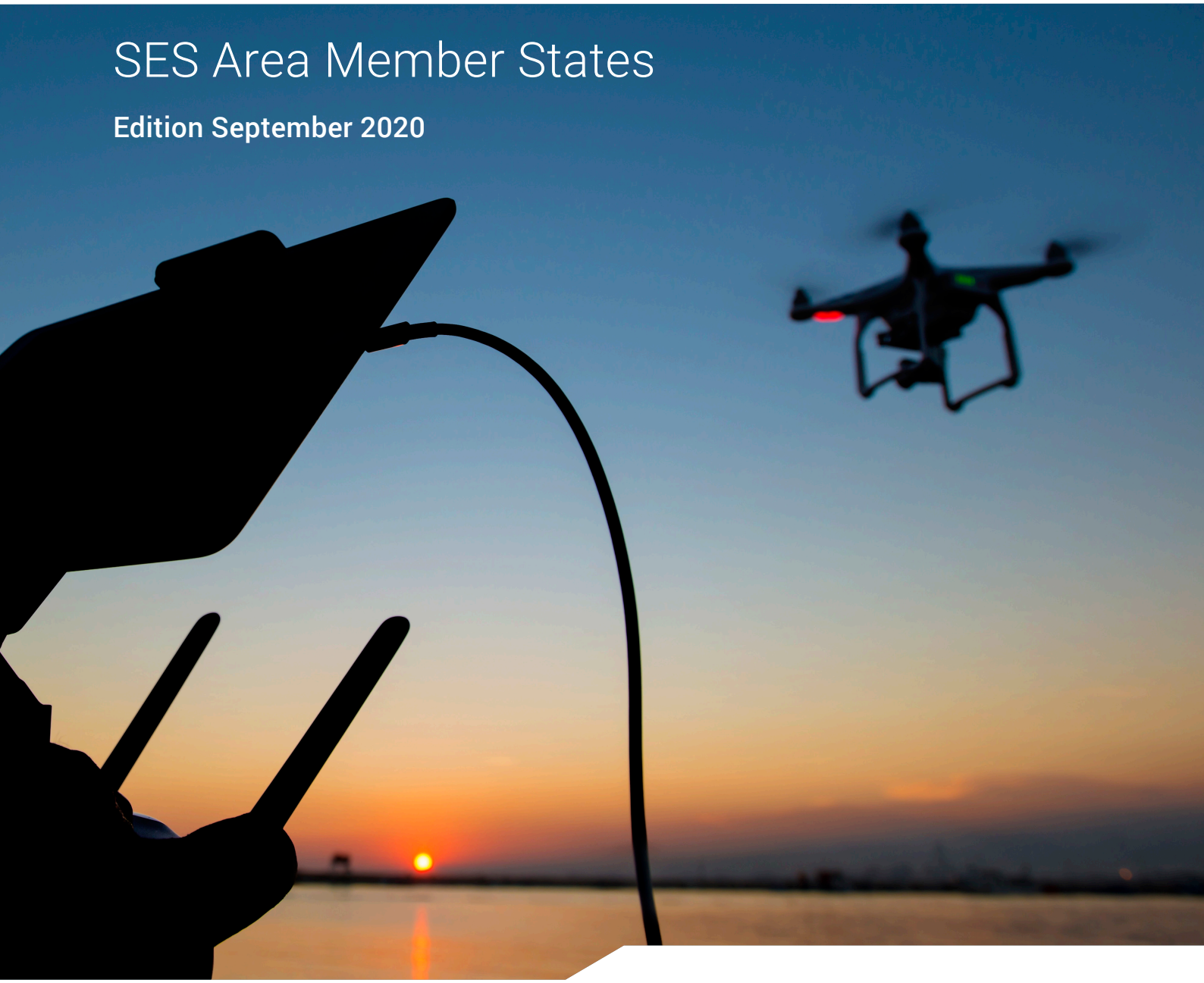
EUROCONTROL

U-SPACE Services
Implementation Monitoring Report

SES Area Member States

Edition September 2020



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DOCUMENT CHANGE RECORD

Edition No.	Edition Date	Reason for Change
0.1	30/06/2020	Initial draft
1.0	03/08/2020	First release
1.1	07/09/2020	Expert review

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EXECUTIVE SUMMARY

This report assesses the implementation progress, with a reference date of December 2019, the main elements underlying the provision of the U-Space services enabling VLL drone operations in the Single European Sky (SES) Member States Area.

An implementation survey, composed by 60 closed-ended questions derived from SESAR U-Space Blueprint [2], covering 16 services, whose gradual implementation is planned in phases U1 (2019) to U3 (2025), was conducted by the EUROCONTROL Planning and Support (PAS) Unit.

In particular, 148 representatives from EU SES national stakeholders were invited to provide implementation progress, as well as short to medium term planning information concerning implementation of U-Space Services in their national environment.

A univariate analysis of the implementation data was performed in order to determine progress frequency distributions (i.e. summary of percentages) and provide a snapshot of the level of maturity of each U-Space service.

Figure 1 shows the overall state of the implementation of U-space services amongst the survey respondents.

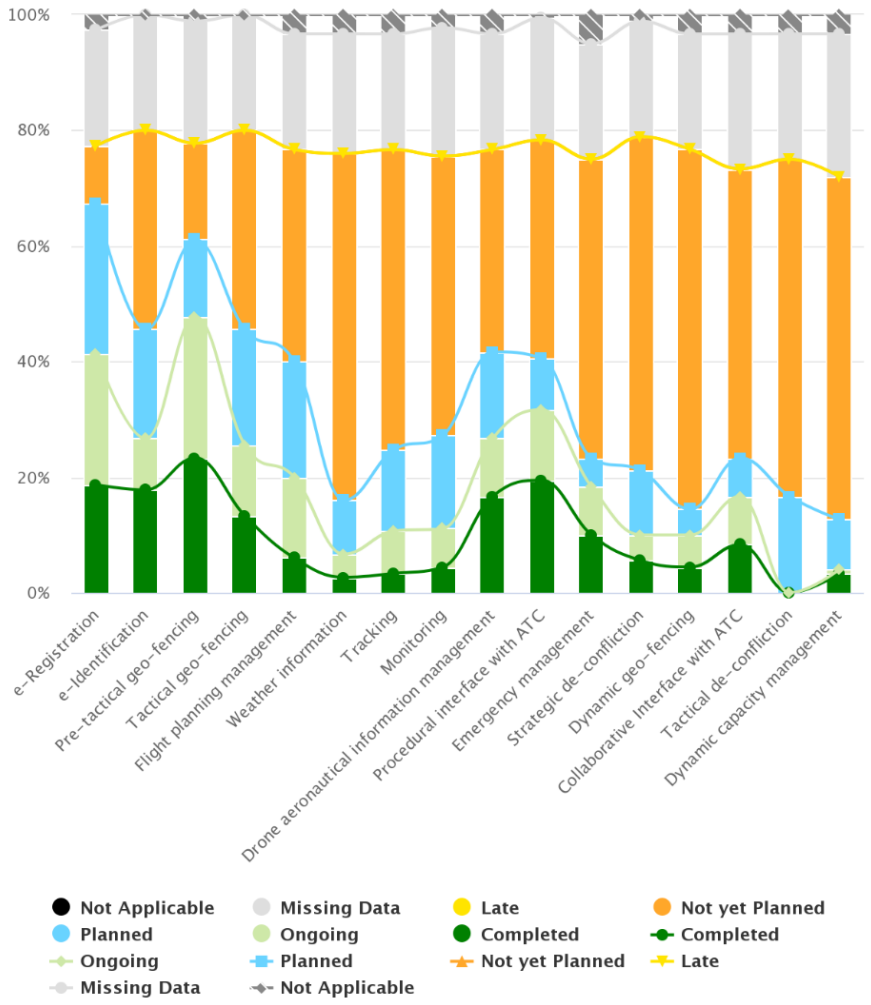


Figure 1 - U-Space services overall implementation

The implementation of elements of U-space services within U1, U2 and U3 is not uniform. Furthermore, negative completion trends were detected for a number of service elements compared with the last report edition. Such findings are due to the enlargement of the scope of the survey from the 28 EU Member States (ref. 2018) to the 30 EU SES Member States. It is also notable how some of the most active stakeholders did not provide any information, which also contributed to decrease completion rates. However, even though the reporting process is still in his infancy, it benefited from the integration with the more mature, consolidated Local Single Sky Implementation (LSSIP) mechanism in terms of both methodology ad resources allocation, which resulted in a more accurate picture of the U-Space Services implementation over the EU SES area.

Additional information regarding any active/planned demonstrations was also requested in order to develop a list of projects taking place within the European U-Space Demonstrator network.

Figure 2 represents an indicative, cumulative total of U-Space demonstration projects running between 2016 and 2024, mostly supported by EU funding programmes (ref. Figure 3).

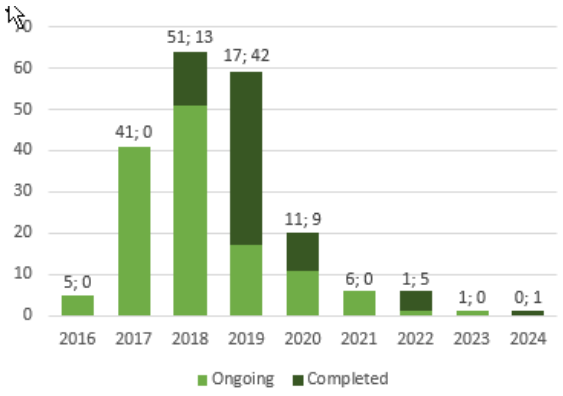


Figure 2 - Cumulative total U-Space demonstration projects

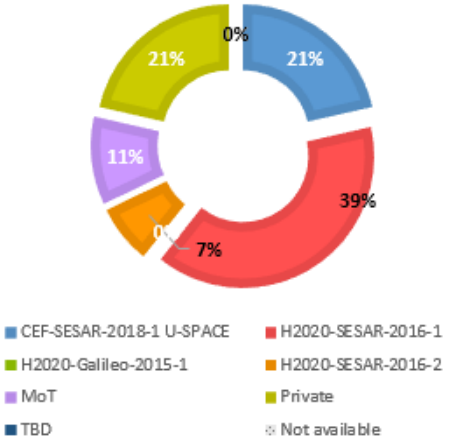


Figure 3 - Demo projects funding sources

Being developed within the scope of the EU Network of U-Space Demonstrators initiative, this report targeted the SES Area. The data collected covered 30 States.

Due to the lack of planning information available, the results should be considered a rather conservative estimate. In fact, although the implementation of many service elements is currently ongoing in several States, no assumptions were made on their deployment in absence of an expected full implementation date.

Finally, a number of stakeholders expressed the desire to have U-Space implementation monitoring integrated into EUROCONTROL's Master Plan Level 3 reporting framework, in order to optimise staff allocation and internal reporting procedures. Such a solution would indeed provide the opportunity to consolidate a coherent, all-encompassing approach to the European ATM planning and monitoring processes, methods, and tools. In addition, they also requested revisions to the questionnaire for future surveys with a view to clarifying some questions that are prone to misinterpretation.

1. INTRODUCTION

1.1. PURPOSE AND SCOPE OF THE REPORT

Projects aimed at both deployment and demonstration of U-Space-based concepts are currently in development all around Europe, evaluating the use of U-Space technologies for full-fledged commercial drone operations, notably very low level (VLL) operations, below 500 ft above ground level (AGL).

This U-Space Services Implementation Report presents an overview of the current implementation status and short to medium term planning information on the 16 services expected to be provided in phases U1 (2019) to U3 (2025), defined in the SESAR U-Space Blueprint [2].

The report provides a snapshot of the level of maturity, with reference date December 2019, of the main elements underlying the provision of the services enabling VLL drone operations in the Single European Sky (SES) Area.

The implementation progress is assessed against the implementation dates set in the Roadmap proposed for the safe integration of drones into all classes of airspace [1]. These Full Operational Capability (FOC) dates represent the target date by which the implementation of the service is expected to be completed.

It should be however noted that FOC dates are not prescriptive and are defined for harmonisation purposes only. In fact, the national stakeholders involved in this process can decide which services are the most promising for their own operating environment, with the exception of any possible future regulated and mandatory items.

This analysis will be updated regularly, as it will serve the monitoring of the U-Space concept implementation evolution, as well as support the development of roadmaps and the governance of the European Network of U-Space Demonstrators, in order to comprehensively address a rapid deployment of U-space Services framework.

1.2. U-SPACE FRAMEWORK

U-Space represents the European ecosystem of services and specific procedures designed to support safe, efficient and secure access to airspace for drones operations[2][3].

In order to achieve safe and efficient integration with manned aviation, the phased approach shown in Figure 4 is followed.

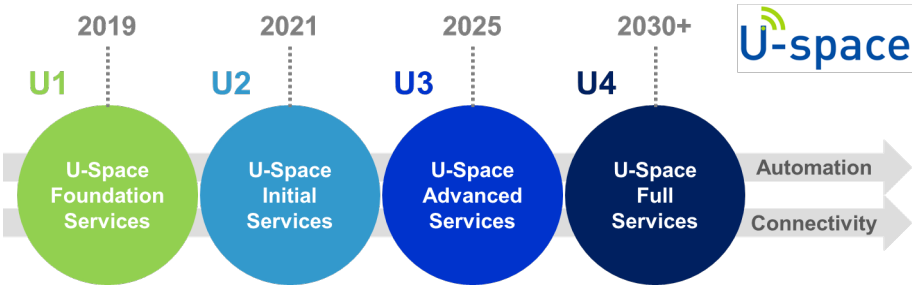


Figure 4 - U-Space implementation roadmap

Each phase of the incremental deployment of U-space will propose a new set of services (ref. Table 1), while including an upgraded version of the services already existing in the previous phase.

Phase		Service	
U1	Foundation Services	U1.1	e-Registration
		U1.2	e-Identification
		U1.3	Pre-tactical Geo-fencing
U2	Initial Services	U2.1	Tactical Geo-fencing
		U2.2	Flight Planning Management
		U2.3	Weather Information
		U2.4	Tracking
		U2.5	Monitoring
		U2.6	Drone Aeronautical Information Management
		U2.7	Procedural Interface with ATC
		U2.8	Emergency Management
		U2.9	Strategic De-confliction
U3	Advanced Services	U3.1	Dynamic Geo-fencing
		U3.2	Collaborative Interface with ATC
		U3.3	Tactical De-confliction
		U3.4	Dynamic Capacity Management
U4	Full Services	-	TBD

Table 1 - U-Space services framework

1.3. EUROPEAN NETWORK OF U-SPACE DEMONSTRATORS

The Helsinki High Level Conference on Drones, held in November 2017, called for establishment of a European U-space Demonstrator Network in order to provide a discussion forum based on the practical expertise of demonstrators, as the regulatory framework and standards are developed.

This network, developed in close collaboration with EUROCONTROL, EASA and SJU, was established in October 2018 considers demonstrations covering all aspects of drone operations, underscoring the importance of such initiatives in the implementation of the U-Space concept.

These demonstration projects are expected to give guidance on where the regulatory bar for safe and secure operations would be set; the industry will then be able to demonstrate that their solutions would fall within the regulatory limits. Such reassurance will allow industry to further invest in testing the feasibility of their technological solutions and standards.

2. SURVEY DESIGN AND DATA ANALYSIS METHODS

2.1. U-SPACE SERVICES IMPLEMENTATION SURVEY

A U-Space Services Implementation Survey was conducted by the EUROCONTROL PAS Unit in order to assess the level of maturity of the main elements underlying the provision of the services enabling VLL drone operations at European level.

The questionnaire was composed by a set of 60 questions covering 16 services (ref. Figure 5), whose implementation is planned in phases U1 (2019) to U3 (2025) - U4 services are not yet defined.

In particular, Member States part of SES Area were invited to provide data on the state of progress on implementation of the U-Space services, as well as any short to medium term planning information concerning those not yet fully implemented.

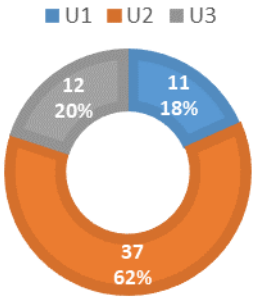


Figure 5- Survey composition

A national U-Space Focal Point (FP) was nominated by the State among the staff of either the National Supervisory Authority (NSA) or the Regulatory Authority or the Air Navigation Service Provider (ANSP), in order to ensure correct and consistent U-Space Services implementation information by respecting the agreed procedures and time schedule.

26 FPs equally distributed among national Ministries of Transport (MoT), Civil Aviation Authorities (CAA), and Air Navigation Service Providers (ANSP), including the LSSIP National Focal Points, were officially nominated by national administrations (ref. Figure 6).

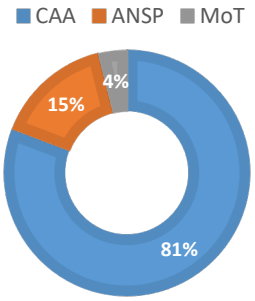


Figure 6 - Participants' profile

Additional information regarding any active/planned demonstrations were also requested in order to develop a list of projects taking place within the European U-Space Demonstrator network, including

a brief description, start and finish dates, organisation(s) and location(s) involved, as well as funding sources.

2.2. IMPLEMENTATION DATA ANALYSIS

The U-Space Services Implementation Survey was designed using closed-ended questions, in order to perform a quantitative analysis of the data through descriptive statistics.

Table 2 provides a definition of the different implementation statuses, as well as a colour schema used in the following implementation maps for assessment of the progress of the U-Space Services at national level.

	Status	Definition
	Completed	Deployment is reportedly fulfilled (i.e. in operational use).
	Ongoing	The implementation progress falls into one of the following cases: • Implementation is reportedly not yet completed; • Most of the service elements are completed but not operational.
	Planned	A planned schedule (including an approved and allocated budget) is defined, but the implementation has not yet kicked off.
	Late	The implementation progress falls into one of the following cases: • Part or all the elements of the service are planned to be implemented after the FOC date; • The implementation is ongoing, but expected to be in operational use after the FOC date; • The FOC date is already exceeded.
	Not Yet Planned	A project plan (including assigned financial and human resources) has not yet been developed.
	Not Applicable	The service element is not seen necessary or beneficial to the overall implementation of the service. N.B. Not applicable service elements are considered as completed when aggregated to others.

Table 2 - Implementation statuses definition

Each service was covered by one or more questions related to single associated monitoring elements.

An additional value, namely “MISSING DATA”, was finally introduced in order to codify the following cases:

- No information concerning a specific monitoring item;
- No response from the State - complete lack of information on the national environment.

In particular, “MISSING DATA” occurs whenever responders do not answer a specific question for any reason (e.g. the item is considered sensitive; inability to retrieve information on the item). In such a case the entire observation related to a U-Space service containing even a single missing value was assigned the status “MISSING DATA”.

The implementation status of a U-Space service was given by the equivalent aggregated status of the associated service elements, according to a recursive aggregation algorithm, assuming the status of each element equally relevant (i.e. no weight coefficients applied).

A univariate analysis of the implementation statuses was performed in order to determine progress frequency distributions (i.e. summary of percentages) and provide a snapshot of the level of maturity of each U-Space service.

To complement the information obtained analysing the answers to the closed-ended questions, several comments were also studied in detail. In order to allow for a more systematic analysis, questions were grouped by U-Space Service and comments were associated to their respective groups. Any potentially structured information contained in the comments (e.g. planning dates, number of demonstration projects, etc.) was extrapolated and encoded as quantitative data.

3. IMPLEMENTATION PROGRESS AND DEPLOYMENT PLANNING

This chapter provides an overview, mainly in the form of maps and statistics, of the current implementation progress and deployment planning information on each U-Space service.

The report presents data concerning 30 Member States of the SES Area (ref. Figure 7).

A “MISSING DATA” status (grey fill) was assigned to the States who did not provide any information on the implementation of U-Space services in their national environment.

Figure 7 - Responses coverage

The maps presented in the following sections show an aggregated view of the implementation status of each service at national level, determined according to an aggregation algorithm presented in the Implementation Data Analysis section.

A set of line charts provides deployment planning information, showing the expected completion rate evolution achieved in correspondence of the U-Space roadmap milestones (i.e. U1-2019, U2-2021, U3-2025) by the different elements underlying the provision of the services, starting from the current percentage of completion among the EU Member States.

Due to the lack of future planning information reported by respondents in the survey, the data presented in this chapter shall be considered a rather conservative estimate.

Indeed, although the implementation of many service elements is already ongoing in several States, no assumptions were made on their deployment, where the expected full implementation date was not provided. Therefore, their completion could not contribute to the overall data shown below.

Figure 8 shows the overall U-Space services completion rate evolution taking into account the average progress of implementation of different service elements among SES Member States. As an illustration, the figure shows that 7% of Member States reported to have implemented E-registration by 2019, 43% plan to implement in by 2021 and 46% by 2025.

