



MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

**Challenges and benefits of harmonising
the licensing process for emerging technologies**

14-18 December 2020



MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

**Challenges and benefits of harmonising
the licensing process for emerging technologies**

Welcome

Day 2 – Tuesday 15 December



Session 3

Moving safely from aircrafts to drones: licensing disruptive technologies



Ms. Silvia GEHRER

Regional Director, ICAO European and North Atlantic (EUR/NAT) Office, United Nations International Civil Aviation Organisation



ICAO PARIS

UNITING AVIATION

Innovation and International Regulatory Frameworks: The ICAO RPAS case

Silvia Gehrler

ICAO Regional Director

Europe and North Atlantic

OECD/NEA Multi-sector Workshop on Innovative Regulations | 15 December 2020





- **ICAO Brief**
- **ICAO Innovation Areas (video)**
- **Technical Innovation Approval Process: How do we do it?**
- **RPAS Case: Aircraft, Components, Stakeholders, Layered Approach, RPAS Panel, Scope of Work & Timelines**
- **Upcoming Webinars, Events & Training**



UN specialized agency

Established by the “Chicago Convention” in 1944

Global Forum for cooperation in all fields of civil aviation

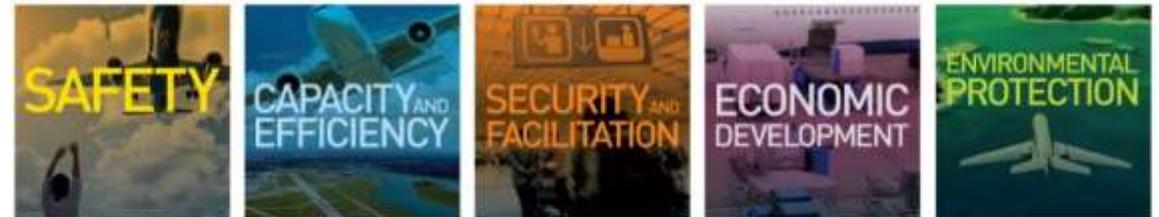
193 Contracting States

19 Annexes –
Standards, policies & guidance

ICAO



Strategic Objectives to support the global aviation





ICAO Regional Offices - Main functions

- Facilitate a regionally coordinated implementation of ICAO strategies, SARPs and guidance
- Facilitate regional monitoring and provision of feedback on the implementation progress and hurdles
- Maintain continuous liaison with States, regional and international organizations
- Ensure intra and inter - regional coordination



Introduction to the ICAO Innovation in Aviation Gateway (video)

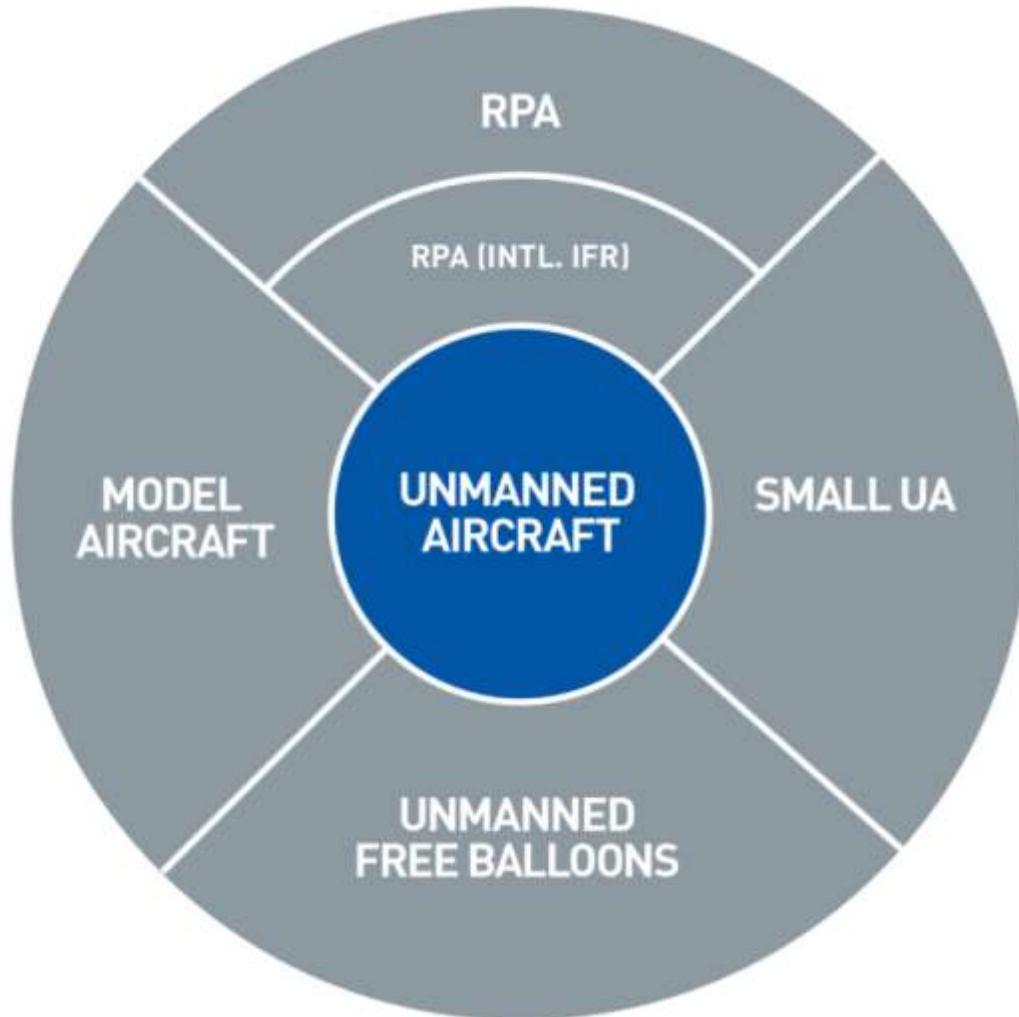




Innovation: Approval process

- Regulation is almost always focused on minimizing risks
- Understanding from States is required
- How innovation behaves in a variety of states: normal, abnormal and failure
- Regulation requires consistency
- The challenge: The Design, the interaction between systems, and the human training greatly impact the regulatory work
- Manufacturer & Regulator symbiotic relationship | The need for standardization vs speed of discoveries
- SMS model: Adapting regulations | Direct submissions (SARPS)
- Complementing Industry Standards (EUROCAE, RTCA, SAE or ISO)

