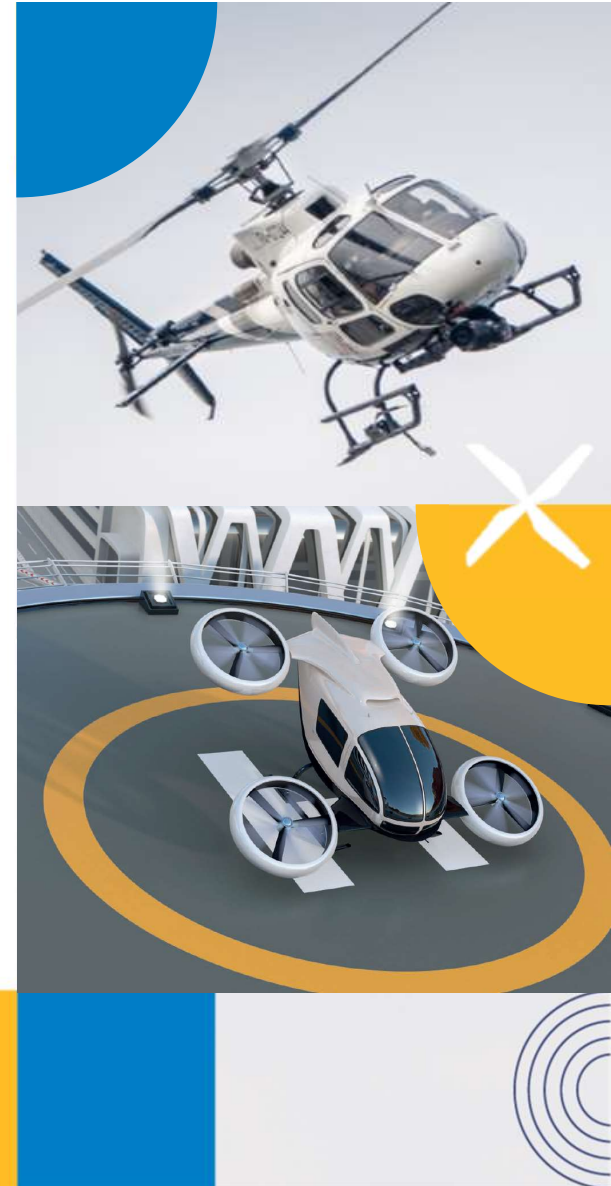


Rotorcraft Safety Roadmap – Highlights 2022

David, Solar
Head of GA and VTOL, EASA



Rotorcraft and VTOL
Symposium 2022



EASA Rotorcraft and VTOL Symposium 2022

General update

Welcome by David Solar and
general EASA and VTOL
activities

Rotorcraft Safety Roadmap

The main deliverables of the
Roadmap published this year
and the ongoing activities of
the Rotorcraft Safety
Roadmap are presented.

EASA News 2022

- In VTOL, significant increase of activity compared to 2021
 - **+42%** Major Change (+54% last year)
 - **+8%** STC (+26% last year)
 - **+6%** Major Change to STC (+40% last year)
 - However, total number of open projects reduced by 7%
 - Efficiency increased
- Unconventional designs
- Organisations not necessarily mature at application
- And increased of TAC, PAC and IPC

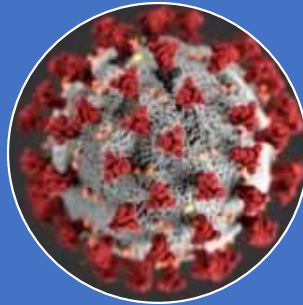


Facts from the recent past



Drop in staffing levels
owing to:

- Non-replacement of leavers during COVID
- Internal mobility



De facto insourcing of
tasks since COVID



Workload:

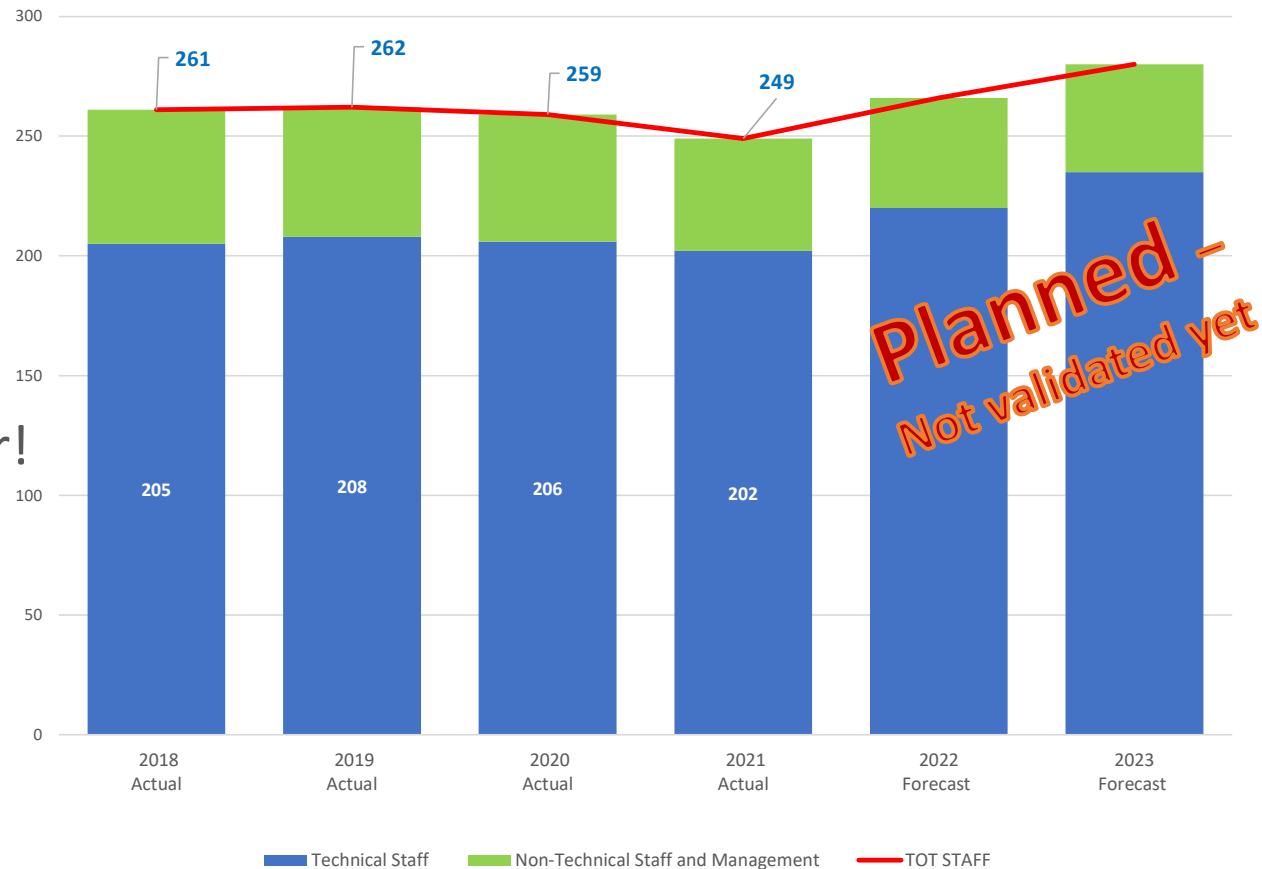
- Stable workload on conventional projects
- Increasing workload on “Innovation” activities

CT Staffing level evolution since 2017



An exceptional recruitment effort

- Ca. 30 on-going recruitments
- Visit us at the Job Fair!



Short-term measures related to staff shortage

- Optimisation of processes and ways of working – IAW Project
- Increased outsourcing (where possible)
- Transparency and coordination of priorities with Industry on capacity and adjustment of planning
- “Waiting room” concept to structure & manage project prioritisation

Conclusion



Data confirming a decrease in workforce



Temporary measures being put in place in transparency and cooperation with Industry



Investment in recruitment & induction



Challenging context on job market affecting EASA too



Expected stabilised situation in 2023

Business Jets, GA, VTOL: major certification projects

Recently certified:



Tecnam P-Mentor



Flight Design F2



F6X



F10X



G700



G800 and G400



Heart Aerospace

In progress:



APUS and many Gas
(27 TCs)



Flying Whales



eVTOL: Velocity, Lilium, Vertical
Aerospace



UAS – TCs and Design
Verifications (20)



Vertex, AW09,
AW609...