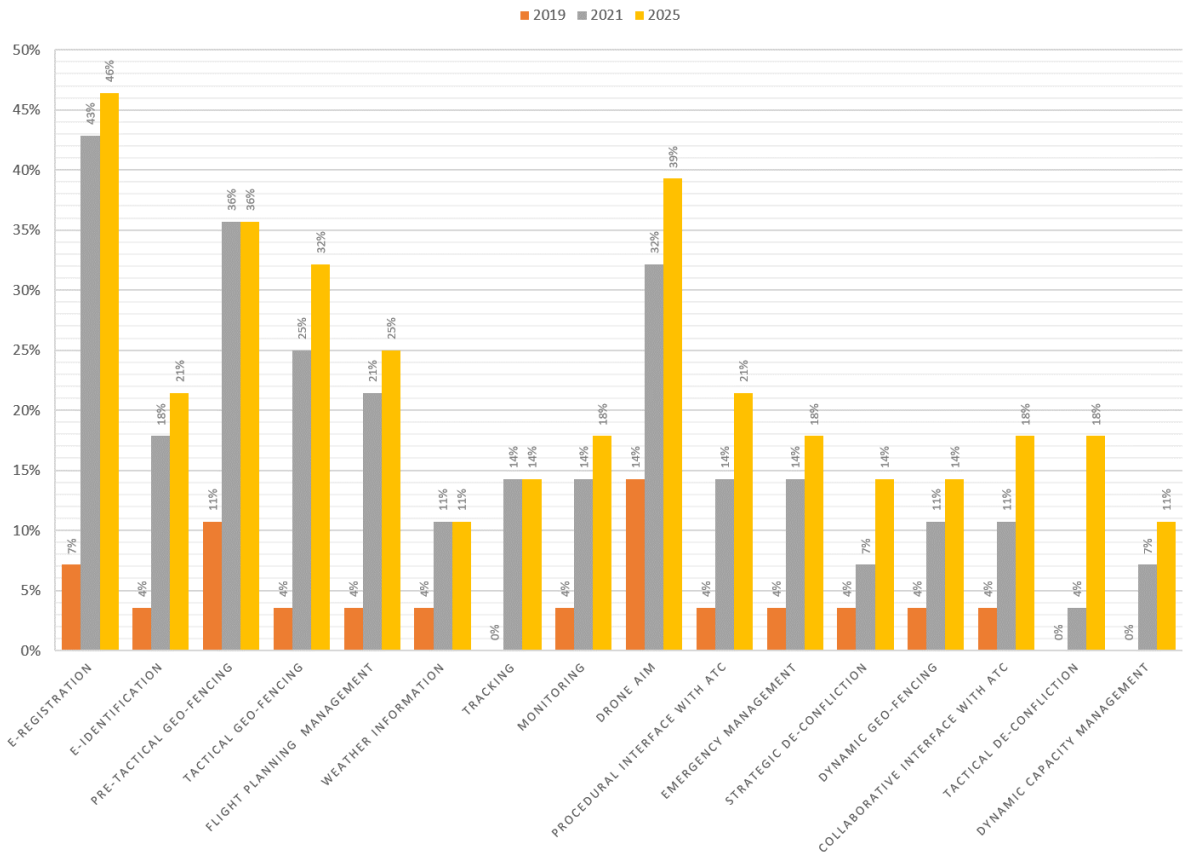


Figure 8 - Overall U-Space services completion rate evolution

3.1. U1 - E-REGISTRATION

Figure 9 shows that the implementation of the e-registration service is currently completed in 3 Member States, ongoing in 12 and planned in 7 States.

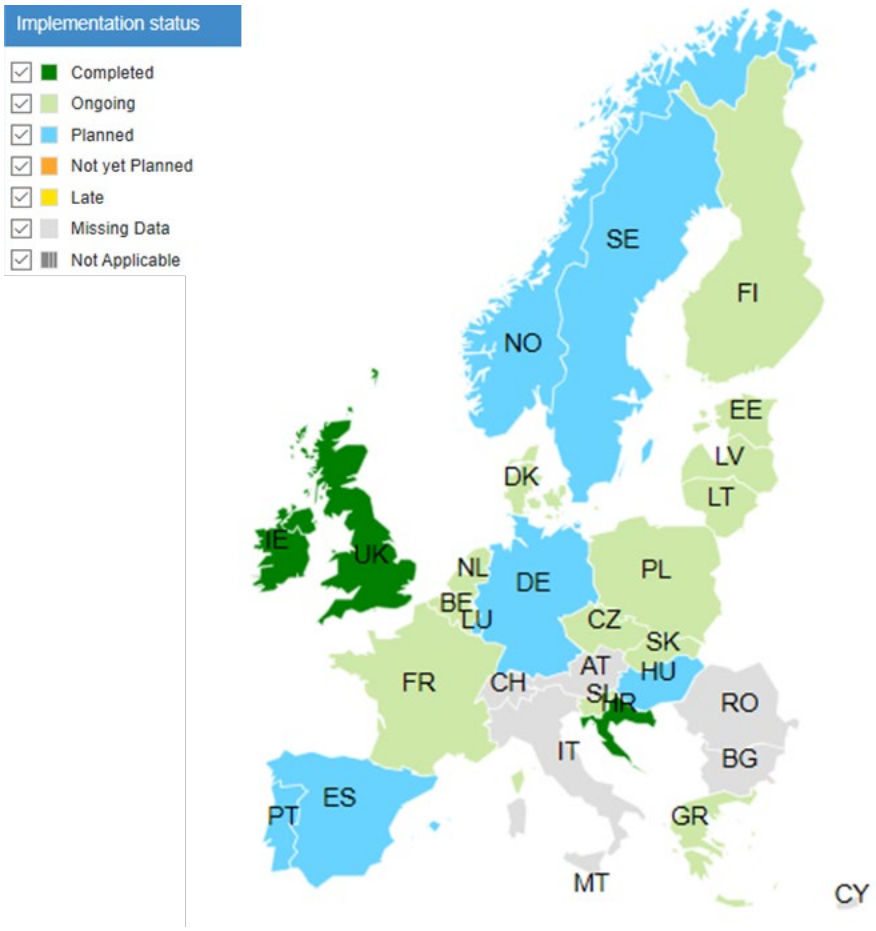
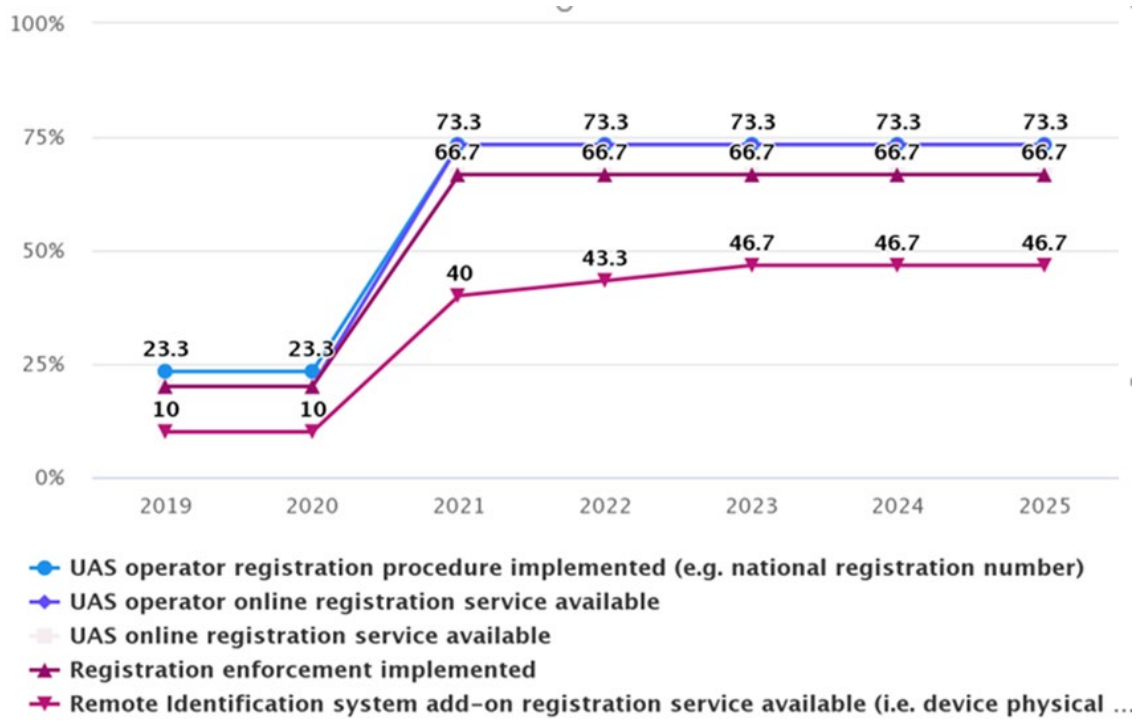


Figure 9 - E-Registration current implementation status

Figure 10 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
UAS operator registration procedure implemented (e.g. national registration number)	23,3%	23%	73,3%	73,3%	73,3%	73,3%	73,3%
UAS operator online registration service available	20%	20%	73,3%	73,3%	73,3%	73,3%	73,3%
UAS online registration service available	20%	20%	66,7%	66,7%	66,7%	66,7%	66,7%
Registration enforcement implemented	20%	20%	66,7%	66,7%	66,7%	66,7%	66,7%
Remote Identification system add-on registration service available (i.e. device physical serial number)	10%	10%	40%	43,3%	46,7%	46,7%	46,7%

Figure 10 - E-Registration completion rate evolution

The chart depicted in Figure 11 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of E-registration, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

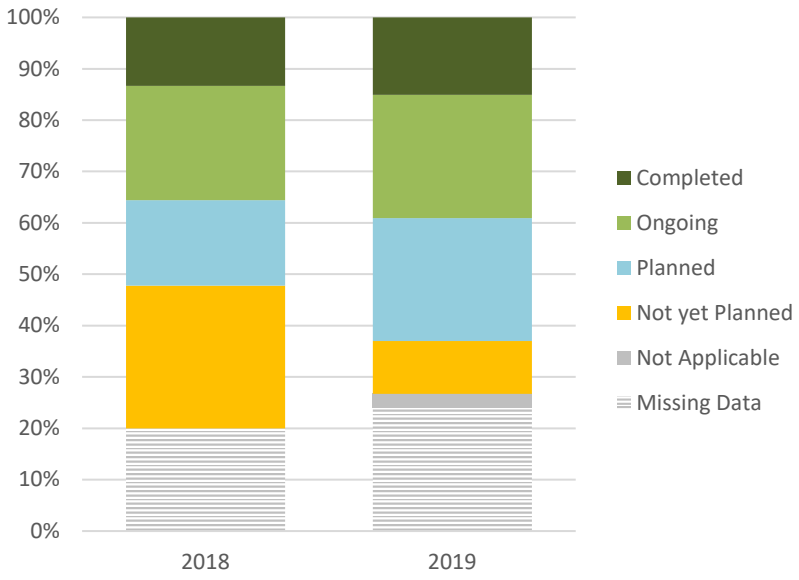


Figure 11 - E-Registration overall implementation progress comparison

3.2. U1 - E-IDENTIFICATION

Figure 12 shows that the implementation of the e-identification service is currently completed in 3 Member States, ongoing in 9 and planned in 8 States. On the other hand, 2 States do not have any plans yet.

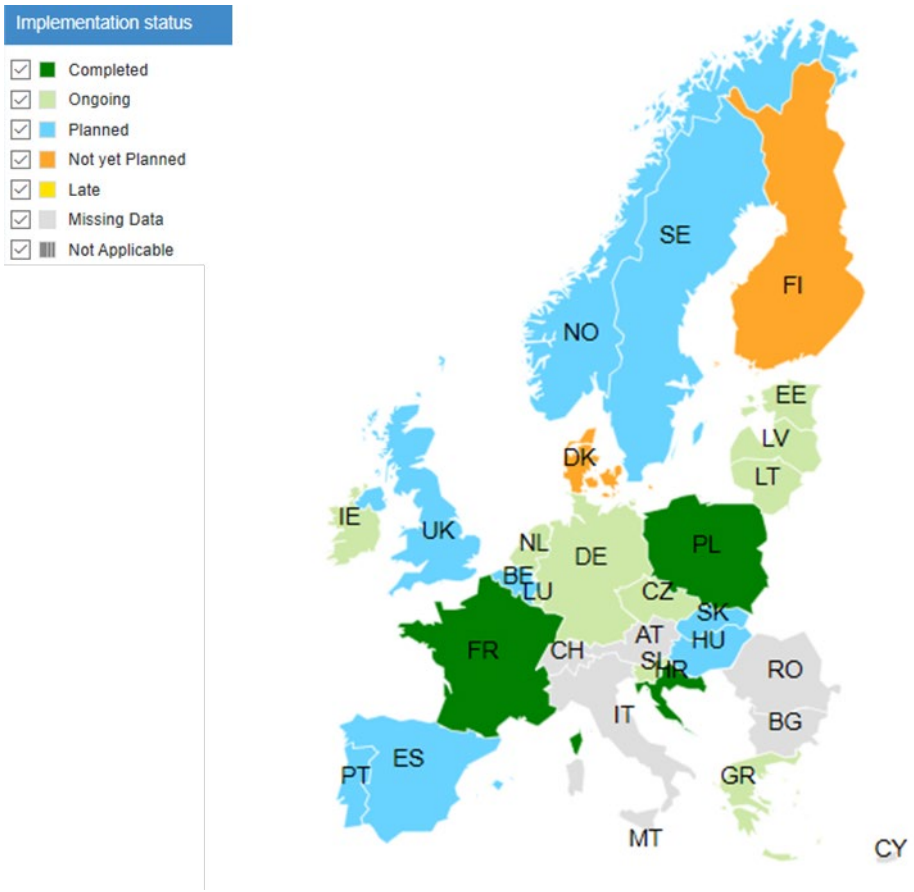
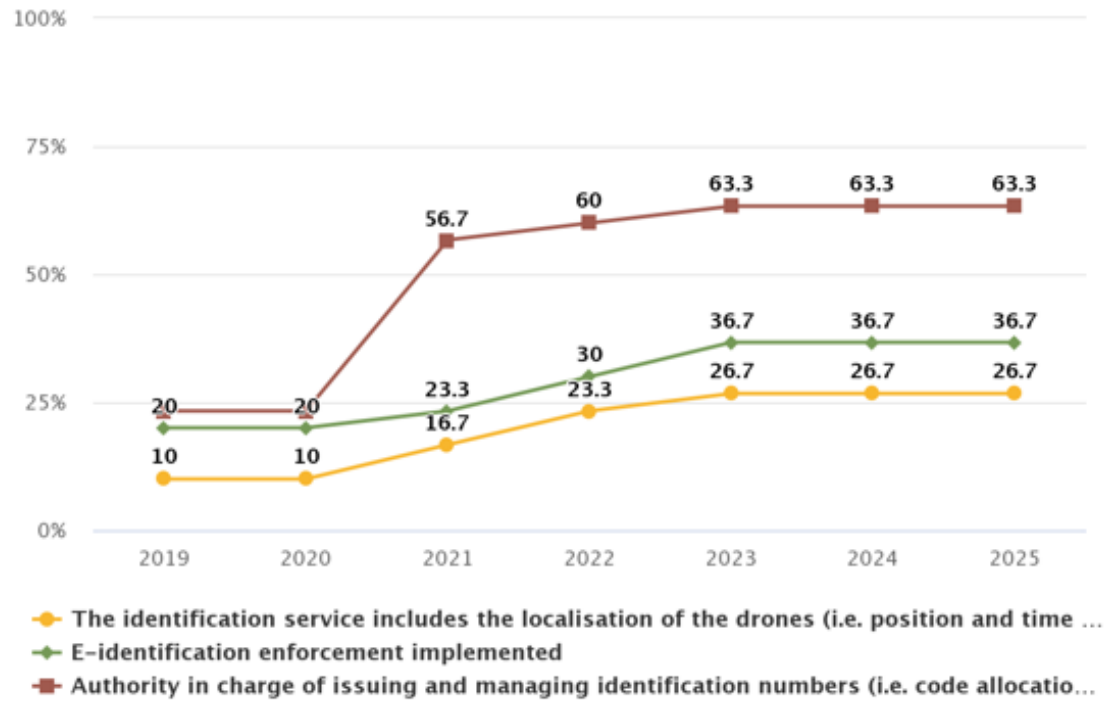


Figure 12 - E-Identification curent implementation status

Figure 13 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
The identification service includes the localisation of the drones (i.e position and time stamp)	10,00%	10%	16,70%	23,30%	26,70%	26,70%	26,70%
E-identification enforcement implemented	20%	20%	23,30%	30,00%	36,70%	36,70%	36,70%
Authority in charge of issuing and managing identification numbers (i.e. code allocation and	20%	20%	66,70%	66,70%	66,70%	66,70%	66,70%

Figure 13 - E-Identification completion rate evolution

The chart depicted in Figure 14 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the e-identification service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

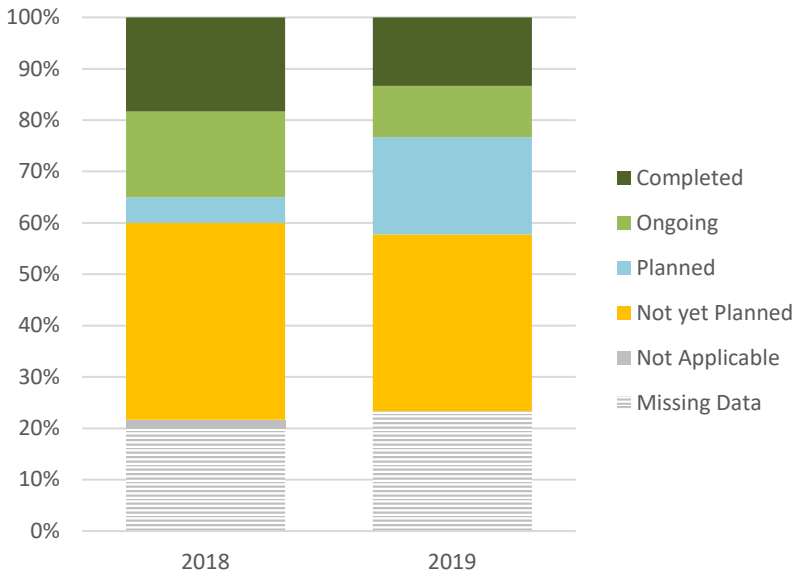


Figure 14 - E-Identification overall implementation progress comparison

3.3. U1 - PRE-TACTICAL GEO-FENCING

Figure 15 shows that the implementation of the pre-tactical geo-fencing service is currently completed in 4 Member States, ongoing in 15 and planned in 2 States. On the other hand, 1 State does not have any plans yet.

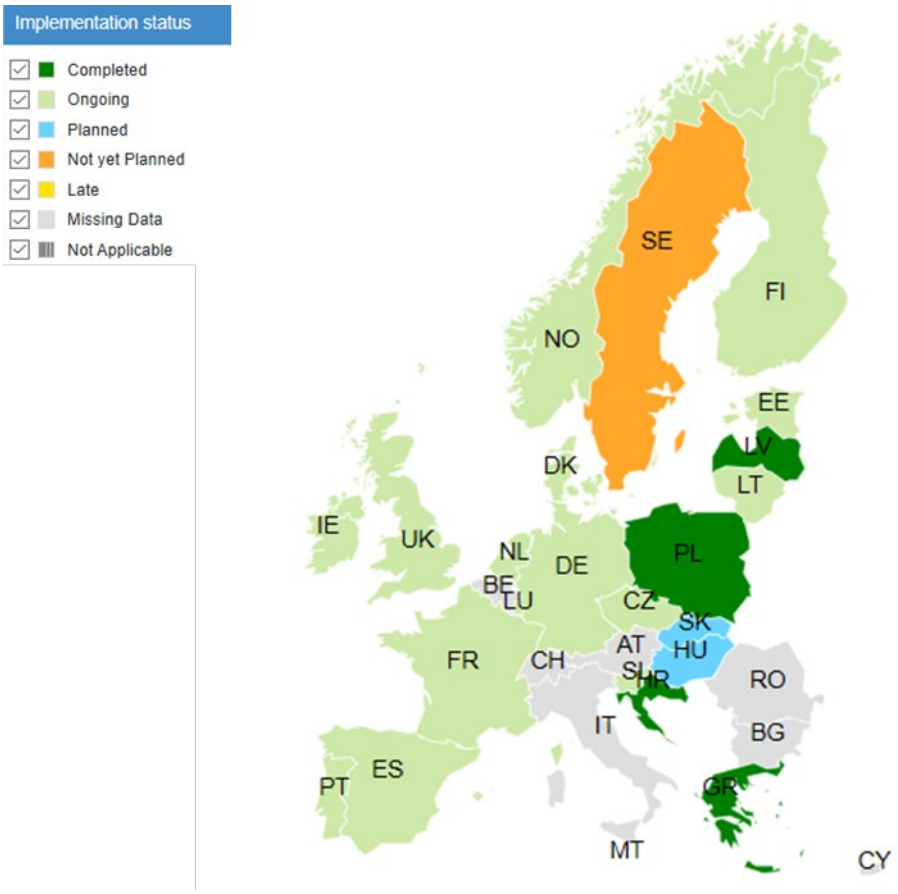
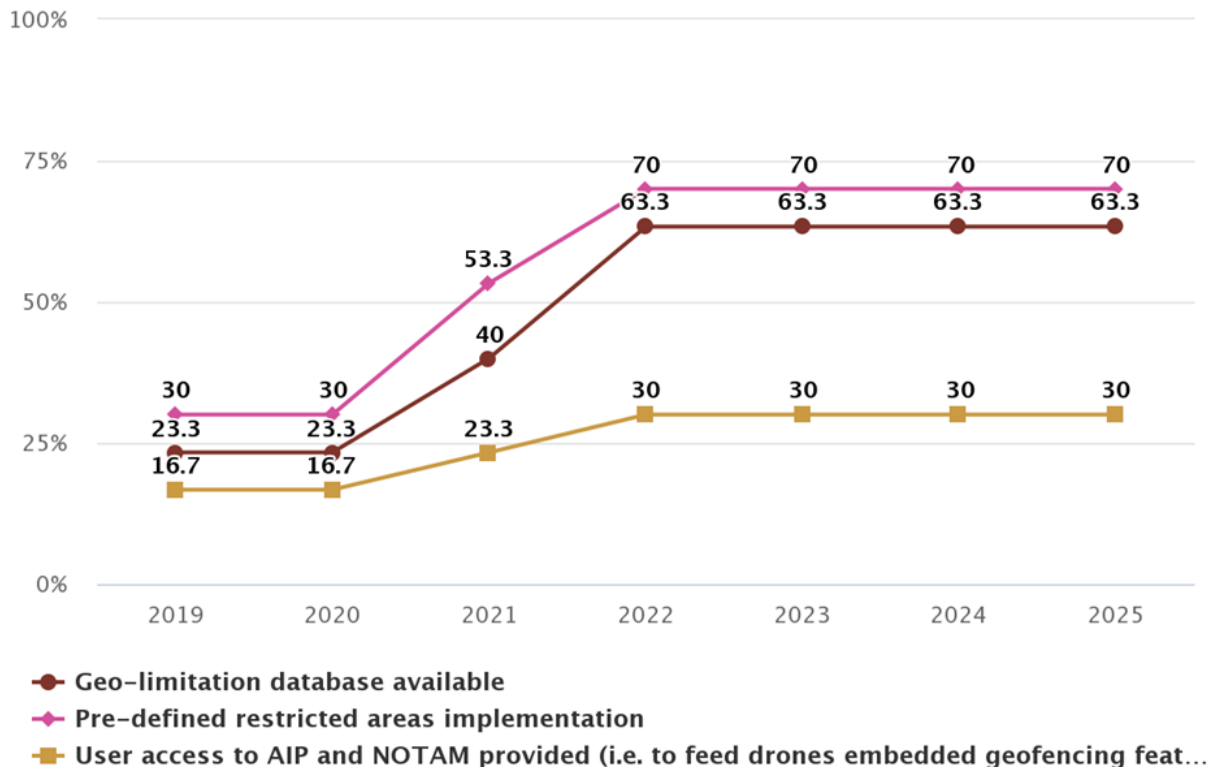