RPAS are aircraft



Aircraft. Any machine that can derive support in the atmosphere from the **reactions of the air** other than the reactions of the air against the earth's surface.

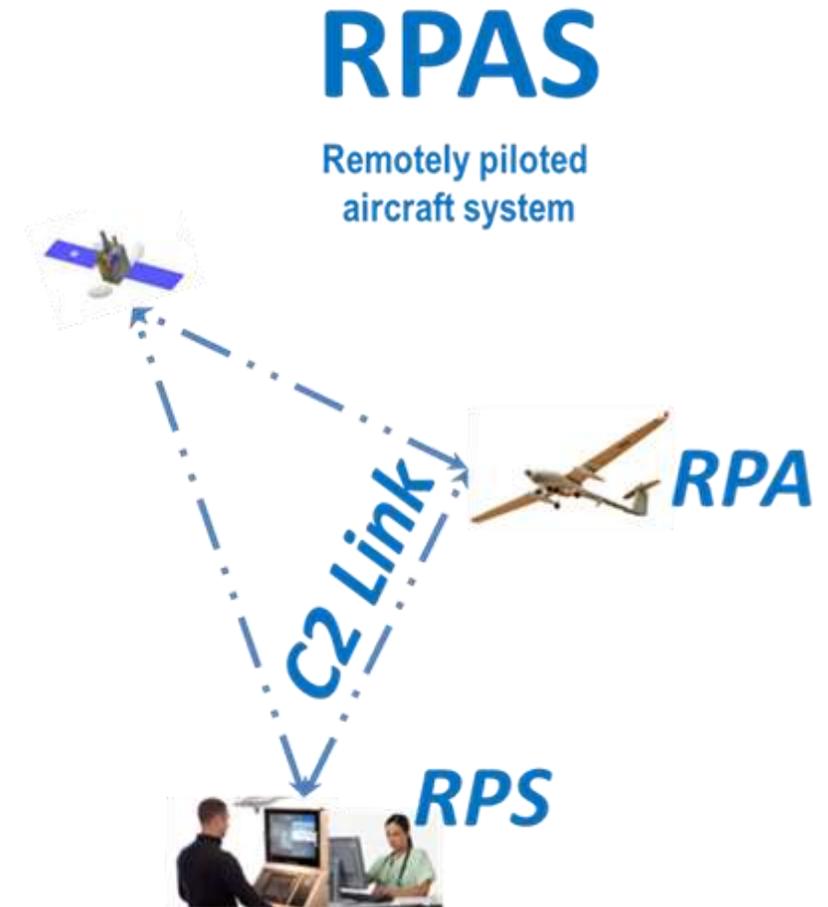
Unmanned aircraft. An aircraft intended to be operated with **no pilot on board**:

- **A remotely piloted aircraft (RPA)** is part of an **RPAS (system)**; piloted from a RPS
 - subset of RPA intended for **international, instrument flight rules (IFR)** operations; full regulatory **certification**
- **Small UA**: generally <25 kg (commonly “**drones**”)
- **Unmanned free balloons**: non-power driven, unmanned, lighter-than-air aircraft in free flight
- **Model aircraft**: scaled down version; recreational

RPAS components

An **RPAS** consists of:

