INTERNATIONAL CIVIL AVIATION ORGANIZATION

SAM/SRVSOP Workshop/Expert Meeting: Roadmap for the Implementation of UAS/RPAS in the Specific Category

SAM Regional Office

May, 2026

Leonardo Haberfeld
ICAO RPAS Technical Officer

ICAO

Global Harmonized Framework for UAS Operations

Leonardo Haberfeld
ICAO RPAS Technical Officer

ICAO

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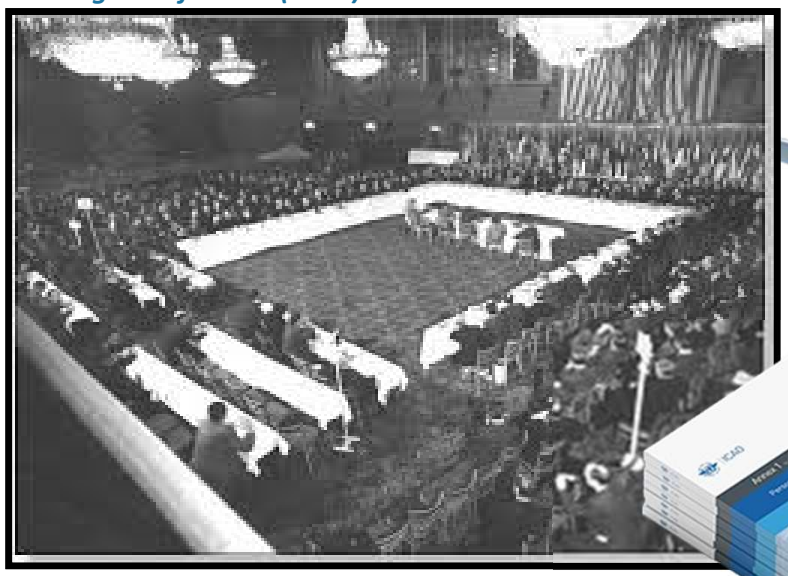
UN SPECIALIZED AGENCY

Chicago Conference (1944)



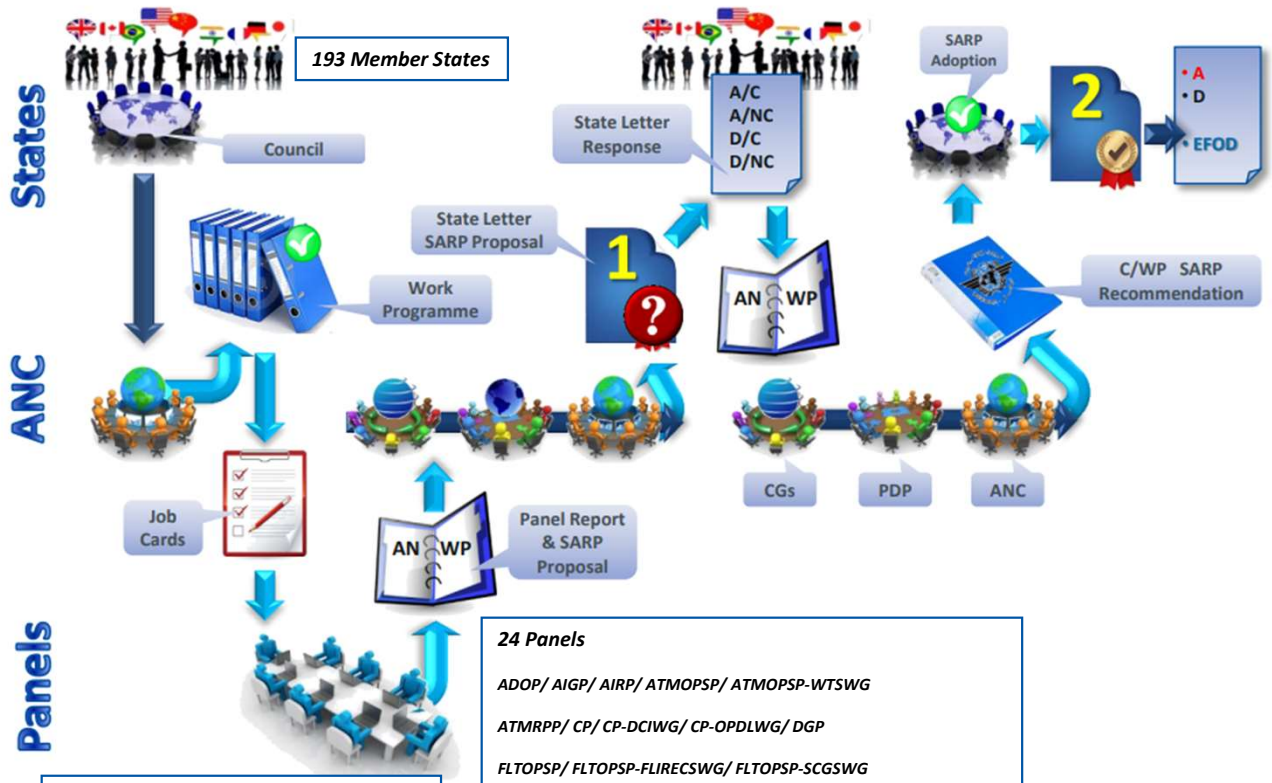
Standard and Recommended Practices (SARP)

AAM Symposium (2024)

ICAO

GLOBAL HARMONIZATION
SAFETY AND EFFICIENCY OF AIR NAVIGATION

Standard and Recommended Practices - RPAS



- Council reviews ANC proposal. Adopts if 2/3 support.
- Within 2 weeks of adoption, interim edition sent to States
- 3 months to indicate disapproval of adopted amendments
- Effective Date approximately 4 months after adoption by Council
- 4 months between Effective Date and Applicability Date
- Provided a majority of States have not registered disapproval, the amendment becomes Effective
- One month prior to the Applicability Date, States must notify the Secretariat of any differences.
- Differences published in supplements to Annexes.

