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FUTURE.

# ICAO ESAF/WACAF Regional Office UAS/RPAS Workshop

**Nairobi, Kenya**
**June, 2025**

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# AAM Environment & UTM Framework

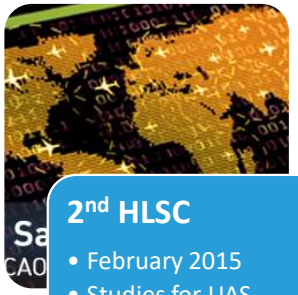
# Objectives



- Understand the Advanced Air Mobility Concept;
- Understand the Scope of the AAM-Study Group;
- Understand the ICAO UTM Framework; &
- Discuss Practical Applications.

# Background & Context





**2nd HLSC**

- February 2015
- Studies for UAS operations that pose a menace to International Navigation (Aerodromes…)

**39th Assembly**

- September 2016

✓Development of […] and **guidance material for UAS** out of IFR framework

**13th ANConf**

- October 2018
- Formulate & implement technical and regulatory solutions for UAS

**40th Assembly**

- Develop guidance material for safety risks of unauthorized presence of UA near aerodromes;
- Provisions for UAS and UTM.

***UNMANNED AIRCRAFT SYSTEMS – ADVISORY GROUP (UAS-AG)***

# Background & Context

## TASKS UAS-AG


a) Review and examine national and regional legal and **regulatory frameworks and initiatives** to identify commonalities and **existing best practices** with a view to **developing guidance material for routine SUAS operations** while maintaining the existing **level of safety of manned aircraft operations and people and property on the ground**;

b) **Develop guidance material to assist States with SUAS rulemaking** including assessing requirements for airworthiness, operations, licensing, communications, detect and avoid and air traffic management; and

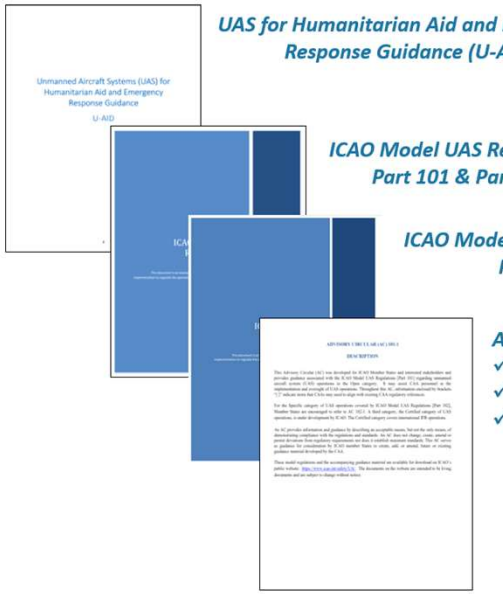
c) Develop **training and outreach material** in order to **educate regulators, industry stakeholders, model aircraft associations and civil operators** and to establish a balanced long-term approach towards the **safe operation of SUAS in national airspace systems**.

# Background & Context



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

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

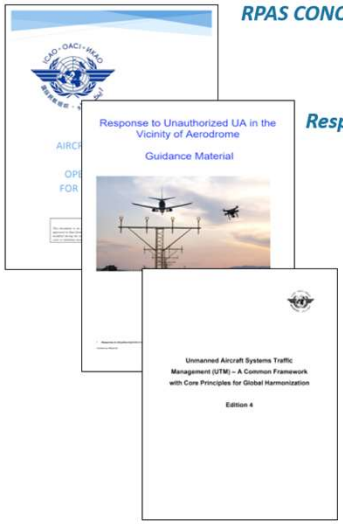



***UAS for Humanitarian Aid and Emergency Response Guidance (U-AID)***

***ICAO Model UAS Regulations Part 101 & Part 102***

***ICAO Model UAS Regulations Part 149***

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




***RPAS CONOPS for International Operations***

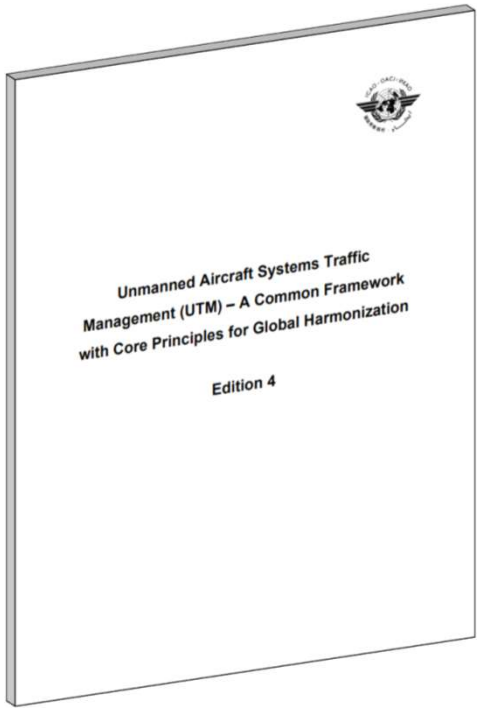
***Response to Unauthorized UA in the Vicinity of Aerodrome***