Figure 15 - Pre-tactical geo-fencing current implementation status

Figure 16 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Geo-limitation database available	23,30%	23%	40,00%	63,30%	73,30%	73,30%	73,30%
Pre-defined restricted areas implementation	30%	30%	53,30%	70,00%	70,00%	70,00%	70,00%
User access to AIP and NOTAM PROVIDED (i.e. to feed drones embedded geofencing features)	16,7%	16,7%	23,30%	30,00%	30,00%	30,00%	30,00%

Figure 16 - Pre-tactical geo-fencing completion rate evolution

The chart depicted in Figure 17 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the pre-tactical geo-fencing overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

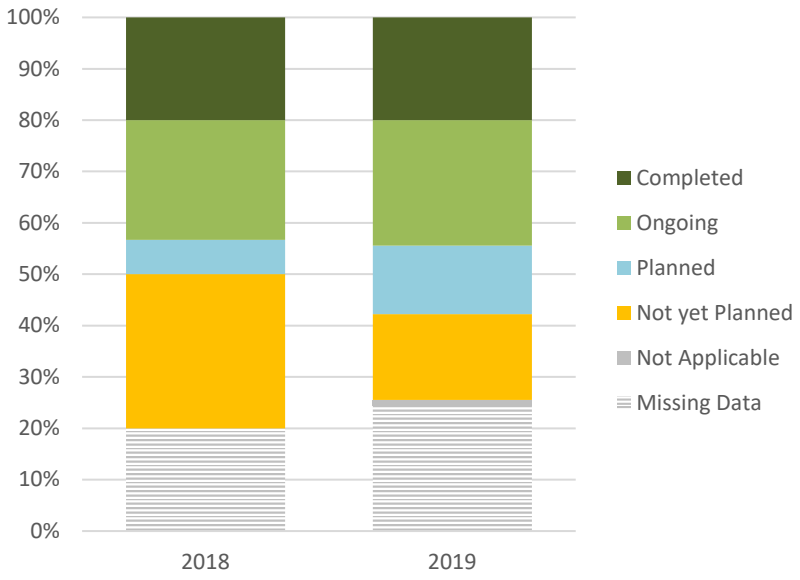


Figure 17 - Pre-tactical geo-fencing overall implementation progress comparison

3.4. U2 - TACTICAL GEO-FENCING

Figure 18 - Tactical geo-fencing current implementation status shows that the implementation of the tactical geo-fencing service is currently completed in 1 Member State, ongoing in 9 and planned in 6 States. On the other hand, 7 do not have any plans yet.

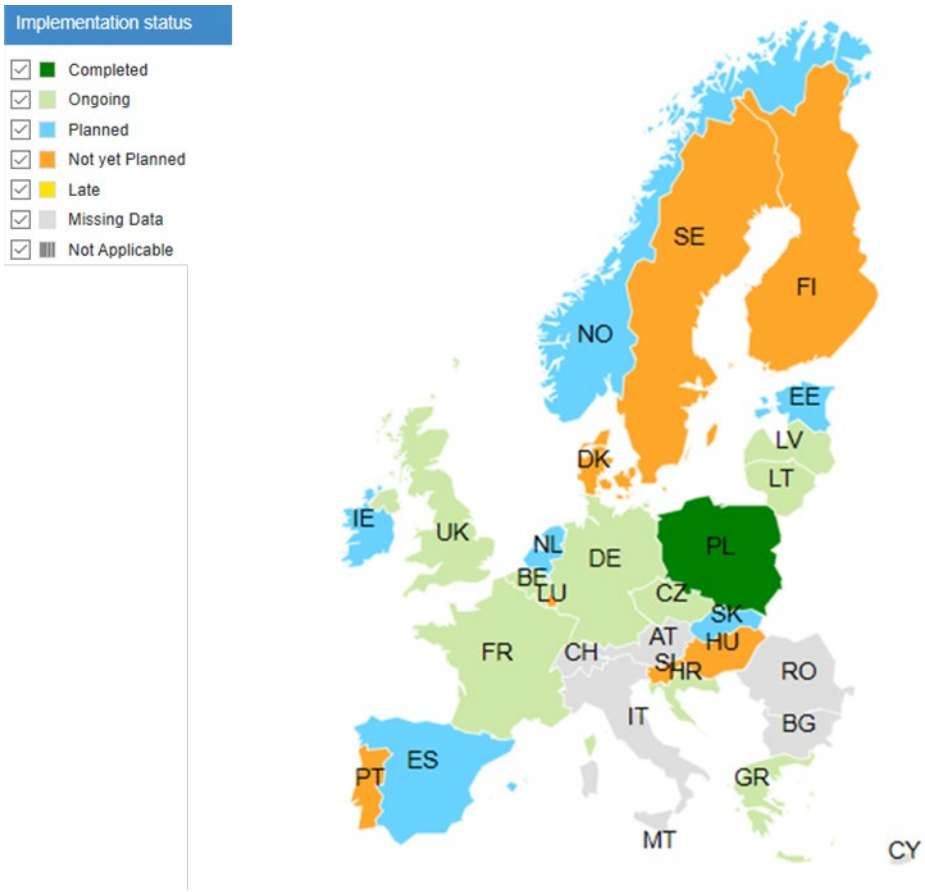
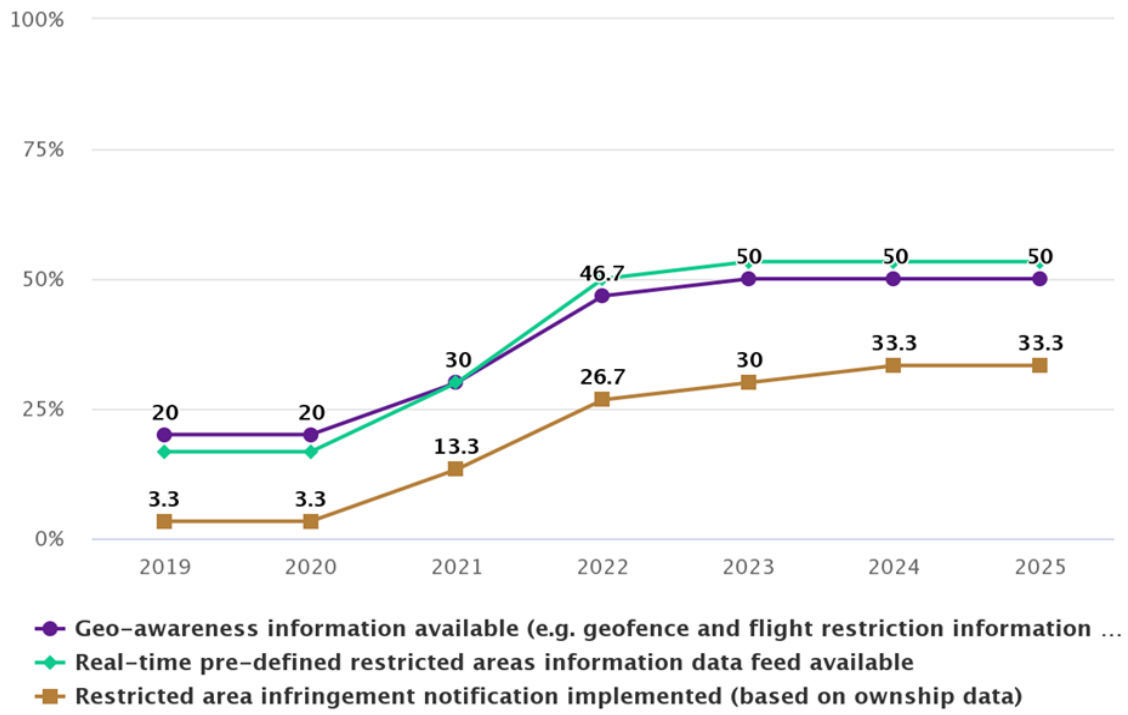


Figure 18 - Tactical geo-fencing current implementation status

Figure 19 - Tactical geo-fencing completion rate evolution shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Geo-awareness information available (e.g. geofence and flight restriction information provided up to the moment to take-off)	20,00%	20,00%	46,70%	50,00%	50,00%	50,00%	50,00%
Real-time pre-defined restricted areas information data feed available	16,7%	16,7%	30,00%	50,00%	53,30%	53,30%	53,30%
Restricted area infringement notification implemented (based on ownship data)	3,3%	3,3%	13,30%	26,70%	30,00%	33,30%	33,30%

Figure 19 - Tactical geo-fencing completion rate evolution

The chart depicted in Figure 20 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the tactical geo-fencing overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

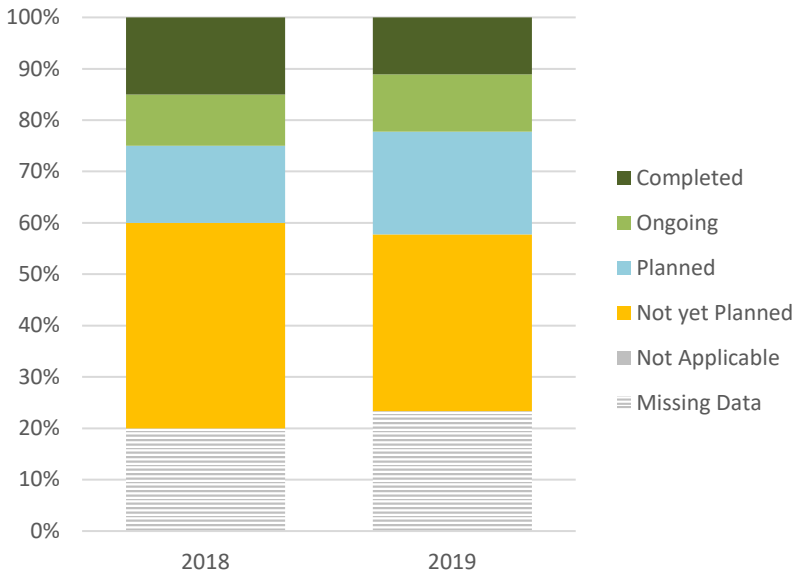


Figure 20 - Tactical geo-fencing overall implementation progress comparison

3.5. U2 - FLIGHT PLANNING MANAGEMENT

Figure 21 shows that the implementation of the flight planning management service is currently completed in 1 Member State, ongoing in 12 and planned in 4 States. On the other hand, 6 States do not have any plans yet.

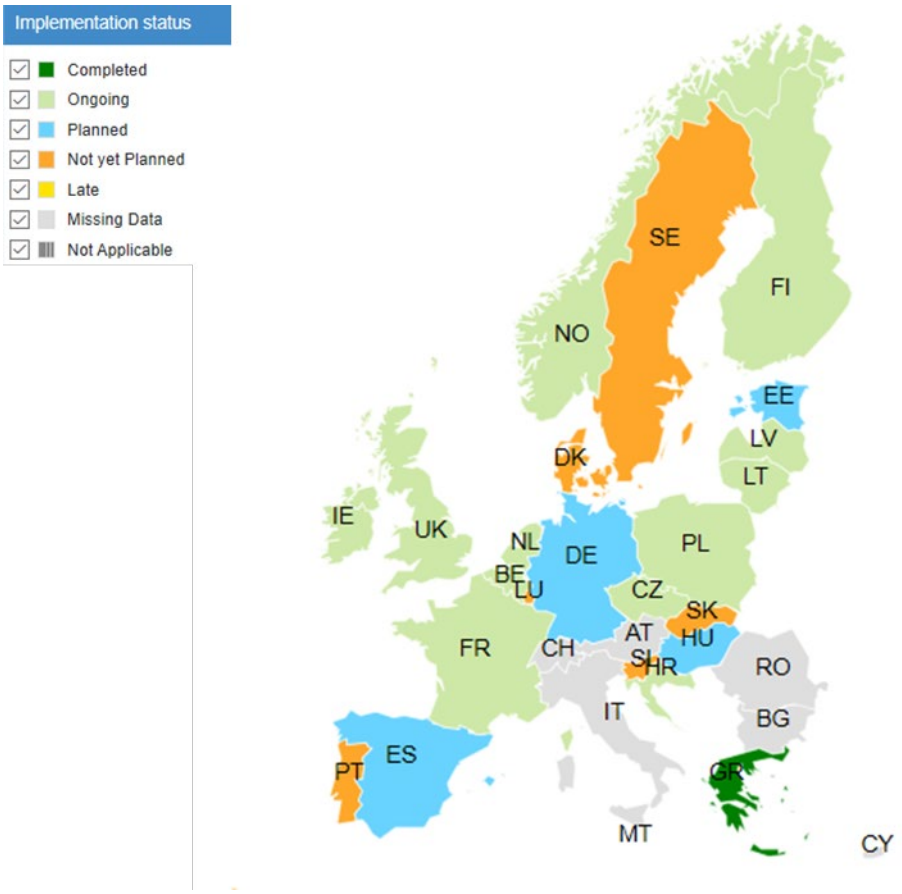
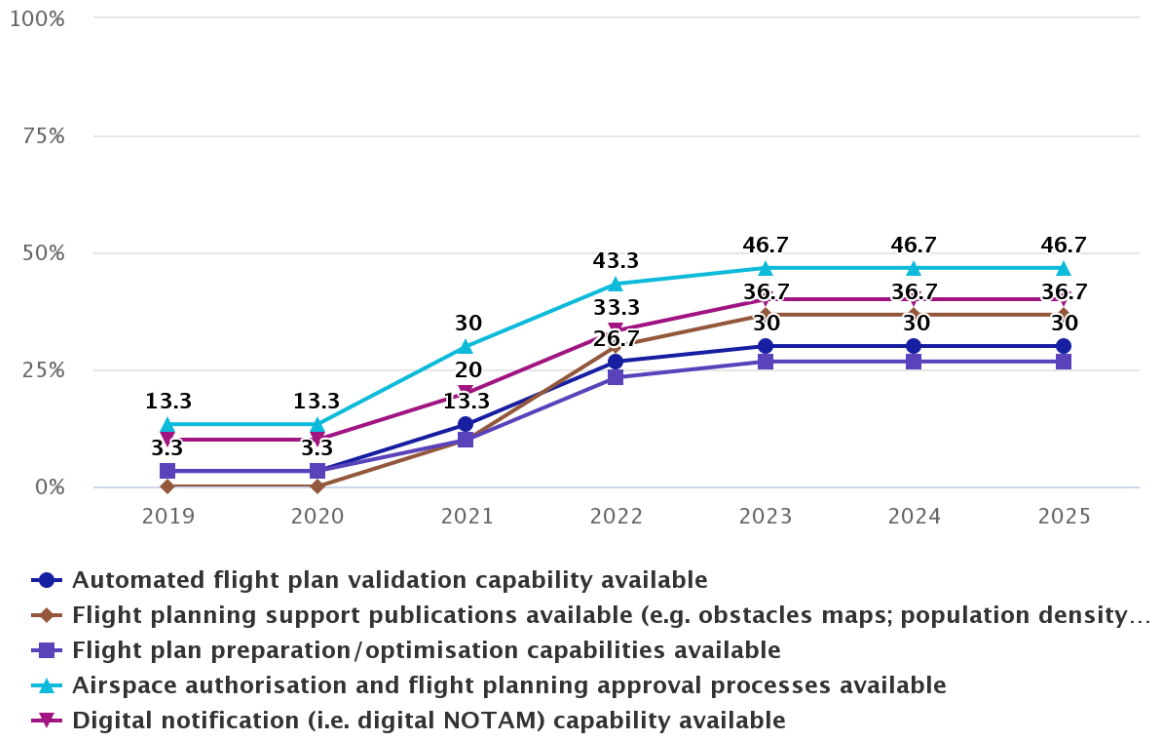


Figure 21 - Flight planning management current implementation status

Figure 22 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Automated flight plan validation capability available	3,3%	3,3%	13,3%	26,7%	30%	30%	30%
Flight planning support publications available (e.g obstacle maps; population density maps; risk reduction)	0%	0%	10%	30,0%	36,7%	36,7%	36,7%
Flight plan preparation/optimisation capabilities available	3,3%	3,3%	10%	23,3%	26,7%	26,7%	26,7%
Airspace authorisation and flight planning approval processes available	13,3%	13.3%	30,0%	43,3%	46,7%	46,7%	46,7%
Digital notification (i.e. digital NOTAM) capability available	10%	10%	20%	33,3%	40%	40%	40%

Figure 22 - Flight planning management completion rate evolution

The chart depicted in Figure 23 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the flight planning management overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

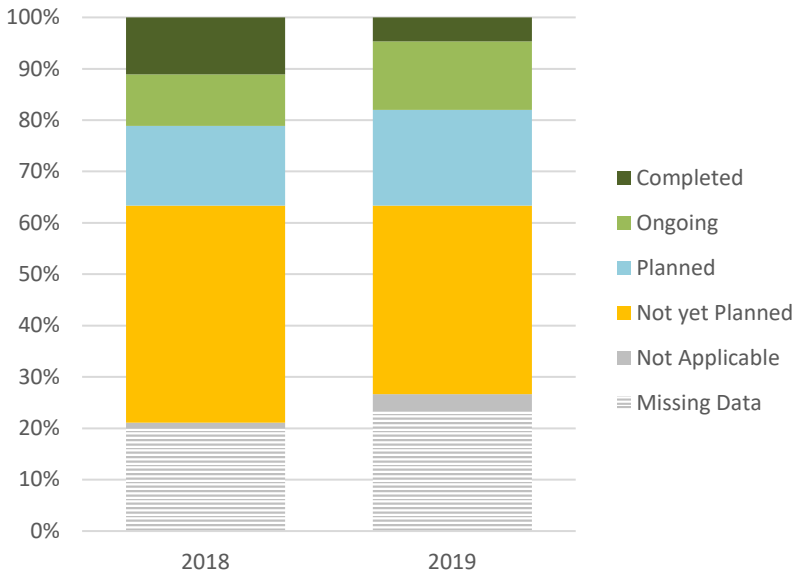


Figure 23 - Flight planning management overall implementation progress comparison

3.6. U2 - WEATHER INFORMATION MANAGEMENT

Figure 24 shows that the implementation of the weather information service is currently competed in 1 Member State, ongoing in 6 and planned in 2 States. On the other hand, 13 States do not have any plans yet.

