anyone flying and connected to the system can have that information on-board in real time. The solution is to scale-down and adapt the concept of the control tower to the use case of drones, by creating unmanned micro control towers to detect the position of aircraft. This has the advantage of enabling integration of all latest technologies in such devices, while taking out from the loop the weakest element of the equation: the human. The data gathered from a network of micro control towers will be made available in real-time on a platform. In this way, the information on surrounding air traffic could be used by any air traffic connected to it, to automatically and efficiently.	http://www.involi.com/how-it-works.html
Japan UTM consortium	**UTM system**	A conglomeration of companies and agencies which aims to create a new industrial "drone innovation space". Has developed a roadmap of technologies; in March 2017 carried out a large-scale drone operation demonstration of multiple operators in Minami-Soma City, Fukushima Prefecture. The aim is to incorporate Japanese systems and technologies into "international standards" targeted by NASA's UTM.	http://www.jutm.org/

Kittyhawk	**Flight planning tool**	Kittyhawk unifies the mission, aircraft and data to empower safe and effective drone operations. Based in San Francisco, the company develops real-time flight operations and management solutions for professional pilots and fleet managers across a multitude of missions. Leading companies and organizations in media, insurance, oil and gas, education, law enforcement, fire and emergency management all rely on Kittyhawk for their end-to-end drone operations.	https://kittyhawk.io.
Kongsberg Geospatial	**Emergency Operations Airspace Management System (EOAMS)**	Kongsberg Geospatial, an Ottawa-based developer of geospatial software technology, is developing an Emergency Operations Airspace Management System (EOAMS) for evaluation by Canadian government agencies for safely managing drones at emergency and disaster scenes. The EOAMS is a portable display that interfaces with a variety of local sensors, including radar and Automatic Dependence Surveillance – Broadcast (ADS-B) receivers to give a clear picture of the airspace around disaster areas. It is intended to allow first responders to safely use unmanned aerial vehicles (UAVs) to survey the area, without risking collision with other emergency aircraft, including water bombers or rescue and police helicopters. The system would also provide a warning to first responders if unapproved UAVs approach the area – providing a degree of protection against what is becoming an increasing problem with the proliferation of small consumer camera drones at fires and accident scenes. The new EOAMS will be based on Kongsberg Geospatial's IRIS UAS™ airspace visualization system. The IRIS spatial awareness system evolved from technology originally developed for air traffic management display systems, and for supporting flight operations for military UAV systems like the US Navy Triton Global Hawk. The system has been developed for safely operating UAVs beyond visual line-of-sight (BVLOS), and has been adopted by the FAA ASSURE group for use in research toward developing regulations for commercial BVLOS operations in the United States.	https://www.kongsberggeospatial.com/company/news-media/100-govt-of-canada-awards-uas-airspace-management-system-contract-to-kongsberg-geospatial

Leonardo	**Automated UTM system**	Leonardo is ready to deploy an automated UTM system, relying on new technologies, to efficiently and safely manage drone traffic in VLL airspace. The system can provide public register of drones, communication, route and mission planning, conformance monitoring, dynamic geo-fencing, ground based safety nets and contingency management. The cooperative drones have to be equipped with: • self-identification and self- positioning facilities • communication facilities to transmit to the UTM system position data and equipment status. The UTM functionalities are implemented in a scalable cloud platform in order to offer Cloud Service Applications to the various UTM stakeholders. The system is designed as a "Platform as a Service", able to integrate additional SW solutions such as payload cloud data storage, thus offering full functional applications as "Software as a Service". The software components are virtualized and included in a Cloud Architecture using the open source Apache CloudStack platform. The Communication Gateway manages the links with all UTM stakeholders and their secure authentication and the pre-flight mission requests are validated by the Public UAV and Pilots Registry (and by the Mission Safety Processor). During the mission the position reports received from drones are filtered and forwarded in ASTERIX to the VLL Data Fusion processor that combines them in a single scenario with other data coming from adjacent UTM or ATM systems and distributes them to remote users through the Communication Gateway. The Mission Safety Processor uses drones mission data and other relevant information to check flights safety both in medium and short-term, monitoring separation among drones, among drones and aircraft and with respect to restricted portions of airspace. Depending on the safety rules, it either warns the involved stakeholders or acts directly one the drone Flight Management System to activate the "Return To Home" embedded function, when available. Both unprocessed and processed data are recorded by Recording & Data Reduction, allowing, for example, to retrieve all the missions executed by a given drone and/or pilot, to perform infringements/ incidents investigation, to make statistics for billing and airspace configuration improvement. The UTM Working Position is a Java application to remotely manage the geographic volumes and to display the VLL airspace traffic on an Open Source Geographic Information System (OpenStreetMap).	Http://leonardocompany.com

