

EUROCONTROL



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The EUROCONTROL Unmanned Aircraft Systems (UAS) ATM Integration Activity

EUROCONTROL's mission is to harmonise and integrate air navigation services in Europe, aiming to create a uniform and optimised air traffic management (ATM) system for both civil and military users. This is undertaken on a pan-European scale in order to achieve the safe, secure, orderly, expeditious and economic flow of traffic throughout Europe, while minimising adverse environmental impact.

The rapid evolution of unmanned aircraft systems (UAS) for both civil and military applications requires that EUROCONTROL takes a leading role in ensuring that UAS ATM integration is optimised as regards levels of overall ATM network safety, security and efficiency. On this basis, the Agency established in 2008 the «EUROCONTROL UAS ATM Integration Activity», which will coordinate several areas of the Agency's expertise into a consolidated UAS ATM network integration work programme.

This UAS ATM Integration Activity involves extensive internal cooperation within the EUROCONTROL Agency, spread across various domains, such as ATM, Safety, Security, Human Factors, Surveillance, Spectrum, Communications, Civil/Military ATM Coordination, Research and Development.

Because of its unique civil-military composition, EUROCONTROL is well-suited to position itself regionally and globally within current & future UAS ATM developments. The aim is to ensure that ATM supports the airspace requirements of UAS operations in segregated as well as non-segregated airspace, whilst also continuing to support the requirements of other airspace users, both existing and evolving. This ATM integration initiative will seek to ensure that ATM requirements form a basis for UAS performance standards and certification specifications, to be developed by relevant bodies e.g. EUROCAE, NATO, EASA, in coordination with ICAO, European States, RTCA, FAA, and the UAS industry itself.

The EUROCONTROL UAS Activity «2-Stream» Approach

The UAS ATM Integration Activity will be undertaken on the basis of a «2-stream approach» along two parallel timelines (described in more detail below). Stream 1 deals with the ATM integration of UAS in the short/medium term (up to 2020) while Stream 2 will support the integration of UAS in the context of SESAR for the longer term (post 2020). Both streams are focused on achieving integration of UAS based on full UAS type certification (including UAS ground elements) to meet ATM network requirements. The streams will also be driven by the key perspective of deriving overall ATM network performance improvements on the basis of the major opportunities afforded by development of UAS avionics, command and control links, «sense & avoid» capabilities and performance standards. Indeed, EUROCONTROL is of the opinion that such improvements could be transposed to manned aviation as a means of enhancing ATM for all airspace users.

Up to 2020: Stream 1

ATM performance-compliant technological solutions in areas such

as UAS sense-and-avoid, as well as radio frequency spectrum standardisation (for UAS communications, command and control), are under development by industry. In this regard, it is expected that significant numbers of UAS already in use, and also some produced and delivered in the near- to medium-term, may not achieve full airworthiness certification. Nevertheless, they may still require access to non-segregated airspace to fulfil their various commercial and operational objectives. Furthermore, it remains the role of EUROCONTROL to ensure that ATM can respond to the business/mission needs of all airspace users, including UAS.

Stream 1 will therefore undertake integration issues of all UAS types expected in the short to medium term, on the basis of a possible «phased/stepped approach», embracing both segregated and non-segregated airspace, with safety considerations being paramount. In addition, Stream 1 will support development of UAS certification specifications. It will be the role of EUROCONTROL to establish, in close coordination with States, the ATM requirements associated with integration of UAS (possibly on the basis of restricted UAS type certificates, restricted certificates of airworthiness and/or permits to fly).

Stream 1 will also examine existing national strategies for UAS integration, with the objective of building a cohesive «Pan-European UAS ATM Integration Proof of Concept». This is a key element of Stream 1 and will be built in coordination with States' ATM experts. It will validate the ATM acceptability of UAS technical specifications with a view to either their acceptance or the development of ATM strategies for mitigation of possible shortcomings, where feasible.

Post 2020: Stream 2 - SESAR

The long-term integration of UAS into the pan-European ATM network is to be undertaken within the framework of SESAR. Indeed, it will be an objective to establish the support required by SESAR for ensuring that the SESAR ATM end-state will accommodate both manned and unmanned aircraft systems as equal and legitimate airspace users.

Stream 2 will therefore seek to integrate those aspects of UAS operations which could improve overall ATM performance. Equally, SESAR ATM operational and technical requirements, derived from the SESAR ATM Target Concept, will be the subject of Stream 2 input to UAS certification activities. In this way, UAS certification specifications will evolve in tandem with the evolving SESAR requirements.

It can be noted that the SESAR ATM Target Concept itself provides: «*Specific technologies needed for UAS to ensure a transparent operation similar to a manned aircraft (e.g. dedicated high integrity UAS/operator command and control data links) fall outside SESAR. It is however conceivable that some technologies that will be developed in the coming years by and for the UAS community will find their way to manned aircraft as well, as we know of the requirements of advanced business aviation where sense and avoid technologies are sought in the not too far future.*»

In consideration thereof, Stream 2 will ensure, in cooperation with the SESAR Joint Undertaking (SJU), a comprehensive

SESAR interface. This will aim to ensure the development and availability of those enabling technologies which fall outside SESAR, but which prove to directly support the SESAR Target Concept as regards both manned and unmanned aviation.

