GHENT UNIVERSITY

IARIA

The Eleventh International Conference on Data Analytics
DATA ANALYTICS 2022
TTASC: Transport and Traffic Analytics in Smart Cities

AURORA

Safe urban air mobility for European citizens

Title:

Overview of European Union Guidelines and Regulatory Framework for Drones in Aviation in the context of the introduction of automatic and autonomous flight operations in Urban air mobility

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Academic Experience

- ✓ BSc: Mechanical Engineering
- ✓ MSc: Energy System Engineering
- ➢ Studying Ph.D. in: Industrial Engineering and operations research

  Thesis title: Digital twin based certification for smart industry application

The research topics and current project

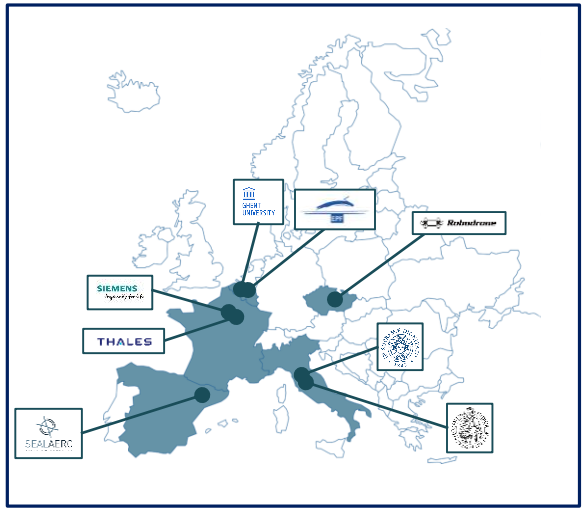
AURORA's Unmanned Aerial Vehicles

< 10 kg UAV

75 kg UAV

600 kg rotorcraft

8 partners in 5 EU states

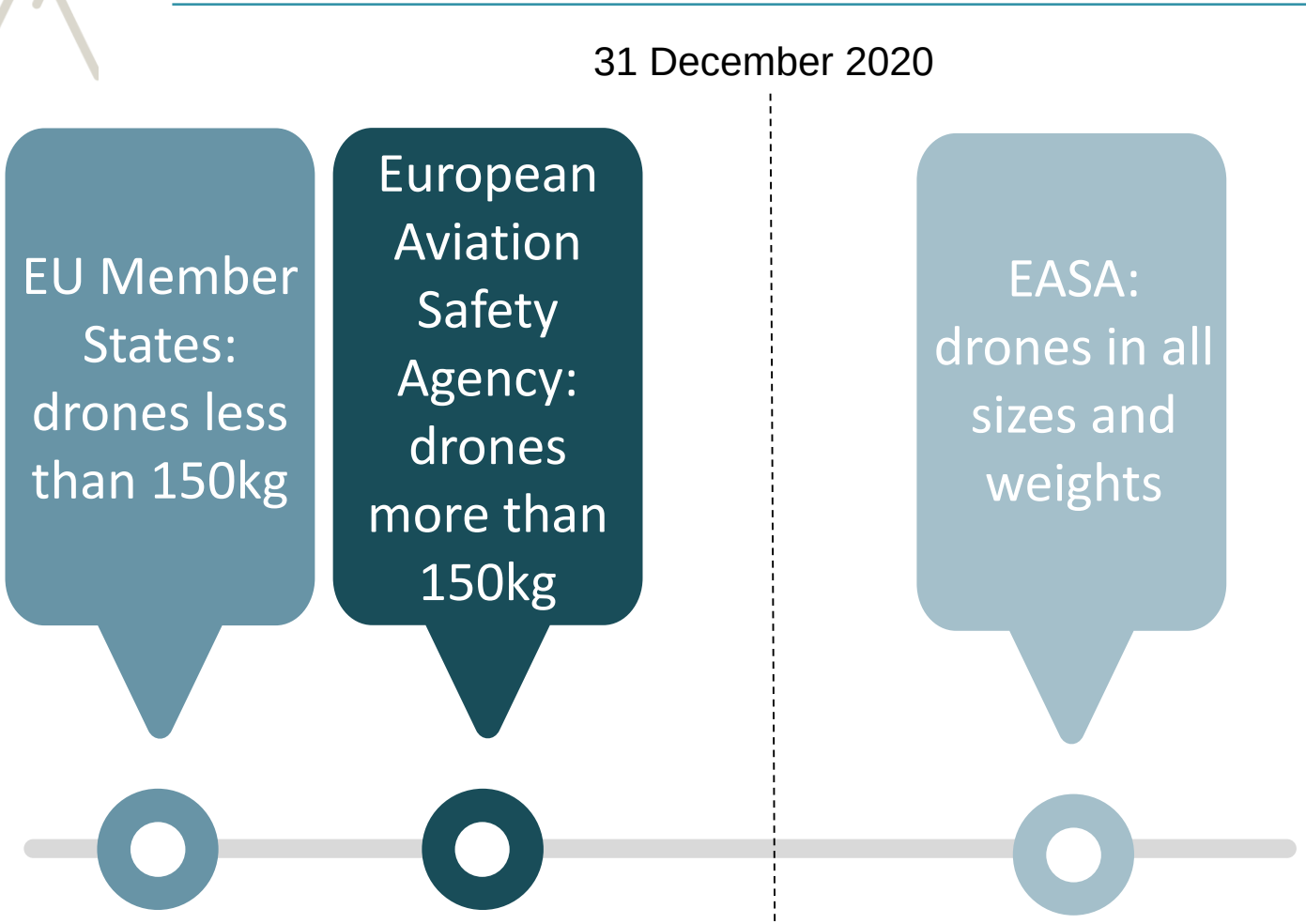


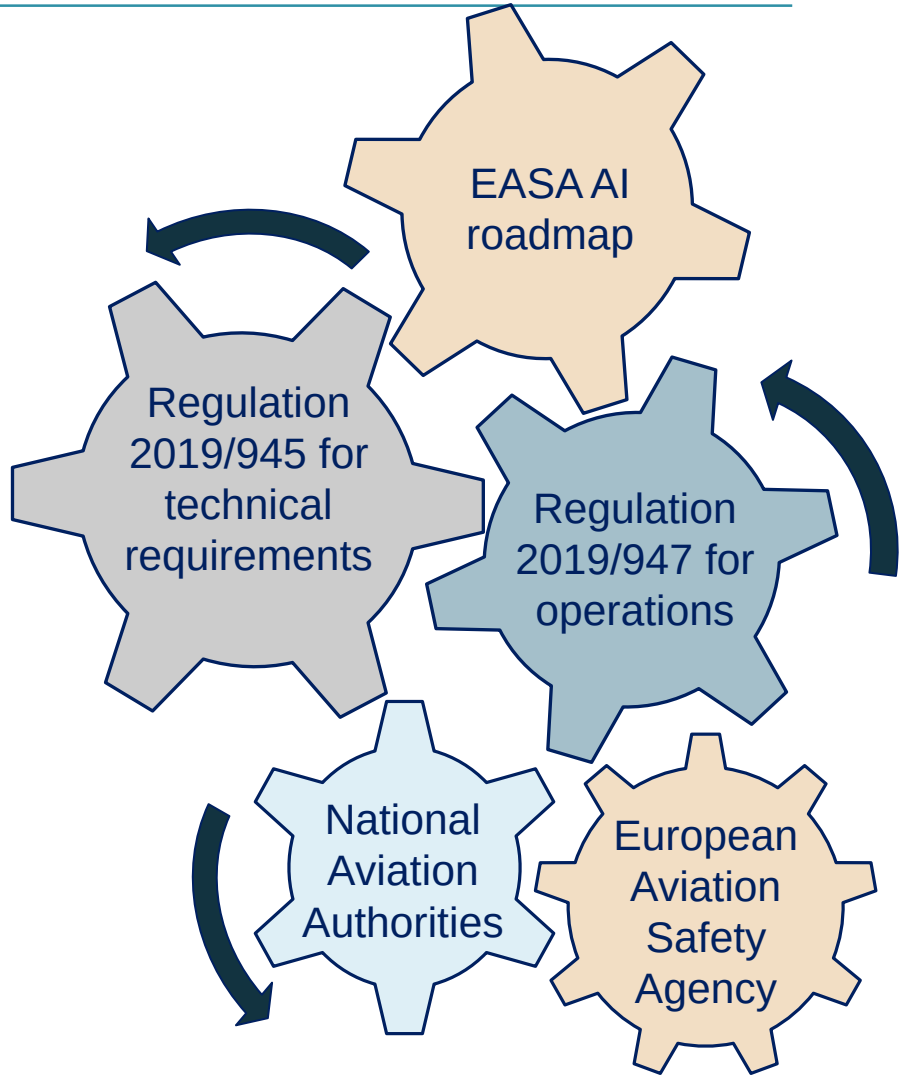
Aurora demonstration and Potential locations