Continuing Airworthiness top issues: None



Rotorcraft Safety Roadmap Update 2022

Objective

Reminder
Statistics 2022

Implementation

The main deliverables
published this year and the
ongoing activities and what is
next?

Vision and Strategic objectives

Endorsed by EASA and published in Dec 2018



Vision:

Achieving significant safety improvement for Rotorcraft with a growing and evolving aviation industry

Strategic objectives:

1. Improve the overall Rotorcraft safety by **50% within the next 10 years**.
2. Make positive and visible changes to the Rotorcraft safety trends within the next 5 years.
3. Develop performance-based and proportionate solutions.



1. **Number of Rotorcraft accidents in Europe with at least a fatality or a serious injury.**
2. Additional KPIs based on European Risk Classification Scheme (ERCS).
3. Complemented by data collection activity using D4S to built robust accident rates data.

Vision and Strategic objectives



1. **Number of Rotorcraft accidents in Europe with at least a fatality or a serious injury.**
2. Additional KPIs based on European Risk Classification Scheme (ERCS).
3. Complemented by data collection activity using D4S to built robust accident rates data.



■ Roadmap SPI

► **Figure 52** Number of accidents with a least one fatality or serious injury for all helicopter operations

→ The 2021 figure is the third lowest observed since 2011 but has increased compared to 2020 which is a COVID year

Statistics 2021

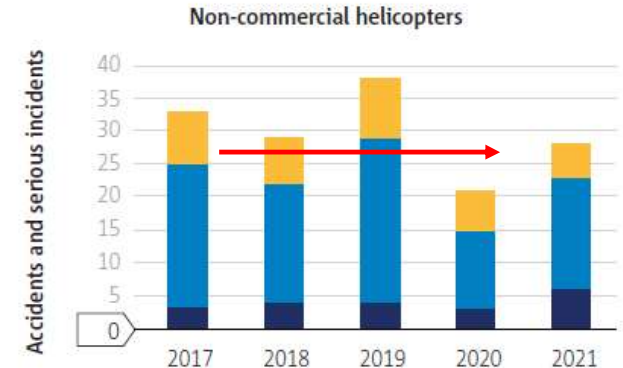
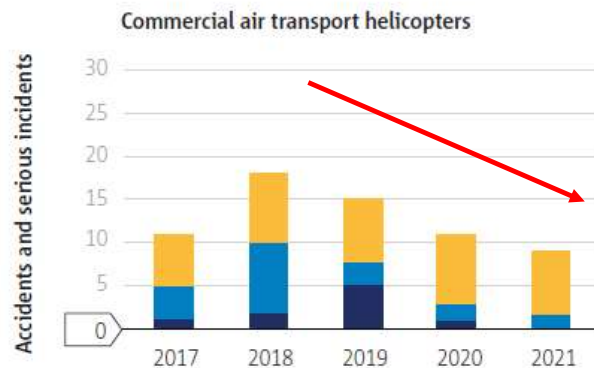
- Trend still positive trend
- But Non-Commercial Operations still too high

■ **Table 1** Cross domain comparison of EASA Member States aircraft fatal accidents and fatalities

AIRCRAFT DOMAIN	FATAL ACCIDENTS 2021	FATAL ACCIDENTS 2011 - 2020 MIN - MAX	FATALITIES 2021	FATALITIES 2011-2020 MIN - MAX	FATALITIES 2011-2020 MEDIAN
Overall	8	5 - 16	13	10 - 37	24
CAT Operations	0	0 - 5	0	0 - 22	6
Specialised Operations	1	0 - 8	1	0 - 17	2
Non-commercial Operations	6	2 - 8	11	4 - 20	7

Statistics 2021

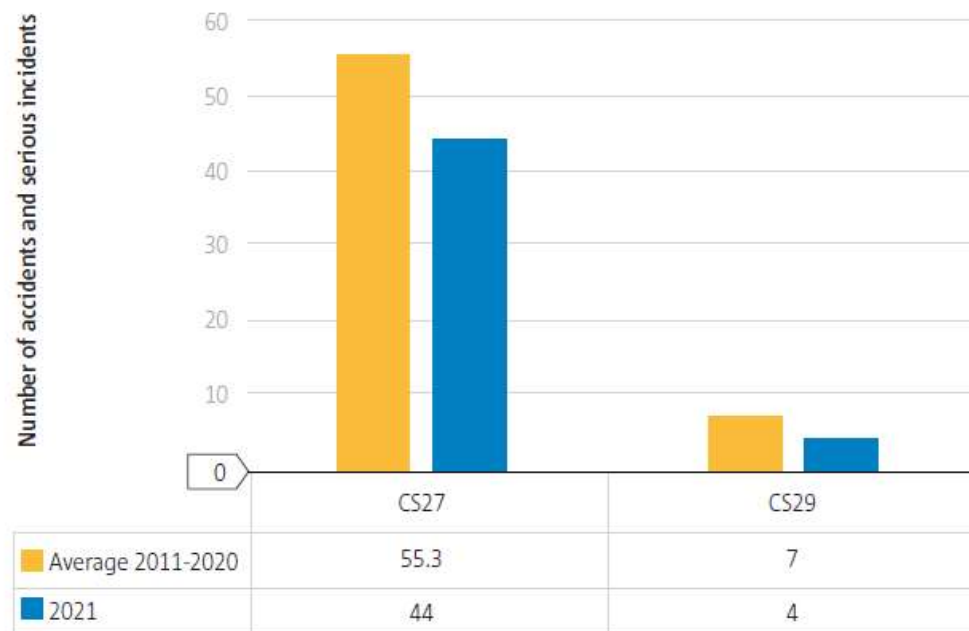
- Trend still positive trend
- But Non-Commercial Operations still too high



■ Fatal accidents ■ Non-fatal accidents ■ Serious incidents

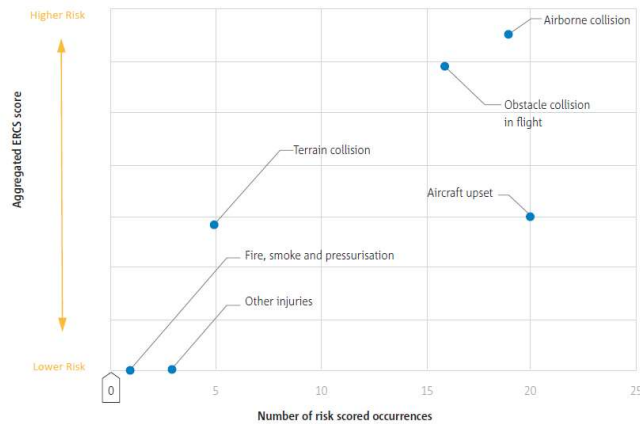
Statistics 2021

→ CS27 helicopters represents 89% of accident and serious incident over the 2011-2020 period

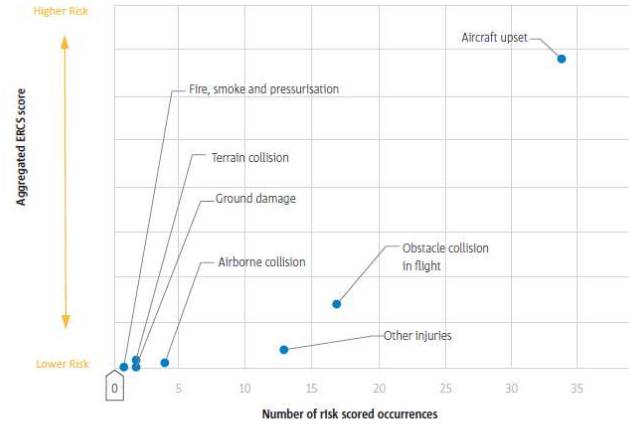


► Figure 54 Accidents and serious incidents by certification specification for all helicopter operations