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

# Background & Context



**This document is intended to provide a framework and core capabilities of a "typical" UTM system to States that are considering the implementation of one.**




**1st Edition**

- Registration
- Identification
- Tracking
- Communications
- Geofencing
- Potential UTM Frameworks

**2nd Edition**

- UTM-ATM Boundaries
- UTM-ATM Transitions
- UTM-ATM Exchange of Information

**3rd Edition**

- UTM Risk Assessment
- Contingency Procedures
- UTM Service Providers
- Separation & Deconfliction on UTM

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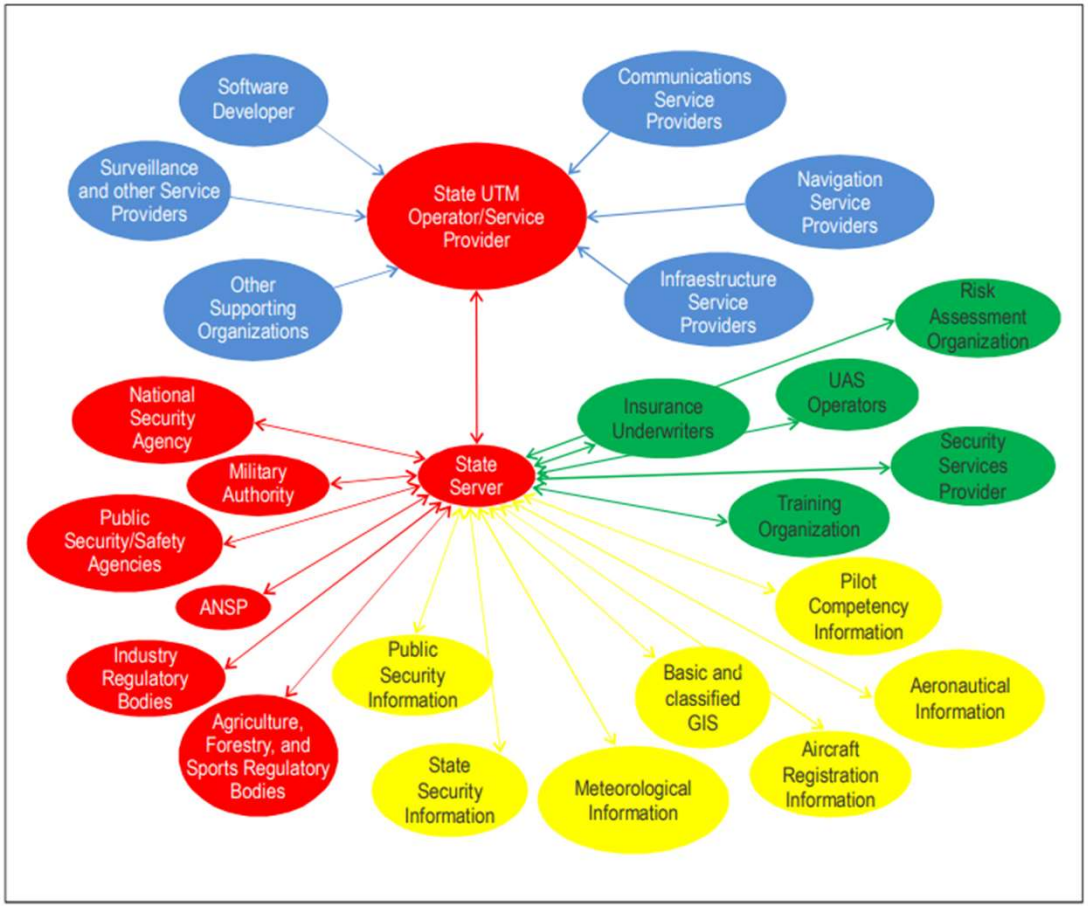
# UTM Framework






- ✓ **Centralized Architecture;**
- ✓ **State Server**
- ✓ **UAS Service Provider (USP);**
- ✓ **Supplement Data Service Provider (SDSP);**
- ✓ **Remote Identification;**
- ✓ **Computational and Network Capacity.**