05 March 2018

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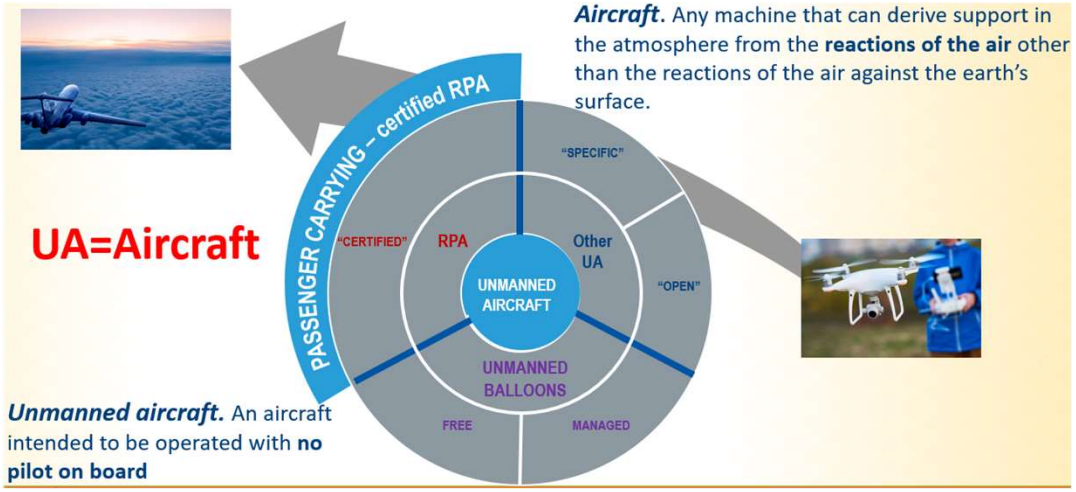
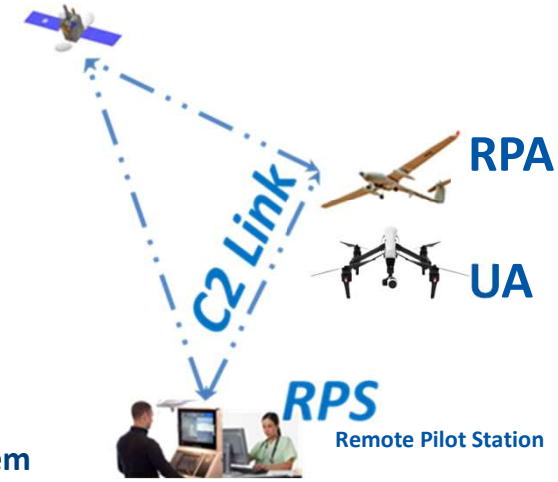
ICAO Unmanned Aviation Regulatory Framework Development

UNMANNED AIRCRAFT SYSTEM FEATURES

- Multiple Frameworks;
- Global Multiple Operational Applications;
- Beneficial Outcomes;
- Manned Aviation Risks...





UAS

Unmanned Aircraft System

RPAS

Remotely Piloted Aircraft System

Other components:
- Launch & Recovery;
- ATC Comm;
- Detect & Avoid (DAA);...

ICAO Unmanned Aviation Regulatory Framework Development

Doc 7300
Convention on International Civil Aviation (1944)

Article 8

Pilotless aircraft

No aircraft capable of being ***flown without a pilot*** shall be flown without a pilot over the territory of a contracting State ***without special authorization*** by that State and in accordance with the terms of such authorization. Each contracting State undertakes to insure that the flight of ***such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft***.

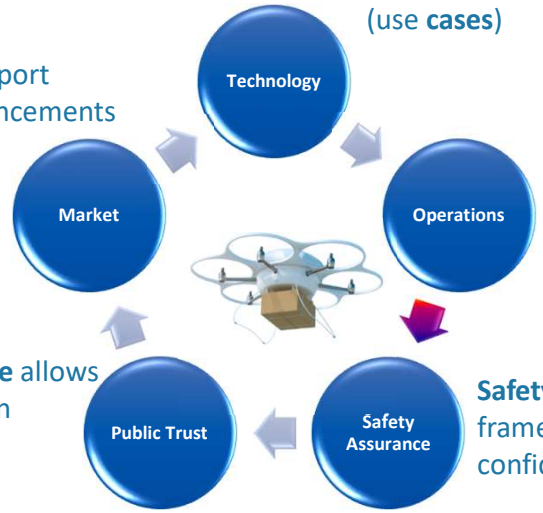
Technology enables new operations (use **cases**)

Operations feed regulatory development (**data-driven, evidence-based**)

Safety assurance (regulatory framework) creates public confidence (**trust**)

Public confidence allows market expansion (**investments**)

Investments support technology advancements (**R&D**)



- **technical** expertise
- **intergovernmental** framework
- **global** geographic coverage
- **regulators** & **industry** cooperation

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ICAO Unmanned Aviation Regulatory Framework Development