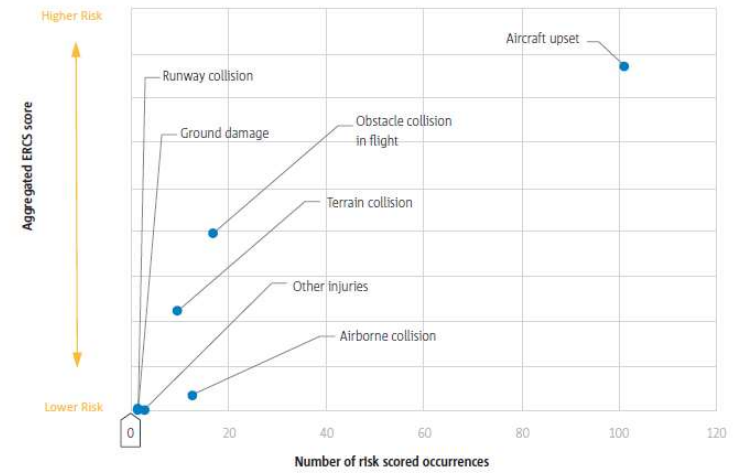
Main risks identified



■ Figure 67 Key risk areas by aggregated ERCS score and number of risk-scored occurrences, involving commercial air transport helicopters



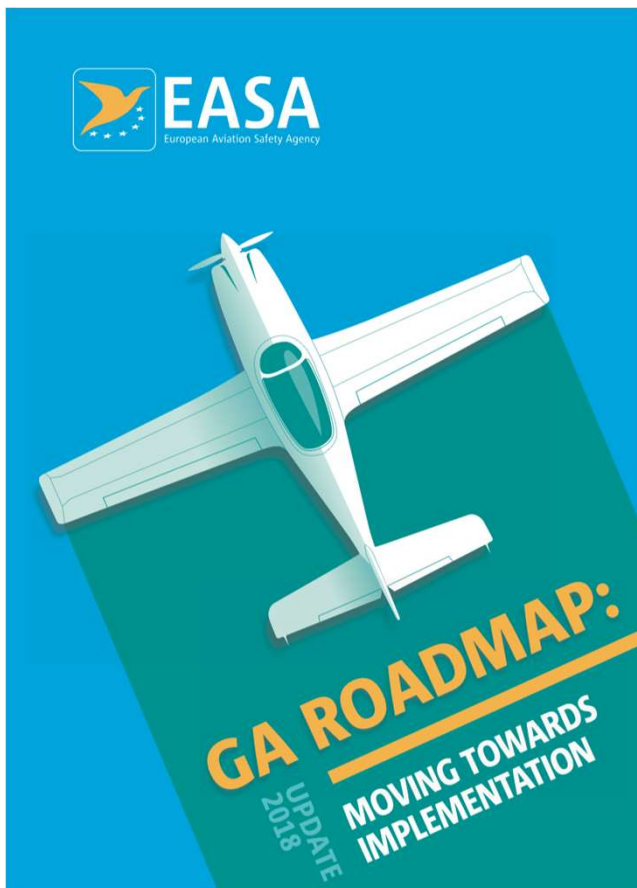
■ Figure 76 Key risk areas by aggregated ERCS score and number of risk-scored occurrences, involving specialised operations helicopters



■ Figure 85 Key risk areas by aggregated ERCS score and number of risk-scored occurrences, involving non commercial operations helicopters

- Aircraft Upset
- Collision in flight
- Terrain Collision

General Aviation and Rotorcraft Safety Roadmaps



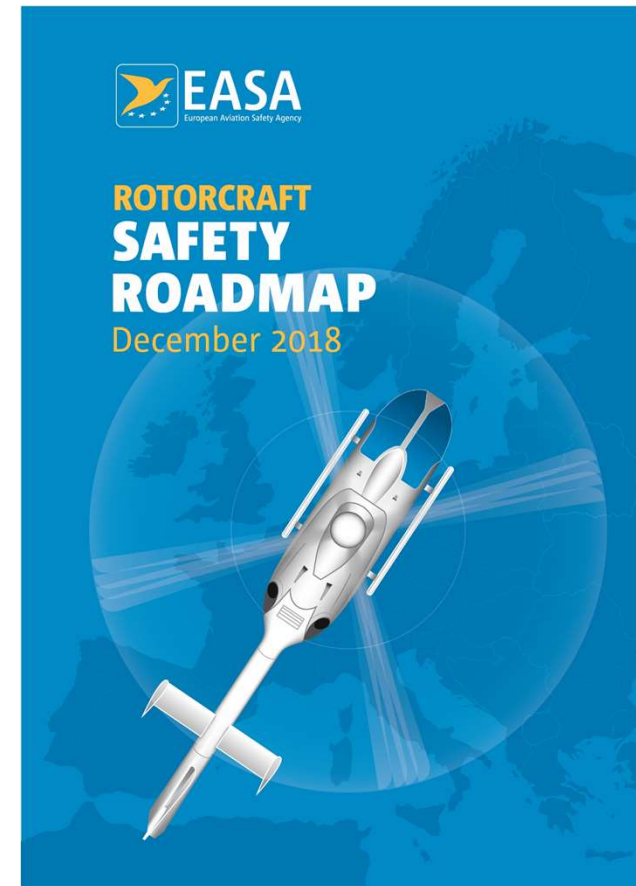
Under the GA Roadmap:

- Addressing the risk of mid-air collisions VFR/VFR in uncontrolled airspace.

Challenges – as usual..

Common issues:

- Access to data (flying hours),
- Safety promotion and reaching out to individual pilots and small operators
- More affordable training methods.



Work-stream Design

Voluntary design improvements

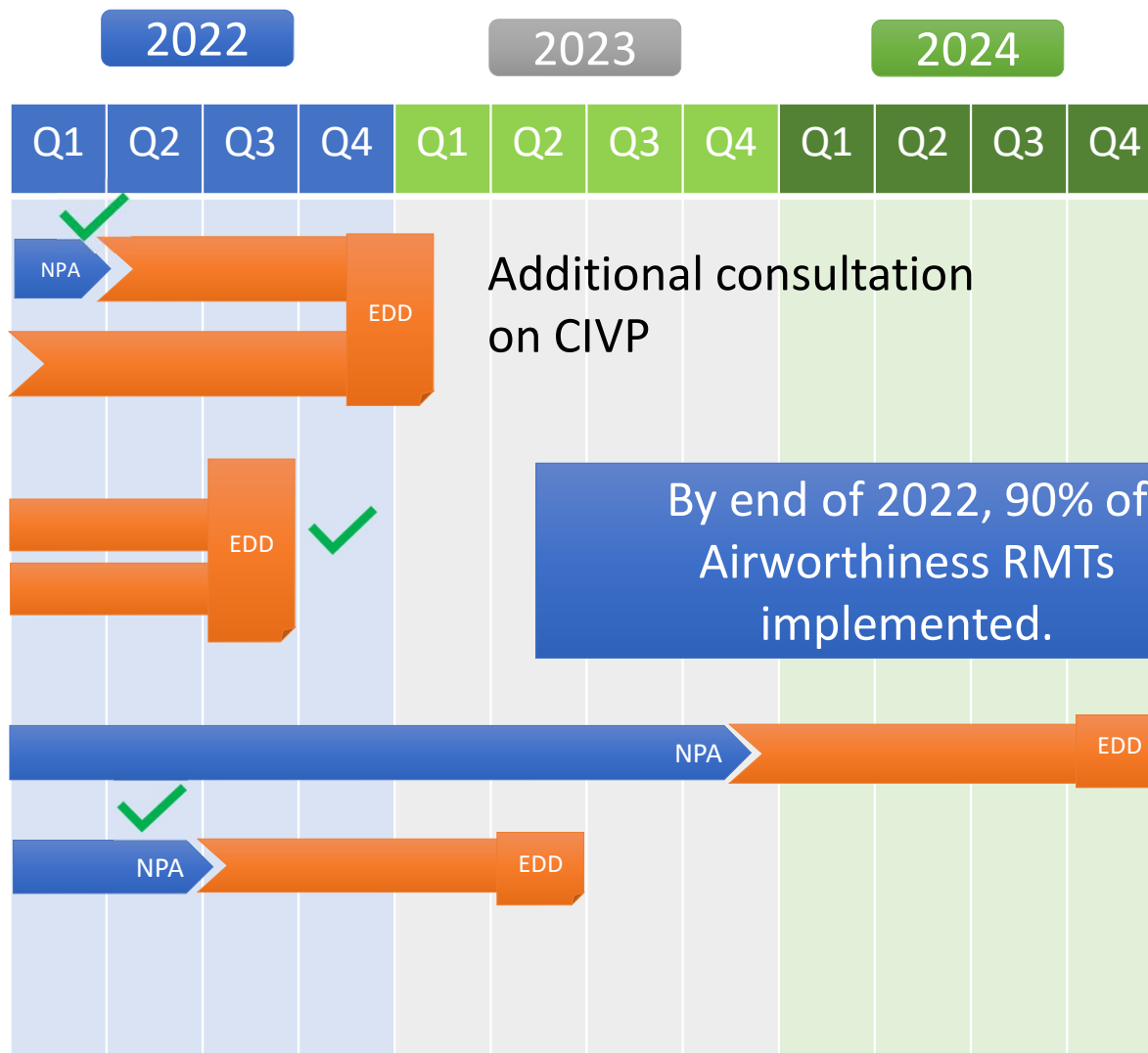
- Work engaged with the Manufacturers to develop on a voluntary basis product improvements
 - Eg: Servo transparency, hydraulic failure, bird strike resistant windshields, crashworthy fuel tanks
- Net Safety Benefit: [Certification Memo CM-SA-001](#) published in June 2021 and available for use
- VAST – Star rating – Prototype rating established