AURORA

sAfe Urban aiR mObility for euRopeAn citizens

Abstract


31 December 2020
EU Member States: drones less than 150kg
European Aviation Safety Agency: drones more than 150kg
EASA: drones in all sizes and weights


EASA AI roadmap
Regulation 2019/945 for technical requirements
Regulation 2019/947 for operations
National Aviation Authorities
European Aviation Safety Agency

Drones Operational Categories

Open

- low-risk operations
- Three sub-categories (A1, A2, and A3)
- No operational authorization or declaration required by operator before start of flight
- VLOS, 25kg MTOM, 120m AGL
- Not carry dangerous goods and no dropping of any material
- Not over assemblies of people
- 5 different C-classes for Open category flights

Specific

- Increased risk
- Declaration suffices if Standard Scenario (STS-x)
- STS-01 (VLOS - maximum height 120m and MTOMs 25kg and Size less than 3m)
- STS-02 (BVLOS-maximum height 120m and MTOMs 25kg and Size less than 3m)
- Operational authorization required based on SORA or PDRA
- LUC self-authorization

Certified

- The highest level of risk
- Always need to be certified.
- The UAS operator will need an air operator approval issued by the competent authority, and the remote pilot is required to hold a pilot license.
- The safety approach will be very similar to manned aviation, and almost all the aviation regulations will need to be amended.
- The UAS has a dimension of 3 m or more in the operation involves flying over assemblies of people
- The transport of people
- The transport of dangerous goods if the payload is not in a crash-protected container.

Drones Operational Categories

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- No operational authorization or declaration required by operator before start of flight
- VLOS, 25kg MTOM, 120m AGL
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- 5 different … pen category flight…

Automated flights

Specific

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- U… …tion

BVLOS and Autonomous flights

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- …ople
- …rt of dangerous goods if the payload is no… a crash-protected container.

Air taxi and cargo over dense urban area

Operational risk assessment for drones in specific category

List of the standard scenarios (STSs)