LibrePilot	**Autonomous Flight, Auto Takeoff, Auto Land and Return to Base**	The LibrePilot open source project was founded in July 2015. It focuses on research and development of software and hardware to be used in a variety of applications including vehicle control and stabilization, unmanned autonomous vehicles and robotics. One of the project's primary goals is to provide an open and collaborative environment making it the home for development of innovative ideas. LibrePilot welcomes and encourages exchange and collaboration with other projects, like adding support for existing hardware or software in collaboration under the spirit of open source. LibrePilot finds its roots in the OpenPilot project and the founding members are all long-standing contributors in that project. Drone applications include Autonomous Flight, Auto Takeoff, Auto Land and Return to Base	https://www.librepilot.org/site/index.html
Lufthansa Systems	**Drone Solutions**	Without a permit, drones are prohibited from flying in close proximity to major international airports, regional airports or military airfields. The app informs drone users about these kinds of zones. Data for the app are drawn from the Lufthansa Systems Lido/SkyData database. Lido/SkyData holds ARINC-424 data that are updated every 28 days. The dataset covers navigational items like airports, heliports, runways, waypoints, navaids, airspaces and airways plus flight procedures. Drone Solutions can also access other relevant aviation information such as chart data with details of streets, cities or the surrounding landscape, obstacle data covering power lines or tall buildings, plus weather reports. These information are based on the certified data that Lufthansa Systems also uses for its own navigation solutions, for example. One special feature in the new app warns drone owners if an aircraft such as a rescue helicopter could enter the zone where the owner's drone is flying, thus preventing potential collisions. The app is also helpful for regulators, as it gives them an at-a-glance overview of where drones are flying, plus reports about unauthorized flights. With the aid of an algorithm built into the app, they can also issue automated flight permits. This not only simplifies their processes and saves regulators time but also increases airspace safety.	https://www.lhsystems.com/tags/drone-solutions
Nanjing Technical University	**Traffic Management of Unmanned Aircraft Systems**	To ensure that traffic is regulated across the whole of Singapore, a possible solution is the establishment of coordinating stations for UAV traffic. These stations can then track all the UAVs that are in the air, schedule the traffic flow, monitor their speeds and ensure a safe separation between the UAVs. Currently, restricted airspace and zones where UAV operations are prohibited have already been identified, such as near airports and military facilities. The researchers will test out several concepts, such as geofencing. The idea is to set up virtual fences where UAVs can be automatically routed around a restricted geographical location such as the airport. Another important research area will be collision detection. UAVs will need to have sensors that enable detection and avoidance of collision with another UAV. This will allow UAVs to follow a set of actions to avoid any mid-air incidents, such as flying above, below, or around other UAVs. This	http://media.ntu.edu.sg/NewsReleases/Pages/newsdetail.aspx?news=20327ba4-b019-4a38-a86f-47e64d89ba0d