Developing tools enabling securing certification of innovation





- Pre-Application concept now available
 - Can develop innovation specific regulatory material upfront formal application
 - Looking forward for some safety related systems such as wire detection, stability augmentation systems, autopilots, virtual co-pilot....

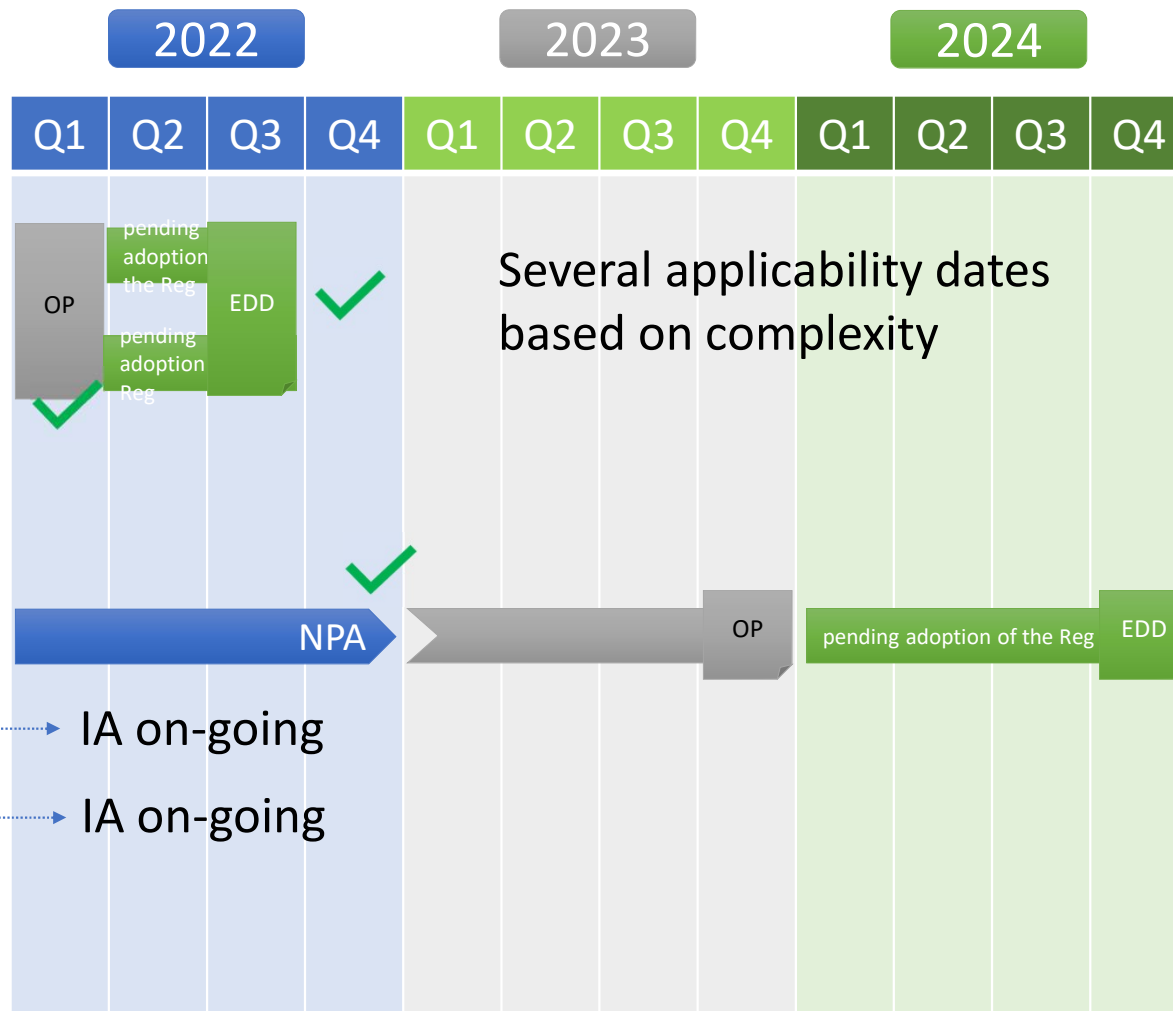
CS-27/29 (New types)

SR	RMT.0128	RU CS-27/29
	RMT.0712	R/C safety assessment
CS-ETSO	RMT.0709	R/C hoist (ETSO)
	RMT.0457	RU CS-ETSO
SR	RMT.0724	R/C FCOM
SR	RMT.0711	R/C VHMS



Part 26 (Certified types)

	RMT.0120	Helicopter ditching
	RMT.0586	TPMS
	RMT.0710	R/C Survivability - fuel tanks
	RMT.0710	R/C Survivability - seats
	RMT.0725	R/C oil monitoring (2)
	RMT.0726	R/C bird strike (2)