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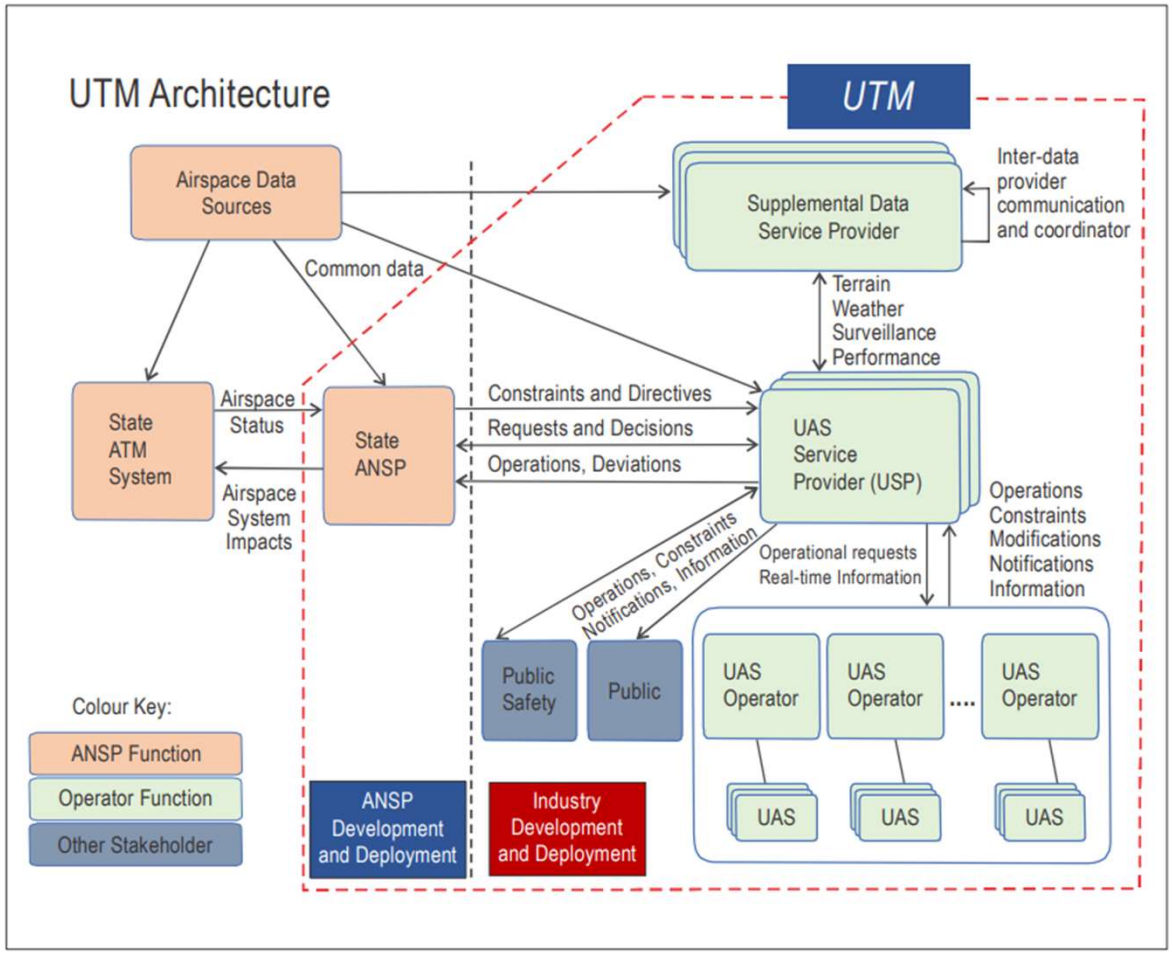
# UTM Framework






- ✓ **Federated Architecture;**
- ✓ **UAS Service Provider (USP);**
- ✓ **Supplement Data Service Provider (SDSP);**
- ✓ **Remote Identification;**
- ✓ **Computational and Network Capacity.**

# UTM Initiatives



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# INDIAN **JETSETGO** PARTNERS **EVE AIR MOBILITY** TO IMPLEMENT **VECTOR UTM** **JANUARY 21, 2025**

**JetSetGo**, India's largest **private jet and helicopter fleet operator**, is collaborating with Eve Air Mobility to **integrate eVTOL aircraft into India's urban airspace**.
This partnership makes **JetSetGo Eve's 14th Vector client globally** and its **second in India**.

**International Expansion**

- **Jeju Air and Eve Air Mobility** are developing a **sustainable, scalable UAM network** in **Jeju, South Korea**.
- **Eve Air Mobility**, in partnership with **L3Harris, Skyports, and CAMI**, developed a **ConOps for Miami's UAM ecosystem**.