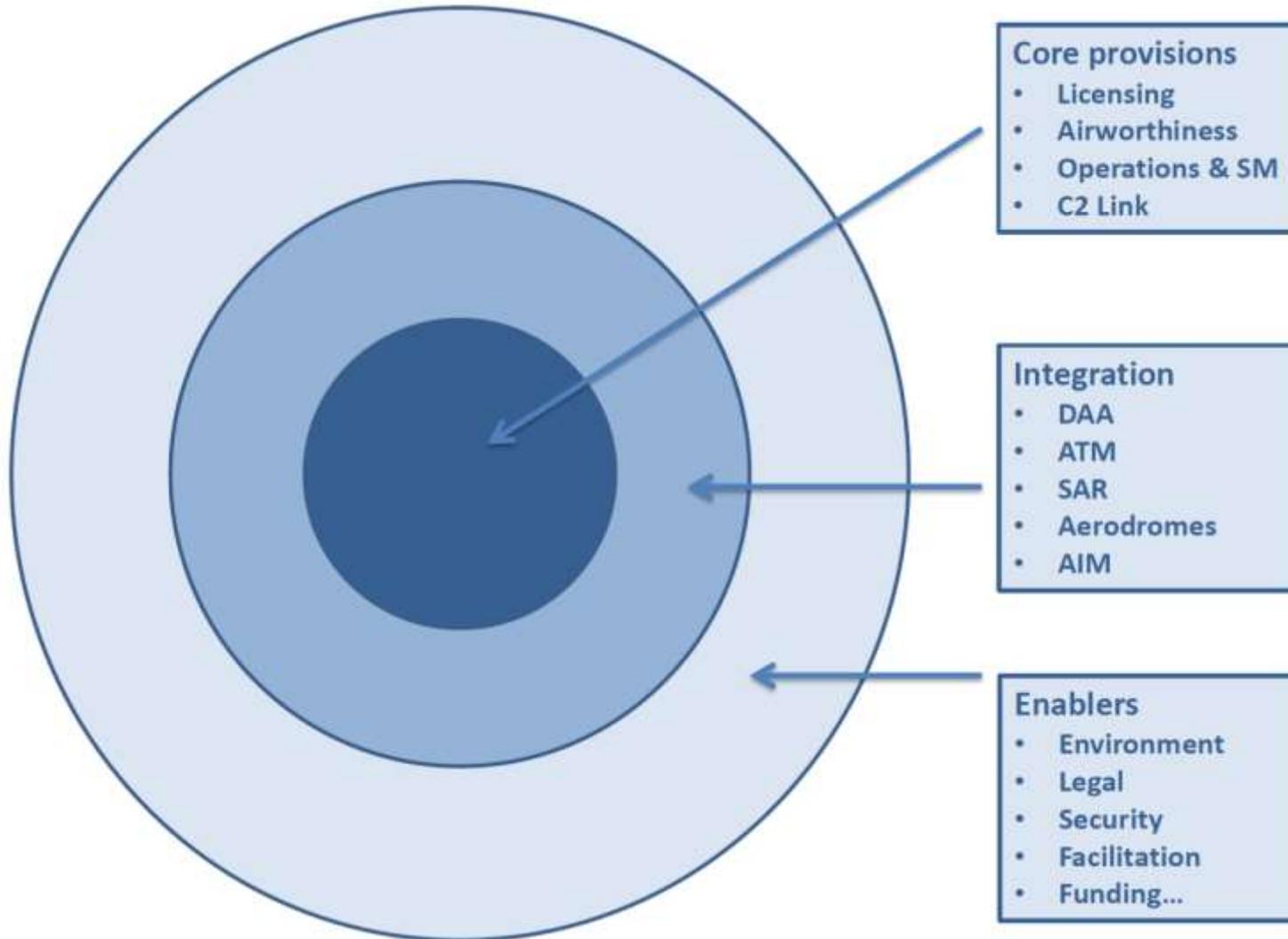
- One (1) **RPA**
- One (1) **or more RPS**
- **RPA and RPS** connected by **C2 Link** (in direct radio line-of-sight or BRLOS, such as via satellite)
- **other components** essential for flight, like manned aircraft, including:
 - ATC communications and surveillance equipment (radio coms; CPDLC; ADS-B; SSR transponder)
 - navigation equipment
 - launch and recovery equipment (e.g. catapult, winch, rocket, net, parachute, airbag)
 - flight control computer (FCC), FMS and autopilot
 - system health monitoring
 - flight termination system





- ICAO **RPAS Panel** brings together **regulators and industry**
- 26 States from all 6 regions, ensuring **geographical** representation and **diversity** of points of views/development stages
- Major aviation **industry** organizations: IATA, ACI, CANSO, EUROCONTROL, EASA, IFALPA, IFATCA, IAOPA, RTCA, EUROCAE, NATO, AUVSI, UVSI
- **RPAS panel** acts as a **focal point** and **coordinator** of RPAS work