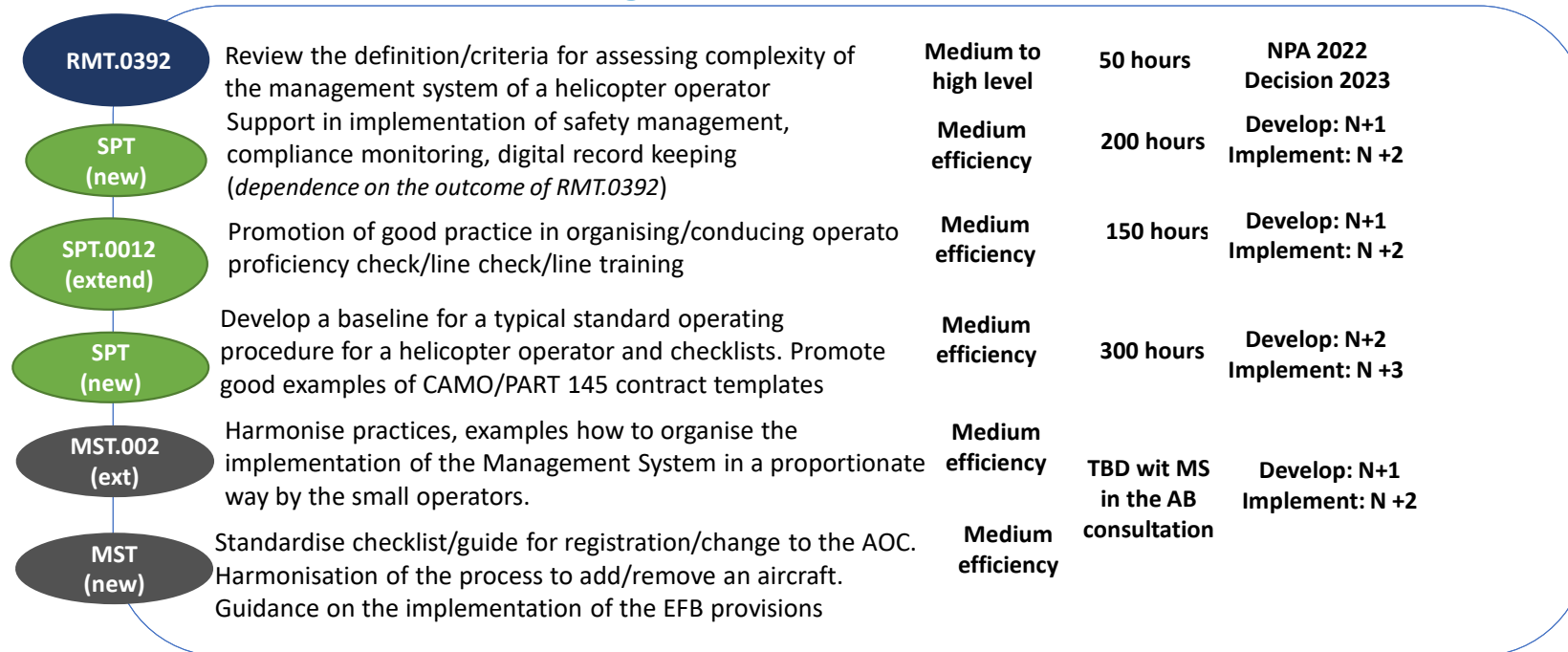
IA on-going

IA on-going

Research

- EASA has launched in 2022 the following research projects
 - Vortex ring state prediction and recovery
 - Determine the flight conditions in which the vortex ring state starts to develop for at least three different types of helicopters to support and evaluate the correctness of theoretical methods for prediction of the vortex ring boundaries.
 - Evaluate the effectiveness of the ‘Vuichard Recovery Technique’ for at least three different types of helicopters compared to “traditional methods”.
 - Helicopter under water evacuation

Work-Stream - Simplification



Timeline is indicative. Year N is the year when the actions can be programmed in the EPAS, provisionally in 2023

- EPAS modified following the outcome of the survey
- Publication of C M-21.1-K-001 issue 2 - Installation of new parts and appliances without an EASA Form 1
- On-going discussion with EHA

Qualification of first VR Simulator

→ Objective: to facilitate and promote the development and use of new innovative and cost-effective training devices.

→ Outcome

- First FNPT II Virtual Simulator Approved (2021)
- First FSTD Virtual Reality Simulator approval (2022)
- Third FSTD in the pipeline
- Working on increasing Simulator training credit

Address Safety and Environment

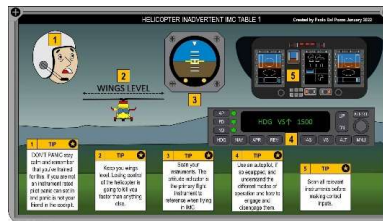


Work-Stream - Safety Promotion

1. Rotorcraft Together4Safety Community

- Continually seeking to engage the global rotorcraft community in positive safety conversations
- Now over 1 Million Views of our Safety Promotion material since the real beginning in 2019
- This year we added another 3,000 Members to our Rotorcraft Community Site and LinkedIn Groups
- Increased global collaboration – 2022 will see a collective effort of 12 Videos and 23 Articles
- Topics covered include Wearing Helmets, Unintended IMC, Sharing Airspace with Drones, Performance Planning and Power Management, SMS implementation, Flight Instructions, Crash Resistant Fuel Tanks
- For 2023 we hope to further increase our deliverables using a new structure to help simplify safety

2. Excellent cooperation with Industry



Roadmap Project

→ Safety KPY



Safety KPY monitored and made public annually in the ASR

→ Action plan



Managed within the EPAS. Fully aligned. No parallel planning.

→ Airworthiness Rulemaking
(modernisation / Safety improvement)



90% completed. Most of RMT finished and EDD Published.

→ OPS / FCL Rulemaking



In progress.

UAS and eVTOL Update 2022

Sustainability

EASA Sustainable Aviation programme - Workstreams



Robust
certification
and green
standard
setting



Operational
Efficiency and
Sustainable
Aviation Fuels /
ETS / CORSIA



Facilitating air
transport
electrification
and de-carbonisation



Managing the
environmental
impact of
Drones and Air
Taxis



Guiding
research
towards zero
emissions
aviation



International co-
operation for
environmental
capacity building



More transparency:
Environmental Label
and European
Aviation
Environmental
Report

Major Publications



1. OVERVIEW OF AVIATION SECTOR

- 1.1 Air traffic
- 1.2 Noise
- 1.3 Emissions
- 1.4 Combining indicators

2. AVIATION ENVIRONMENTAL IMPACTS

- 2.1 Noise
- 2.2 Air quality
- 2.3 Climate change
- 2.4 Adapting aviation to a changing climate

3. TECHNOLOGY AND DESIGN

- 3.1 Aircraft noise
- 3.2 Aircraft engine emissions
- 3.3 Aeroplane CO₂ emissions
- 3.4 Drones and Urban Air Mobility Vehicles
- 3.5 Supersonic aircraft
- 3.6 Novel energy sources
- 3.7 Circular economy
- 3.8 Clean Sky

4. SUSTAINABLE AVIATION FUELS

- 4.1 What are Sustainable Aviation Fuels?
- 4.2 How sustainable are SAF?
- 4.3 SAF policy actions
- 4.4 Current landscape and future of SAF industry

5. AIR TRAFFIC MANAGEMENT AND OPERATIONS

- 5.1 Single European Sky
- 5.2 SES environmental performance and targets
- 5.3 Operational performance indicators
- 5.4 Operational initiatives
- 5.5 SESAR: Towards the digital European sky

6. AIRPORTS

- 6.1 Managing environmental impacts around airports
- 6.2 Aircraft noise performance at European airports
- 6.3 Green airport infrastructure
- 6.4 Net zero CO₂ emissions

7. MARKET-BASED MEASURES

- 7.1 EU Emissions Trading System
- 7.2 Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
- 7.3 Capacity building activities
- 7.4 Other carbon pricing initiatives



EUROPEAN AVIATION ENVIRONMENTAL REPORT 2022







UAS and eVTOL Update 2022

UAS

eVTOL

UAS categories

Open	Specific	Certified
 <p>No pre-approval CE marking process Only VLOS</p>	  <p>NAA Pre-approval required EASA may assess UAS design</p>	   <div>  </div>

[Regulation \(EU\) 2019/945](#) (technical requirements and third country operations)



[Regulation \(EU\) 2019/947](#) (registration and operational requirements)