**Miami UAM Market Forecast**

- **By 2026: 7 vertiports, 40–63 eVTOLs**, serving up to **600,000 passengers annually**.
- **By 2035: 32 vertiports, 210 eVTOLs**, carrying **4 million passengers annually**, generating **$191M in revenue**.


- **Eve Air Mobility**, established on **October 15, 2020**, is a **Brazilian aerospace company** and a **subsidiary of Embraer**.
- The **EVE eVTOL** features **fully electric propulsion**, designed to carry **four passengers and one pilot** with a range of approximately **60 miles (100 km)**.
- Eve Air Mobility is also developing **urban air traffic management (UATM) solutions**, including the **Vector UATM software**.
- A **manufacturing plant in Taubaté, Brazil** is set to produce **480+ eVTOLs per year**.
- As of **March 2024**, Eve had signed contracts with **28 companies** for **2,850 eVTOL orders**, valued at **$8 billion**, across **13 countries**.
- 🚀 **Expected entry into service: 2026.**

**Eve Air Mobility** established a **UAM ecosystem ConOps for Rio de Janeiro**.
**Use Case: eVTOL Airport Shuttle**

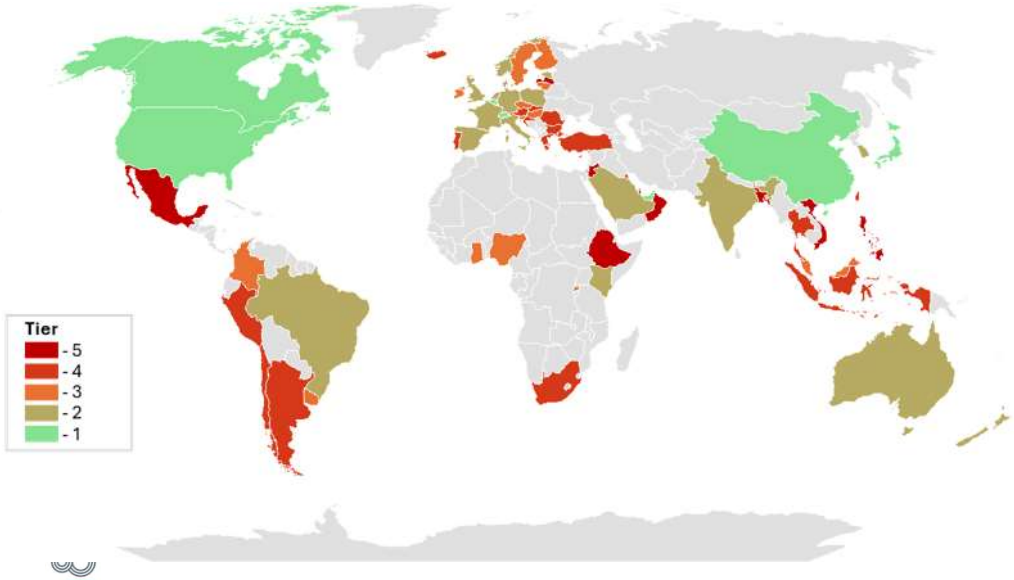
- **Route: Barra da Tijuca ↔ Rio de Janeiro International Airport (GIG)**
- **Time Reduction: 35 km car journey (1.5 hours) → 12 minutes via eVTOL**

**UAM Market Growth in Rio de Janeiro (Projection for 2035):**

- **245 eVTOL aircraft**
- **37 vertiports**
- **4.5 million passengers annually**
- **100+ routes**
- **$220 million in annual revenue**
- **Total projected revenue (2026–2035): $23 billion**

# GUTMA UTM Ecosystems' Readiness Index 2024 Report






**January 29, 2025**

**Active U-Space/UTM Airspace:** *Switzerland and France* have operational *U-Space airspace*, while *Belgium, Spain, and Germany* are advancing implementation.

**Regulatory Leadership:** The *EU's U-Space framework* is the most mature, providing a *standardized approach* to UAS integration.

**BVLOS Progress:** The *United States* leads in *Beyond Visual Line of Sight (BVLOS) operations*, with ongoing regulatory developments.

**Governance & Strategy***: Japan and Belgium* demonstrate *strong UTM governance*, fostering collaboration between regulators and industry.

**Market Growth:** *Australia and China* leverage *economic tools and investment incentives* to accelerate UTM adoption.

**Technology Advancements:** *Switzerland's SUSI initiative* and *digital U-Space services in the EU* set benchmarks for automation and airspace integration.

**Source:** GUTMA UTM Readiness Index 2024

# AIRmarket and Alberta Invest $4.7M in Canada's First RPAS Traffic Management SystemAccelerate the Drone Economy and Cut Emissions.