ICAO's layered approach

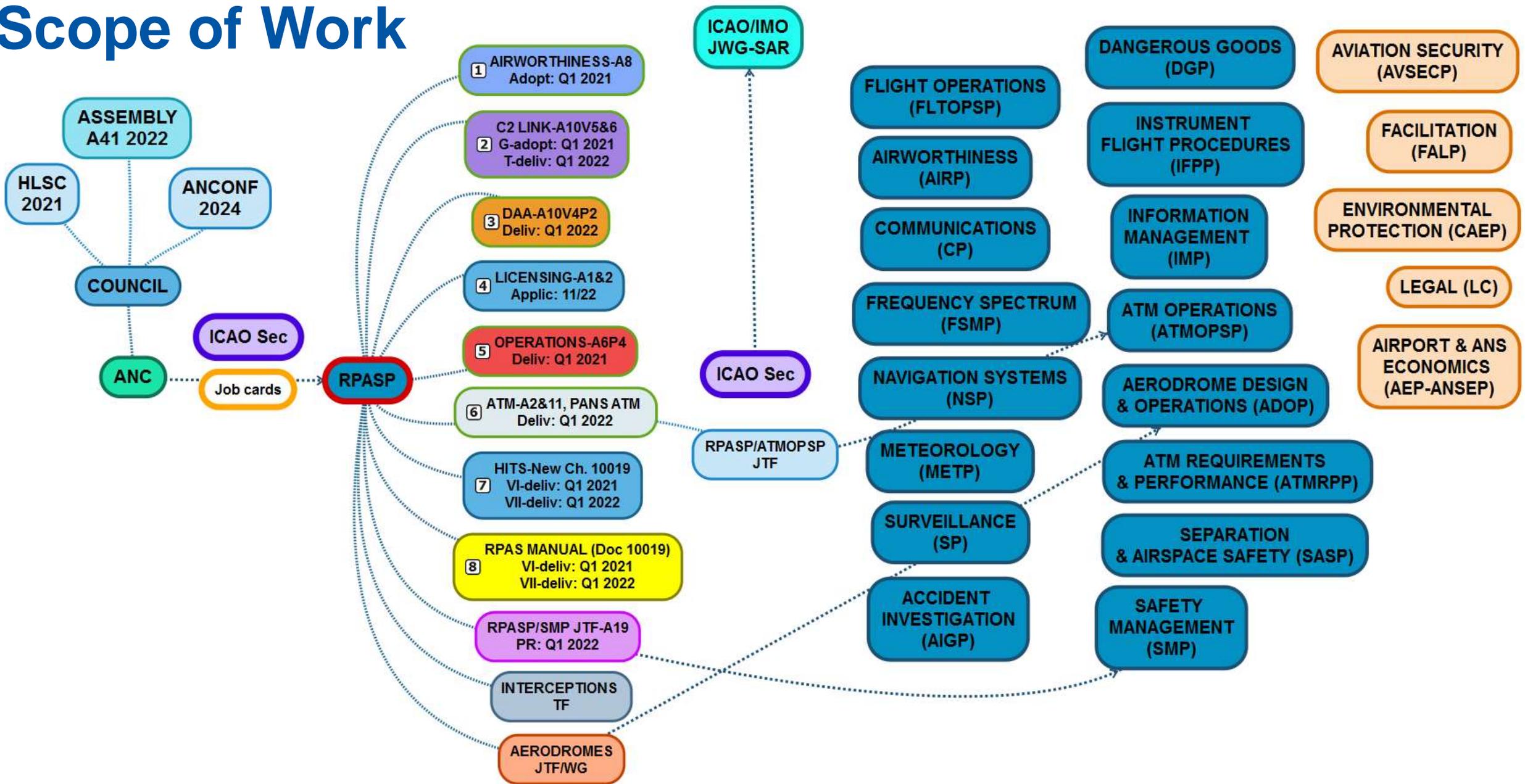


- **Core provisions for international air navigation**
- **Key requisites for safe integration**
- **Longer-term enablers**



Area	Provision	Reference
RPAS	Annex 2, App. 4	Annex 2, App. 4
Registration	Annex 7	Annex 7 (2.2 & 2.3)
Accident investigation	Annex 13	Annex 13 (Def. & 5.1.2 note 3)
Licensing	Annex 1 (Amdt. 175)	AN 12/1.1.23-18/11
Airworthiness	Annex 8	AN-WP/9439
C2 Link	Annex 10	AN-WP/9440
Operations	Annex 6	RPASP/16-WP/6
Detect and avoid	Annex 10	RPASP/16-WP/7

Scope of Work



RPAS Amendments	2019				2020				2021				2022				2023				2024				2025					
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Events	RPASP/13	RPASP/14	A40	RPASP/15 DE/3	RPASP/16		WGWHL RPAS/4 & DE/4		RPASP/17		WGWHL DE/5		RPASP/18		A41 WGWHL	RPAS/5 & DE/6	RPASP/19		WGWHL DE/7		RPASP/20		WGWHL RPAS/6		RPASP/21		A42 WGWHL	DE/8	RPASP/22	
Annex 7 and Annex 2 Appendix 4																														
Annex 1 and PANS-TRG															Applicable															
Annex 8	Delivered RPASP/11 18-22/03/18	PR					FR		Adoption		Effective																			
Annex 2 consequential amendments of Annex 8 approval	Delivered RPASP/11 18-22/03/18	PR					FR		Adoption		Effective																			
Annex 10 C2 Generic SARPs	Delivered RPASP/13 11-15/03/19	PR					FR		Adoption		Effective																			
Airworthiness Manual									Delivery RPASP/17 March 2021												Delivery RPASP/20 March 2021									
Annex 6									Delivery RPASP/17 March 2021				PR					FR			Adoption		Effective							
Annex 2 consequential amendments of Annex 6 approval									Delivery RPASP/17 March 2021				PR					FR			Adoption		Effective							
PANS-OPS																	Earliest delivery				FR					FR				Approval
Annex 19	Delivered RPASP/9	Endorsed SMP/4 22-26/04/19											PR					FR			Adoption		Effective							
Safety Management Manual									Delivery RPASP/17 March 2021																					
Annex 10 C2 Technological SARPs													Delivery RPASP/18 March 2022			PR					FR					Adoption		Effective		
C2 Link Manual													Delivery RPASP/18 March 2022																	
Annex 10 DAA													Delivery RPASP/18 March 2022			PR					FR					Adoption		Effective		
DAA Manual													Delivery RPASP/18 March 2022																	
Annex 2													Delivery RPASP/18													FR				Adoption

Timeline example

Current scope of RPAS Panel

- International IFR operations
- Controlled airspace and aerodromes
- Global interoperability
 - RPA to operate alongside manned aircraft, as a predictable, cooperative airspace user: All **19 Annexes** affected
 - Priority given to **fundamentals** to initiate **international** operations
 - » **Remote pilot licence** – adopted March 2018
 - » **Certificate of airworthiness** – adoption Q1 2021
 - » **C2 Link** – adoption Q1 2021
 - » **RPAS operator certificate** – delivery Q1 2021





ICAO unmanned aviation webinars

- Enabling UAS Operations Part I
- Enabling UAS Operations Part II - Panel Discussion
- Introducing ICAO UAS Model Regulations
- UAS Beyond Visual Line of Sight Operations - for Regulators
- ICAO UTM Framework - Core Principles for Global Harmonization
- U-AID - Humanitarian Operations using UAS
- Safety Management System (SMS) for UAS Operations
- RPAS International IFR Regulatory Framework

www.icao.int/Meetings/webinar-series



DRONE ENABLE 2021

April

www.icao.int/Meetings/DRONEENABLE4



ICAO PARIS

UNITING AVIATION

Unmanned aviation course



Online Course

www.icao.int/training

Air Navigation Services
Unmanned Aviation Fundamentals



North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU



Ms. Jagoda EGELAND

Advisor to the Secretary-General, International Transport Forum at the OECD

Drones in the Transport System: Regulation, Acceptability and Integration

Jagoda Egeland, ITF

Session 3: Moving safely from aircraft to drones: licensing disruptive technologies

NEA Multi-Sector Workshop on Innovative Regulation

15 December 2020

International Transport Forum at the OECD (ITF)

- ▶ Only intergovernmental organisation for all transport modes
- ▶ 62 members
- ▶ Platform for discussion
- ▶ Annual Summit
- ▶ Mission = foster a deeper understanding of the role of transport in economic growth, environmental sustainability and social inclusion

SINCE 2006 !