[NPA 2022-06](#) in consultation
until 30/09/2022

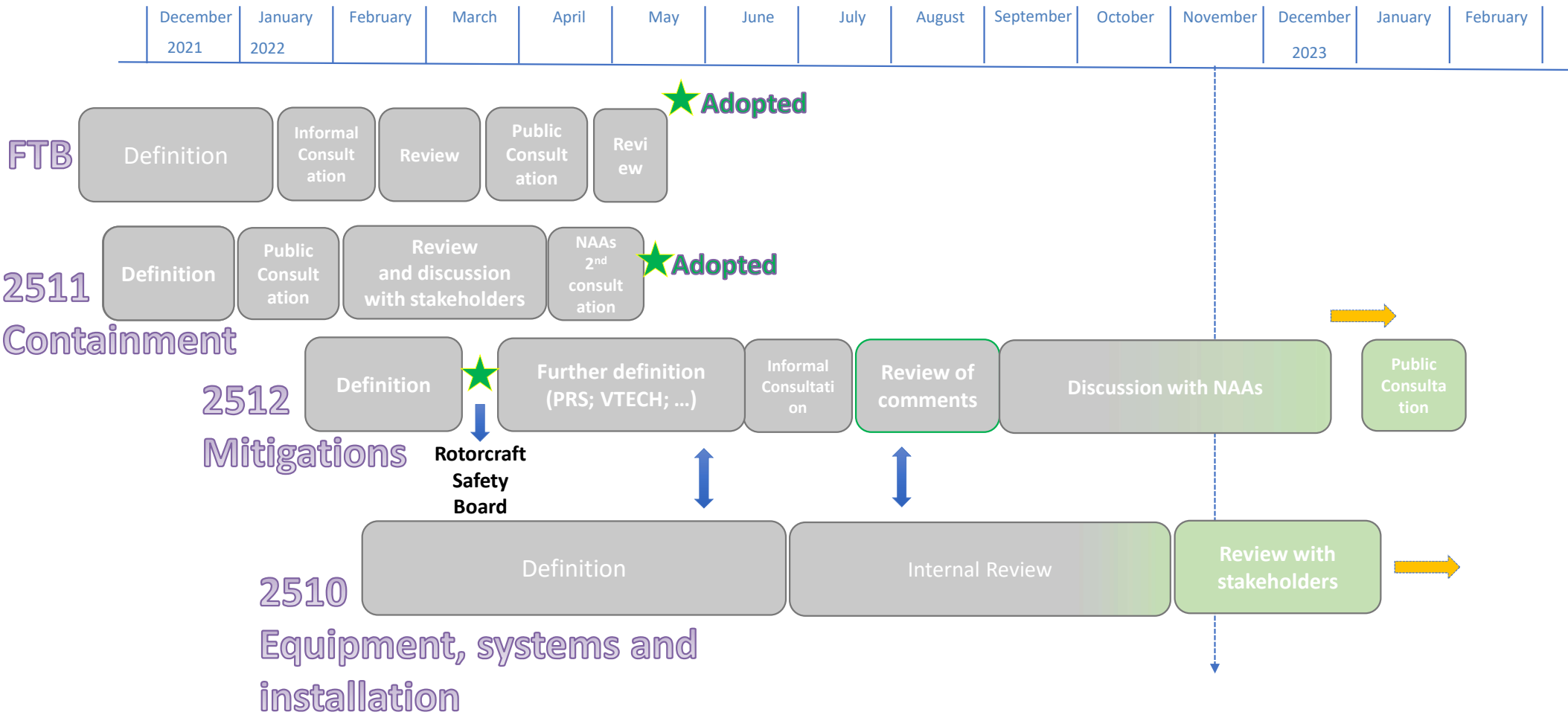
New UAS Easy Access Rules published in September 2022

→ Main changes:

- Postponement of some transition dates (UAS in the open category and Standard Scenario)
- AMC/GMs on Geographical zones
- Operational Authorisation Forms
- New Pre Defined Risk Assessment PDRA-G-03 (capturing need of routine and automatic inspection/surveillance of facilities/infrastructures)

[Easy Access Rules for Unmanned Aircraft Systems \(Regulations \(EU\) 2019/947 and 2019/945\) - Revision from September 2022 - Available in pdf, xml, and online format | EASA \(europa.eu\)](#)

EASA-developed MoCs to SC Light UAS

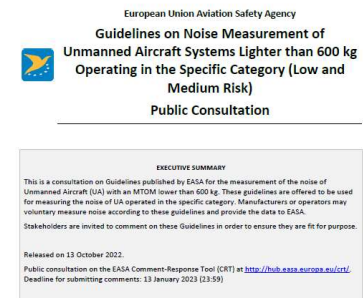


EUROCAE-developed MoCs to SC Light UAS (SAIL III / IV)

- Priority areas agreed early 2022 between EASA and EUROCAE on the base of:
 - research project **AW Drone** output on standards for SC Light UAS
 - EASA internal review with experts
- EUROCAE MoCs under development
 - **Subparts G crew interface and Subpart H C2 link have reached internal consultation in October 2022**
- **Shepherd** H2020 research project kick-off early 2022
 - Will further contribute to MoC establishment finalizing the work of AW-Drone

Noise

- Noise measurement Guidelines for specific category UAS published for consultation on 13.10.2022
- Guidelines on Noise Measurement of Unmanned Aircraft Systems Lighter than 600 kg Operating in the Specific Category (Low and Medium Risk) | EASA (europa.eu)
- Utilization on voluntary basis



SORA 2.5

- EASA has continuously supported JARUS WG6 in finalizing the SORA package 2.5 for the upcoming public consultation
 - Revised Body and Annexes
 - New step#9 (containment)
 - Quantitative approach to ground risk as per Annex F of SORA
- EASA intends to adopt the new package as AMC in 2023
 - AMC to article 11 of regulation 2019/947 on risk assessment for the specific category of operation

Publication of NPA 2022/06

Comprehensive and interrelated set of affected regulations



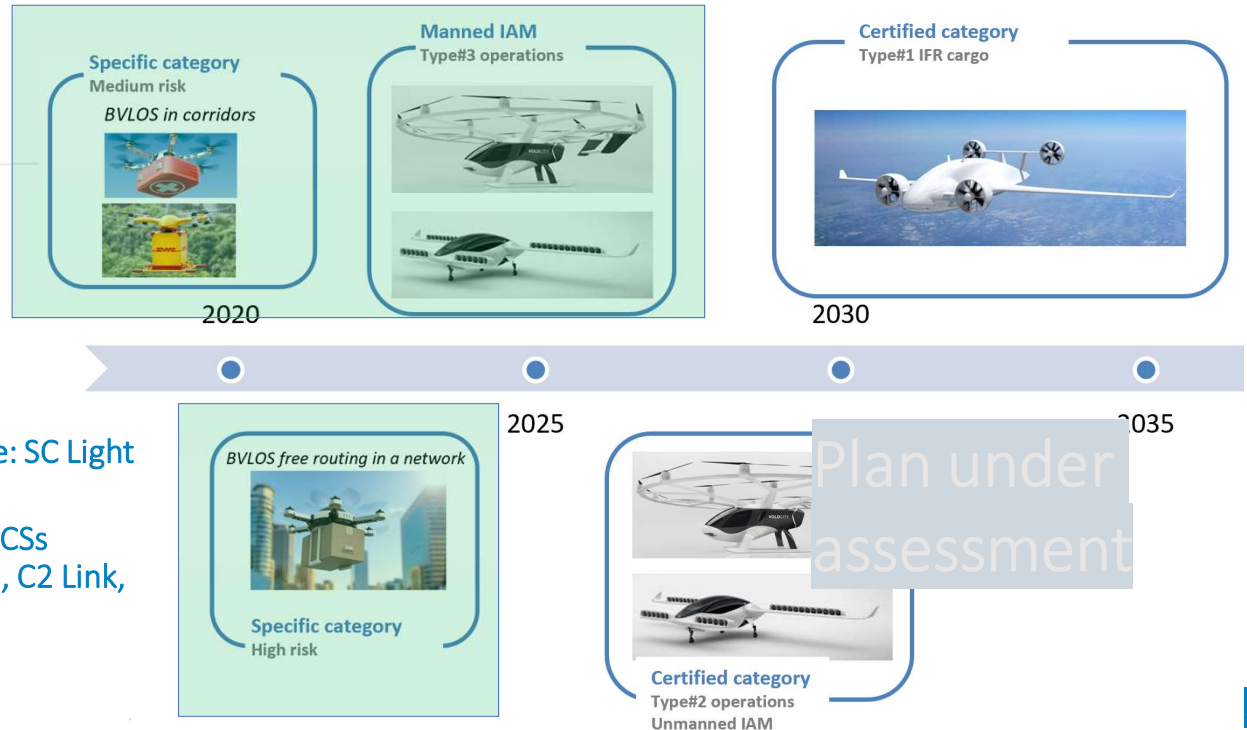
NPA 2022 / 06

Introduction of a regulatory framework for the operation of drones — Enabling innovative air mobility with manned VTOL-capable aircraft, the IAW of UAS subject to certification, and the CAW of those UAS operated in the 'specific' category