Press


**Project Overview:** AIRmarket and Alberta invest *$4.7M* to develop an RPAS Traffic Management (RTM) system for BVLOS UAS operations.

**Use Cases:** Includes *wildfire detection, precision agriculture, and emergency response* to enhance safety and efficiency.

**Economic Impact:** Expected to *support 100,000 daily UAS flights*, create jobs, and contribute *$14B annually* to Alberta's GDP.

**Environmental Benefits:** Reduces *greenhouse gas emissions* by replacing traditional aircraft and ground vehicles.

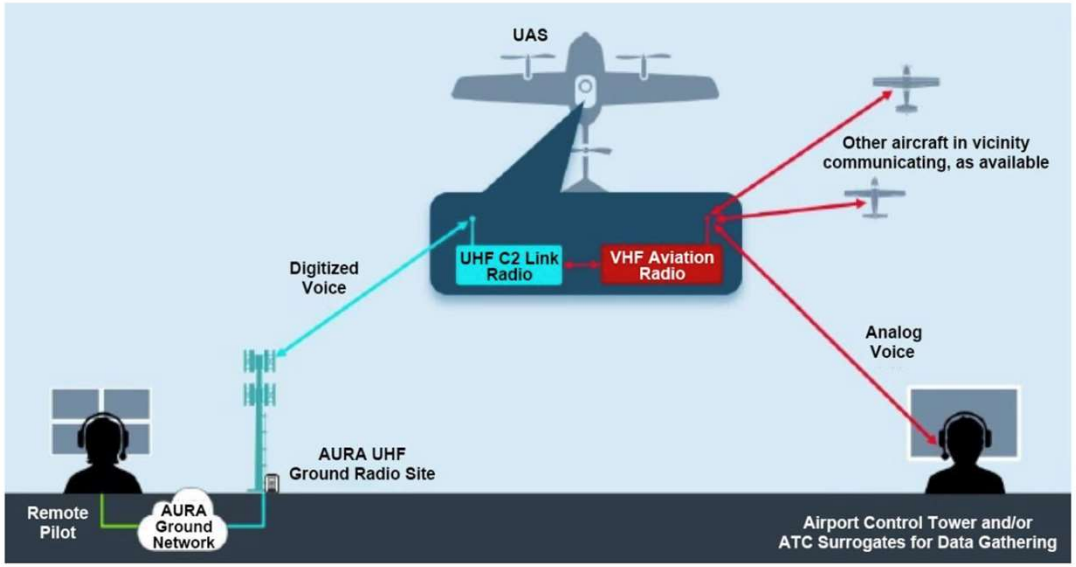
**Strategic Goal:** Positions *Alberta as a leader in UAS innovation*, aligning with *NAV CANADA's RTM framework*.

**Source:** sUAS News

# FAA Contracts Aura to Test Uncrewed Aircraft Integration

Air traffic control voice relay tests will evaluate sound quality and latency

February 11, 2025




*This infographic details the various aspects of Aura's commercial network, which is designed to enable remotely piloted flight operations in controlled airspace. © Aura Network Systems*

**Aura Network Systems**

**Objective:** Evaluate *voice-relay capabilities* for uncrewed aircraft systems (UAS) in controlled airspace.

**Scope:** Assess *sound quality* and *latency* of air traffic control communications relayed through Aura's network.

**Significance:** Aims to enhance *safety and reliability* of UAS operations within the National Airspace System.

**Source:** AIN Online

# ANRA Technologies to Power Finland's U-space with Advanced UTM Solutions

Press


**Contract Award:** ANRA Technologies has been chosen by *VTT Technical Research Centre of Finland* to deliver advanced *U-Space services* using its *ANRA Noon* UTM platform.

**Scope of Services:** The platform will provide essential U-Space services, including ***f****light authorization, geo-awareness, network identification*, and *traffic information.*

**Objective:** Enhance the safety and efficiency of UAS operations across various sectors in Finland, such as *research, commercial, and public safety* applications.

**Strategic Significance:** This initiative aims to position Finland as a leader in *integrated UAS operations* within the European U-Space framework.

**Source:** ANRA Technologies Press Release

# ENAIRE manages nearly 10,000 drone operations in 2024

February 7, 2025 UAS traffic management news

**Total Operations:** Coordinated *9,588 UAS operations*, a *6% decrease* from 2023.

**Efficiency Measures:** Implemented *administrative simplifications* and established *procedures and agreements* with public and private users, reducing the need for individual coordination.

**Regulatory Update:** Enforced *Royal Decree 517/2024*, defining general UAS zones to enhance airport operation safety.

**Coordination Process:** The *Airspace Operations Coordination Department* manages flight requests, collaborating with airport managers as necessary.