		multidisciplinary research initiative will bring together faculty and researchers from different fields in NTU, from aerospace engineering and air traffic management to robotics and electronic engineering. Spanning a period of four years, the project which will also tap on industry experts, is expected to complete its initial phase of conceptual design and software simulation by end 2017. This is followed by actual test bedding of solutions using UAVs developed by NTU that can be used for relevant applications in 2018.	
NASA	**Safeguard**	The Safeguard system monitors and enforces conformance to a set of rules defined prior to flight (e.g., geospatial stay-out or stay-in regions, speed limits, altitude limits). Safeguard operates independently of the UAS autopilot and is strategically designed in a way that can be realized by a small set of verifiable functions to simplify compliance with regulatory standards for commercial aircraft. A framework is described that decouples the system from any other devices on the UAS as well as introduces complementary positioning source(s) for applications that require integrity and availability beyond what the Global Positioning System (GPS) can provide. Additionally, the high level logic embedded within the software is presented, as well as the steps being taken toward verification and validation (V&V) of proper functionality.	https://ntrs.nasa.gov/search.jsp?R=20160012239
NASA	**UTM system**	Engineers at NASA's Ames Research Center in Moffett Field, California, are developing UTM cloud-based software tools in four segments of progressively more capable levels. They design each "technical capability level" for a different operational environment that requires development of proposed uses, software, procedures and policies to enable safe operation, with Technical Capability Level One focusing on a rural environment. UTM TCL1 concluded field testing in August 2015 and is undergoing additional testing at an FAA site. Technologies in this activity addressed operations for agriculture, firefighting and infrastructure monitoring, with a focus on geofencing, altitude "rules of the road" and scheduling of vehicle trajectories. UTM TCL2, completed in October 2016, leveraged TCL1 results and focused on beyond visual line-of-sight operations in sparsely populated areas. Researchers tested technologies that allowed dynamic adjustments to availability of airspace and contingency management.	https://www.nasa.gov/feature/ames/first-steps-toward-drone-traffic-management

		UTM TCL3, scheduled for Spring 2018, will leverage TCL2 results and focus on testing technologies that maintain safe spacing between cooperative (responsive) and non-cooperative (non-responsive) UAS over moderately populated areas. UTM TCL4, with dates to be determined, will leverage TCL3 results and focus on UAS operations in higher-density urban areas for tasks such as news gathering and package delivery. It will also test technologies that could be used to manage large-scale contingencies. NASA's UTM technologies research and development is taking place in collaboration with the FAA. Results of research in the form of airspace integration requirements are expected to be transferred from NASA to the FAA in 2019 for their further testing. With continued development, the Technical Capability Level One system would enable UAS operators to file flight plans reserving airspace for their operations and provide situational awareness about other operations planned in the area.	

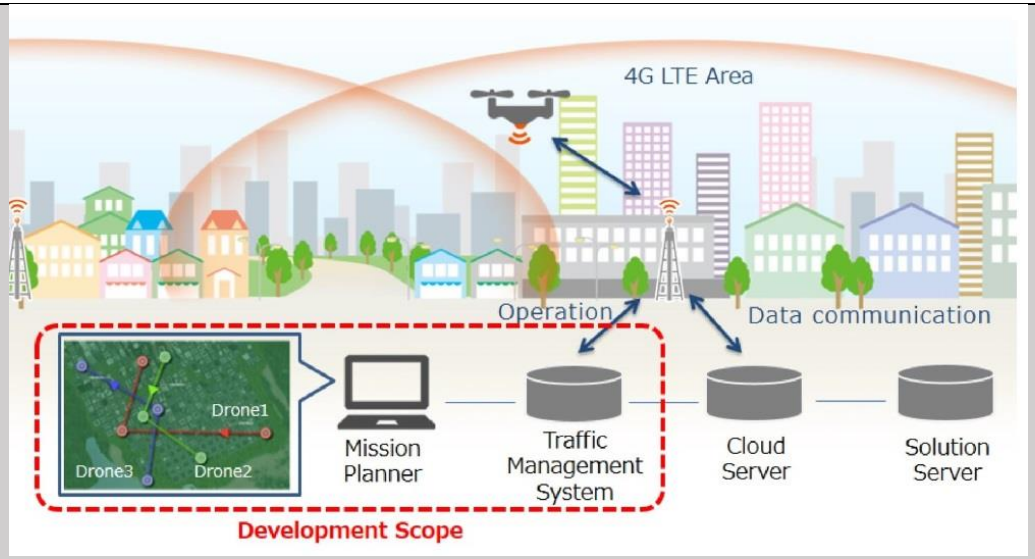
One of the attributes of the UTM system is that it would not require human operators to monitor every vehicle continuously. The system could provide to human managers the data to make strategic decisions related to initiation, continuation, and termination of airspace operations. This approach would ensure that only authenticated UAS could operate in the airspace. In its most mature form, the UTM system could be developed using autonomicity characteristics that include self-configuration, self-optimization and self-protection. The self-configuration aspect could determine whether the operations should continue given the current and/or predicted wind/weather conditions.