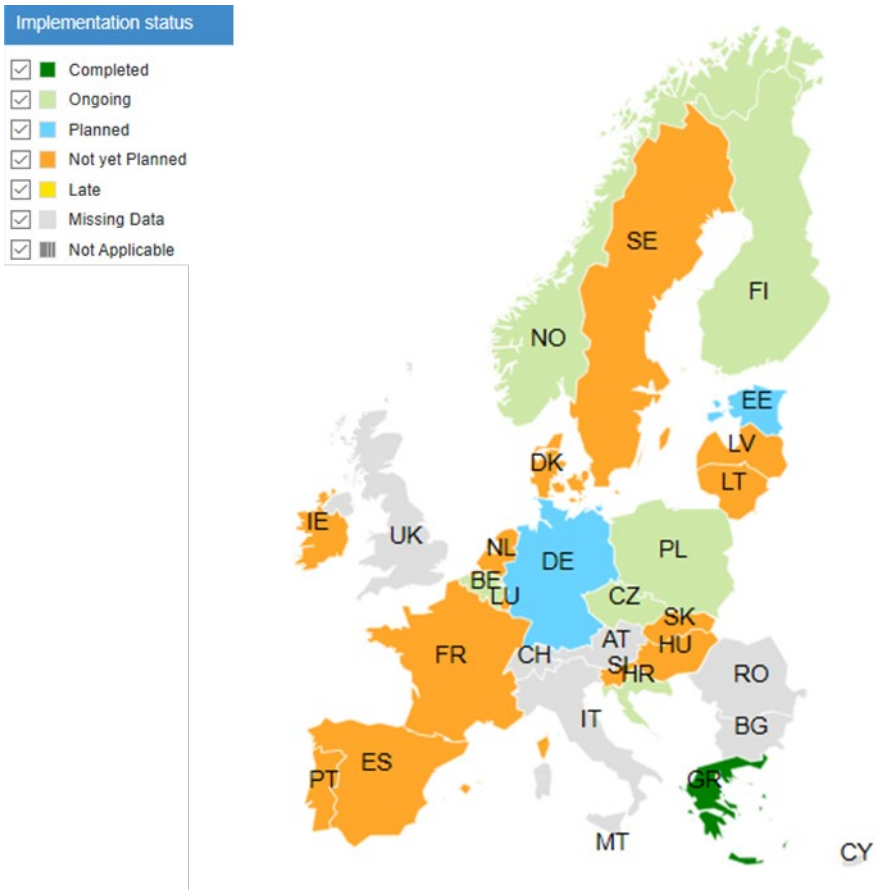
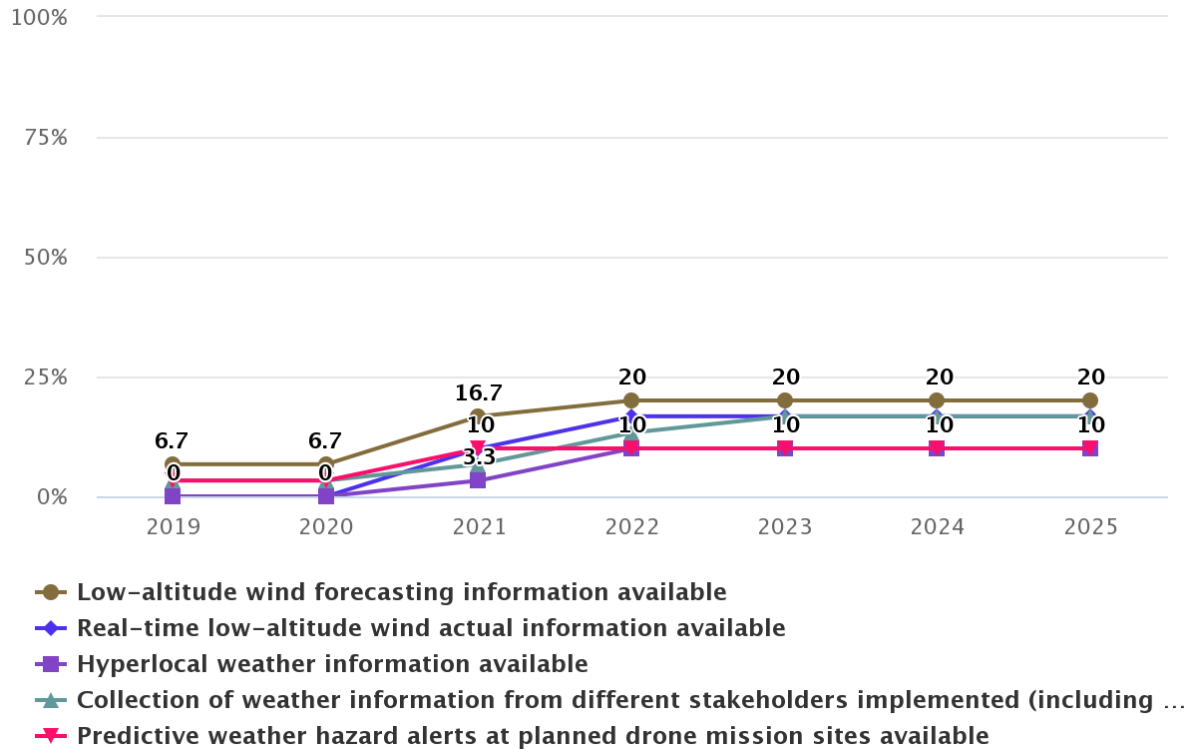


Figure 24 - Weather information management current implementation status

Figure 25 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Low-altitude wind forecasting information available	6,7%	6,7%	16,7%	20%	20%	20%	20%
Real-time low-altitude wind actual information available	0%	0%	10,0%	16,7%	16,7%	16,7%	16,7%
Hyperlocal weather information available	0%	0%	3,3%	10%	10%	10%	10%
Collection of weather information from different stakeholders implemented (including return of weather info drone to UTM)	3,3%	3,3%	6,7%	13,3%	16,7%	16,7%	16,7%
Predictive weather hazard alerts at planned drone mission sites available	3.3%	3.3%	10%	10,0%	10%	10%	10%

Figure 25 - Weather information management completion rate evolution

The chart depicted in Figure 26 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the weather information management overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

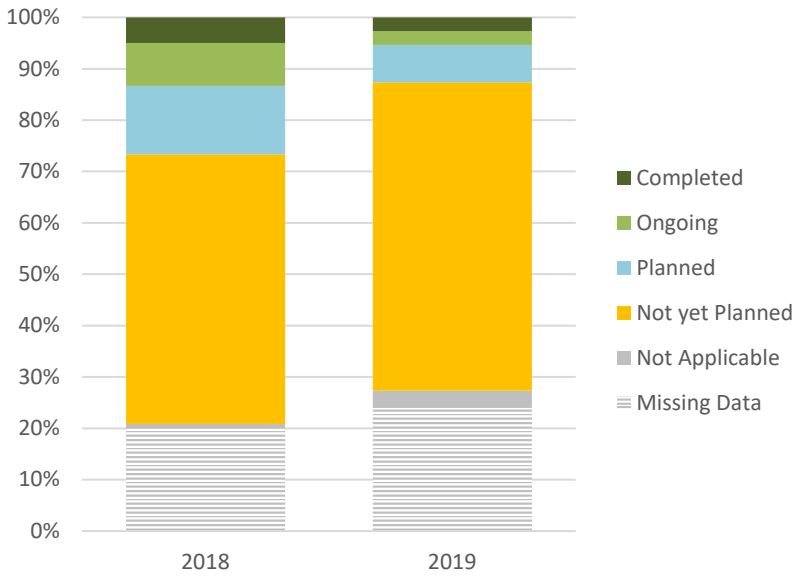


Figure 26 - Weather information management overall implementation progress comparison

3.7. U2 - TRACKING

Figure 27 shows that the implementation of the tracking service is currently ongoing in 5 Member States and also planned in 5 other States. On the other hand, 12 States do not have any plans yet and 1 State declared the service not applicable.

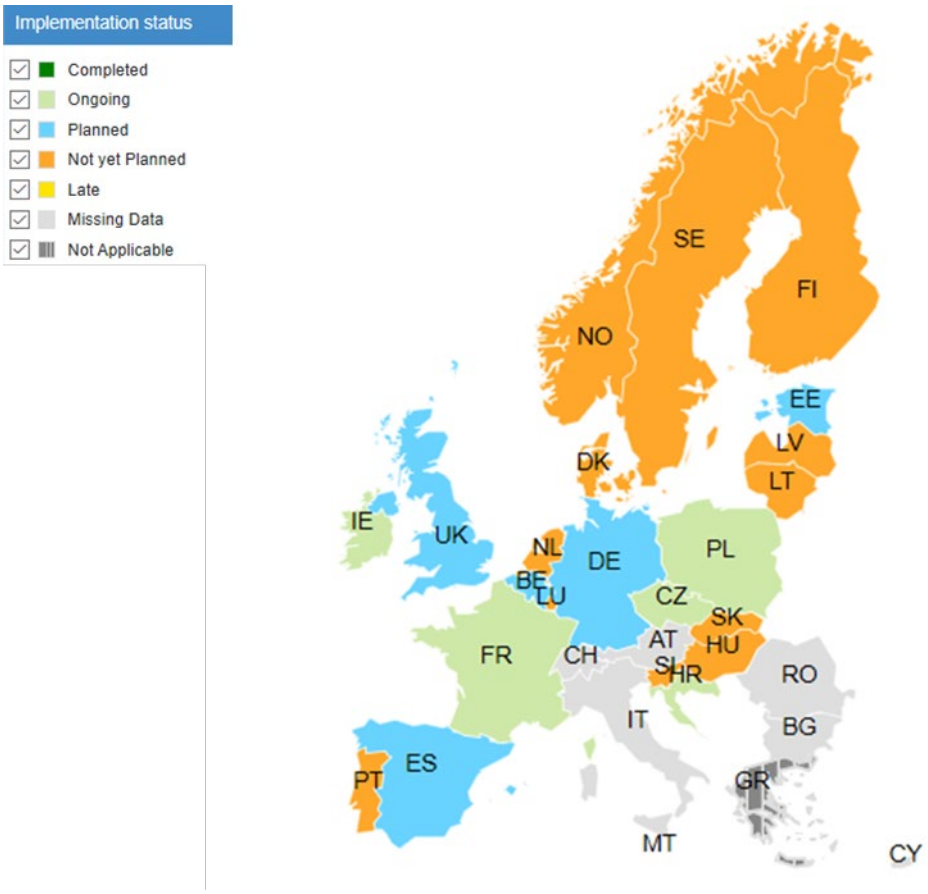
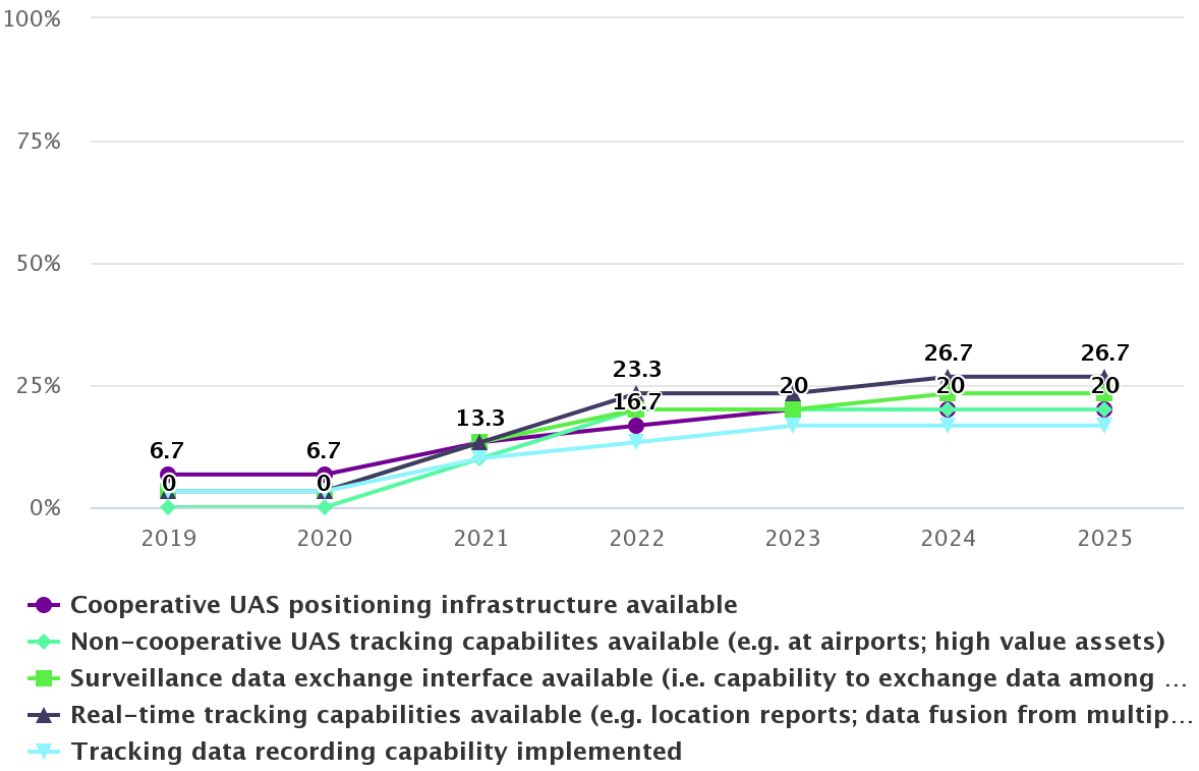


Figure 27 - Tracking current implementation status

Figure 28 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Cooperative UAS positioning infrastructure available	6,7%	6,7%	13,3%	16,7%	20%	20%	20%
Non-cooperative UAS tracking capabilites available (e.g. at airports; high value assets)	0%	0%	10%	20%	20%	20%	20%
Surveillance data exchange interface available (i.e. capability to exchange data among the tracking service and other services/systems)	3,3%	3,3%	13,3%	20%	20%	23,3%	23,3%
Real-time tracking capabilities available (e.g. location reports; data fusion from multiple sources)	3,3%	3.3%	13,3%	23,3%	23,3%	26,7%	26,7%
Tracking data recording capability implemented	3,3%	3,3%	10%	13,3%	16,7%	16,7%	16,7%

Figure 28 - Tracking completion rate evolution

The chart depicted in Figure 29 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the tracking overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

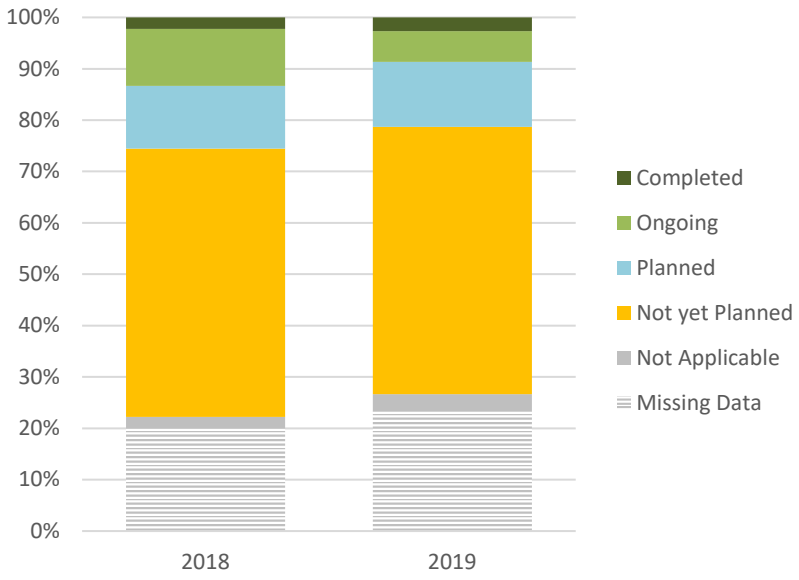


Figure 29 - Tracking overall implementation progress comparison

3.8. U2 - MONITORING

Figure 30 shows that the implementation of the monitoring service is currently ongoing in 5 Member States and also planned in 5 other States. On the other hand, 12 States do not have any plans yet and 1 State declared the service not applicable.

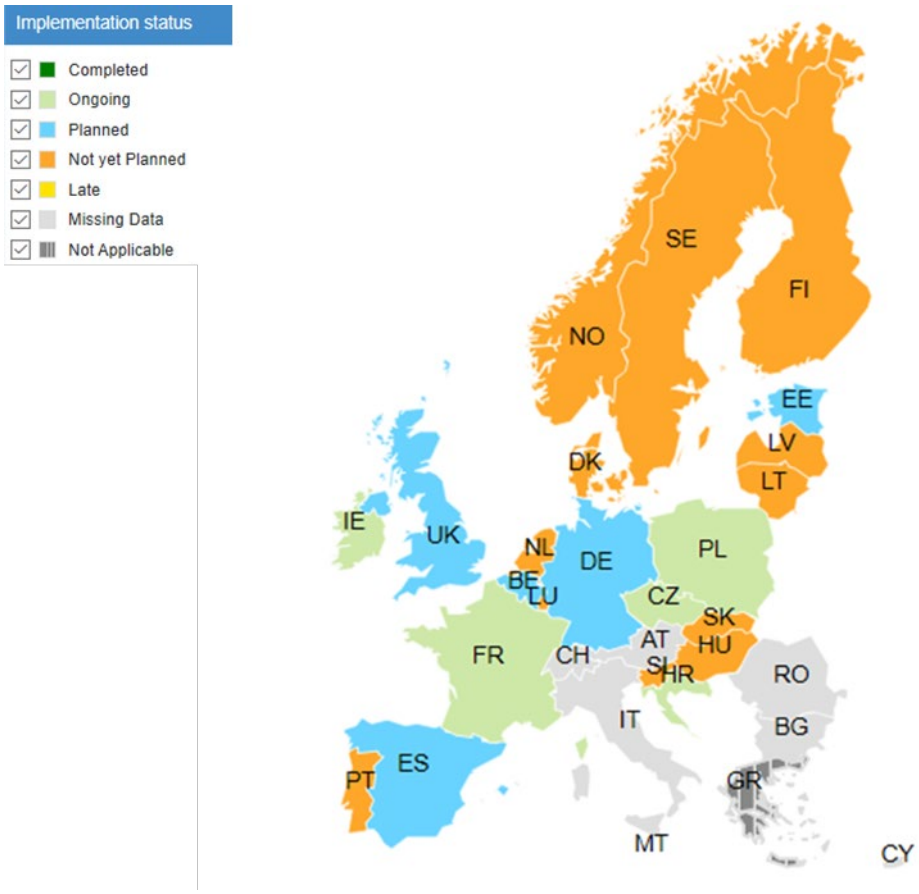
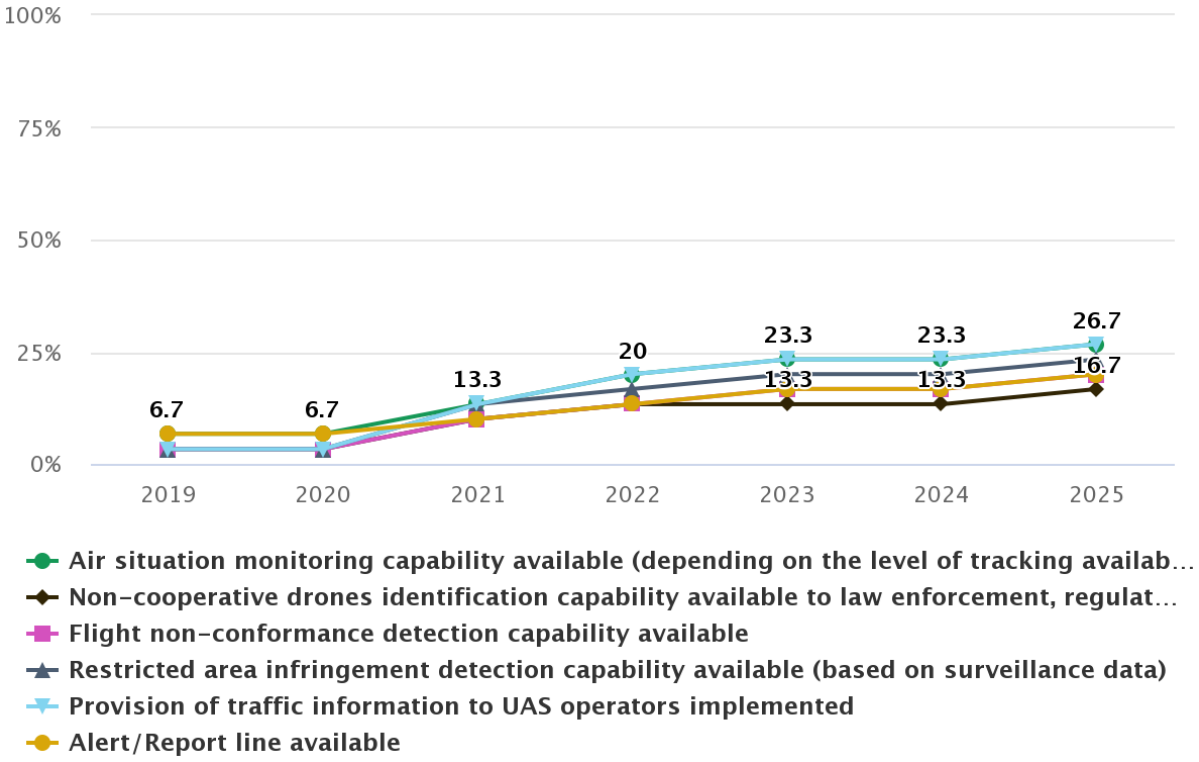


Figure 30 - Tracking overall implementation progress comparison

Figure 31 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Air situation monitoring capability available (depending on the level of tracking available. See U2 Tracking capabilities)	6,7%	6,7%	13,3%	20%	23,3%	23,3%	26,7%
Non-cooperative drones identification capability available to law enforcement, regulatory authority and service providers	3.3%	3.3%	10%	13,3%	13,3%	13,3%	16,7%
Flight non-conformance detection capability available	3,3%	3,3%	10%	13,3%	16,7%	16,7%	20%
Restricted area infringement detection capability available (based on surveillance data)	3,3%	3.3%	13,3%	16,7%	20%	20%	23,3%
Provision of traffic information to UAS operators implemented	3,3%	3,3%	13,3%	20%	23,3%	23,3%	26,7%
Alert/Report line available	6,7%	6,7%	10%	13,3%	16,7%	16,7%	20%

Figure 31 - Monitoring completion rate evolution

The chart depicted in Figure 32 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the monitoring overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

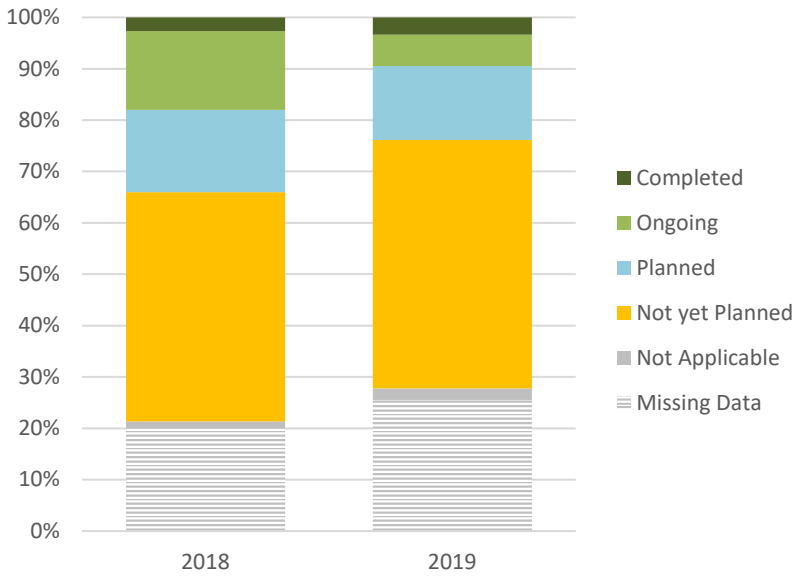


Figure 32 - Monitoring overall implementation progress comparison

3.9. U2 - DRONE AERONAUTICAL INFORMATION MANAGEMENT

Figure 33 shows that the implementation of the drone AIM service is currently completed in 5 Member States, ongoing in 4 and planned in another 4 States. On the other hand, 9 States do not have any plans yet and 1 State declared the service not applicable.