**Source:** ENAIRE Press Release

# Airservices Australia announces first round of Uncrewed Aircraft Systems Service Suppliers

Gary Mortimer

**Selected Suppliers:** *OneSky*, *AvSoft*, and *Yarra UASs* chosen to integrate with the new *Flight Information Management System (FIMS).*

**FIMS Purpose:** Facilitates seamless data sharing between air traffic control, traditional aircraft, and uncrewed airspace users, forming the core of Australia's Uncrewed Aircraft Systems Traffic Management (UTM) ecosystem.

**Future Outlook:** With projections estimating over *60 million UASs* in Australian airspace by 2043, these collaborations aim to ensure a safe, efficient, and harmonized airspace for both uncrewed and conventional aircraft.

**Source:** sUAS News

# A first for Europe: Air taxi and drones fly together in Benidorm

**Location**: Benidorm, Spain
**Event**: First **simultaneous flight** of an **air taxi (EH216-S)** and **12 drones** in an **urban setting**

**Project**: Conducted under the **EU-funded U-ELCOME** initiative
**Managed by**: **Universitat Politècnica de València (UPV)**
**Use Cases**: Cargo, delivery, surveillance, rescue.

**Airspace managed by**: **U-space digital platforms** with **3 USSPs** – ENAIRE, ITG, UAB
**Key partners**: EHang, EUROCONTROL, AESA, DGCA Spain, local police, Telefónica, UAV Works, etc.

🛬 **Milestone**:
- First coordinated **multi-USSP** U-space operation with **manned and unmanned aircraft**
- Demonstrates future **urban air mobility** integration potential

🔧 **Challenges Ahead**:
- Regulatory framework for air taxis
- Physical infrastructure (e.g., **vertiports**)
- Urban planning and **public acceptance**

**Source**: U-ELCOME / UPV / ENAIRE


# EHang, Zaragoza and Guangzhou universities establish low-altitude flight safety laboratory

Source: EHang Press Release

🌐 **Global Partnership**:
🤝 **EHang, University of Zaragoza (Spain)**, and **University of Guangzhou (China)**

📍 Agreement signed at **Zaragoza City Hall** with city officials from **Guangzhou & Zaragoza**

🧪 **Focus Areas of the Joint Lab:**
- **Low-altitude flight safety**
- **UAM**, logistics, and smart city integration
- **Research, innovation, and education**
- **Academic exchange** and **talent development**

📈 **Market Outlook** (China):
China's low-altitude economy is projected to reach approximately USD 210 billion by 2025 and could exceed USD 490 billion by 2035 backed by **CAAC** projections and government support.


# United Arab Emirates introduces UTM service provider certification regulations

*Source: unmannedairspace*

📜 **New Regulation**: Defines operational standards for certifying UAS air navigation service providers.

🌍 **Based on EU U-space Reg.**: Adapted to the UAE environment for local relevance.

📋 **Coverage**: Contracts, training, quality, safety, auditing—ensuring safe UAS-commercial aviation integration.

📈 **Strategic Impact**: Supports UAE's leadership in aviation innovation; aligns with global investment trends.

🛬 **Future Growth**: UAS operations in UAE expected to double in coming years.

🗣️ **GCAA Leadership**: Regulation is "a transformative step… and a cornerstone for safe airspace integration."

📑 **Guidance Materials**: Includes Acceptable Means of Compliance (AMC) and Guidance Material (GM) under development.

## Altitude Angel and AirHub Partner to Expand UTM Services Across Europe


**Partnership Overview**:
•**Altitude Angel**, UTM platform provider, and **AirHub**, Dutch drone operations platform, form a strategic alliance.
•Integration enables streamlined **mission planning, flight approval**, and **real-time airspace compliance** for drone operators.

**Platform Capabilities**:
•**AirHub** app and web platform integrates with **GuardianUTM** to deliver:
•**Real-time geospatial airspace data**,
•**U-Space connectivity** for filing flight plans,
•**Digital Approval Services** in UTM Ready zones,
•**Live telemetry sharing** via Surveillance API.

**Benefits for Operators**:
•Faster, safer, and **legally compliant mission workflows** in Europe.
•Support for **public safety, critical infrastructure, and security sectors**.
•Enhances airspace **deconfliction and coordination** with authorities.

**Strategic Impact**:
•Expands UTM access across **Netherlands and mainland Europe**, with future potential **global extension**.
•Supports the broader **U-Space ecosystem** and **new airspace user integration**.