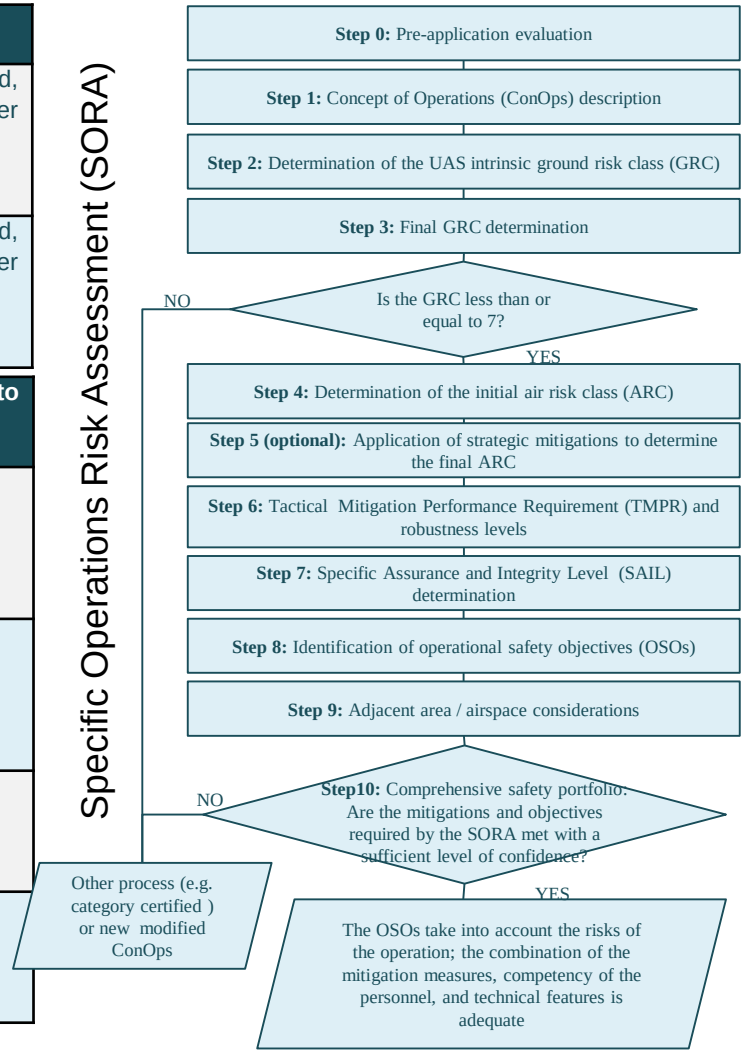
STS#	Edition/ date	UAS characteristics	BVLOS/ VLOS**	Overflown area	Maximum range from remote pilot	Maximum height	Airspace
STS-01	June 2020	Bearing a C5 class marking (maximum characteristic dimension of up to 3 m and MTOM* of up to 25 kg)	VLOS	Controlled ground area that might be located in a populated area	VLOS	120 m	Controlled or uncontrolled, with low risk of encounter with manned aircraft
STS-02	June 2020	Bearing a C6 class marking (maximum characteristic dimension of up to 3 m and MTOM of up to 25 kg)	BVLOS	Controlled ground area that is entirely located in a sparsely populated area	2 km with an AO*** 1 km, if no AO	120 m	Controlled or uncontrolled, with low risk of encounter with manned aircraft

List of the predefined risk assessments (PDRAs)

PDRA#	Edition/ date	UAS characteristics	BVLOS/ VLOS	Overflown area	Maximum range from remote pilot	Maximum height	Airspace	AMC#**** to Article 11
PDRA-S01	1.0/July 2020	Maximum characteristic dimension of up to 3 m and MTOM of up to 25 kg	VLOS	Controlled ground area that might be located in a populated area	VLOS	120 m	Controlled or uncontrolled, with low risk of encounter with manned aircraft	AMC4
PDRA-S02	1.0/July 2020	Maximum characteristic dimension of up to 3 m and MTOM of up to 25 kg	BVLOS	Controlled ground area that is entirely located in a sparsely populated area	2 km with an AO 1 km, if no AO	120 m	Controlled or uncontrolled, with low risk of encounter with manned aircraft	AMC5
PDRA-G01	1.1/July 2020	Maximum characteristic dimension of up to 3 m and typical kinetic energy of up to 34 kJ	BVLOS	Sparsely populated area	If no AO, up to 1 km	150 m (operational volume)	Uncontrolled, with low risk of encounter with manned aircraft	AMC2
PDRA-G02	1.0/July 2020	Maximum characteristic dimension of up to 3 m and typical kinetic energy of up to 34 kJ	BVLOS	Sparsely populated area	N/a	As established for the reserved airspace	As reserved for the operation	AMC3

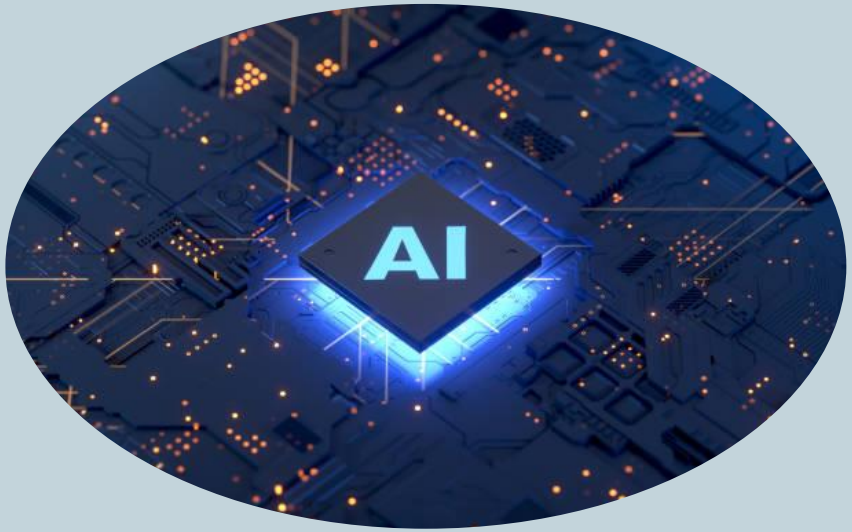
* Maximum TakeOff Mass ** Beyond Visual Line of Sight / Visual Line of Sight *** Airspace Observer **** Acceptable Means of Compliance