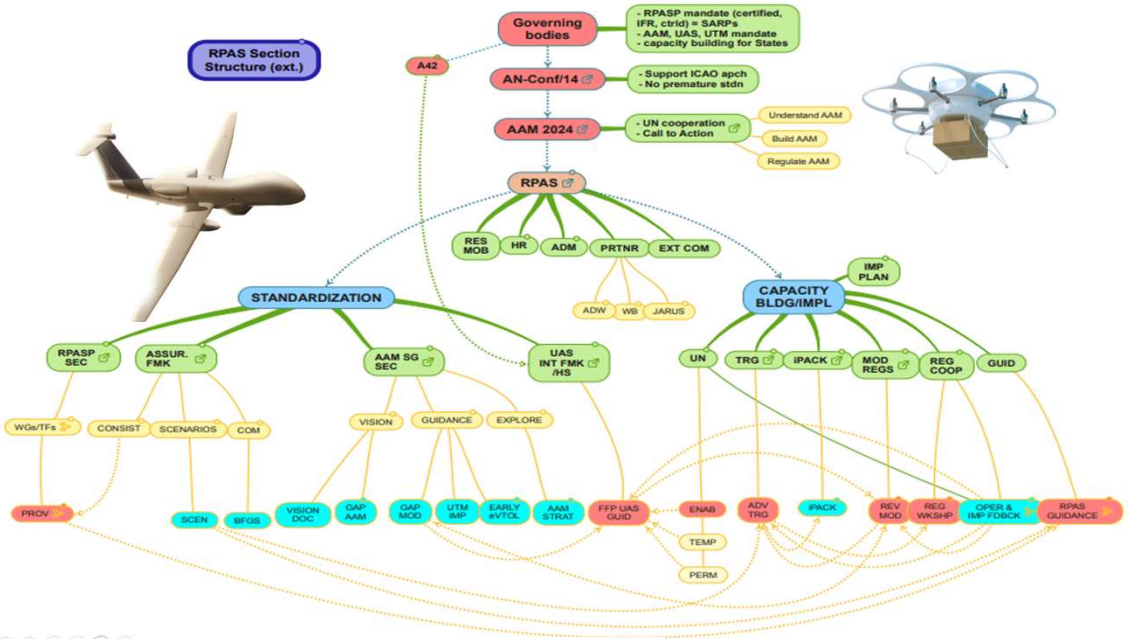
UNMANNED AIRCRAFT SYSTEM STUDY GROUP (UASSG) 2008 - 2014

CIRC 328 – Unmanned Aircraft Systems (2011)

REMOTELY PILOTED AIRCRAFT SYSTEMS PANELS (RPASP) 2014 - Now

- ✓ *> 130 experts*
- ✓ *13 WGs/TFs*
- ✓ *19 Annexes*

DOC 10019 – Manual on Remotely Piloted Aircraft Systems (2015)



SARPs Development RPAS

Studies Development AAM / UAS

Capacity Building & Implementation Regulatory Framework

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Benefits
Scalability
Reduced Oversight Burden
Simplified RPAS Operator Approvals
Simplified and Improved Performance Monitoring
Oversight at Appropriate Level
Also...

ICAO Unmanned Aviation Regulatory Framework Development

1
INTERNATIONAL OPERATIONS
High Risk (Certified)

- Certified RPAS Based on SARPS (Annexes – Full Certification)

2
INTERNATIONAL OPERATIONS
Medium/Low Risk (Specific/Open)

- Cross-Border UAS
- High Seas UAS
- Future SARPs

3
DOMESTIC OPERATIONS
High Risk (Certified)

- Certified RPAS Based on SARPS (National Regulations based on Annexes Provisions)

4
DOMESTIC OPERATIONS
Medium/Low Risk (Specific/Open)

- National Regulations based on ICAO Guidance Materials & Annexes Provisions (where applicable).

ICAO Unmanned Aviation Regulatory Framework Development

"OPEN" — "SPECIFIC" — "CERTIFIED"

PART 101

Regulated low-risk
Visual Line-of-sight
Weight limits (<25kg)
Altitude (<500ft)

- Photography;
- Inspections;
- Recreational;…

PART 102

Operations centric-risk based
Visual Line-of-sight or
Beyond Visual Line-of-sight
Greater weights
Higher altitudes

- Long route inspections
- Deliveries

ICAO SARPs

Traditional approach
Integrated operations
International/IFR
Certificated aircraft, pilots, and operators

- Similar to manned aviation

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ICAO Unmanned Aviation Regulatory Framework Development

1
INTERNATIONAL OPERATIONS
High Risk (Certified)

- Certified RPAS Based on SARPS (Annexes – Full Certification)

Standard and Recommended Practices

Annex 2 – Rules of the Air - Appendix 4
Applicable 2012

Annex 7 – Aircraft Nationality and Registration Marks
Applicable 2012

Annex 1 – Personnel Licensing
Applicable 2022

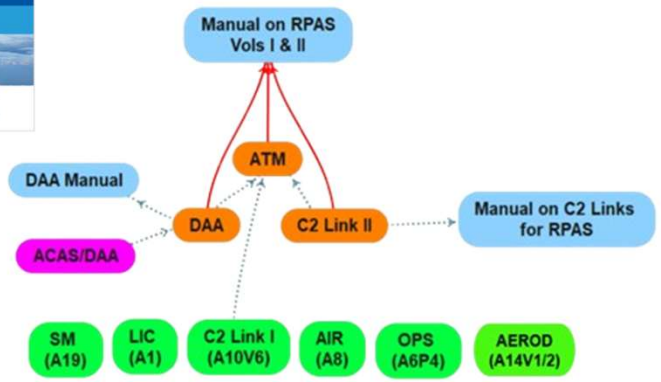
Annex 8 – Airworthiness of Aircraft
Effective 2021/ Applicable 2026

Annex 10 – Aeronautical Telecommunications - Part VI
Effective 2021/ Applicable 2026

Annex 6 – Operation of Aircraft - Part IV
Effective 2024/ Applicable 2026

Review Process
Annex 19 – Safety Management
Applicable 2026

In Progress
Annex 14 – Aerodromes
Applicable 2026



Completed (adopted) packages

Packages under development

Dependencies are between:

1. Technical areas SARPs/PANS
2. SARPs/PANS - other SARPs/PANS
3. SARPs/PANS - guidance

	2021	2022	2023	2024	2025	2026	2027	2028
Licensing		Applicable						
Airworthiness	Effective					Applicable		
C2 Link (gen.)	Effective					Applicable		
Operations				Effective		Applicable (2030)		
SM				Effective		Applicable		
C2 Link (techn.)								Effective & Applicable (2030)
DAA								Effective & Applicable (2030)
ATM								Effective & Applicable (2030)
Aerodromes								Effective & Applicable (2030)
Other	Meteorology, Facilitation, Accident investigation, AIM, Environment, Security, Dangerous Goods, Infrastructure funding/financing, Legal issues…							