**Source**: SUAS News, April 2025

## Malaysia to Implement UTM System and Publish New UAS Regulations in Q4 2025

**New UAS Regulatory Framework**:
•**Civil Aviation Authority of Malaysia (CAAM)** to issue updated **Civil Aviation Regulations** on UAS operations in **Q4 2025**, replacing **CAR 2016 Reg. 140–144**.
•Framework aims to align with **global best practices**, fostering **safe and innovative UAS integration**.

**Introduction of UAS Traffic Management System (UAS-TMS)**:
•New digital platform to manage **registration, application, and monitoring** of UAS operations.
•Expected to **streamline approval processes** and reduce application times.

**Interagency Collaboration**:
•CAAM is coordinating with:
•**Royal Malaysia Police**, **MCMC**, **SIRIM**, **Government Security Office**, **Survey and Mapping Department**, and authorities from **Sabah and Sarawak**.

**Fee Revision**:
•CAAM will update **charges and fee structures** to reflect the new regulatory system.

**Strategic Objective**:
•Support **safe commercial and recreational UAS use**, enhance governance, and **prevent unlawful activities** such as illegal surveillance or airspace violations.

**Source**: Unmanned Airspace, 23 April 2025

## Altitude Angel & NexG CSA Partner to Advance UTM Services in Malaysia


**Strategic Partnership Announced**: Altitude Angel and NexG CSA unveiled collaboration at **Airspace World 2025 (Lisbon)** to deliver **unified traffic management (UTM)** services across Malaysia.

**GuardianUTM Deployment**: Altitude Angel's GuardianUTM platform to provide **real-time situational awareness**, improving safety and efficiency in UAS operations under Malaysia's **Drone Technology Action Plan 2022–2030 (MDTAP30)**.

**Live Monitoring Capabilities**: Key stakeholders will gain **direct visibility into UAS activity**, supporting public safety and regulatory oversight.

**Future Innovation**: Partnership may introduce Altitude Angel's **ARROW technology** to enable **BVLOS operations** and integration with crewed aviation via full airspace user detection.

**National Alignment**: Supports Malaysia's strategic ambitions for **a regulated, scalable, and commercially viable drone ecosystem**.

**Industry Leadership**: Combines **Altitude Angel's global UTM expertise** with NexG CSA's **local market knowledge and infrastructure**.

**Source**: sUAS News, 2 May 2025

# EASA Certifies First U-space ATM Service Provider For Uncrewed Aircraft

Anra Technologies is ready to launch U-space services across Europe

**Certification Announced**: At **Airspace World (Lisbon), 14 May 2025**, Anra Technologies became the **first company certified by EASA** as a **U-space service provider (USSP)** under **Regulation (EU) 2021/664**.

**European Milestone**: Marks a major step in enabling **BVLOS and automated UAS operations** across Europe; certification sets a **benchmark for technical and regulatory readiness**.

**Source**: AIN Online, 14 May 2025


**Service Readiness**: Anra now prepared to **launch U-space services** in multiple EU Member States, pending **national authority and ANSP approvals**.

**Rigorous Evaluation**: Certification followed **two years of EASA oversight**, including assessments of **safety, cybersecurity, and data protection systems**.

**Strategic Impact**: Supports development of **secure, interoperable, and scalable U-space ecosystems** to enable future **autonomous passenger and commercial drone operations**.

**EASA Statement**: Certification “moves us closer to a safe, secure, and interoperable European U-space,” said EASA Director Florian Guillermet.

## First Real-Time UTM Coordination Between BVLOS Drone Operators in U.S.

**Milestone in Texas**: Flytrex **and** Wing launched the **first daily commercial UTM-enabled BVLOS operations** in **Dallas-Fort Worth** area, using the Strategic Coordination standard.

**Automated Deconfliction**: Operators **share flight intent data** and **auto-adjust routes** to avoid conflicts—no manual coordination required.

**FAA UTM Operational Evaluation**: Initiative forms part of the **FAA's broader national UTM framework**, supporting scalable, safe drone delivery.

**Industry Perspective**:
- Flytrex: UTM is "the backbone" of scalable drone delivery.
- Wing: This sets the foundation for **multi-operator airspace sharing** and expanded commercial delivery networks.

**Operational Significance**:
- Enables **sustained, low-altitude commercial BVLOS operations**.
- Supports safe expansion of drone services in **densely populated, shared airspace**.

**Delivery Leadership**:
- **Flytrex**: 200,000+ drone deliveries in TX & NC.
- **Wing**: 450,000+ global deliveries across 3 continents.