Specific Operations Risk Assessment (SORA)



Autonomous vs Automatic

Autonomous UAV

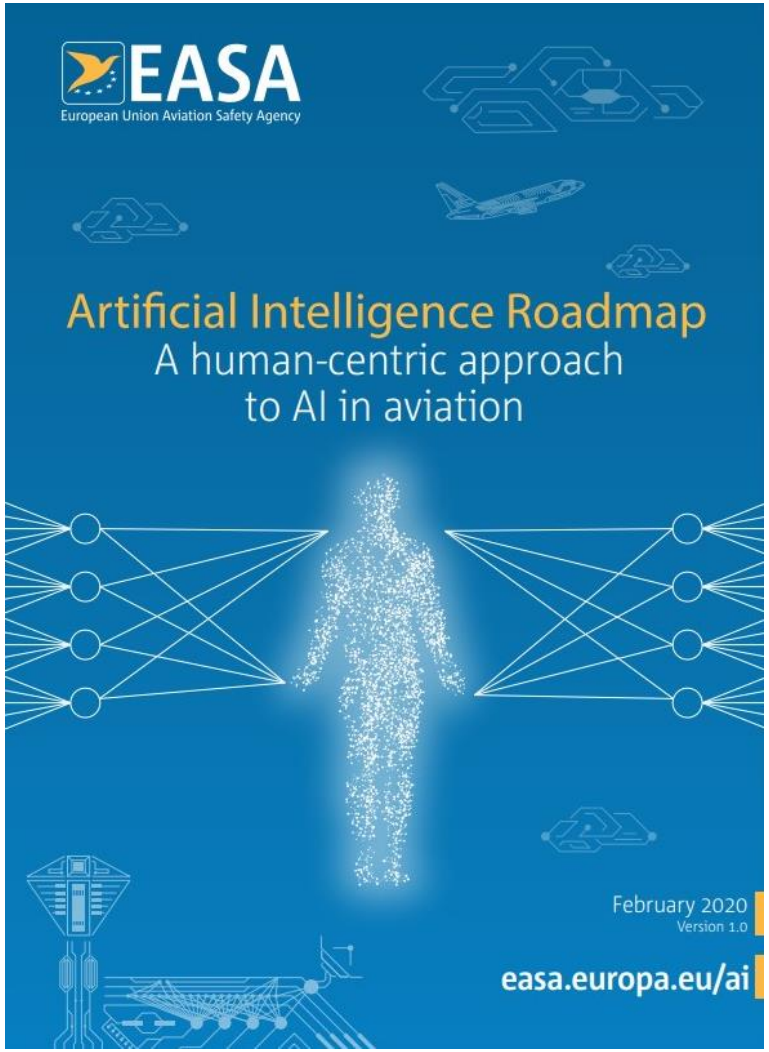


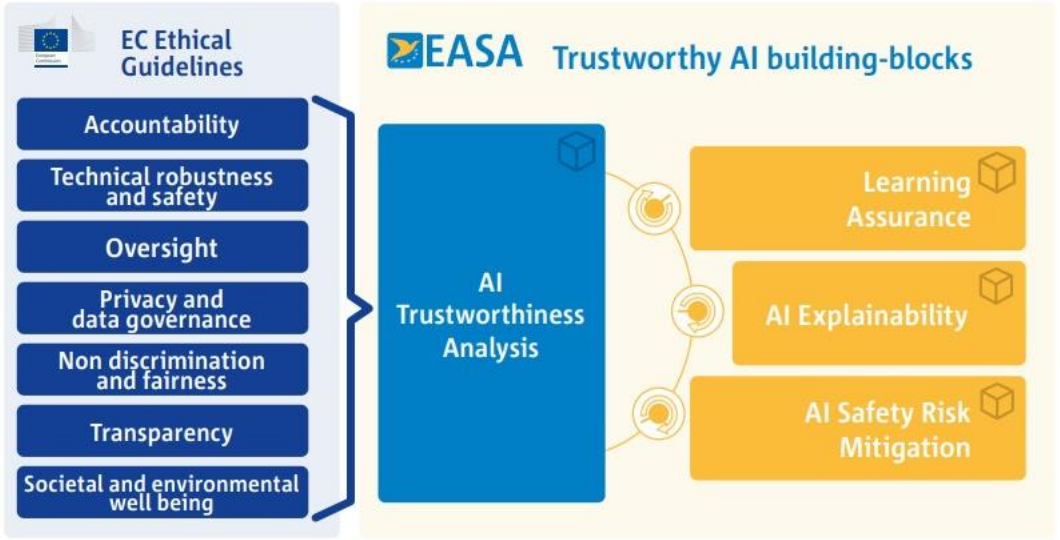
With the help of artificial intelligence, autonomous UAS must cope with unforeseen conditions and unpredictable emergencies to conduct a safe flight without the pilot's intervention.

Automatic UAV

Automatic UAS flies on pre-determined routes, and the remote pilot intervenes in case of unforeseen events not programmed in pre-determined operation.