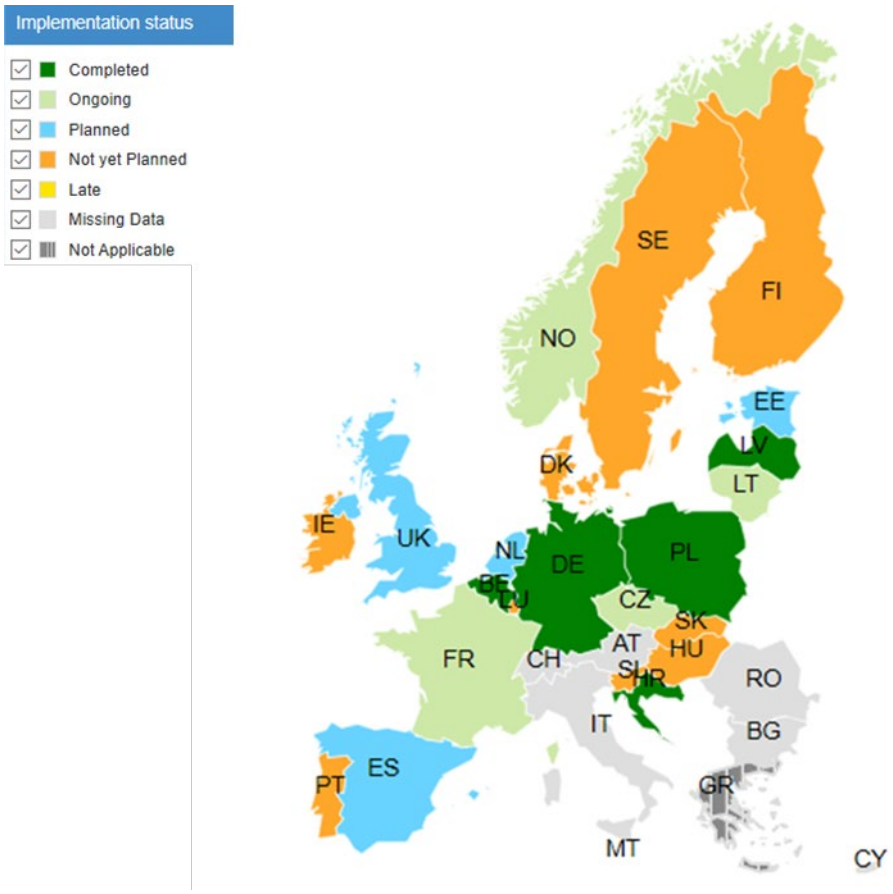
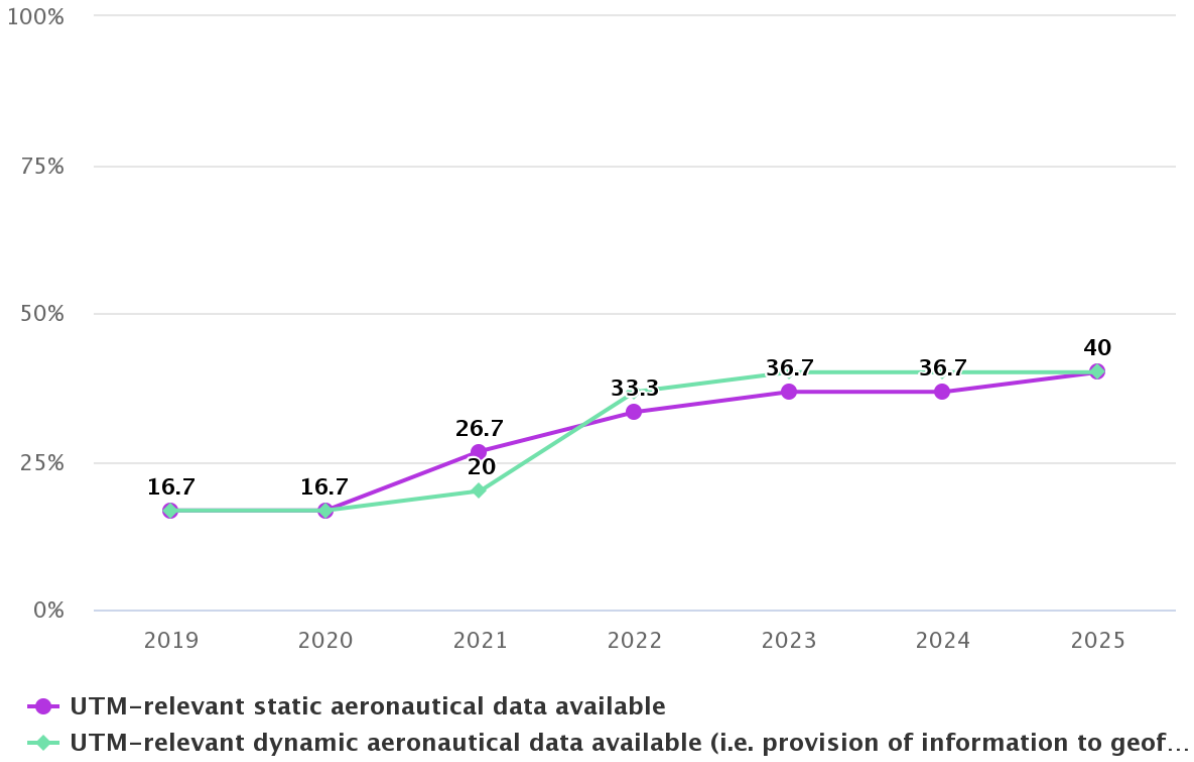


Figure 33 - Drone AIM current implementation status

Figure 34 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
UTM-relevant static aeronautical data available	16,7%	16,7%	26,7%	33,3%	36,7%	36,7%	40%
UTM-relevant dynamic aeronautical data available (i.e. provision of information to geofencing and mission planning services)	16,7%	16,7%	20%	36,7%	40%	40%	40%

Figure 34 - Drone AIM completion rate evolution

The chart depicted in Figure 35 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the monitoring overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

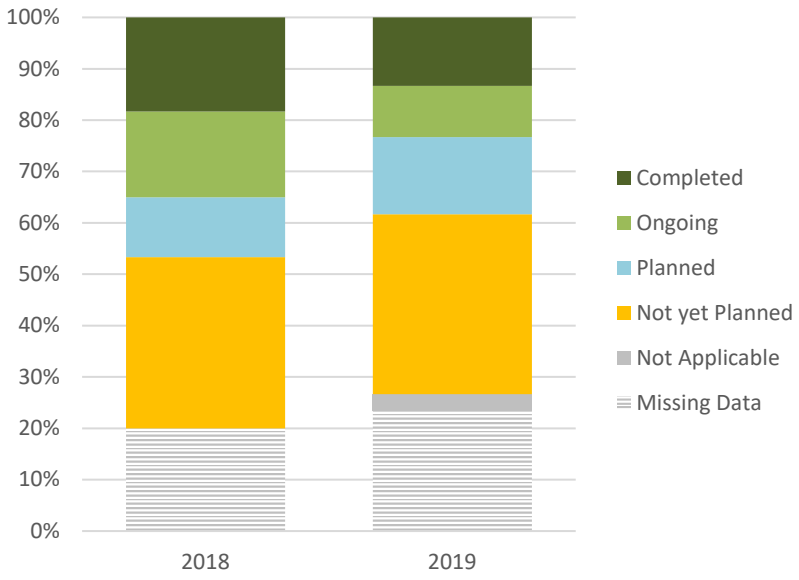


Figure 35 - Drone AIM overall implementation progress comparison

3.10. U2 - PROCEDURAL INTERFACE WITH ATC

Figure 36 shows that the implementation of the procedural interface with ATC is currently completed in 2 Member States and ongoing in 11 and planned in 2 States. On the other hand, 7 do not have any plans yet.

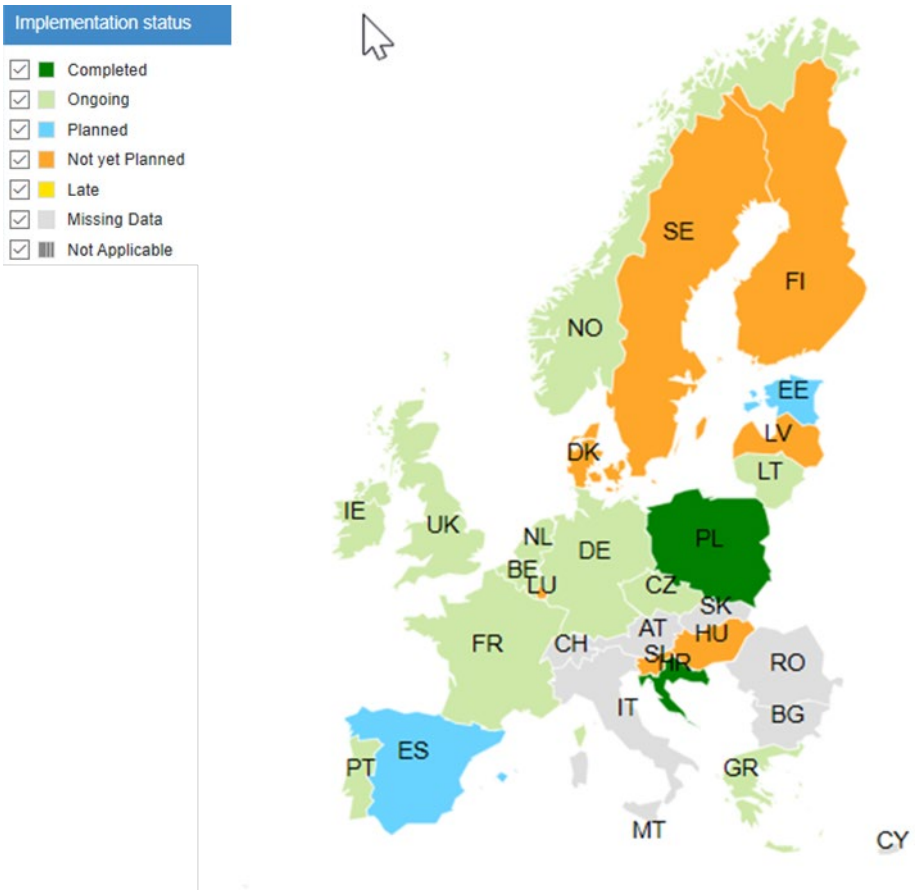
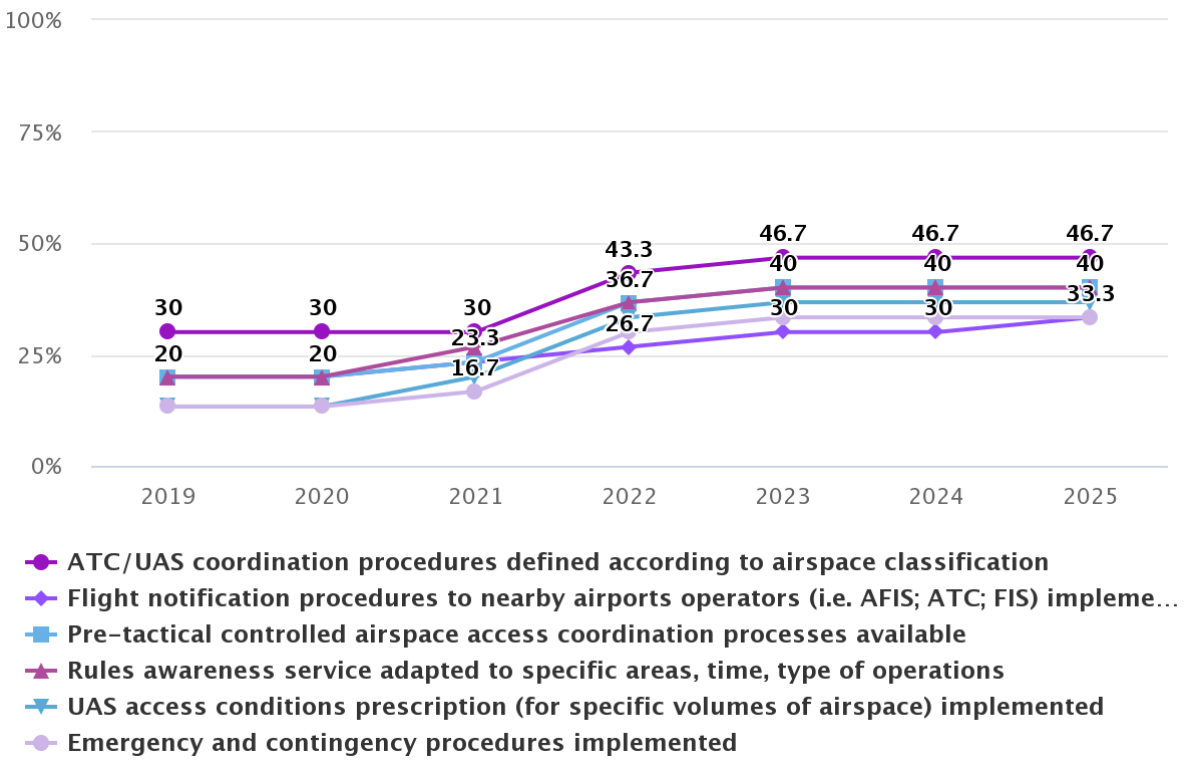


Figure 36 - Procedural ATC interface current implementation status

Figure 37 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
ATC/UAS coordination procedures defined according to airspace classification	6,7%	6,7%	13,3%	20%	23,3%	23,3%	26,7%
Flight notification procedures to nearby airports operators (i.e. AFIS; ATC; FIS) implemented	3.3%	3.3%	10%	13,3%	13,3%	13,3%	16,7%
Pre-tactical controlled airspace access coordination processes available	3,3%	3,3%	10%	13,3%	16,7%	16,7%	20%
Rules awareness service adapted to specific areas, time, type of operations	3,3%	3.3%	13,3%	16,7%	20%	20%	23,3%
UAS access conditions prescription (for specific volumes of airspace) implemented	3,3%	3,3%	13,3%	20%	23,3%	23,3%	26,7%
Emergency and contingency procedures implemented	6,7%	6,7%	10%	13,3%	16,7%	16,7%	20%

Figure 37 - Procedural ATC interface completion rate evolution

The chart depicted in Figure 38 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of procedural ATC interface overall implementation progress comparison service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

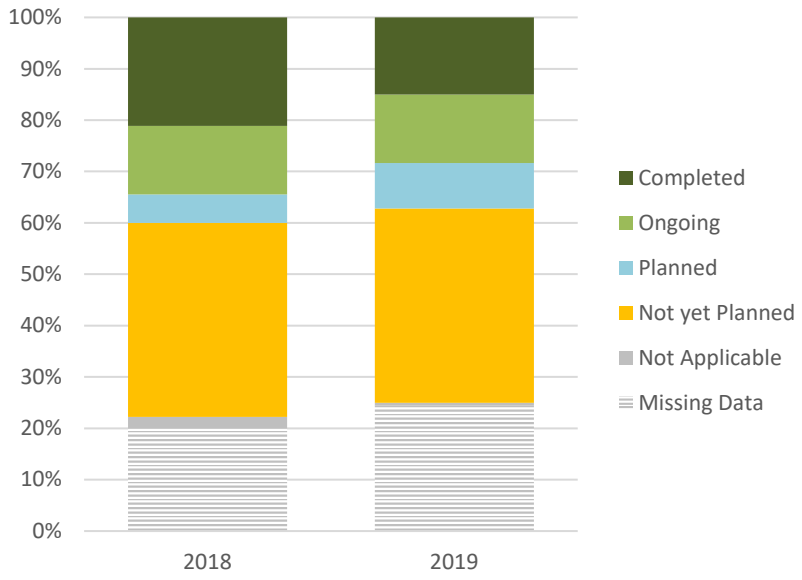


Figure 38 - Procedural ATC interface overall implementation progress comparison

3.11. U2 - EMERGENCY MANAGEMENT

Figure 39 shows that the implementation of the emergency management service is currently completed in 2 Member States, ongoing in 5 and planned in 1 State. On the other hand, 14 States do not have any plans yet and 1 State declared the service not applicable.

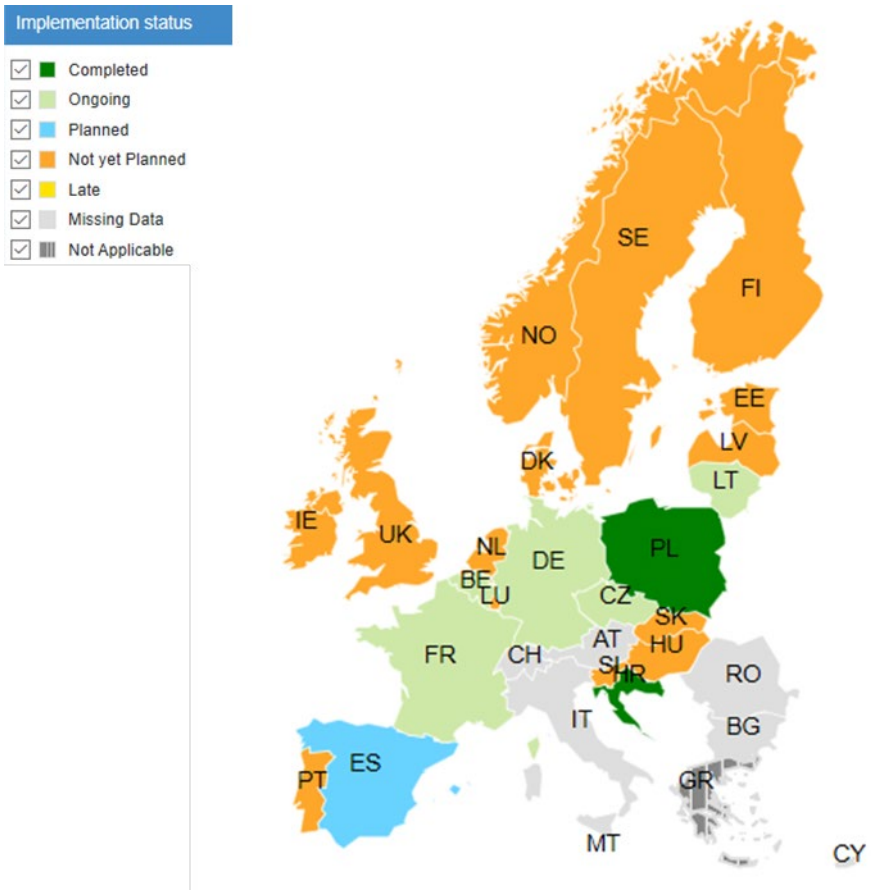
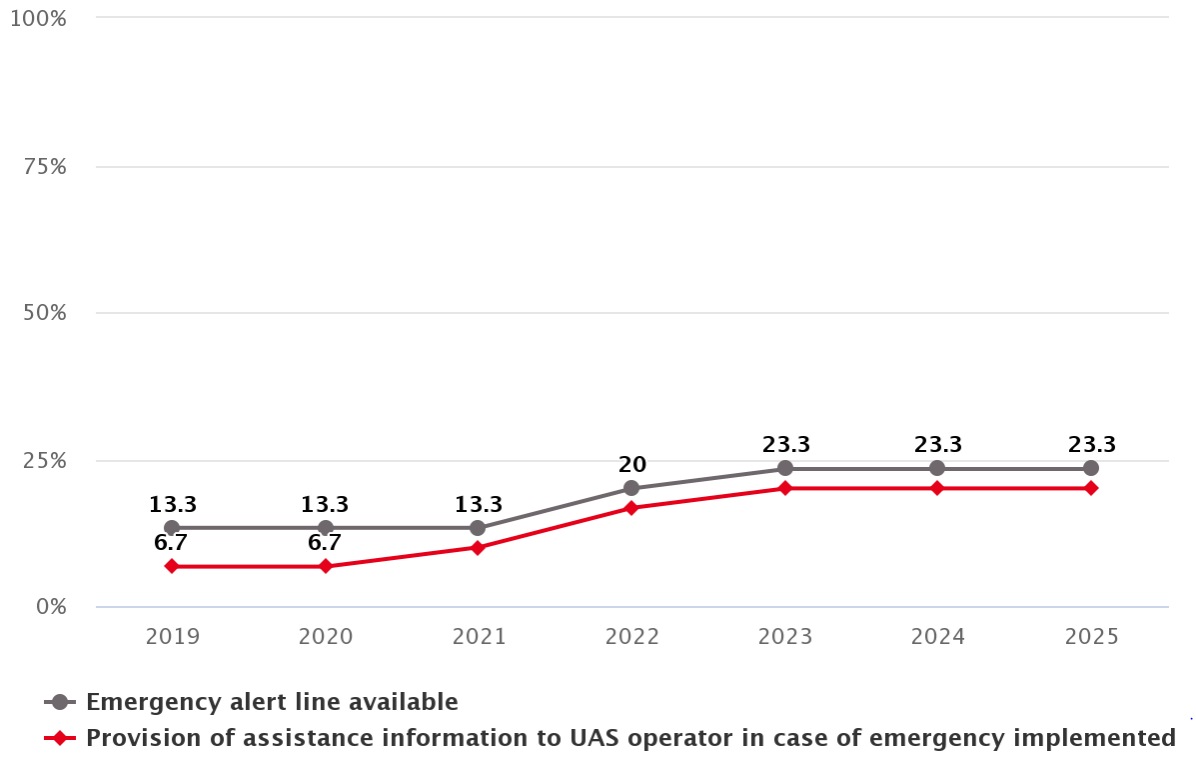


Figure 39 - Emergency management current implementation status

Figure 40 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Emergency alert line available	13,3%	13,3%	13,3%	20,0%	23,3%	23,3%	23%
Provision of assistance information to UAS operator in case of emergency implemented	6,7%	6,7%	10%	16,7%	20%	20%	20%

Figure 40 - Emergency management completion rate evolution

The chart depicted in Figure 41 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the emergency management overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

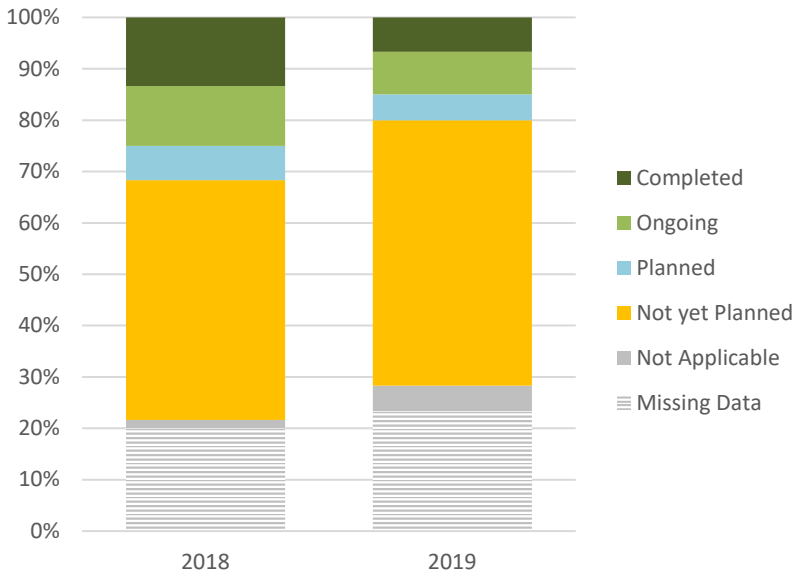


Figure 41 - Emergency management overall implementation progress comparison

3.12. U2 - STRATEGIC DE-CONFLICTION

Figure 42 shows that the implementation of the strategic de-confliction service is currently completed in 1 Member State, ongoing in 4 and planned in another 4 States. On the other hand, 14 States do not have any plans yet.