ICAO Unmanned Aviation Regulatory Framework Development

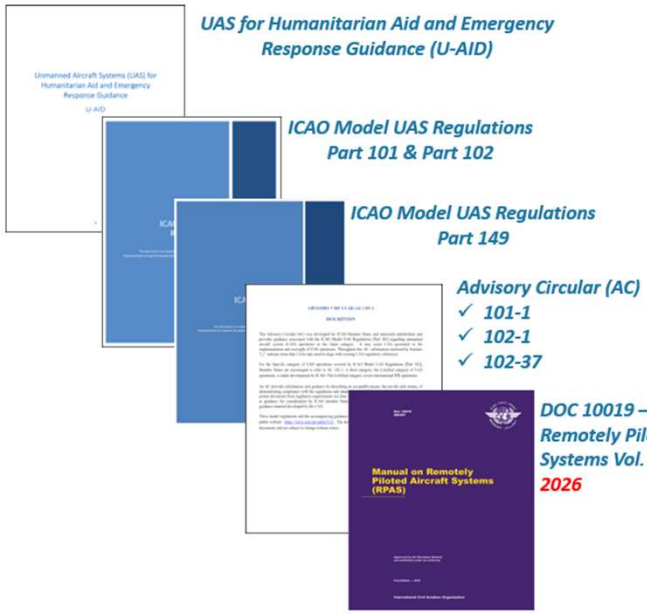
UNMANNED AIRCRAFT SYSTEMS – ADVISORY GROUP (UAS-AG) 2015 - 2023

- ✓ *> 20 experts*
- ✓ *6 Drone Enable*
- ✓ *UTM framework*

4
DOMESTIC OPERATIONS
Medium/Low Risk (Specific/Open)

- National Regulations based on ICAO Guidance Materials & Annexes Provisions (where applicable).

Guidance Materials



UAS for Humanitarian Aid and Emergency Response Guidance (U-AID)

ICAO Model UAS Regulations Part 101 & Part 102

ICAO Model UAS Regulations Part 149

Advisory Circular (AC)
- ✓ *101-1*
- ✓ *102-1*
- ✓ *102-37*

DOC 10019 – Manual on Remotely Piloted Aircraft Systems Vol. II
2026

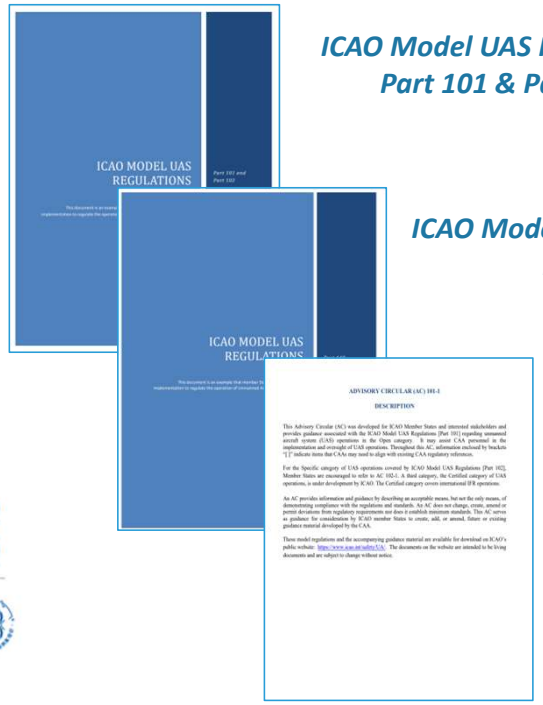
RPAS CONOPS for International Operations

Response to Unauthorized UA in the Vicinity of Aerodrome

Protection of Civil Aviation Infrastructure Against Unmanned Aircraft

UTM: A Common Framework with Core Principles for Global Harmonization (4ed)

ICAO Unmanned Aviation Regulatory Framework Development Model Regulations



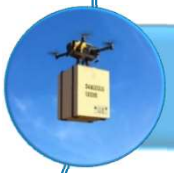
ICAO Model UAS Regulations Part 101 & Part 102

ICAO Model UAS Regulations Part 149

Advisory Circular (AC)
- ✓ ***101-1***
- ✓ ***102-1***
- ✓ ***102-37 (DG)***

ICAO Model Regulations are Guidance Materials to be used/consulted by States to develop their own UAS regulatory framework;

ICAO Model Regulations are not intended to be prescriptive, mandatory, or constructed in any way as to pre-empt individual States` legal structure;



States are free to adapt the model regulations, as appropriate, to meet their specific needs. [brackets] spaces to be filled by States;

ICAO Model Regulations are accompanied by Advisory Circulars (AC) and other guidance material to assist CAA personnel in the implementation and oversight of UAS operations.

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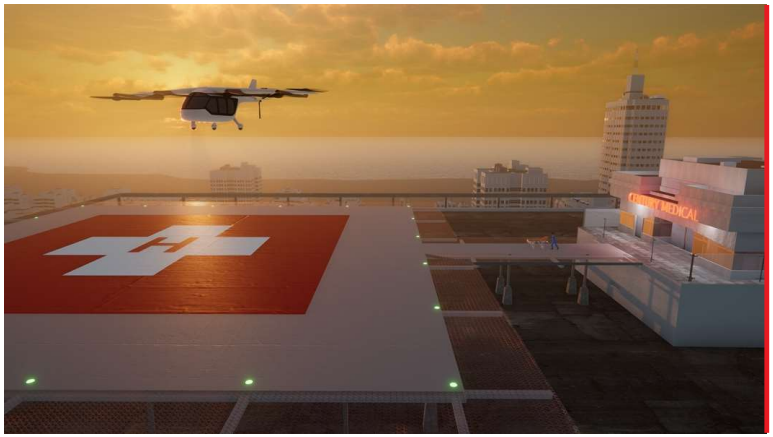
REGIONAL CARGO AND PASSENGER TRANSPORT