A human-centric approach to AI in aviation





Conclusion

2020

2023

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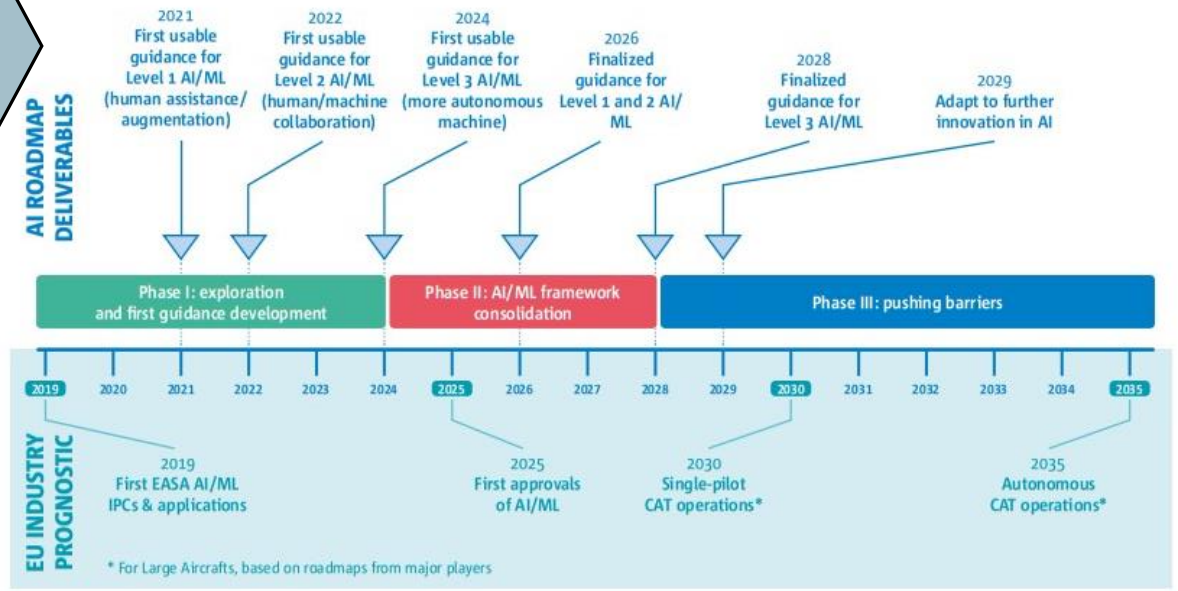
European Aviation Safety Agency: drones more than 150kg

EASA: drones in all sizes and weights

National Aviation Authorities

EASA: drones in all sizes and weights



Thank you for your attention!

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AURORA

http://aurora-uam.eu/

European Commission
Innovation and Networks Executive Agency

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