ITF's Corporate Partnership Board

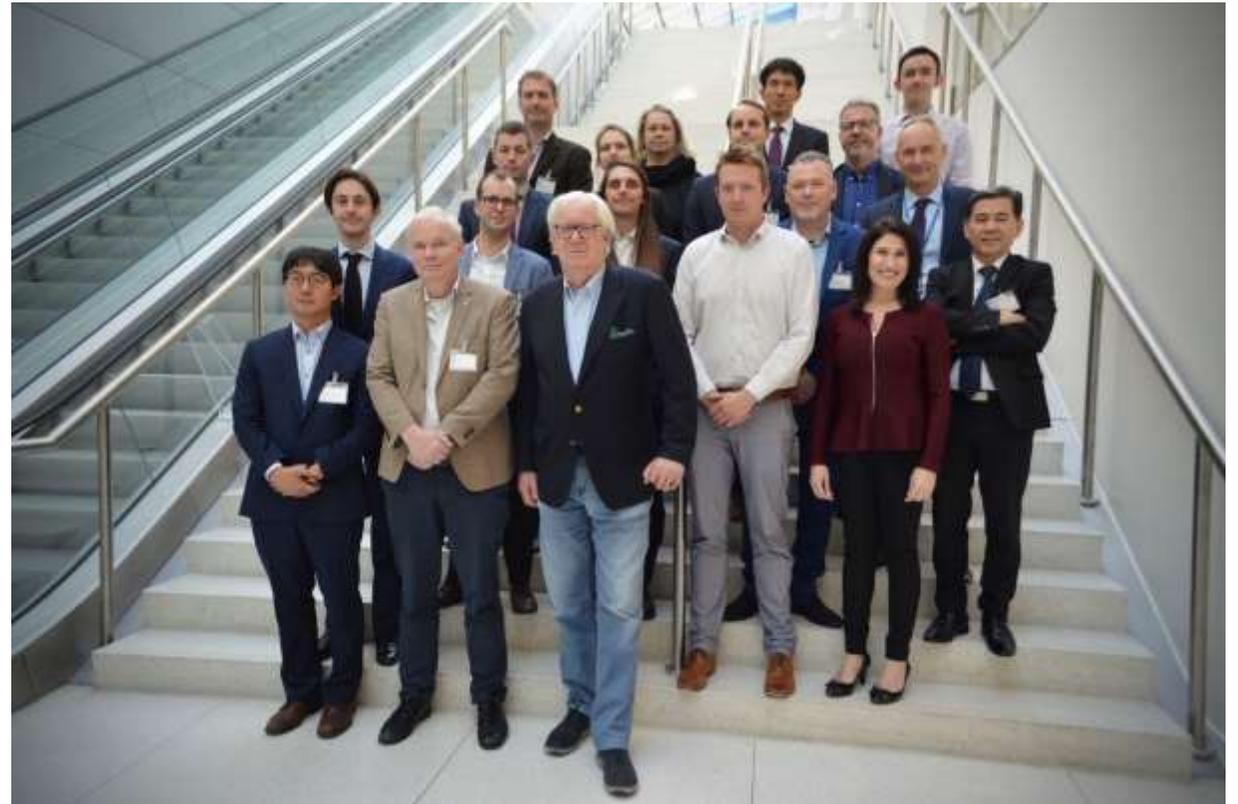


Departure point:

If drones are safe to fly, what are the other issues policy makers need to tackle to unlock the benefits of drones?

Working Group on Drones in the Transport System: Acceptability and Integration

- **30** practitioners and academics from **14** countries with expertise in aviation, transport regulation, mobility systems and urban planning.
- Report publication: **spring 2021**.



Drones create positive socio-economic impacts, but their market potential remains uncertain

- Drones have the potential to unlock a wide range of economic benefits by improving the efficiency of supply chains and offering a new mode of passenger transport.

How can we leverage the benefits?

- Governance and regulation
- Acceptability
- Integration



To seize the market opportunities provided by drones:

- **Recruit** experienced personnel from the drone and IT industries.
- **Define** responsibilities across public authorities and levels of government.
- **Assess** if/how much economic regulation is necessary
 - Assess the adequacy of national regulations developed under **the Chicago Convention**.
- **Foster** PPPs to overcome investment uncertainty.
- **Address** impacts, risks and public concerns that may come with deployment of drones.

Challenges to competition and how to address them

- **Examine:** Access to infrastructure, vertical integration.
- **Be aware** of common competition issues and of specific regulatory tools to address them.
- **Learn** from other sectors, e.g.:
 - Access rules where capacity is scarce (airport slot allocation)
 - Technical interoperability requirements (telecommunications)
- When regulating, **consider** the existing framework guiding transportation of people and goods by air (Chicago Convention)

Unlocking the benefits of drones will need public acceptance

- Adverse impacts of drones need to be addressed:
 - Noise
 - CO2 emissions
 - Air pollution
 - Impacts on wildlife
 - Optical pollution
 - Privacy concerns

- Acceptability of drones can be enhanced by:
 - Stakeholder consultation
 - Launching public information/communication campaigns
 - Raising awareness among drone operators re. public concerns and their mitigation



Regulations can protect individuals' privacy

- **Adapt/expand** existing legal data protection frameworks.
- **Provide** information to drone operators on how to mitigate privacy concerns.
- **Consider** static and dynamic no-fly zones.
- **Consider** requirements for mandatory registration and remote identification.
- **Develop** communication strategies.
- For each drone service: **decide** what data a drone is allowed to collect considering potential privacy concerns; **provide** information to the affected parties.