PUBLIC GOOD

CONSUMER/ ENTERPRISE GOODS AND SERVICES

LOCAL PASSENGER TRANSPORT

ICAO

ADVANCED AIR MOBILITY (AAM) STUDY GROUP

REGIONAL CARGO AND PASSENGER TRANSPORT

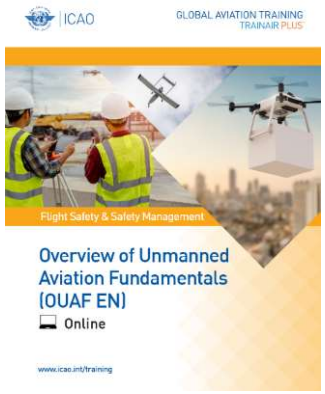
PUBLIC GOOD

CONSUMER/ ENTERPRISE GOODS AND SERVICES

LOCAL PASSENGER TRANSPORT

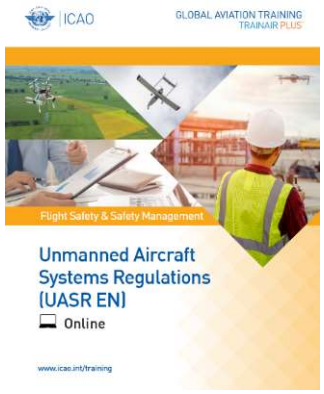
ICAO

Other ICAO UAS Resources



Overview of Unmanned Aviation Fundamentals (OUAF)

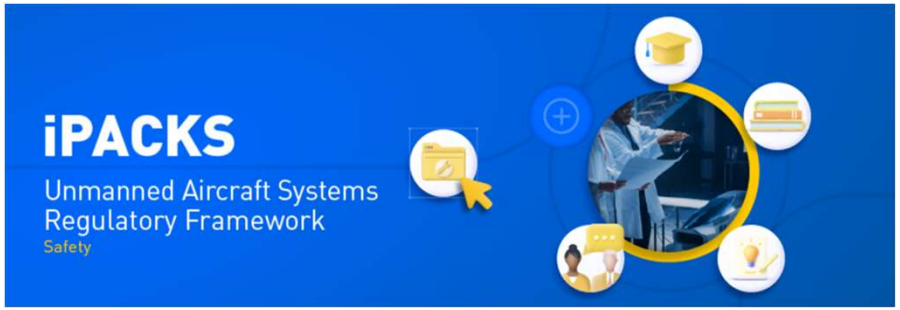
Unmanned Aircraft Systems Operations (UASO)



Unmanned Aircraft Systems Regulations (UASR)

Unmanned Aircraft Systems Safety Management System (UASSMS)

Other ICAO UAS Resources



iPACK: This Implementation Package (iPack) is a self-contained package aimed at assisting and guiding ministries of transport, Civil Aviation Authorities (CAAs), and organizations that intend to operate UAS in multiple countries in the implementation of a UAS regulatory framework that remains outside of the Remotely Piloted Aircraft Systems (RPAS) framework.

SCAN ME

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Other ICAO UAS Resources

ICAO TV

- ✓ Enabling UAS Operations (2 episodes)
- ✓ 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
- ✓ UTM Financial Sustainability Strategies
- ✓ UTM Deployment Best Practices and Lessons Learned

Visit ICAO TV (www.icao.tv) to register for your free account and Stream the latest videos from ICAO and civil aviation partners. Watch events, expert webinars, training content and much more.

ICAO Unmanned Aviation & Advanced Air Mobility Webpage

ICAO Unmanned Aviation Regulatory Framework Development

IMPLEMENTATION CONSIDERATIONS

COMMON CONSTRAINTS

Regulatory Hurdles

Varying or unclear national/international drone laws; airspace restrictions

Limited Battery/Range

Drones can’t fly far enough or carry large payloads

Data Security/Privacy

Concerns about capturing images of civilians or sensitive areas

Community Acceptance

Fear or misunderstanding of drones among local populations

Weather Dependence

Many drones can't fly safely in high winds, rain, or extreme conditions

Cost and Logistics

High cost of advanced drones, plus transport and maintenance in remote areas

* Key constraints commonly mentioned in sources discussing UAS use in humanitarian contexts, identified across academic, NGO, and regulatory literature.

* Stakeholders Interactions

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ICAO Unmanned Aviation Regulatory Framework Development

SAFETY IS PARAMOUNT!

SAFETY LEVEL IS NOT NEGOTIABLE!

IMPLEMENTATION CONSIDERATIONS

Manned vs Unmanned Concepts
HUMAN INTO THE SYSTEM

- Proprioceptive Condition (Pilot`s feeling);
- Noise, Smell, …;
- Cockpit Coordination;
- Visual Conditions (Human Eyes)
- Spatial Disorientation;
- Task Load vs Stress Level (Emergency vs Risk of Death);
- Comm Fail – Pilot On Board (No Comm);
- …

SITUATIONAL AWARENESS

Regulatory Perspective

- No Proprioceptive Condition (Pilot`s feeling);
- Limited Visual Cues (Sensors` Dependency);
- Cockpit Coordination;
- Low Level for Spatial Disorientation;
- Task Load vs Stress Level (Emergency vs Risk of Death);
- Comm Fail – Pilot Not On Board (Possible Comm);
- …

IMPLEMENTATION CONSIDERATIONS

Regulatory Approach

PRESCRIPTIVE

- ✓Prescribes in detail what must be done in order to be compliant;
- ✓Constrains operations to the technology available and procedures at the time the rule was implemented.