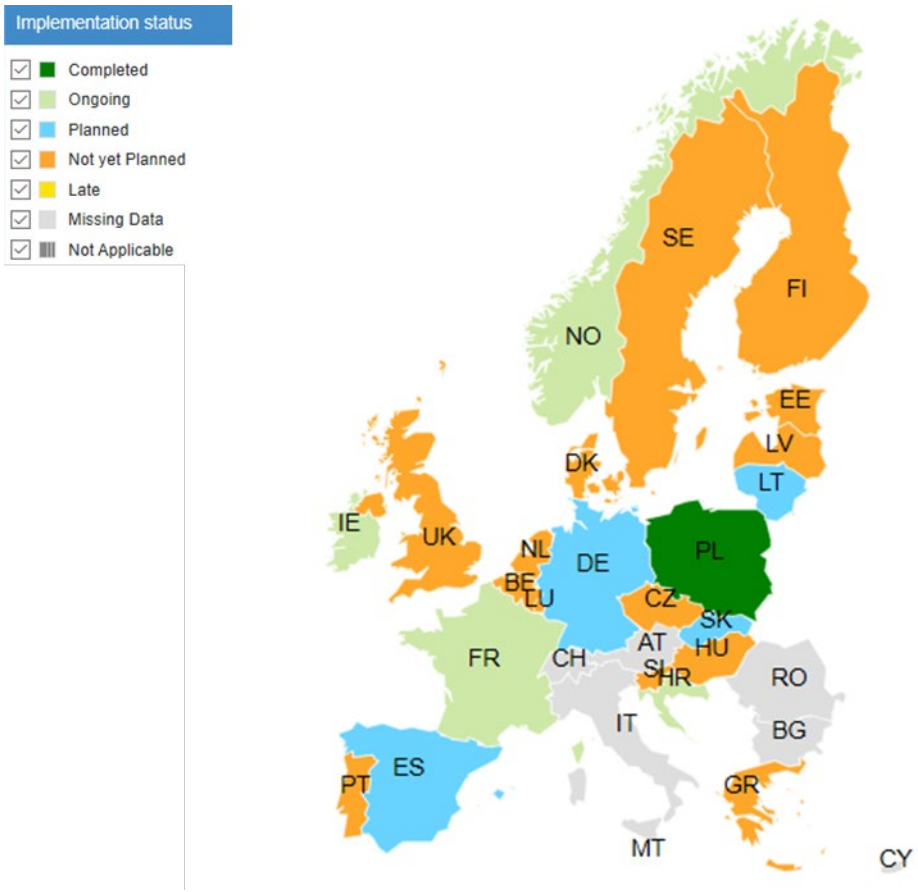
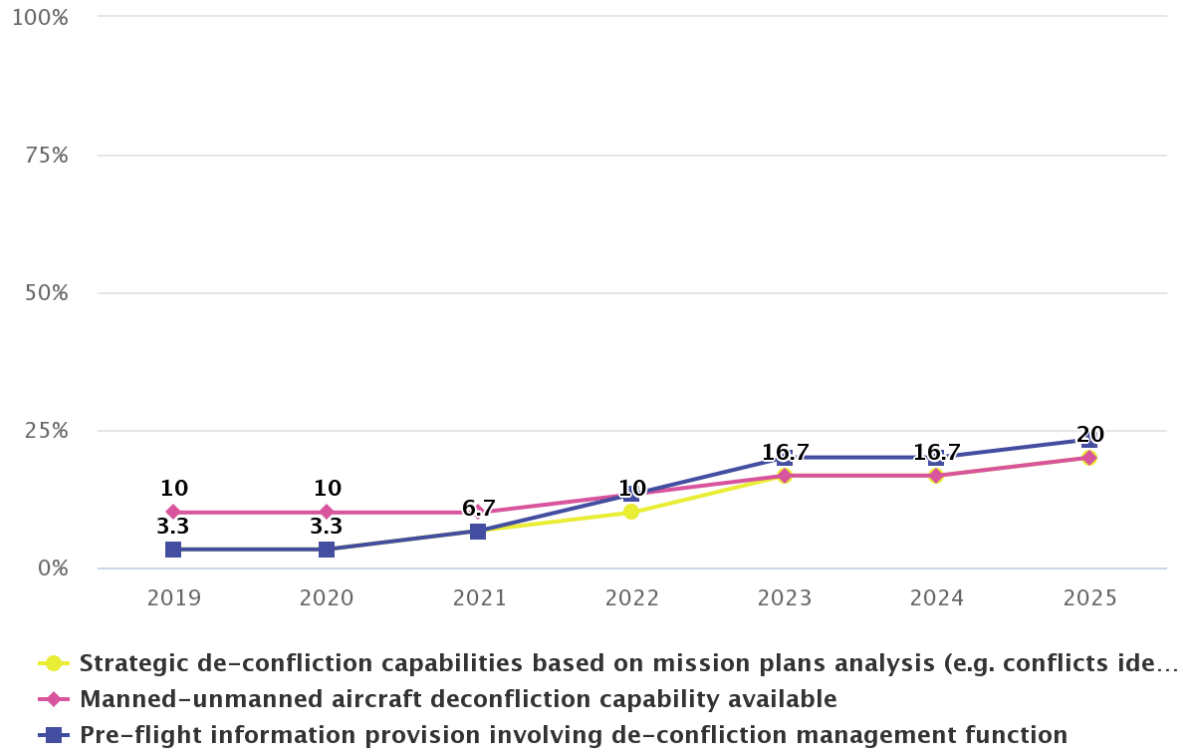


Figure 42 - Strategic de-confliction current implementation status

Figure 43 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Strategic de-confliction capabilities based on mission plans analysis (e.g. conflicts identification; solution proposal) available	3,3%	3,3%	6,7%	10%	16,7%	16,7%	20,0%
Manned-unmanned aircraft deconfliction capability available	10%	10%	10%	13,3%	16,7%	16,7%	20,0%
Pre-flight information provision involving de-confliction management function	3,3%	3,3%	6,7%	13,3%	20%	20%	23%

Figure 43 - Strategic de-confliction completion rate evolution

The chart depicted in Figure 44 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the strategic de-confliction overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

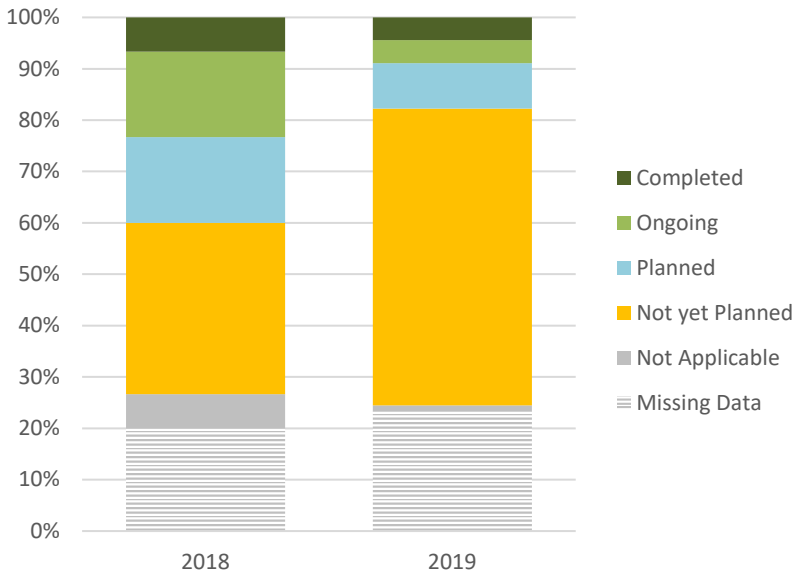


Figure 44 - Strategic de-confliction overall implementation progress comparison

3.13. U3 - DYNAMIC GEO-FENCING

Figure 45 shows that the implementation of the dynamic geo-fencing service is currently completed in 1 Member State, ongoing in 3 and planned in 1 Member State. On the other hand, 17 States do not have any plans yet and 1 State declared the service not applicable.

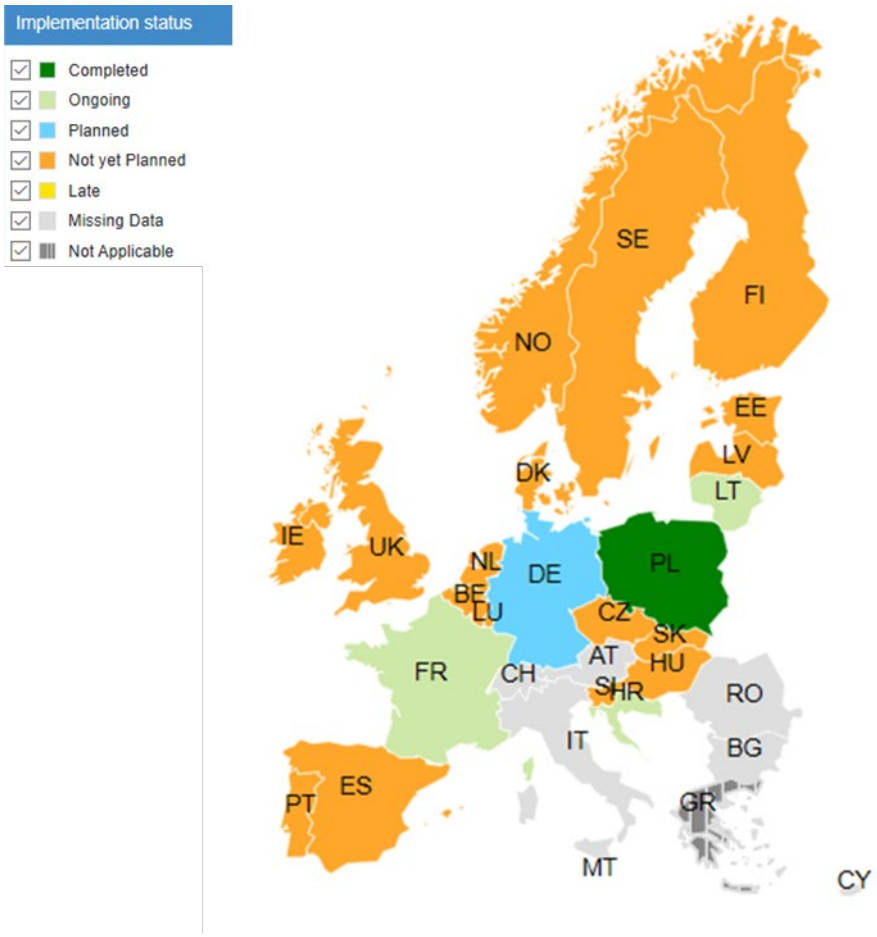
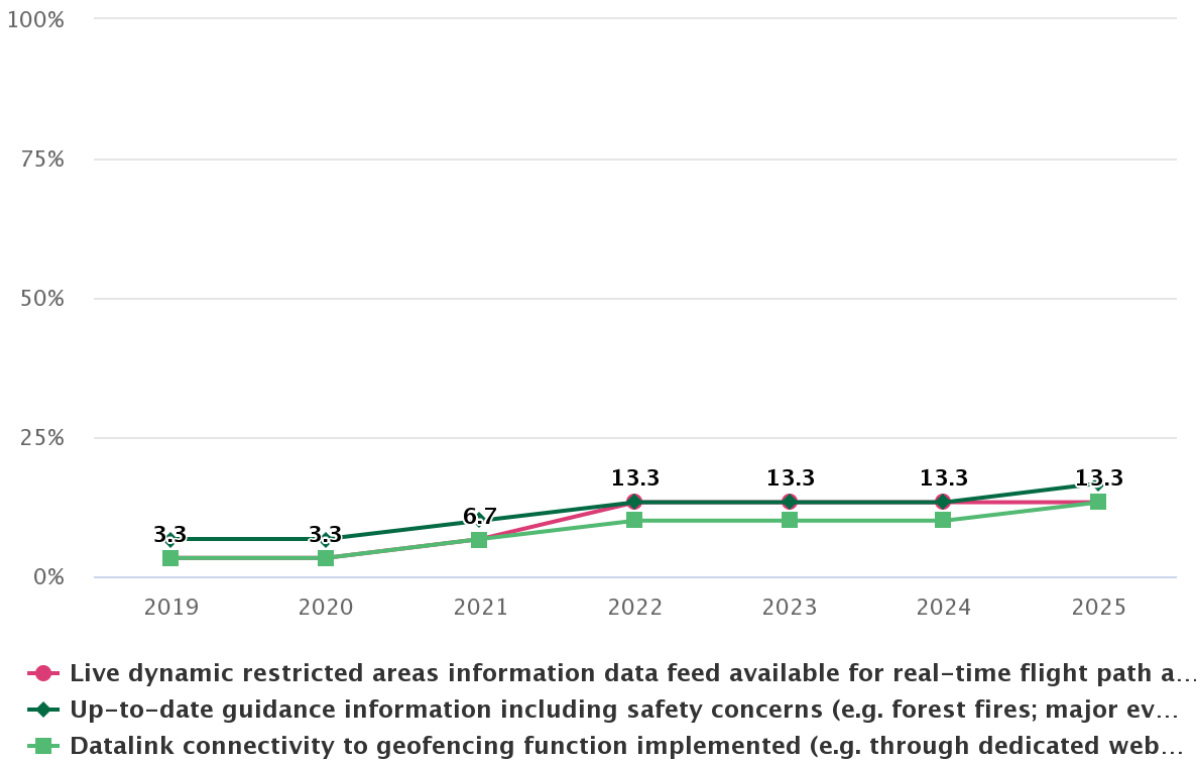


Figure 45 - Dynamic geo-fencing current implementation status

Figure 46 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Live dynamic restricted areas information data feed available for real-time flight path adjustments	3,3%	3,3%	6,7%	13%	13,3%	13,3%	13,3%
Up-to-date guidance information including safety concerns (e.g. forest fires; major events; VIP travel) provided	6,7%	6,7%	10%	13,3%	13,3%	13,3%	16,7%
Datalink connectivity to geofencing function implemented (e.g. through dedicated web service)	3,3%	3,3%	6,7%	10%	10%	10%	13,3%

Figure 46 - Dynamic geo-fencing completion rate evolution

The chart depicted in Figure 47 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the dynamic geo-fencing implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

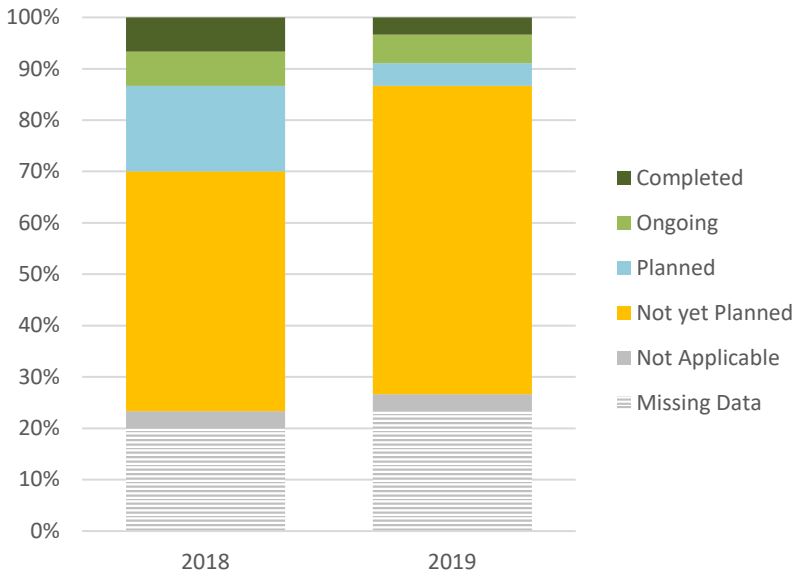


Figure 47 - Dynamic geo-fencing overall implementation progress comparison

3.14. U3 - COLLABORATIVE INTERFACE WITH ATC

Figure 48 shows that the implementation of the collaborative interface with ATC is currently completed in 1 Member State, ongoing in 5 and planned in 2 Member States. On the other hand, 13 States do not have any plans yet and 1 State declared the service not applicable.

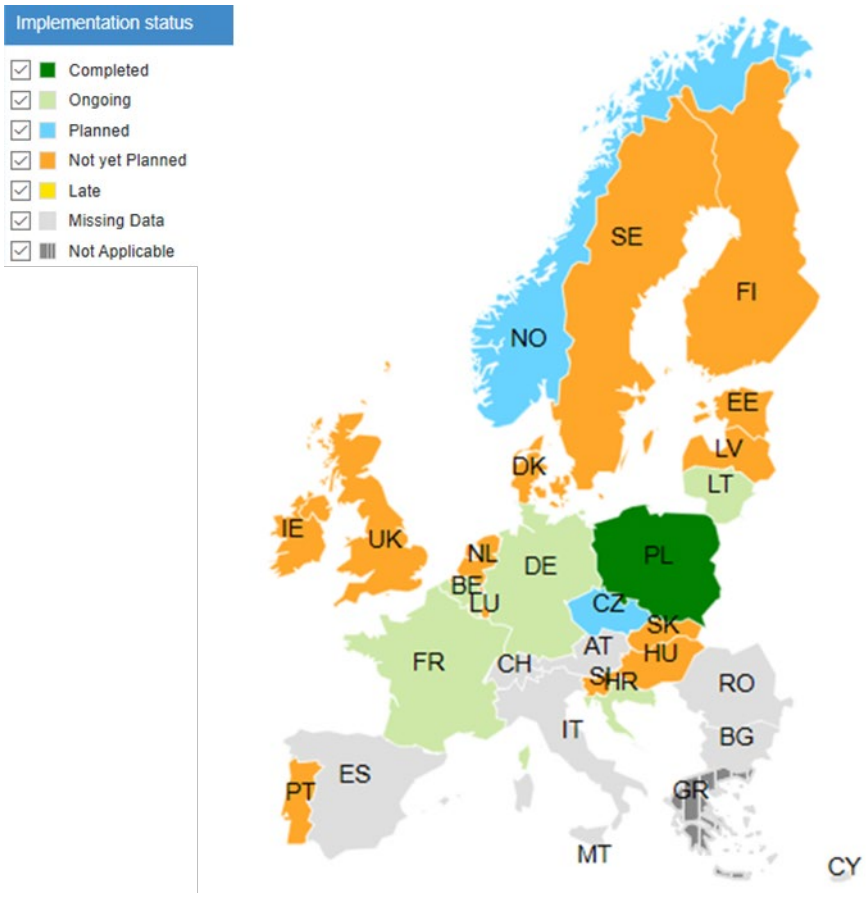
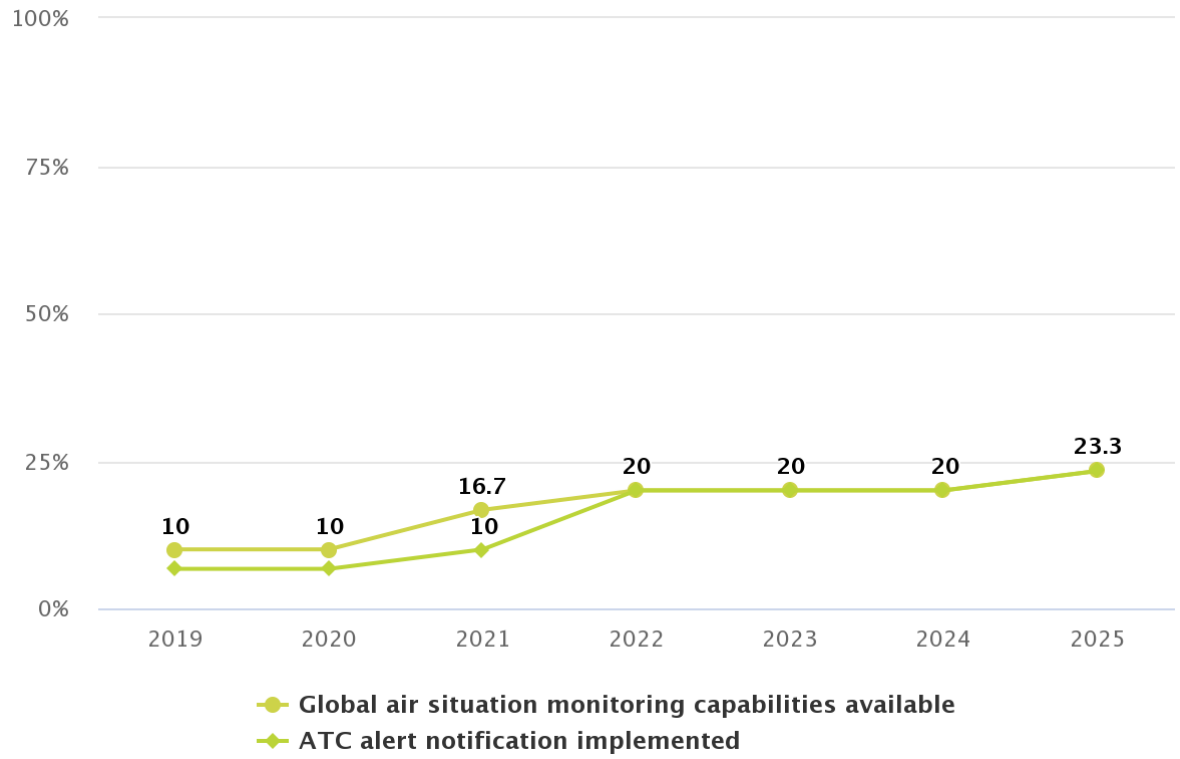