Drones as part of the transport system: Don't wait, be proactive

- **Establish** mobility needs and priorities and explore how drones can support them.
 - **Ensure** interoperability and scalability of drones within the mobility network.
 - **Ensure** citizens are protected and have fair access to the market.
 - **Adopt** performance-based standards.
 - **Conduct** public-private small-scale drone pilot programs.
 - **Foster** the emergence of civil aviation authorities with interdisciplinary competencies and capabilities.
 - **Support** the design and implementation of a robust UTM system
 - **Incorporate** drone operations into long-term urban planning strategy.
-

Thank You

Jagoda EGELAND

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Workshop Moderator

Mr. Ramzi Jammal

Executive Vice-President and Chief Regulatory Operations Officer Regulatory Operations Branch
Canadian Nuclear Safety Commission (CNSC)



Mr. Christian SCHLEIFER-HEINGÄRTNER
Secretary General, EUROCAE

OECD/NEA Workshop

Certification process in aviation

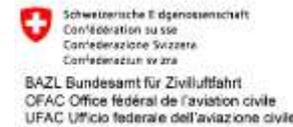


Christian Schleifer-Heingärtner
Secretary General



Certification responsibilities

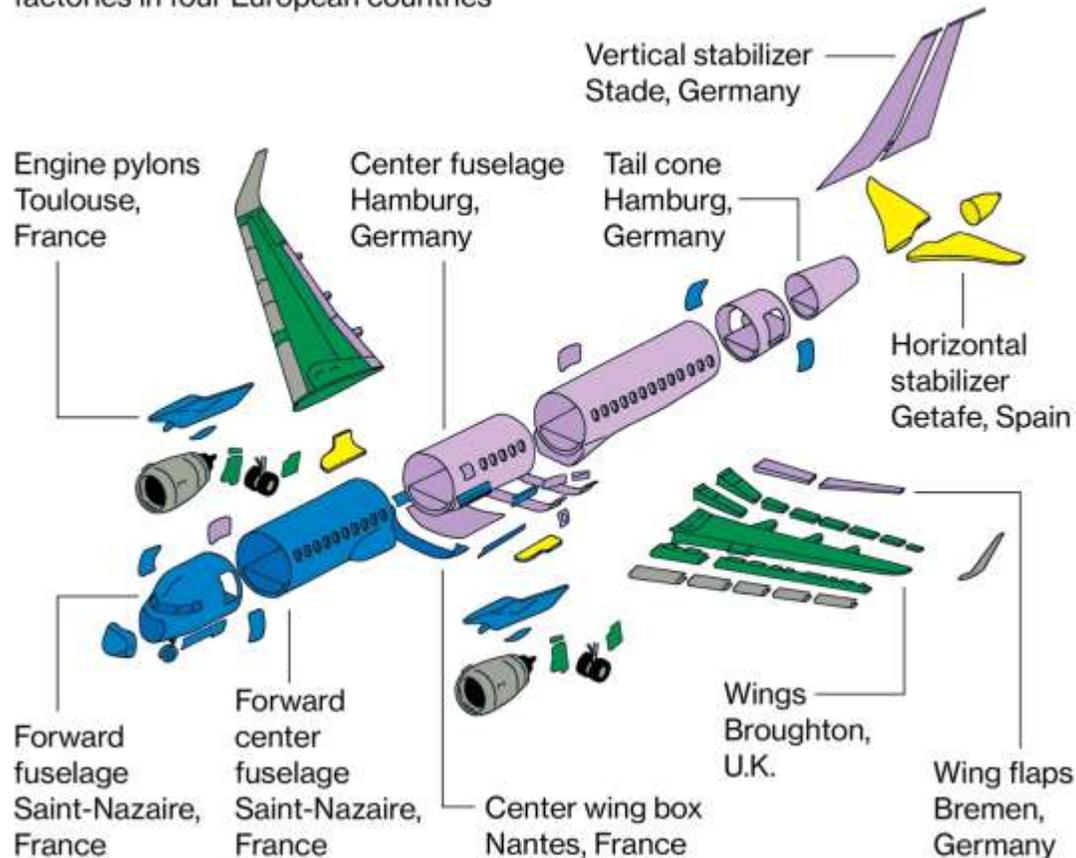
- Global frame
 - Chicago convention
 - 19 Annexes
- Regional bodies
 - RSOOs - EASA
- National CAAs



Aircraft certification

Divided, It Flies

Parts for the latest A320 come from factories in four European countries



- State of design
 - Certification
 - Continued airworthiness
 - Δ - production
 - Conformity
- Products certified
 - Aircraft
 - Engines
 - Propeller
 - TCDS
- Parts and equipment
 - ETSO
 - Integration
- Safety level

Regulation – Standard

- Prescriptive versus PB, RB and OPS centric
 - Reference to industry standards
- Standards reaction to regulation
- Forward looking
 - In anticipation of regulatory requirements
- Referenced by the regulator
 - EASA, EU Leg, FAA, ICAO
- (E)TSO – MOPS, SW, Environment