PERFORMANCE BASED

- ✓Specifies the desired outcome;
- ✓Specifies the risks or hazards which must be mitigated against;
- ✓Allows operator to adapt operation to more efficient models.

COMPETENCY BASED

- ✓Human performance;
- ✓Knowledge, skills, and attitude;
- ✓Conditions, performance, standards.

IMPLEMENTATION CONSIDERATIONS

OPERATION-CENTRIC

"An evaluative approach focused on the entirety of an activity".

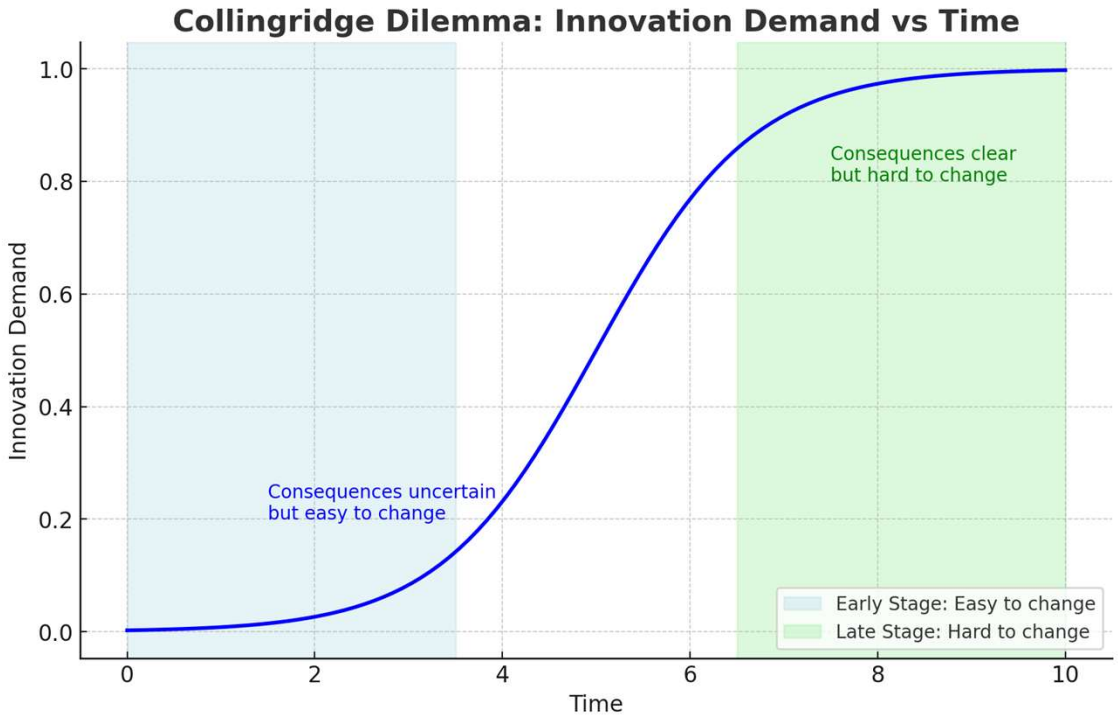
+

RISK-BASED

"A proactive approach involving safety risk management principles to reduce and control risks to a tolerable level."

IMPLEMENTATION CONSIDERATIONS

- Innovation includes commercial applications of new technology, new material, or new methods and processes(1).
- Innovation also includes the invention of new technologies and disruptive business models(1).



(1) Cirera, Xavier; Maloney, William F.. 2017. The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up. © World Bank. http://hdl.handle.net/10986/28341.

IMPLEMENTATION CONSIDERATIONS

- The pace, scope and complexity of innovation pose far-reaching and interrelated regulatory challenges for governments(2).
- These challenges can be grouped around four broad categories: the “pacing problem”; designing “fit-for-purpose” regulatory frameworks; regulatory enforcement challenges, and institutional and transboundary challenges. (2)

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(2) OECD, Recommendation of the Council for Agile Regulatory Governance to Harness Innovation, OECD/LEGAL/0464.
https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0464

IMPLEMENTATION CONSIDERATIONS

- **"Pacing Problem" > gap between the rapid development of emerging technologies and the much slower pace at which regulatory frameworks evolve;**
- **"Fit-For-Purpose" > regulatory instruments to match specific policy targets.**
- **Regulatory enforcement challenges (For instance - difficulties in apportioning and attributing responsibility for damages caused);**
- **Transboundary Challenges: innovations can span multiple regulatory regimes.**

(2) OECD, Recommendation of the Council for Agile Regulatory Governance to Harness Innovation, OECD/LEGAL/0464. https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0464

IMPLEMENTATION CONSIDERATIONS

Key implications of innovation on markets and societies (3)

- Competition
- New market failures
- Data privacy and security challenges
- Reduction in transaction costs
- Development of decentralised exchanges
- Development of networks
- Shift towards services
- Growing powers to consumers
- Socio-ethical challenges

(3) OECD/KDI (2021), Case Studies on the Regulatory Challenges Raised by Innovation and the Regulatory Responses, OECD Publishing, Paris, https://www.oecd.org/content/dam/oecd/en/publications/reports/2021/12/case-studies-on-the-regulatory-challenges-raised-by-innovation-and-the-regulatory-responses_82fcd441/8fa190b5-en.pdf

IMPLEMENTATION CONSIDERATIONS

Understanding the relation between regulation & innovation.

Assess the market demands & operational needs (contact people).

Assess regulatory relationships & regulatory impact (Sandbox, Enabling Clause,…).

Leverage the use of technology to reach out the users (Digital Platforms).

Promote Regulatory Knowledge (Training, Workshops, Seminars,..).

Seek for International Harmonization.

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KCAA
ICAO UNMANNED AIRCRAFT SYSTEM / REMOTE PILOT AIRCRAFT SYSTEM WORKSHOP
25 – 27 JUNE 2025 | NAIROBI, KENYA

UN Unmanned Aviation Coordination Forum

Main Objective

Standardize and Leverage Unmanned Aviation activities in the UN System, in an efficient and collaborative environment, based on the principles of **Safety**, **Expertise**, **Harmonization** & **Capacity Building**.