Show internal statistics ▾

📅 30 Jun 2022 POPULAR

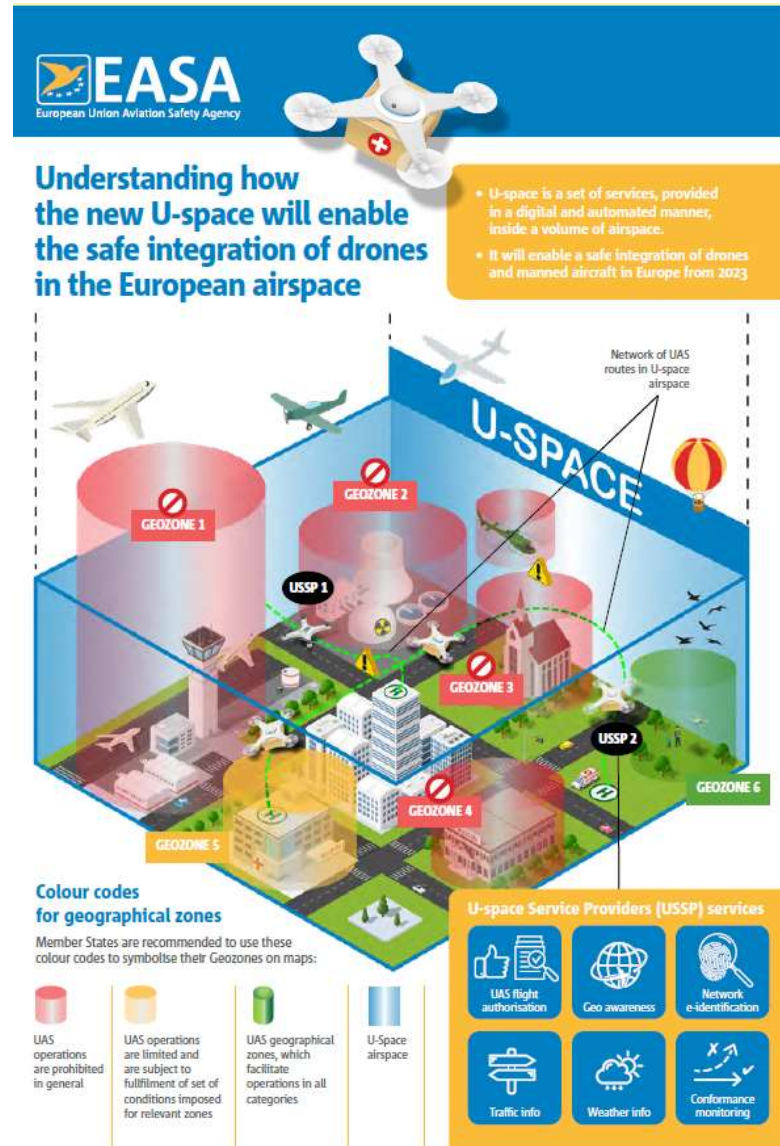
Expiration date for comments: 30/09/2022



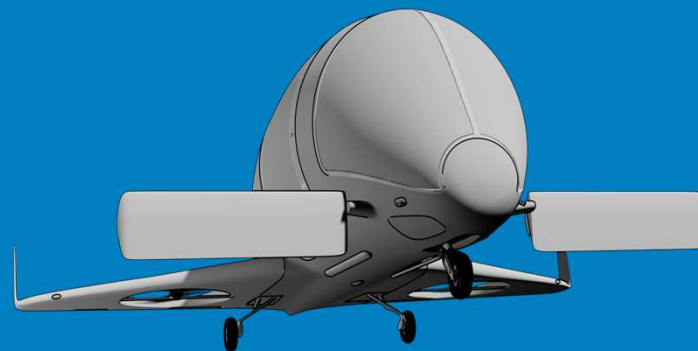
→ Certification basis

- MTOM < 600 Kg and no transport of people: SC Light UAS
- Other cases: created from manned aircraft CSs complemented with appropriate SC (for CU, C2 Link, ...)