UAS Integration ATC Real-time Simulations

EUROCONTROL's UAS ATM integration real-time ATC simulations have already started and are intended to explore major UAS-ATM interface issues, human factors, sense-and-avoid functionalities and additional requirements. This activity will directly support the EUROCAE WG-73 (UAS) processes, associated with establishing UAS certification categories based on ATM requirements. A first exploratory real-time ATC/UAS simulation was performed in September 2008 using an integrated ATC/UAS simulation platform provided by LFV (Sweden ANSP) and SAAB Industries. The Final Report of the simulation, published and distributed widely by EUROCONTROL, includes important initial ATM requirements & certification considerations.

EUROCONTROL's Interface with External UAS-related Establishments

EUROCONTROL is progressing its UAS work in full cooperation with various national and international groups. Accordingly, coordination has been established with EUROCAE, FAA, ICAO, EASA, SJU, UVS International and the UAS industry (through the Aerospace and Defence Industries Association, ASD).

Work with EUROCAE

EUROCONTROL provides leadership and considerable expert support to EUROCAE by supporting the EUROCAE UAS Working Group 73 in areas such as ATM, safety, security, military considerations and spectrum.

Work with FAA

Coordination with the FAA (USA) has already been established, in the framework of the Agency's Memorandum of Cooperation with the FAA, on UAS integration issues such as ATM, safety and spectrum. This FAA/EUROCONTROL partnership will coordinate UAS items of mutual interest in order to support and drive global inter-operability. In addition, it will ensure coordination of R+D activities and the sharing of knowledge & experience, thereby avoiding duplication of effort.

Work with EASA

On certification issues, EUROCONTROL is working closely with the European Aviation Safety Agency (EASA) in order to support the development of UAS certification criteria. This coordination will help to ensure that ATM-related aspects of certification specifications are consistent with EUROCONTROL UAS ATM integration strategies as regards UAS of weights both above and below 150 kg.

Work with ICAO

The integration of UAS into the pan-European network is undertaken with a view to achieving global inter-operability. EUROCONTROL's participation in the recently established ICAO UAS Study Group will afford the Agency the opportunity to foster consistency between EUROCONTROL's UAS ATM integration strategies and ICAO's globally-promulgated provisions. The ICAO processes will be aimed at both short-term development of global UAS guidance material/best practices and medium- to long-term development of comprehensive UAS SARPs/PANS.

Work with industry

Due to the complexity of the many activities underway in support of integrating UAS, and notwithstanding the extensive coordination taking place between international organisations,

communication with industry is essential in order to make progress. Moreover, this progress will only be achieved in close cooperation with organisations such as UVS International, whose expertise and contacts within the UAS industry are essential.

EUROCONTROL Activities Planned for 2009/2010

Following the successful UAS ATC Real Time Simulation of 2008, the EUROCONTROL Agency is expected to progress specific UAS studies in the following areas during 2009/2010:

- UAS ATM Safety assessments for UAS visual-line-of-sight and UAS as IFR in Class C airspace (enroute),
- UAS collision avoidance studies (including UAS ACAS requirements definition),
- UAS C3 Channel saturation quantitative modelling and mitigation studies
- UAS ATM Human Factors Case
- UAS ATM Security Case

Furthermore, in direct support of the EUROCONTROL UAS ATM Integration Activity, the EUROCONTROL Experimental Centre located in Brétigny sur Orge, France, will conduct additional statistical studies on the UAS Command, Control and Communications link latency values and their impact on ATC. The complexity of traffic mix, including a wide range of UAS, will also be assessed, using the COCA (Complexity and Capacity) methodology. The impact of various UAS deployment scenarios on pan-European ATM system capacity will also be quantified. Future European air traffic samples, at several time horizons, will be generated for various UAS development scenarios. These traffic samples will then be integrated into fast time and real time ATM simulations addressing both short term and SESAR ATM. A specific UAS real time simulation might be conducted. A UAS ground control station simulator direct connection to the EUROCONTROL Real Time ATC simulator is also planned.

Also of great significance will be the EUROCONTROL development during 2009 and early 2010 of «EUROCONTROL Specifications» for the operation of Global Hawk/Euro Hawk outside segregated airspace. Such specifications, in the frame of EUROCONTROL's existing regulatory competencies, will form the basis for harmonised pan-European ATM regulations for the safe integration of Global Hawk/Euro Hawk into the European ATM environment, enabling important deployments by the German and US military of these advanced UAS systems.

EUROCONTROL's long-term involvement in the UAS sphere is expected, from EUROCONTROL's perspective, to lead to tangible benefits not only for UAS and ATM, but for all airspace users. The EUROCONTROL Agency is committed to its involvement in developing the potential of unmanned aircraft systems, both civil and military, for the benefit of the entire aviation community.



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