Assumptions

- UAS operations should be conducted **safely and efficiently** across the UN system;
- Comprehensive customized **training programs for personnel** should be implemented and **shared among the partner** entities;
- Frameworks (*inter alia*: **regulatory, standards, operational guidelines, etc.) should be harmonized**, as far as practical, to **facilitate UAS employment** across the UN System;
- **Exchange of knowledge** should be established through the necessary mechanisms to **share best practices and lessons learned** through UN System entities;
- States should receive the **appropriate support to develop and implement unmanned aviation regulatory frameworks** to enable such UAS employment; and
- **Collaborative partnerships** should be fostered and executed to promote the development and implementation of a harmonized Unmanned Aviation regulatory framework.

Strategic Concept

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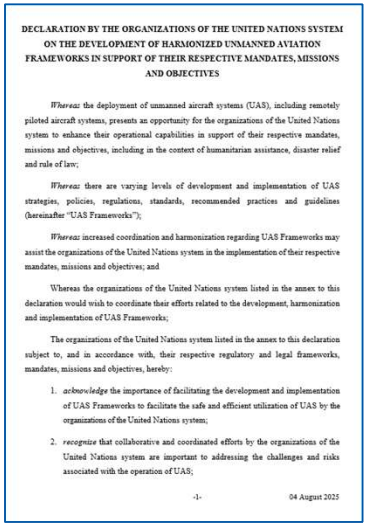
UN Unmanned Aviation Coordination Forum

DECLARATION BY THE ORGANIZATIONS OF THE UNITED NATIONS SYSTEM ON THE DEVELOPMENT OF HARMONIZED UNMANNED AVIATION FRAMEWORKS IN SUPPORT OF THEIR RESPECTIVE MANDATES, MISSIONS AND OBJECTIVES



DECLARATION BY THE ORGANIZATIONS OF THE UNITED NATIONS SYSTEM ON THE DEVELOPMENT OF HARMONIZED UNMANNED AVIATION FRAMEWORKS IN SUPPORT OF THEIR RESPECTIVE MANDATES, MISSIONS AND OBJECTIVES

Whereas the deployment of unmanned aircraft systems (UAS), including remotely piloted aircraft systems, presents an opportunity for the organizations of the United Nations system to enhance their operational capabilities in support of their respective mandates, missions and objectives, including in the context of humanitarian assistance, disaster relief and rule of law;

Whereas there are varying levels of development and implementation of UAS strategies, policies, regulations, standards, recommended practices and guidelines (hereinafter "UAS Frameworks");

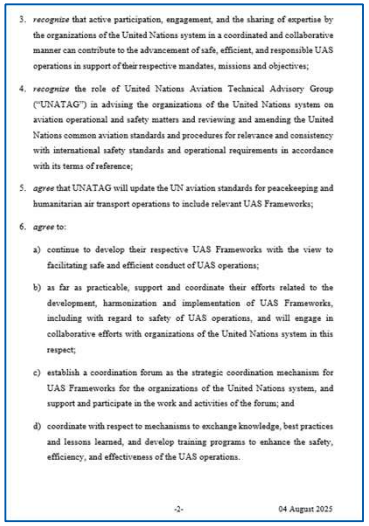
Whereas increased coordination and harmonization regarding UAS Frameworks may assist the organizations of the United Nations system in the implementation of their respective mandates, missions and objectives; and

Whereas the organizations of the United Nations system listed in the annex to this declaration would wish to coordinate their efforts related to the development, harmonization and implementation of UAS Frameworks;

The organizations of the United Nations system listed in the annex to this declaration subject to, and in accordance with, their respective regulatory and legal frameworks, mandates, missions and objectives, hereby:

1. *acknowledge* the importance of facilitating the development and implementation of UAS Frameworks to facilitate the safe and efficient utilization of UAS by the organizations of the United Nations system;
2. *recognize* that collaborative and coordinated efforts by the organizations of the United Nations system are important to addressing the challenges and risks associated with the operation of UAS;

-1- 04 August 2025



3. *recognize* that active participation, engagement, and the sharing of expertise by the organizations of the United Nations system in a coordinated and collaborative manner can contribute to the advancement of safe, efficient, and responsible UAS operations in support of their respective mandates, missions and objectives;
4. *recognize* the role of United Nations Aviation Technical Advisory Group ("UNATAG") in advising the organizations of the United Nations system on aviation operational and safety matters and reviewing and amending the United Nations common aviation standards and procedures for relevance and consistency with international safety standards and operational requirements in accordance with its terms of reference;
5. *agree* that UNATAG will update the UN aviation standards for peacekeeping and humanitarian air transport operations to include relevant UAS Frameworks;
6. *agree* to:
   a) continue to develop their respective UAS Frameworks with the view to facilitating safe and efficient conduct of UAS operations;
   b) as far as practicable, support and coordinate their efforts related to the development, harmonization and implementation of UAS Frameworks, including with regard to safety of UAS operations, and will engage in collaborative efforts with organizations of the United Nations system in this respect;
   c) establish a coordination forum as the strategic coordination mechanism for UAS Frameworks for the organizations of the United Nations system, and support and participate in the work and activities of the forum; and
   d) coordinate with respect to mechanisms to exchange knowledge, best practices and lessons learned, and develop training programs to enhance the safety, efficiency, and effectiveness of the UAS operations.