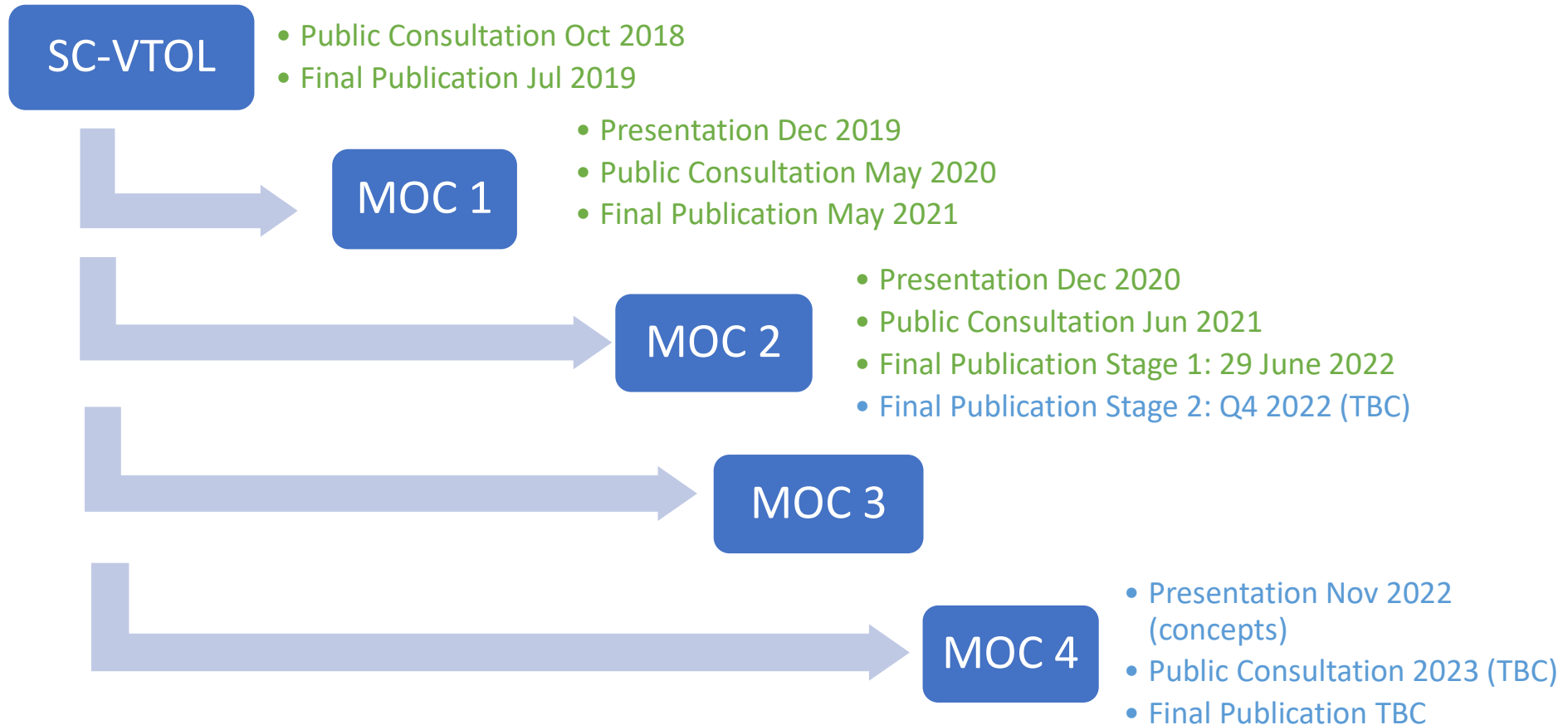
U-Space



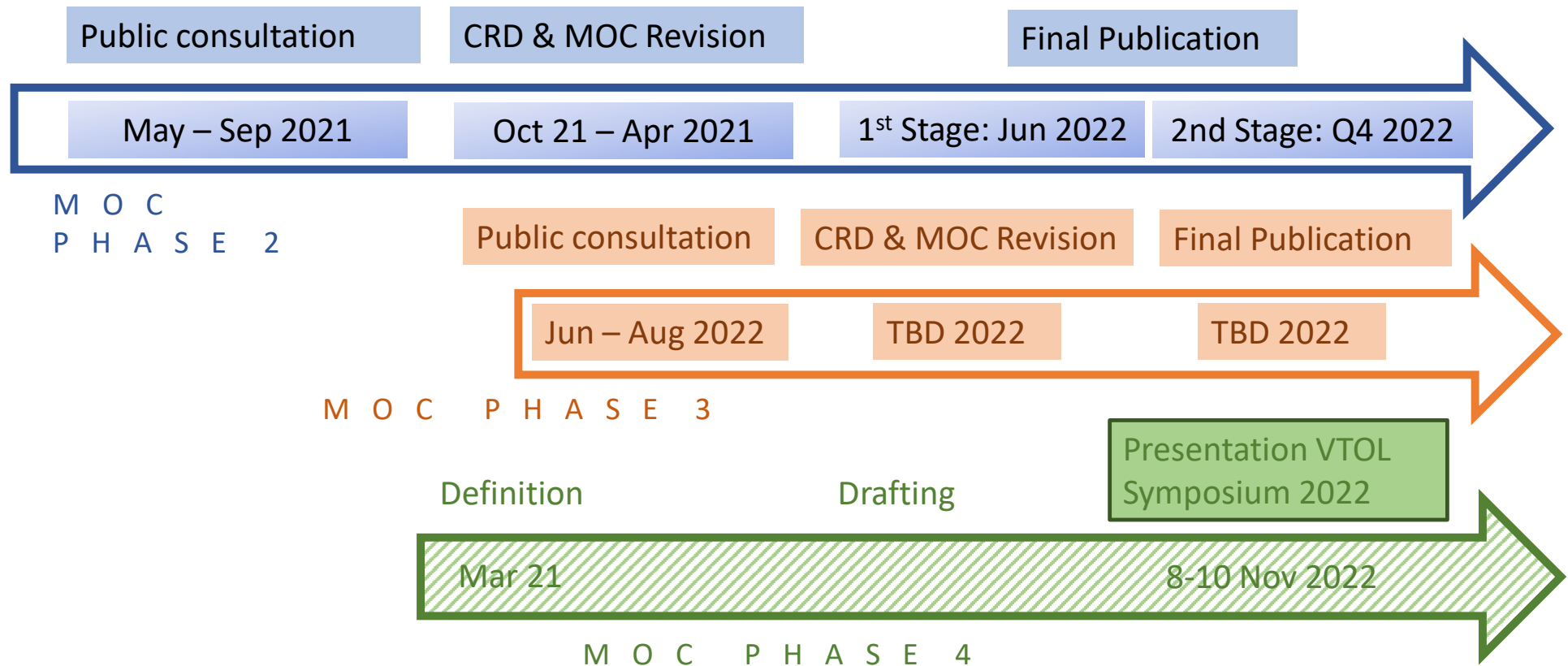
eVTOL



Overview SC VTOL and MOC



Schedule of MOC Phase 2, 3 and 4



TOPICS FOR MOC PHASE 4

MOC	Title	Topic
VTOL.2000	Applicability and definitions	Certified Minimum Performance Determination
VTOL.2100	Mass and centre of gravity	Consideration of possible changes of configuration
VTOL.2125	Climb Information	
VTOL.2160	Vibration	Vibration and Ground resonance: Consideration of multi rotors configuration and rpm range and combination
VTOL.2210	Structural Design Loads	<ul style="list-style-type: none">• Proof of structure (Approach for the selection of configurations to be demonstrated for static strength)• Skid Towing loads• Equivalent criteria of CS 27.547 and 27.549 (possibly including design case for engine mounts)

TOPICS FOR MOC PHASE 4

MOC	Title	Topic
VTOL.2225	Component loading conditions	V-tail considerations and other non-conventional designs (possibly also lift/thrust mounts)
VTOL.2270(c)	Emergency Conditions	Adaptation of CS 27/23.785 (Seats, berths, safety belts, and harnesses) (On top of Eurocae/SAE on the AS6849 Standard for Seats)
VTOL.2400(c)(3)	Lift/thrust system installation	Exposure to EM Fields generated by DC HV: <ul style="list-style-type: none">- For passengers and ground handling/maintenance staff inside and around the aircraft , ref. ICNIRP Guides for limiting exposure to EM Fields (versions 1989, 2010 and 2020).

TOPICS FOR MOC PHASE 4

MOC	Title	Topic
VTOL.2400(d)	Lift/thrust system installation	Means for isolation, containment, discharge of hazardous fluids, vapours, gases (MOC VTOL.2400(c)(3) Section (d) covers the definition of Hazard Areas)
VTOL.2430	Lift/thrust system installation, energy storage and distribution systems	<ul style="list-style-type: none">• Non-rechargeable Batteries → Existing material applicable to Enhanced Category VTOL• Rechargeable batteries other than propulsion → Existing material applicable to Enhanced Category VTOL
VTOL.2545	Pressurised systems elements	Extension of CS 25.1438 and related AMC to VTOL

TOPICS FOR MOC PHASE 4

MOC	Title	Topic
VTOL.2500(b)	General requirements on systems and equipment function	Autoflight system, incorporating CS/FAR-25 autopilot AMC 1329. → Under investigation
VTOL.2510	Equipment, systems and installations	Single Event Effect (e.g. caused by atmospheric radiation)
VTOL.2620	Aircraft Flight Manual	Electronic Checklist → Discussion ongoing with Eurocae WG-112 SG-6 to develop a standard.

General Regulation Updates

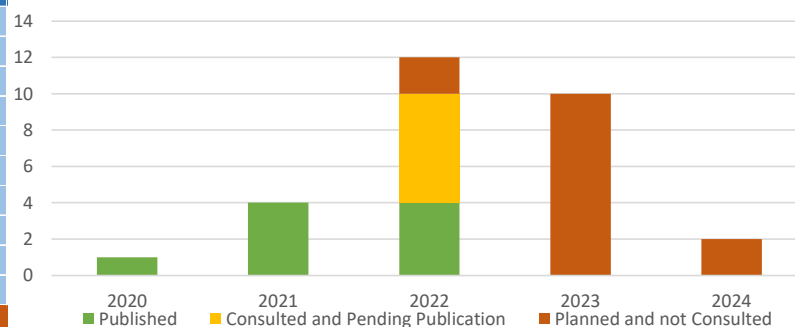
- EASA issued in March 2022 the Prototype Technical Design Specifications for Vertiports
- The first NPA of Rulemaking Task RMT.0230 published – refer to UAS slides



EUROCAE WG-112

EUROCAE WG-112 Standards Publication	2020 Published	2021 Published	2022 Published	2022 Consulted and pending Publication	2022 Planned and not consulted	2023 Planned	2024 Planned
SG-0 Steering Committee / General	1						
SG-1 Electrical		3				4	
SG-2 Lift/Thrust			1			1	1
SG-3 Safety				3		1	
SG-4 Flight				1	1	2	
SG-5 Ground			1	1	1	1	1
SG-6 Avionics			1	1		1	
SG-7 ConOps		1					
SG-8 Seats			1				
SG-9 Electromagnetic Hazards							
TOTAL	1	4	4	6	2	10	2

EUROCAE WG-112 Publication of new Standards
Status 1 Nov 2022



Conclusions

Your safety is our mission.

An Agency of the European Union 

We are all delivering despite circumstances

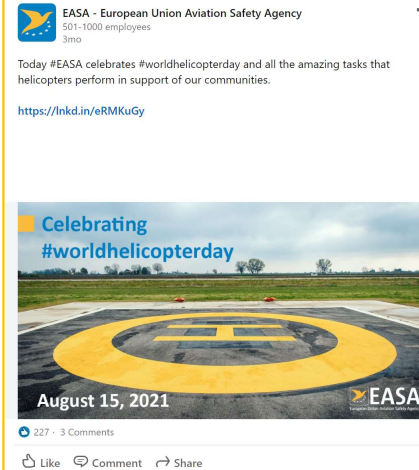
- Industry is very active and innovative
- The Rotorcraft Safety Roadmap is moving forward
 - Large Industry consensus
- It's living and assessment of all opportunities/synergies
 - Leveraging Sustainable Aviation?
 - Leveraging eVTOL technologies
- It shows that we are better when working together



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**Thank you
for your attention!**

Your safety is our mission.



Rotorcraft and VTOL
Symposium 2022

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