Figure 48 - Collaborative ATC interface current implementation status

Figure 49 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Global air situation monitoring capabilities available	10%	10%	16,7%	20%	20%	20%	23,3%
ATC alert notification implemented	6,7%	6,7%	10%	20%	20%	20%	23%

Figure 49 - Collaborative ATC interface completion rate evolution

The chart depicted in Figure 50 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the collaborative ATC interface overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

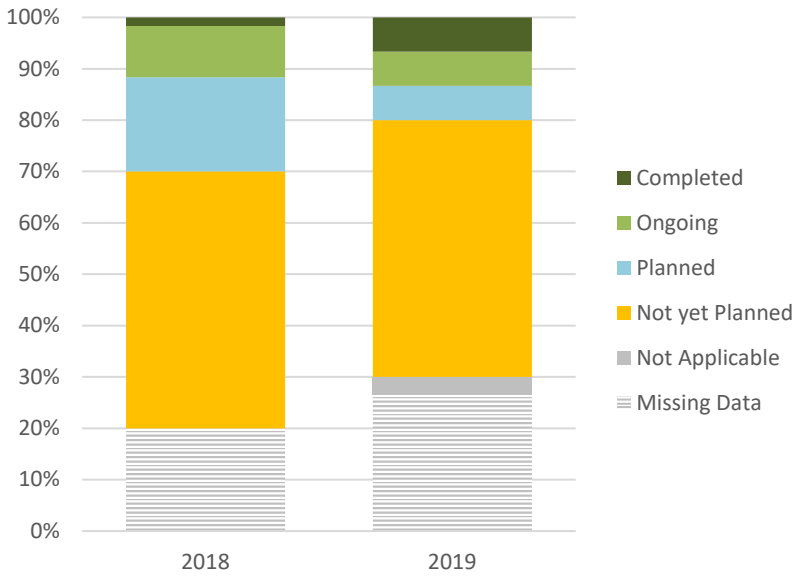


Figure 50 - Collaborative ATC interface overall implementation progress comparison

3.15. U3 - TACTICAL DE-CONFLICTION

Figure 51 shows that the implementation of the tactical de-confliction service is currently planned in 5 Members States. On the other hand, 16 States do not have any plans yet and 1 State declared the service not applicable.

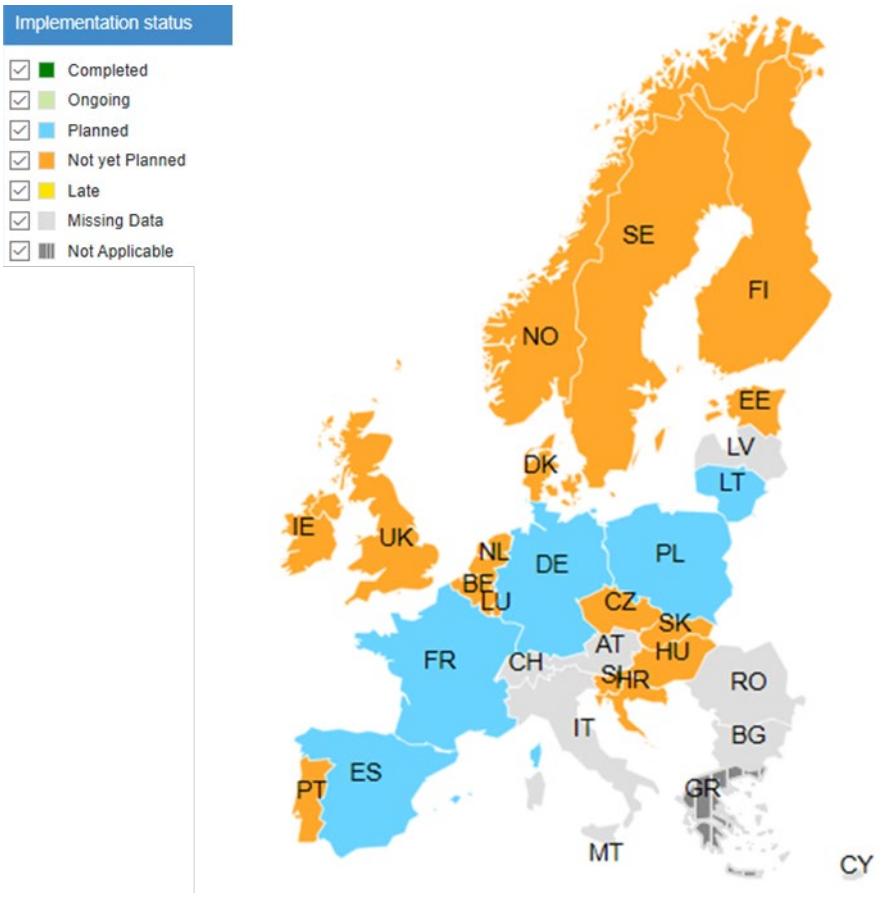
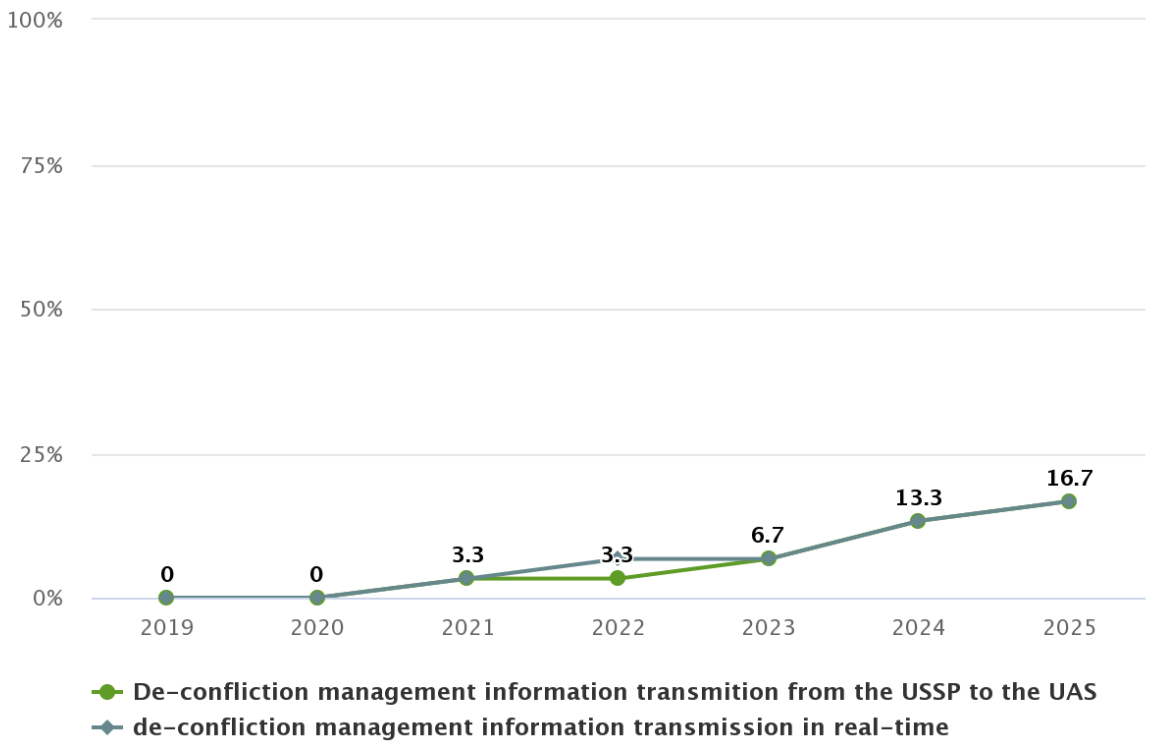


Figure 51 - Tactical de-confliction current implementation status

Figure 52 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
De-confliction management information transmition from the USSP to the UAS	0%	0%	3,3%	3,3%	6,7%	13,3%	16,7%
De-confliction management information transmission in real-time	0%	0%	3,3%	6,7%	6,7%	13,3%	16,7%

Figure 52 - Tactical de-confliction completion rate evolution

The chart depicted in Figure 53 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the tactical de-confliction overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

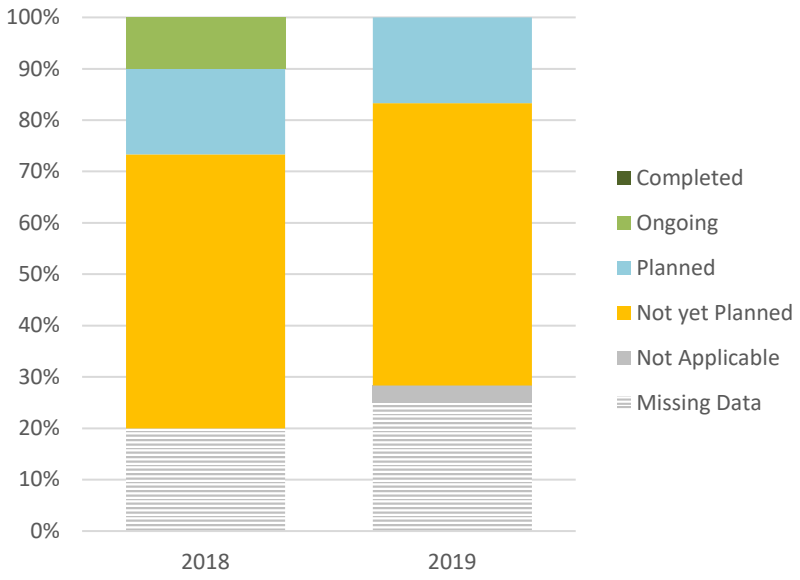


Figure 53 - Tactical de-confliction overall implementation progress comparison

3.16. U3 - DYNAMIC CAPACITY MANAGEMENT

Figure 54 shows that the implementation of the dynamic capacity management service is currently ongoing in 3 Member States and planned in 3. On the other hand, 14 States do not have any plans yet and 1 State declared the service not applicable.

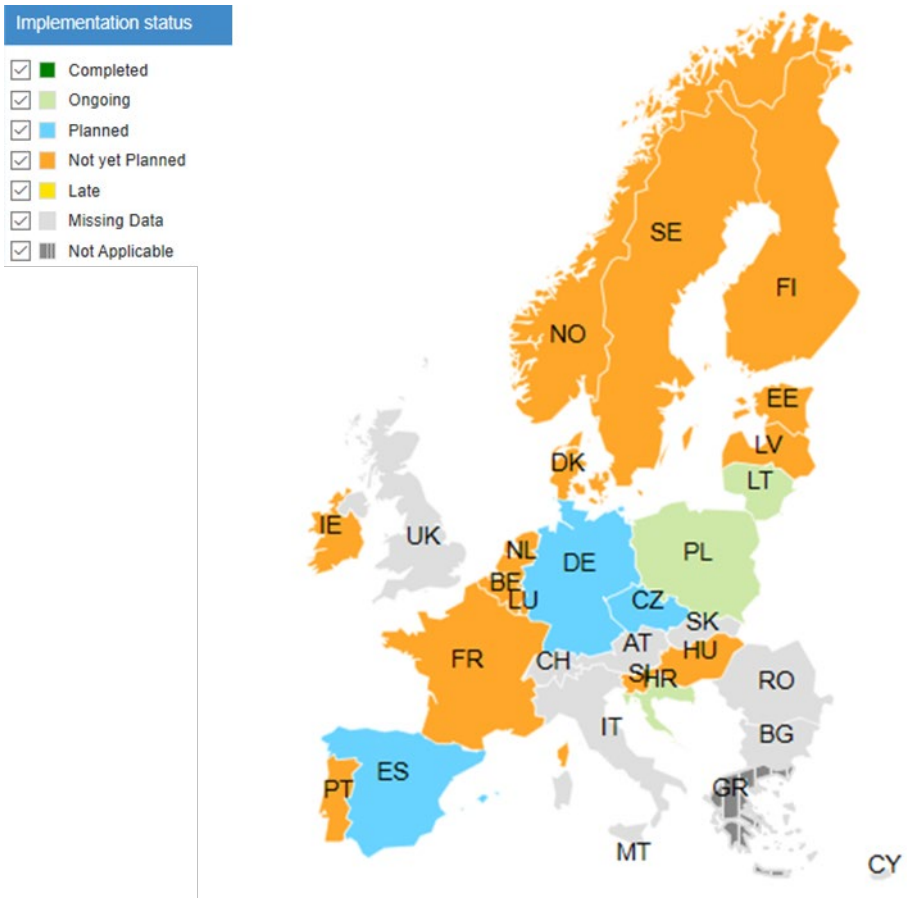
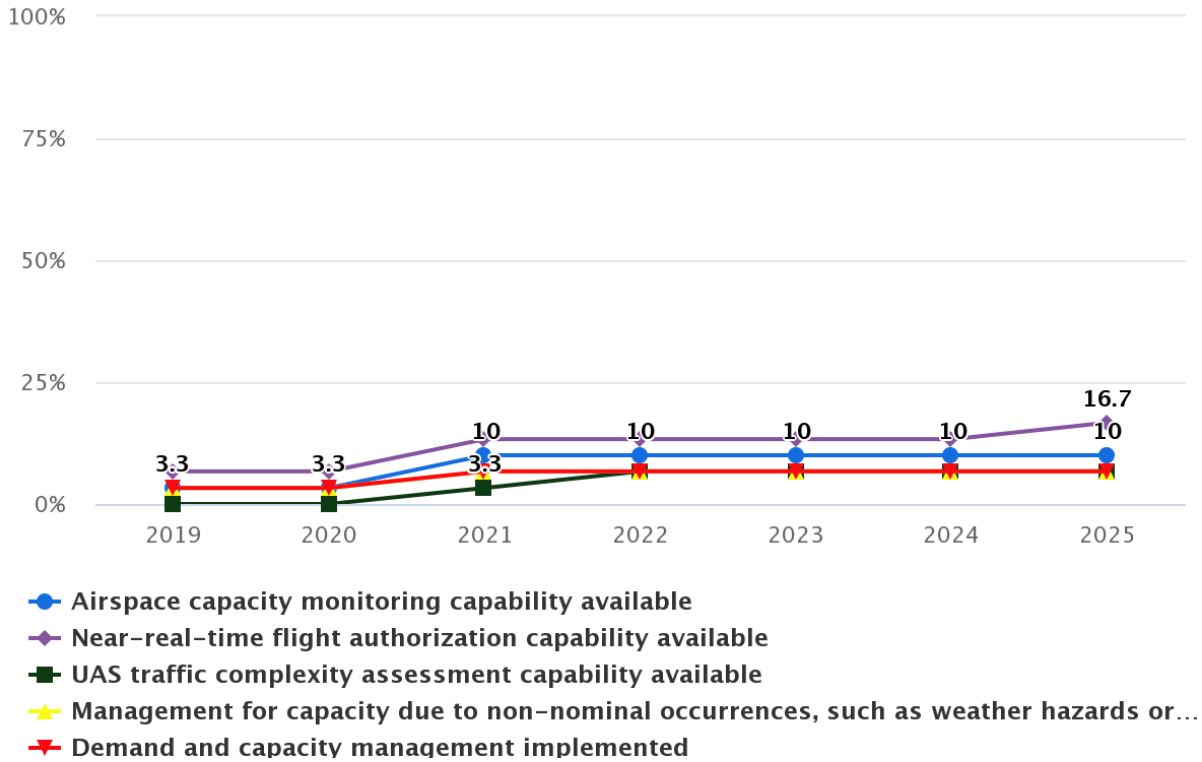


Figure 54 - Dynamic capacity management current implementation status

Figure 55 shows the evolution of the completion rate expected in 2019, 2021 and 2025.



	2019	2020	2021	2022	2023	2024	2025
Airspace capacity monitoring capability available	3.3%	3.3%	10%	10%	10%	10%	10%
Near-real-time flight authorization capability available	6.7%	7%	13%	13,3%	13,3%	13,3%	16,7%
UAS traffic complexity assessment capability available	0,0%	0,0%	3.3%	6,7%	6,7%	6,7%	6,7%
Management for capacity due to non-nominal occurrences, such as weather hazards or emergency situations	3,3%	3.3%	6,7%	6,7%	6,7%	6,7%	6,7%
Demand and capacity management implemented	3,3%	3,3%	6,7%	6,7%	6,7%	6,7%	6,7%

Figure 55 - Dynamic capacity management completion rate evolution

The chart depicted in Figure 56 represents a comparison of the overall implementation progress against the previous edition of the Report. Complementary information, including remarks concerning the single elements underlying the provision of the dynamic capacity management overall implementation progress service, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

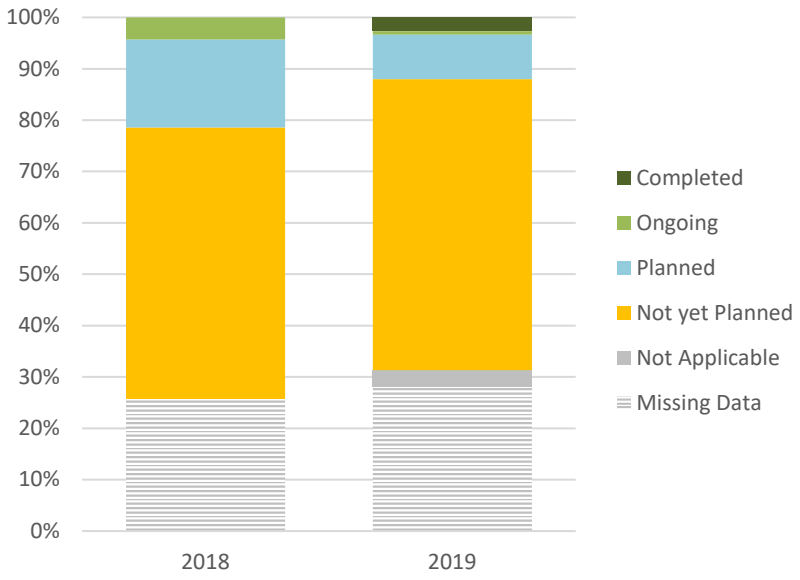


Figure 56 - Dynamic capacity management overall implementation progress comparison

4. U-SPACE DEMONSTRATION PROJECTS

This chapter provides an overview of the implementation of the U-Space demonstration projects, involving organisations from the EU Member States.

shows implementation information concerning completed, ongoing, as well as planned demonstration projects.

Table 3 provides a definition of the implementation statuses applicable to the demonstration projects, as well as a colour schema used in Figure 57.

	Status	Definition
	Completed	Project successfully accomplished and approved, including the delivery of its outcomes.
	Ongoing / Partially implemented	Implementation is reportedly not yet completed.
	Planned	A planned schedule (including an approved and allocated budget) is defined, but the project has not yet kicked off.

Table 3 - Demonstration projects implementation statuses definition

In the absence of more detailed information, markers are placed on the map in correspondence of a Country without specific reference to the exact location. They also contain a number representing the number of initiatives in which the organisations based in that Country are reportedly involved. Consequently, projects run by an international consortium contributed to the figures of each Country involved. Complementary information, underlying the demonstration projects implementation statuses, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

Finally, Table 4 provides detailed information regarding any completed/ongoing/planned U-Space demonstration project, including name, description, duration, Countries involved, leadership, and funding sources.