NASA envisions concepts for two types of possible UTM systems. The first type would be a Portable UTM system, which would move from between geographical areas and support operations such as precision agriculture and disaster relief. The second type of system would be a

		Persistent UTM system, which would support low-altitude operations and provide continuous coverage for a geographical area. Either system would require persistent communication, navigation, and surveillance (CNS) coverage to track, ensure, and monitor conformance.	
NATS	**DroneAssist**	Drone Assist, powered by Altitude Angel and available for free on Android and iOS presents drone pilots with an interactive map of areas of airspace used by commercial air traffic. It also contains a 'Fly Now' feature that shares the user's drone flight location with other app users, and the wider drone community, helping to reduce the risk of a drone related incident in the UK's airspace. The app also includes the location of ground based hazards that might pose a safety or privacy risk, such as power lines, schools or sports venues.	http://www.nats.aero/news/new-app-to-help-drone-pilots-comply-with-uk-rules/
NTT DATA	**airpalette®**	NTT DATA Corporation launched the drone traffic management software package "airpalette® UTM" to drone-utilizing businesses and local governments in November 2017. The software package enables simultaneous remote control of multiple drones of different models, thus improving the efficiency of infrastructure inspections and disaster responses that would be dangerous and time consuming for human workers to conduct. The airpalette UTM software package consists of two functions: an "FOS" (Flight Operation System) drone operation control function that enables simultaneous remote operations*1 of multiple drones and a "UTM core" (UAS Traffic Management core) unmanned aircraft traffic management function that centralizes the management of position information of multiple drones operating in a certain airspace. The FOS function enables simultaneous remote operation of multiple drones and helps improve the efficiency of activities conducted by workers involved in infrastructure inspections, disaster responses, etc. The UTM core function centralizes the management of position information and the like of multiple drones operating in a certain airspace. By detecting possibilities of midair collisions and entry into a no-fly zone and by providing such information to drone operators, this function realizes enhanced airspace safety.	http://www.nttdata.com/global/en/news-center/others/2017/111500.html

Numerica	**Collision avoidance system**	The company provides dynamic air space management for UAS integration within the national air space. • Robust solution considers uncertainty in aircraft type, performance, and flight path, as well as uncertainty from noisy sensor measurements when determining collision risk. • Modelling dynamics of aircraft flight allows useful risk predictions over long time horizons (60-180 seconds) that provide pilots time to respond while controlling the rate of false alarms. • Solution is agnostic to sensing modality and can be adapted to cooperative sensors (ADS-B), ground-based or air-borne radar, or optical sensors, as demanded by platform and mission	http://www.numerica.us/defense/unmanned-systems/#collision-avoidance-system
ONERA	**Low Level RPAS Traffic Management (LLRTM)**	ONERA has designed the LLRTM to address two safety issues: the risk of RPAS versus manned aircraft conflict. LLRTM system provides a set of capabilities: all traffic monitoring and RPAS traffic management in uncontrolled airspace; all traffic monitoring and coordination with ATC in controlled airspace; ground-based system to manage RPAS operations below 500 ft (class E/G), using a combination of sensors: airborne collaborative alerting system, ground sensor to detect non-cooperative traffic, role of human actors.	https://www.eurocontrol.int/sites/default/files/events/presentation/art-workshop-rpas-and-their-impact-on-atm-3-dubot.pdf
Precision Hawk	**LATAS Ground, LATAS Air and location tracking**	LATAS Ground: the company's 3D ground obstacle database gives the drone operator visibility of trees, buildings, power lines and other hazards that could cause damage to the aircraft. LATAS Air: LATAS displays live, FAA radar feeds to US drone operators. With real-time aircraft traffic in 128 countries, operators can receive notifications when manned aircraft trajectories create a potential hazard for a drone's area of operation. Easy to understand no fly zones, airspace classes, geofences and temporary restrictions are included. The system also provides flight data to the insurance provider to receive preferred rates based on flight history. LATAS is being flown under the FAA Pathfinder Program and the NASA UTM Program. In addition, LATAS is partnered with Harris and satellite imagery provider DigitalGlobe. Live Location Tracking: Telemetry data is transferred twice per second to track a drone during flight. For flights in areas without cellular coverage, LATAS will store and upload missing flight information upon reconnection. The mounting kit allows the device to be mounted to any drone and track real-time positioning, heading, speed and altitude for a safer flight.	http://www.flylatas.com