ETSO – example 2C501

European
Aviation
Safety
Agency

ETSO-2C501
Date: 1.24.10.03

European Technical Standard Order

Subject: MODE S AIRCRAFT DATA LINK PROCESSOR

- 1 - Applicability:
This ETSO gives the requirements which Mode S Aircraft Data Link Processors that are manufactured on or after the date of this ETSO must meet in order to be identified with applicable ETSO marking.
- 2 - Procedures:
 - 2.1 - General:
Applicable procedures are detailed in CS-ETSO Subpart A.
 - 2.2 - Specific:
None
- 3 - Technical Conditions:
 - 3.1 - Base:
 - 3.1.1 - Minimum Performance Standard:
Standards set forth in EUROCAE document ED-82A dated November 1999.
 - 3.1.2 - Environmental Standard:
See CS-ETSO Subpart A paragraph 2.1.
 - 3.1.3 - Computer Software:
See CS-ETSO Subpart A paragraph 2.2.
 - 3.2 - Specific:
None
- 4 - Marking:
 - 4.1 - General:
Marking is detailed in CS-ETSO Subpart A paragraph 1.2.
 - 4.2 - Specific:
None
- 5 - Availability of Referenced Document:
See CS-ETSO Subpart A paragraph 1.

ETSO-2C501

Subject: MODE S AIRCRAFT DATA LINK PROCESSOR

1 – Applicability: This ETSO gives the requirements which Mode S Aircraft Data Link Processors that are manufactured on or after the date of this ETSO must meet in order to be identified with applicable ETSO marking.

2 – Procedures

2.1 – General: Applicable procedures are detailed in CS-ETSO Subpart A.

3 – Technical Conditions

3.1.1 – MOPS: set forth in EUROCAE document **ED-82A** dated Nov 1999

3.1.2 – Environmental Standard: See **CS-ETSO Subpart A paragraph 2.1**

3.1.3 – Computer Software: See **CS-ETSO Subpart A paragraph 2.2**

4 – Marking: marking is detailed in CS-ETSO Subpart A paragraph 1.2.

5 – Availability of Referenced Document: See CS-ETSO Subpart A para 3



Example: ROAAS

- EASA and ICAO Runway excursion one of the main causes for accidents in international aviation
 - ICAO GASP – runway safety “main killer in aviation”
 - European Action Plan for the Prevention of Runway excursions
- EASA NPA 2013-09
 - Proposal to mandate ROAAS **BUT Lack of standards**
- Industry/EASA initiative for ROAAS MOPS in EUROCAE



A340 F-GLZQ in Toronto – photo from the investigation report



Example: ROAAS

- EUROCAE WG-101 established 2015
- Deliverable:
 - **ED-250** Minimum Operational Performance Specification (MOPS) for ROAAS
 - Published Dec 2017
- High level of interest and support
 - Representation from Europe and other regions
 - Active participation of all main stakeholders and manufacturers
- EASA NPA 2018-12 'Reduction of runway excursions' → CS-25.705 → CS-26.205 → AMC25.705 → ED-250
- Decision 2020/001/R → CS25
- NPA 2019-06 ETSO 2C518



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR A RUNWAY OVERRUN AWARENESS AND ALERTING SYSTEM

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ED-250
December 2017

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Example: Cybersecurity in Aviation



→ Focus

- Primarily on information security for aviation safety
 - air and ground
- Expanded to other interfacing areas of relevance,
 - Supply Chain, Ops & Biz

→ Membership

- > 230 participants
- Stakeholders from 10 countries & several European/international organisations



Example: Cybersecurity in Aviation



→ Published documents

- ED-201 AISS Framework Guidance Document
- ED-202A Airworthiness Security Process Specification
- ED-203A Airworthiness Security Methods and Considerations
- ED-204A Information Security Guidance for Continuing Airworthiness
- ED-205 ATM and Ground Systems
- ER-013 Aeronautical System Security Glossary
- ER-017 Int. Aeronautical Information Security Mapping Summary

→ Training



Examples for Cyber Security



- ED Decision 2020/006/R (1 July 2020)
 - RMT 0648, NPA 2019-01, SC
 - Amdt CS 23, CS-25, CS-27, CS-29, CS-APU, CS-E, CS-ETSO, CS-P
- SUBPART F — EQUIPMENT CS 25.1319 is inserted as follows:

CS 25.1319 Equipment, systems and network information protection

- (a) Aeroplane equipment, systems and networks, considered separately and in relation to other systems, **must be protected from intentional unauthorised electronic interactions** (IUEIs) that may result in adverse effects on the safety of the aeroplane. Protection must be ensured by showing that the security risks have been identified, assessed and mitigated as necessary.
- (b) When required by paragraph (a), the applicant must make procedures and Instructions for Continued Airworthiness (ICA) available that ensure that the security protections of the aeroplane's equipment, systems and networks are maintained.



Cybersecurity in Aviation



→ ED Decision 2020/006/R (1 July 2020)

→ and to the related AMC and/or GM → AMC 20-42

(b) This AMC recognises as an acceptable means of compliance the following EUROCAE documents:

- EUROCAE ED-202A, Airworthiness Security Process Specification, dated June 2014
- EUROCAE ED-203A, Airworthiness Security Methods and Considerations, dated June 2018
- EUROCAE ED-204, Information Security Guidance for Continuing Airworthiness, dated June 2014

(c) This AMC establishes guidance to use ED-202A, 203A and 204 in the different contexts of the initial and continued airworthiness of products and parts.