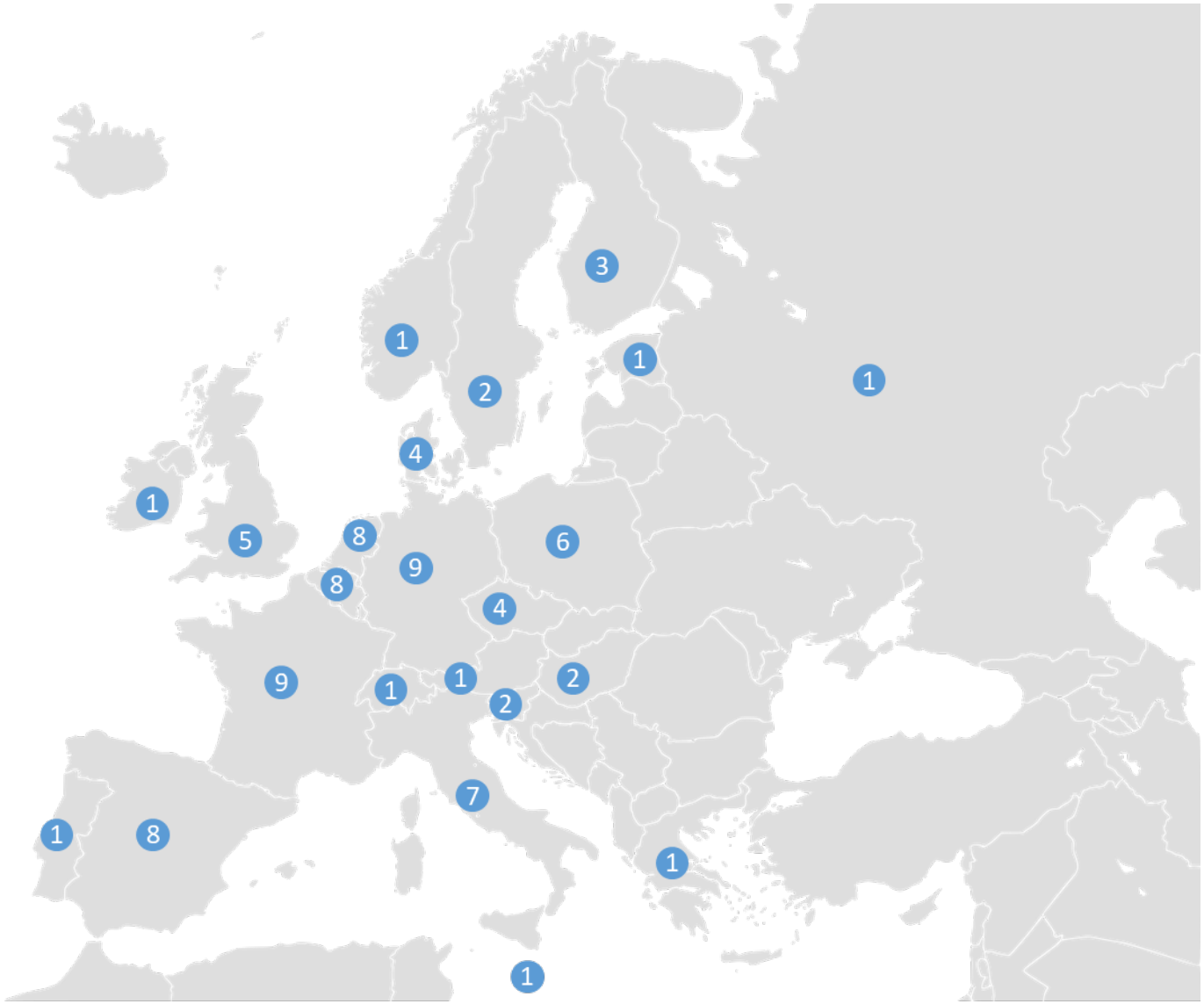


Figure 57 - U-Space demonstration projects map

Project ID	Status	Duration	Country	Description	Funding Source
SAFIR	Completed	2018 > 2020-03	Belgium Czech Republic Denmark Portugal United Kingdom	Not available.	CEF-SESAR-2018-1 U-SPACE
CLASS	Completed	2017-06 > 2019-06	Belgium France Germany Norway United Kingdom	The CLASS (Clear Air Situation for UAS) project will merge existing technologies to build the core functions of an Unmanned Traffic Management System (UTMS). This research increases the maturity level of the main technologies required for surveillance of UAS traffic.	H2020-SESAR-2016-1
PODIUM	Completed	2018-01 > 2019-10	Belgium France Denmark Netherlan ds	The PODIUM (Proving Operations of Drones with Initial UTM) project will demonstrate U-space services, procedures and technologies, providing conclusions on the maturity of U-space services and technologies when used in a defined set of operational scenarios and environments.	H2020-SESAR-2016-1
EURODRONE	Completed	2018-10 > 2020-03	Greece	EURODRONE is a project of the SESAR Joint Undertaking in co-financing research and development projects on UAS Air Traffic Management (UTM) in the Very Low Level (VLL) in U-Space Urban Areas (UTM Airspace).	SJU
CORUS	Completed	2017-09 > 2019-10	Belgium France Germany Italy Spain United Kingdom	The CORUS (Concept of Operations for European UTM Systems) project will develop a reference Concept of Operations (CONOPS) for UTM (UAS Traffic Management) in VLL airspace in Europe.	H2020-SESAR-2016-1

Project ID	Status	Duration	Country	Description	Funding Source
SECOPS	Completed	2017-10 > 2019-10	Belgium Finland Netherlands	The SECOPS (Integrated Security Concept for Drone Operations) project will address resistance of drones against unlawful interference, protection of third parties and integration of geo-fencing technology. A proof of concept demonstration of the integrated security concept will be performed, based on a realistic scenario.	H2020-SESAR-2016-1
SKYOPENER	Completed	2016-05 > 2019-06	Belgium France Italy Switzerland United Kingdom	SKYOPENER will develop a system and operational processes that will reduce all categories of risks associated with RPAS and allow an ANSP to manage VLL RPAS operations. The project will also demonstrate two innovative applications: e-TOD and the surveillance of critical infrastructure that both benefit from EGNSS for measurement geolocation and datation.	H2020-EU.2.1.6.
PercEvite	Completed	2017-09 > 2020-08	Belgium France Netherlands	The Project will develop a sensor, communication, and processing suite for small drones for autonomously detecting and avoiding “ground-based” obstacles and flying objects.	H2020-SESAR-2016-1
AIRPASS	Completed	2017-10 > 2019-10	Germany Italy Russia Netherlands Sweden	The AIRPASS (Advanced Integrated RPAS Avionics Safety Suite) project will identify the available CNS infrastructure and on-board technologies to formulate an implementation approach. Based on this an on-board system concept will be developed and evaluated.	H2020-SESAR-2016-1

Project ID	Status	Duration	Country	Description	Funding Source
DREAMS	Completed	2017-10 > 2019-10	Italy Netherlands Spain	The DREAMS (Drone European AIM Study) project aims at contributing to the definition of the European UTM Aeronautical Information Management operational concept by exploring need for and feasibility of new processes, services and solutions for the drone aeronautical information management within the new UTM concept.	H2020-SESAR-2016-1
SAFEDRONE	Completed	2018-06 > 2020-05	Belgium Israel Spain	Activities on drone integration and demonstration in VLL operations.	H2020-SESAR-2016-2
TERRA	Completed	2017-10 > 2019-10	Italy Netherlands Slovenia Spain	The TERRA (Technological European Research for RPAS in ATM) project proposes a technical architecture to support VLL RPAS operations, which are assumed to encompass interaction with VFR traffic. A proof of concept demonstration of the proposed architecture will be conducted, leveraging existing simulation platforms previously developed by members of the consortium.	H2020-SESAR-2016-1
IMPETUS	Completed	2017-10 > 2019-10	Germany Slovenia Spain United Kingdom	The IMPETUS (Information Management Portal to Enable the inTegration of Unmanned Systems) project will develop a cloud-based server-less environment to ensure data quality, integrity, and flexibility to facilitate the integration with manned traffic management systems.	H2020-SESAR-2016-1
DroC2om	Completed	2017-09 > 2019-10	Denmark France Germany	The DroC2om (Drone Critical Communications) project will design a cellular-satellite system architecture concept, which ensures reliable and safe operation for remote controlled, semi-autonomous and fully autonomous small UAS.	H2020-SESAR-2016-1

Project ID	Status	Duration	Country	Description	Funding Source
TBD SWIM U-Space	Planned	2020-12 >2022-12	Czech Republic	This project is founded by SESAR 2020 in wave 3. The goals of the project will be discussed soon by SESAR.	SESAR2020
CK01000185	Planned	2020-03 >2022-03	Czech Republic	This project is funded by Technology Agency of the Czech Republic; the consortium leader is the Czech Technical University (CTU)	See description
CK01000210	Ongoing	2020-01 > n/a	Czech Republic	This project is funded by Technology Agency of the Czech Republic in cooperation with AgentFly Technologies Ltd. This project is focused on risk mitigation (SORA).	See description
FALKE	Ongoing	2019-11 > 2022-12	Germany	DDS + C-AUS tests at Hamburg airport	DE MoT
VISION	Ongoing	2018-01 > 2020-12	Germany	Support search & rescue organisations in implementation of UAS operations.	DE MoT
U:CON	Completed	2018 2019	Germany	Several use cases.	Company own funded
GUTMA Demo	Completed	> 2018-06	Spain	UTM/ATM Interoperability of autonomous drones in BVLOS VLL operations, including e-registration, flight-planning approvals, strategic geo-fencing, tactical geo-fencing and collaborative ATC interface.	ES MoT
DOMUS	Completed	2018-10 >2020-03	Spain	The DOMUS demonstration project aims at preparing and de-risking a rapid deployment of U-space initial services (U2) through the integration of developed technologies and concepts, to enable and authorise initial BVLOS operations. DOMUS will also target some of the specific applications of U3 services.	CEF-SESAR-2018-1 U-SPACE
GOF U-Space	Ongoing	2018-01 >2020-03	Estonia Finland	Major U-Space demonstration by consortium with 20 companies. Flights in Finland and Estonia, including cross-border operations.	SJU
Not available	Completed	> 2018	Finland	Use of RPAS in an airport environment	Not available

Project ID	Status	Duration	Country	Description	Funding Source
[6x] Not available	Completed	> 2018	Germany	Search & Rescue, Pipeline Inspection, System Tests.	Not available
Not available	Completed	> 2018	Denmark	e-Identification.	Not available
PRIUS	Planned	2018-09 > 2020-03	Austria	The PRIUS (Practical Implementation of U-space Services) project will demonstrate the functions (U2 and even U3 or U4 functions) of a drone traffic management (DTM) system in realistic situations.	CEF-SESAR-2018-1 U-SPACE
USIS	Completed	2019-01 > 2020-03	Hungary France	The USIS project aims at validating the initial core UAV Traffic Management services under different conditions of operations (i.e. BVLOS, EVLOS and VLOS) and environment (i.e. rural, sub-urban and urban).	H2020-SESAR-2016-2
BVLOS Trial Campaign	Ongoing	2017-01 > n/a	Italy	BVLOS experimental trials with several operators and industries, in particular interested in asset survey, land observation, S&R operations.	SJU
TBD	Planned	2018 >	Malta	System tracking, geo-fencing, mission planning, e-identification, e-registration, and enforcement.	Private
Not available	Completed	> 2018	Netherlands	Use of UTM in vicinity (though outside CTR) of controlled aerodrome.	Private
VUTURA	Planned	2019-06 > 2020-03	Netherlands	Multiple drones and multiple UTM systems integrated in EHRD CTR, U1 and U2 services in EHGG CTR at aerodrome operations.	CEF-SESAR-2018-1 U-SPACE
PANSA - UAV tracking deployment	Ongoing	2019-01 > 2024-12	Poland	The project is focused on development and testing ADS-B/LTE/5G infrastructure dedicated to UAVs. The infrastructure consists of miniature ADS-B/LTE/5G transceivers installed on board UAVs and ground based receivers. The project includes few phases. The phase 1 is already completed - acquiring the ADS-B infrastructure and integrating it with PansaUTM.	Not available

Project ID	Status	Duration	Country	Description	Funding Source
PansaUTM - digitilised UAV flights coordination	Completed	2018-01 > 2020-02	Poland	PansaUTM – digitalised UAV flights coordination between drone operators and ATC and advanced flight plans management. The system is partly delivered by the technology partners HAWK-E and DroneRadar. The Demonstration was focused to assess the capabilities of the system. The system obtained the positive decision of CAA Poland for operational use in ATC environment in Poland from 2 March 2020.	Not available
CEDD - Central European Drone Demonstrator	Ongoing	2019-01 > 2022-12	Poland	CEDD - an umbrella initiative concentrating testing, demonstration and pilot projects based on advanced UAV flights (including BVLOS, autonomous and automatic). CEDD test beds are located in Upper Silesian-Zaglebie Metropolis and in Port of Gdynia (Poland). In 2019 CEDD tested less complex projects on reducing environmental risks (low emission) crisis management.	Not available
Droniada 2019 - 5th Edition	Completed	2019-06 > 2019-06	Poland	Annual Demonstration project which is focused on testing different advanced solutions for UAV operations. Droniada 2019 was focused on anti-collision protocols, autonomous flights testing and de-confliction solutions in UTM and U-Space environment. Demonstration included ie.: drone flight applications for crisis management, infrastructure inspection and cargo transport.	Not available
[4x] Cities Ready For U-Space Trials	Planned	2018 >	Poland	Integration of RPAS in airspace using UTM. Tests of miniature ADS-B transponders installed on the UAV and ADS-B signal receivers, for traffic awareness, collision avoidance, collaboration with ATC, and geo-fencing applications.	CEF-SESAR-2018-1 U-SPACE

Project ID	Status	Duration	Country	Description	Funding Source
[4x] Not available	Completed	> 2018	Poland	Inspection of line infrastructure, Geo-fencing, BVLOS flights in segregated areas, over 4 00/year regular VLOS flights in urban airspace including controlled airspace (CTRs) in the vicinity of civil and military airports, testing SIM-card based system as source of UAV location.	Private
BVLOS Trial Campaign	Completed	2018-01 >	Sweden	BVLOS VLL trial operations.	Not available
U-Space Trial Campaign	Completed	> 2018	Italy	Live trials in complex environment supported by U1 and U2 Core/non-core services.	Private
Not available	Planned	> 2018	Hungary	Modular Drone Awareness System (ATC drone surveillance).	CEF-SESAR-2017
PEGASUS	Completed	> 2018	Ireland	Proofing of Mode S transponder (ADS-B) with prototype UAV.	Private
MUST	Planned	> 2018	France	Multiple U-Space Services in Toulouse.	CEF-SESAR-2018-1 U-SPACE
Galician Skyway	Completed	2019-04 > 2020-06	Spain	Galician SkyWay aims to address current and future technical issues of security and air traffic management in shared spaces. It will also contribute to supporting the regulatory processes that are underway to make the increase of these operations possible, providing data and results that can guide the definition of possible means of compliance with the regulations in terms of problem management.	ES MoT
U-space Together	Ongoing		France	Fast tracking drone integration initiative	FR MoT

Table 4 - Demonstration projects information

5. CONCLUSIONS

The aim of this report is to present an overview of the current implementation status and short to medium term planning information on the 16 services expected to be provided in phases U1 (2019) to U3 (2025) of the U-Space Framework.

Additional information regarding the implementation of U-Space demonstration projects is also provided, in order to contribute to the coordination and harmonisation of the several initiatives currently in development. Complementary information, including remarks concerning the single elements underlying the provision of the services and demonstration projects, are available on the eATM Portal (atmmasterplan.eu/depl/u-space).

The results of the overall analysis show a non-uniform, slow implementation progress of the U-space services amongst the survey respondents. Furthermore, negative completion trends were detected for a number of service elements compared with the last report edition. Such findings are due to the enlargement of the scope of the survey from the 28 EU Member States (ref. 2018) to the 30 EU SES Member States. It is also notable how some of the most active stakeholders did not provide any information, which also contributed to decrease completion rates. On the other hand, the rate of planned activities increased compared to 2018, indicating that a larger number of stakeholders is taking steps forward into the implementation of many U-Space services.

Even though the reporting process is still in his infancy, it benefited from the integration with the more mature, consolidated LSSIP mechanism in terms of both methodology ad resources allocation, which resulted in a more accurate picture of the U-Space Services implementation over the EU SES area.

Due to the lack of information reported, the results should be considered a rather conservative estimate. In fact, although the implementation of many service elements is currently ongoing in several States, no assumptions were made on their deployment in absence of an expected full implementation date. Therefore, their completion could not contribute to the overall figures.

APPENDIX A - U-SPACE SERVICES

This annex proposes an indicative description of services, for which the detailed definition and the applicable environments are the subject of ongoing research and development [1].

U1 - U-Space Foundation Services

E-Registration

The service enables the registration of the operator, drone and pilot with the appropriate information according to Regulation. A level of security of the service will be defined.

E-Identification

The service allows the identification of a drone operator from a drone in operation (in line with the global scope of registry (ICAO) & eIDAS - Regulation (EU) No 910/2014). The identification provides access to the information stored in the registry based on an identifier emitted electronically by the drone. The identification service includes the localisation of the drones (position and time stamp).

Pre-tactical Geo-fencing

The service provides the operator with geo-information about predefined restricted areas (prisons, etc.) and available aeronautical information (NOTAM, AIRAC cycle) used during the flight preparation. This service requires the identification of accredited sources and the availability of qualified geo-information related to restricted areas.

This service provides information that allows the drone operator to make use of the geo-fencing capability of the drone.

U2 - U-Space Initial Services

Tactical Geo-fencing

Compared to U1 pre-tactical geo-fencing, tactical geo-fencing brings the possibility to update the operator with geo-fencing information even during the flight.

Tracking

This refers to the service provider using cooperative and non-cooperative surveillance data to maintain track-identity of individual drones. The capability includes ground and air surveillance systems, as well as surveillance data processing systems.

The performance requirements of the capability will vary in accordance with the specific requirements of each application.

Flight Planning Management

This service covers the receipt of a flight notification or a flight plan and provides the appropriate answer according to the characteristics of the mission and applicable regulations. This service will be available for any drone operator/user with different levels of requirements.

Weather Information

The service provides drone operators with forecast and actual weather information either before or during the flight; it can also collect and make available weather information from different stakeholders.

Different levels of service provision could be considered; for example:

- MET information for missions in a rural environment (based on existing aeronautical information);
- Enhanced weather information for missions in urban areas;
- Micro-weather information for urban areas (urban canyoning/ autonomous vehicles).

Drone Aeronautical Information Management

This service provides the operator with relevant aeronautical information for drone operations. It will connect to the Aeronautical Information Service (AIS) to guarantee coherent information provision for manned and unmanned operators.

Procedural Interface with ATC

The service is a set of defined procedures for some mission types where there may be an impact on ATC; for example crossing certain types of controlled airspace under prescribed conditions. The procedures ensure clear and unambiguous drone operation, and provide an appropriate flow of information between the drone operators and ATC. Such procedures will allow drones to fly in

controlled airspace and near airports with more flexibility and procedural approval/rejection based on agreed rules.

Emergency Management

The service receives emergency alerts from operators (e.g. loss of control), and informs relevant actors of the ecosystem. These may include drone operators operating drones nearby, ANSPs, police, airport authorities. The service also provides the drone/operator with assistance information to manage the emergency (e.g. location of landing pads).

Strategic De-confliction

The service provides de-confliction assistance to a drone operator at strategic level (when the flight plan is submitted, it is compared to other known flight plans and a de-confliction in time or route could be proposed). This service could be mandatory or optional according to the operating environment.

Monitoring

Subject to appropriate data-quality requirements, this service retrieves data from the tracking service and fuses it with information related to non-cooperative obstacles and vehicles in order to create air situation for authorities, service providers, and operators. This service may include conformance monitoring.

U3 - U-Space Advanced Services

Dynamic Geo-fencing

Compared to tactical geo-fencing in U2, the dynamic geo-fencing targets the drone itself and then this service requires data-link connectivity to a geo-fencing system that allows the data to be updated during the flight.

Collaborative Interface with ATC

The service provides a mechanism to ensure proper effective coordination when drone operations using U-space services affect ATC. It encompasses shared situational awareness and procedures to enable a two-way dialogue supporting the safe and flexible operation of drones in airspace where ANS are provided.

Tactical De-confliction

This service provides information to the operators or the drones to ensure separation management when flying. The differences with the strategic de-confliction described in U2 are twofold: the drone may receive the information and this de-confliction is set for the in-flight phase. It will be necessary to appropriately define the boundaries with the use of Detect & Avoid capabilities.

Dynamic Capacity Management

Upon the definition of drone density thresholds (that can be dynamically modified), the service monitors demand for airspace, and manages access to that airspace as new flight notifications are received. This service may be coupled with the flight planning management service. There should be appropriate set of rules and priorities for slot allocation when a portion of airspace is expected to reach its capacity limits. Apart from the demand and capacity balancing, the service could manage capacity due to non-nominal occurrences, such as weather hazards or emergencies.

U4 - U-Space Full Services

U4 offers the full integration with manned aviation and air traffic services and supports the full operational capability of U-space based on a very high level of automation. It is expected that the need for new services will arise during the roll-out of U3. In addition, it is envisaged that manned aircraft could be equipped to take advantage of U-space services.

DEFINITIONS, ACRONYMS AND ABBREVIATIONS

Term	Definition
ADS-B	Automatic Dependent Surveillance-Broadcast
AGL	Above Ground Level
AIM	Aeronautical Information Management
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Service
AMC	Airspace Management Cell
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATM	Air Traffic Management
BVLOS	Beyond Visual Line of Sight
CAA	Civil Aviation Authority
CEF	Connecting Europe Facility
COM	Communications Technology
CTR	Control Zone
DTM	Drone Traffic Management
EAD	European Aviation Database
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EOC	Essential Operational Change
eIDAS	electronic Identification and Trust Services
EU	European Union
EVLOS	Extended Visual Line Of Sight
FIS	Flight Information Service
FOC	Full Operational Capability
FPL	Flight Plan
GIS	Geographic Information System
IBAF	Integrated Briefing Automated Facility
ICAO	International Civil Aviation Organisation
LSSIP	Local Single Sky ImPlementation
MET	Meteorological
MoT	Ministry of Transport
NOTAM	Notice to Airmen
RPAS	Remote Piloted Aircraft System
SES	Single European Sky
SESAR	Single European Sky ATM Research
SIM	Subscriber Identification Module
SJU	SESAR Joint Undertaking
TMA	Terminal Area
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
UTM	Unmanned Traffic Management
UTMS	Unmanned Traffic Management System
VLL	Very Low Level
VLOS	Visual Line Of Sight

Table 5 - Definitions, acronyms, and abbreviations

REFERENCES

[1] European ATM Master Plan: Roadmap for the safe integration of drones into all classes of airspace.

[2] U-Space Blueprint.

[3] European Drones Outlook Study.

[4] Drones Helsinki Declaration.

[5] U-Space Initial Implementation Survey.

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