Skyward	**Airspace Map and drone operating software**	With Skyward's technology, Verizon will streamline the management of drone operations through one platform designed to handle end-to-end activities such as mission planning, complex workflow, FAA compliance support, supplying information about restricted airspace and pilot credentialing, drone registration and provisioning rate plans for drones on Verizon's network. All of this is designed to help developers and businesses create and manage a wide-range of services backed by Verizon's mobile private network, secure cloud interconnect and data analytics capabilities.	https://skyward.io/commercial-drone-software/
Terra Drone	**UTM system based on mobile telecommunications networks**	Terra Drone is a Japanese industrial drone service provider which is setting up UTM systems based on partnerships with telecom providers. In November 2017 Terra Drone announced it was collaborating with LG U+, a South Korean cellular carrier owned by LG Corporation to provide its "U+ Smart Drone UTM System," which enables a drone to fly safely for disaster monitoring and logistic transport in BVLOS (beyond visual line of sight) and at night. In December 2017 Terra Drone and KDDI Corporation, a Japanese telecommunications operator have succeeded in a fully autonomous flight experiment of "Smart Drone" using a 3D map and drone port, say the organisations. As a result of the experiment, the world's first long-distance drone flight of about 6.3 km via the drone port which enables a drone to recharge automatically, successfully returned to the landing site after spraying terraced ponds with pesticide. Terra Drone and KDDI aim to establish an infrastructure that enables secure long-distance autonomous flight utilizing Smart Drone and the mobile communication network. This demonstration is an experiment for safe flight altitude setting on the 3D map and automatic charging by drone port, which verified that the long-distance autonomous drone flight is technically possible.	https://www.terra-drone.net/



KDDI and Terra Drone have worked together to develop the “4G LTE control system”, which allows operators to control drones via LTE network. This system also helps drone businesses by managing the information on each drone and operator and providing detailed flight logs of each flight. Flight plans will be created via the system by setting altitude of each optional flight point and flight forms between the points on an online map. During the flight, control instructions based on the flight plan are transmitted to a drone through LTE network. Automatic flights following set flight plans are not the only things this system can do. This system allows operators to watch real-time flights images through “Live View Area” in order to control drones remotely by sight. This system also can grasp electromagnetic wave conditions and go off alarm when a drone is in a low electric field. This allows the drone to respond to a sudden changes of a flight route and a forced return in case of emergency. Furthermore, through this system operators can monitor and control images taken by the drone and communication of the survey data

KDDI has also partnered with Terra Drone and Zenrin, a Japanese map publisher to jointly developed the “Smart Drones Platform,” which realizes safe drone flight using the mobile communication network and 3D map for autonomous drone flight and set a secure flight altitude automatically. 3D map enables a drone to cognize altitude differences of topography such as mountains and hills, buildings, and Terra Drone and KDDI accomplished automatic discrimination