-2- 04 August 2025

UN Coordination Webpage
Access to Declaration and Interations Videos

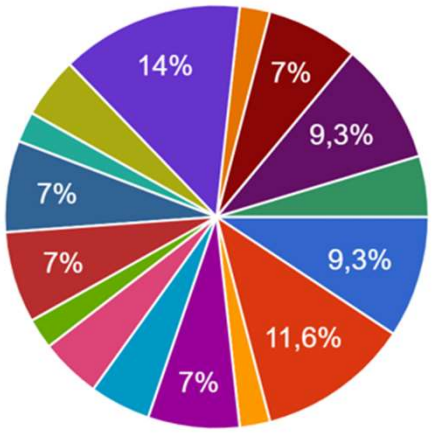
- Establish the UN Unmanned Aviation Forum to align UAS frameworks and facilitate cooperation among UN organizations;
- Establish the commitment of UN entities in developing their frameworks, coordinate efforts to develop, harmonize and implement UAS frameworks, share expertise, lessons learned and best practices, and develop training programs to enhance safety and effectiveness.
- Hitherto, the Declaration has been endorsed by **14 UN Entities.**

UN Unmanned Aviation Coordination Forum

Macro Activities

- Partnership Initiation
- Needs Determination
- National Enabling Clause
- Emergency UAS Framework
- Comprehensive UAS/RPAS Framework

Challenges Identification



- Lack of Knowledge related to UAS Operations/Regulations in CAAs
- Lack of UAS Operational/Technical Training for Personnel
- Absence of a UAS Regulatory Framework in States

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Achievements and Activities 2025

Workshop on UAS for UN System

Workshop on ESAF Region

Understanding Challenges and Opportunities for UN Entities and States on UAS/RPAS Operations

Workshop on NACC Region

Workshop on APAC Region


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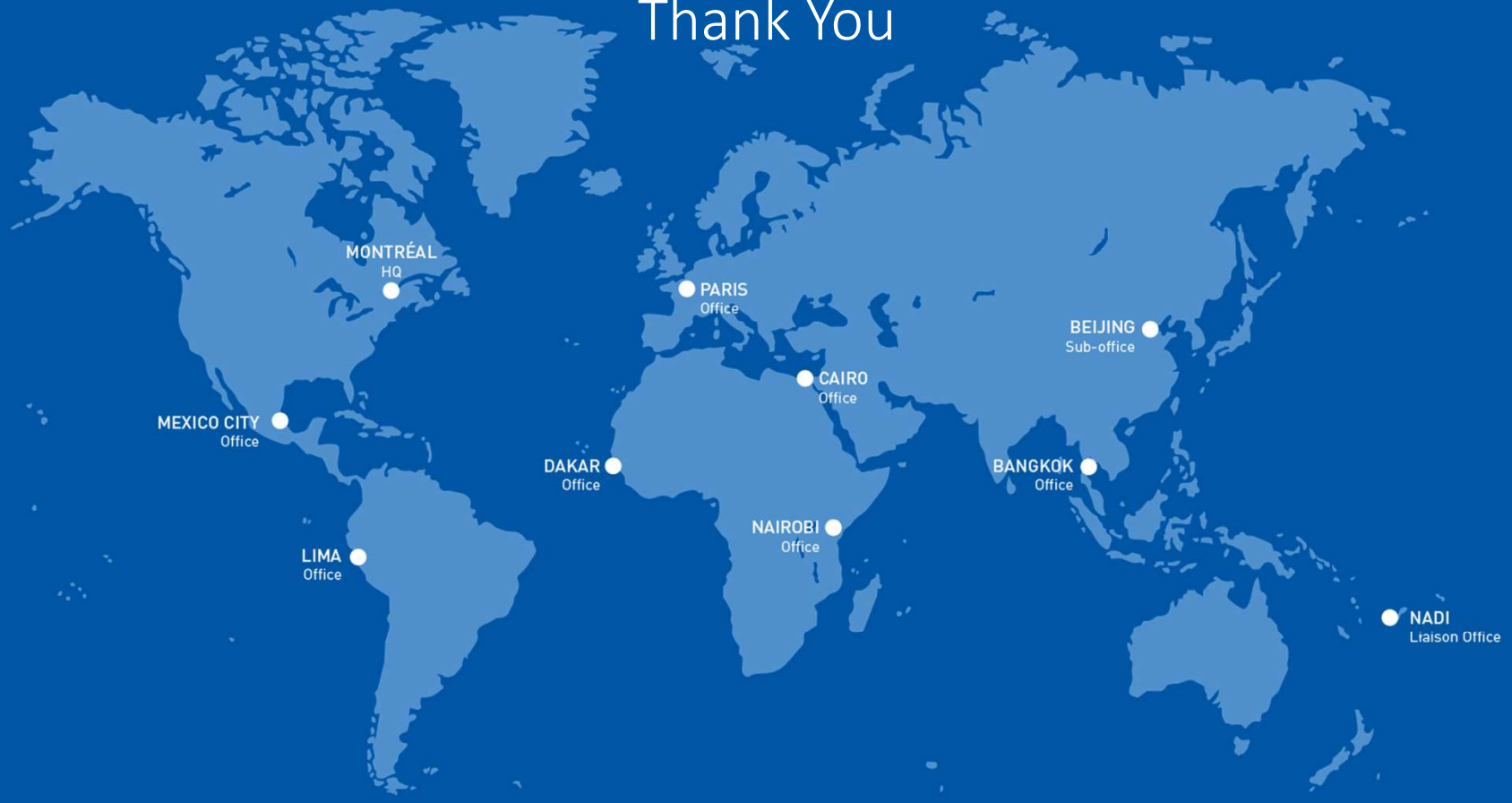
ICAO AIR NAVIGATION WORLD
ADVANCED AIR MOBILITY
AAM 2026
1 - 3 December | Bangkok, Thailand
Hosted by
CAAT
สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand


*"By **embracing innovation and working together,** we can create a **new era in aviation** that is inclusive of a broad range of users and operations. To achieve this vision, **high levels of global cooperation** should be enabled by strategic planning while remaining adaptable to changes".*
Rpas@icao.int
Call to Action AAM 2024

Thank You



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