EASA SC VTOL



 European Union Aviation Safety Agency	SPECIAL CONDITION Vertical Take-Off and Landing (VTOL) Aircraft	Doc. No: SC-VTOL-01 Issue: 1 Date: 2 July 2019
------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------	------------------------------------------------------

→ EASA SC VTOL

→ issued 2 July 2019

→ based on CS23 and CS27, but specific requirements for VTOL

→ Objective based certification requirements

→ flexibility to certify innovative state-of-the-art designs and technology

→ establish a common set of conditions for the certification of these new concepts

→ Accepted Means of Compliance

→ Industry standards - EUROCAE WG-112

→ Priorities agreed between EASA and EUROCAE

→ Structured list with all necessary AMC topics

Special Condition for small-category VTOL aircraft



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Controlled Flight Into Terrain CFIT





Runway Excursion





Mid Air Collision





Replacing existing with new technology



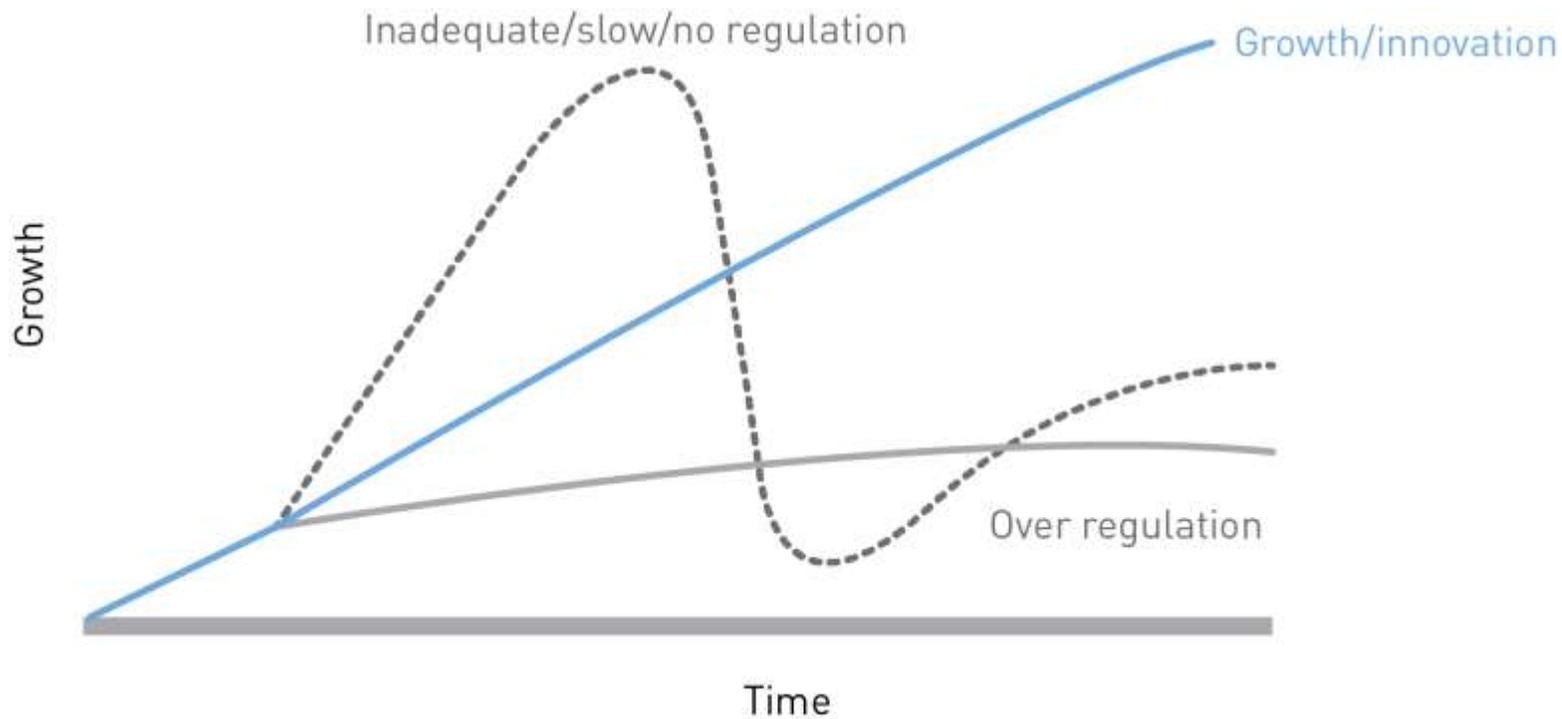


Mr. Simon MOORE

Assistant Secretary, Safety and Future Technology,
Australian Department of Infrastructure, Transport,
Regional Development & Communications

Some key considerations of the Australian approach:

- Timing
- Proportionality
- Social license





Mr. Vassilis AGOURIDAS

UAM Initiative Leader (EU Smart Cities Marketplace) /
Head of EU Public Co-Creation & Ecosystem Outreach
(AIRBUS Urban Mobility)



Drone and micro-reactor emerging ecosystems: how similar might be?

Source: Airbus, 2018



Source: EENewsEurope, 2020



Lessons learnt from the emerging drones ecosystem



The importance of **multilevel governance** & breaking the silos for **CROSS-sectoral** collaboration and coordination

A multi-fold approach is required

ESTABLISH public & private support

Funding & Financing

SEEK ground & air synergies

Urban Mobility Planning

Regulation

Cities & Regions in the driving seat

Regulation

Public Co-Creation & Social Embrace

CO-CREATE with citizens





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Development &
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Mr. Vassilis AGOURIDAS
UAM Initiative Leader
(EU Smart Cities
Marketplace) / Head
of EU Public Co-
Creation & Ecosystem
Outreach (AIRBUS
Urban Mobility)

QUESTIONS FROM PARTICIPANTS

- Question 1
- Question 2
- Question 3



MULTI-SECTOR WORKSHOP ON INNOVATIVE REGULATION

**Challenges and benefits of harmonising
the licensing process for emerging technologies**

**Thank you for your participation today
and see you all tomorrow!**