		of difference in elevation of more than 100m in this experiment. The drone port developed by Prodrone Co., Ltd., an industrial drone platform manufacturer, has the automatic landing function based on image recognition which enables long-distance flight via Drone Port. In the future, when Smart Long-distance autonomous flight infrastructure of smart drone using this mobile communication network has established, this platform will be active in the fields of not only agriculture but also surveying topography and equipment, security of facilities, disaster monitoring and delivery to remote areas.	
Thales	**ECOsystem**	Thales and Unifly have Joined forces to satisfy the growing need for UTM. The companies will leverage Thales's expertise in air traffic management, system integration and cyber security as well as Unifly's dedicated focus on drone management to provide the premier UTM application. The solution will incorporate Unifly's Validation Engine, a sophisticated software application that conducts real-time validation of drone flight plans, into Thales ECOsystem, a decision support platform for improved aviation operations.	https://www.thalesgroup.com/en/ecosystem
TBS	**FLARM**	TBS FLARM is the "first broadly used global traffic information, collision avoidance, and remote identification system for UAV, fully interoperable with 35k+ manned aircraft globally. Different to ADS-B or any other solution, FLARM is truly cooperative, widely used in light aircraft, and dominates the lower airspace outside major airports…." says the company. With TBS's FLARM software update, tens of thousands of UAVs will in the next weeks join the already large FLARM ecosystem.	http://www.team-blacksheep.com/products/prod:flarm_aviation
uAvionix	**ADS-B transcievers/receives, Mode-S transponders, navigation systems**	uAvionix develops the world's smallest, lightest and most affordable ADS-B transceivers, transponders, and GPS receivers. Based in Palo Alto, uAvionix has gathered a cross-disciplinary team of experts in embedded RF engineering, sUAS operations and compliance, hardware, software, and cloud services.	https://www.uavionix.com/news/uavionix-joins-forces-with-foreflight-to-bring-low-cost-ads-b-to-general-aviation/

Unifly	**Launchpad, Pro app, Sentry and Connect**	The Unifly platform consists of four products, each geared to a different set of customers. The free app Launchpad enables users to check if they are allowed to fly at a given location. The Pro app helps professional users to manage their drones, flights and operations. The Sentry application helps ANSP (air navigation service providers) and government officials to keep track of the drones in their airspace, and to manage no-fly zones. The Connect application makes it possible for manufacturers to explore and integrate the API.	https://www.unifly.aero/products
U-Safe	**The UAS Secure Autonomous Flight Environment (U-SAFE) initiative**	The UAS Secure Autonomous Flight Environment (U-SAFE) initiative is a State of New York funded program that will help accelerate the integration of low-altitude, small Unmanned Aircraft Systems (sUAS) into the National Airspace System (NAS). Over the next five years, U-SAFE will bring key government stakeholders, academia, and industry partners to Central New York to deploy and validate the necessary UAS Traffic Management (UTM) infrastructure, safe systems and universal standards for the emerging drone industry. Project U-SAFE will create a low altitude (below 1200') air traffic control system for safe drone operation.	http://nuairalliance.org/u-safe/
Vigilant Aerospace	**FlightHorizon**	Vigilant Aerospace's FlightHorizon product suite, based on a NASA patent and prototype, provides a complete autonomous collision avoidance solution for both piloted and fully autonomous unmanned aircraft to deliver situational awareness, self-separation commands, and collision avoidance for both piloted and autonomous unmanned aircraft. FlightHorizon GCS™ (Ground Control Station) uses an aviation transponder and, when available, ground-based radar, attached to a laptop or workstation at the ground control station to provide collision avoidance commands and situational awareness to the ground-based unmanned aircraft pilot. FlightHorizon COMMANDER™is an airspace management system designed for airspace managers, fleet operators and anyone who needs to maintain a big-picture view of their airspace, maintain well-clear for unmanned aircraft and keep detailed flight logs. FlightHorizon PILOT™uses an on-board FlightHorizon computer, transponder data and, when available, radar data, to send self-separation commands directly to the on-board autopilot	https://vigilantaerospace.com/vigilant-aerospace-to-provide-flighthorizon-for-airspace-safety-to-multiple-faa-unmanned-aircraft-integration-pilot-programs/

VITO, Luciad and FlightPlus	**RPAS VLLOC**	Remotely-Piloted Aircraft Systems Very Low Level Operation Coordination (RPAS VLLOC) is a SWIM-enabled application which helps integrate very low level (VLL) RPAS into the European aviation system. This platform will enable the safe operation of RPAS in Europe. The platform allows users to safely plan a VLL RPAS operation: when, where and which RPAS flights are planned? Additionally, users have an overview of all operations and can control, police, reject and even cancel these operations. The application and services are fully based on interoperable SWIM standards, and the partnership will work to commercialize the solution.	https://vito.be/en/news-events/press-messages/vito-luciad-and-flightplus-awarded-during-2014-sesar-swim-master-class-best-class-awards