**Source**: DroneLife, 28 May 2025

# UTM Initiatives





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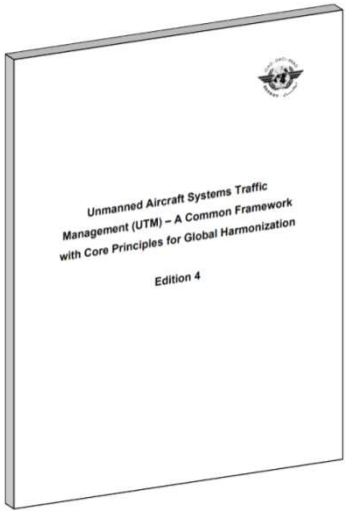
# UTM Framework



**Future evolution is set to be rapid, and will follow paths as yet undefined. Supporting this continued evolution while encouraging innovation will require:**

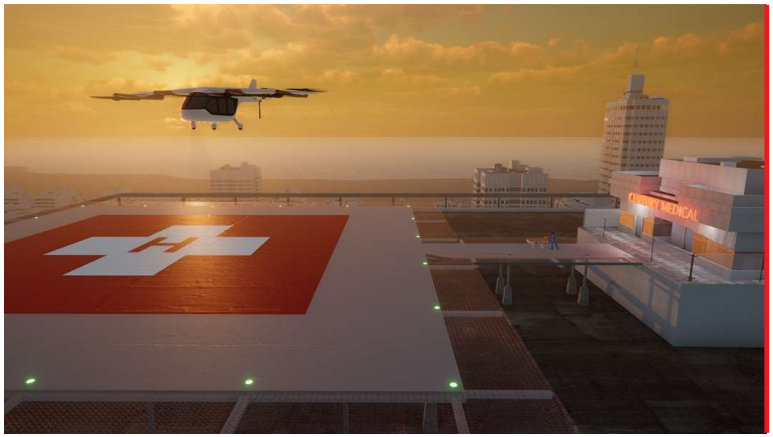



- Safety assurance for manned aviation, UA and people and property on the ground.
- Flexibility in system architecture and UTM service definition to enable UTM systems to react to developments in technology and business applications.
- Increase in efficiency in UTM service provision, especially as numbers of UA increase.
- Ongoing harmonization of standards and regulations that support various implementation options.
- Automatic and continuous validation of UTM systems.
- New and amended economic and cost recovery models for both the services provided and potentially the regulatory oversight aspects may need to be developed..

# ADVANCED AIR MOBILITY (AAM)



REGIONAL CARGO AND PASSENGER TRANSPORT

PUBLIC GOOD

CONSUMER/ ENTERPRISE GOODS AND SERVICES

LOCAL PASSENGER TRANSPORT

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# Advanced Air Mobility (AAM)

# ADVANCED AIR MOBILITY (AAM)



REGIONAL CARGO AND PASSENGER TRANSPORT


PUBLIC GOOD

CONSUMER/ ENTERPRISE GOODS AND SERVICES

LOCAL PASSENGER TRANSPORT

ADVANCED AIR MOBILITY (AAM) STUDY GROUP

# ADVANCED AIR MOBILITY (AAM)



## AAM Study Group (AAM SG) – Terms of Reference

**The AAM SG will support the ICAO Secretariat to develop a holistic vision and framework related to AAM, and:**

a) **serve as a focal point** for ICAO AAM-related work with the aim of ensuring global interoperability and harmonization;

b) perform an **assessment of the AAM ecosystem**, including, as deemed necessary, subsets, such as urban air mobility (UAM) and enablers, such as unmanned aircraft system (UAS) traffic management (UTM), automation and autonomy, information and data management, artificial intelligence (AI), etc.);

c) based on the outcomes of the previous step, **perform a gap analysis between existing practices, ICAO provisions and what might be required from ICAO;**

d) **develop initial guidance material** and the outline of a global framework, as deemed necessary; and

e) develop **recommendations for an ICAO AAM strategy** and on future work.

# ADVANCED AIR MOBILITY (AAM)



## Topics being currently considered by the AAM SG

- ✓ **Assessing the AAM Ecosystem (not only the aircraft)**
- ✓ **Holistic vision of the AAM ecosystem evolution report**
- ✓ **UAS regulatory framework gap analysis**
- ✓ **UTM implementation guidance material**
- ✓ **Early implementation Guidance on eVTOL operations in current ATM environment**
- ✓ **Exploring areas: autonomy and automation, new flight rules, the role of the pilot, information and data management, the link between AAM and the UN SDGs…**
- ✓ **Support ATMRPP on Global ATM Operational Concept (GATMOC) update for AAM related considerations**
- ✓ **Coordination with many ICAO expert groups: ADOP, RPASP, GANP SG, TFP, IMP, FLTOPSP, ATMOPSP…**

# ADVANCED AIR MOBILITY (AAM)



## Current description of AAM

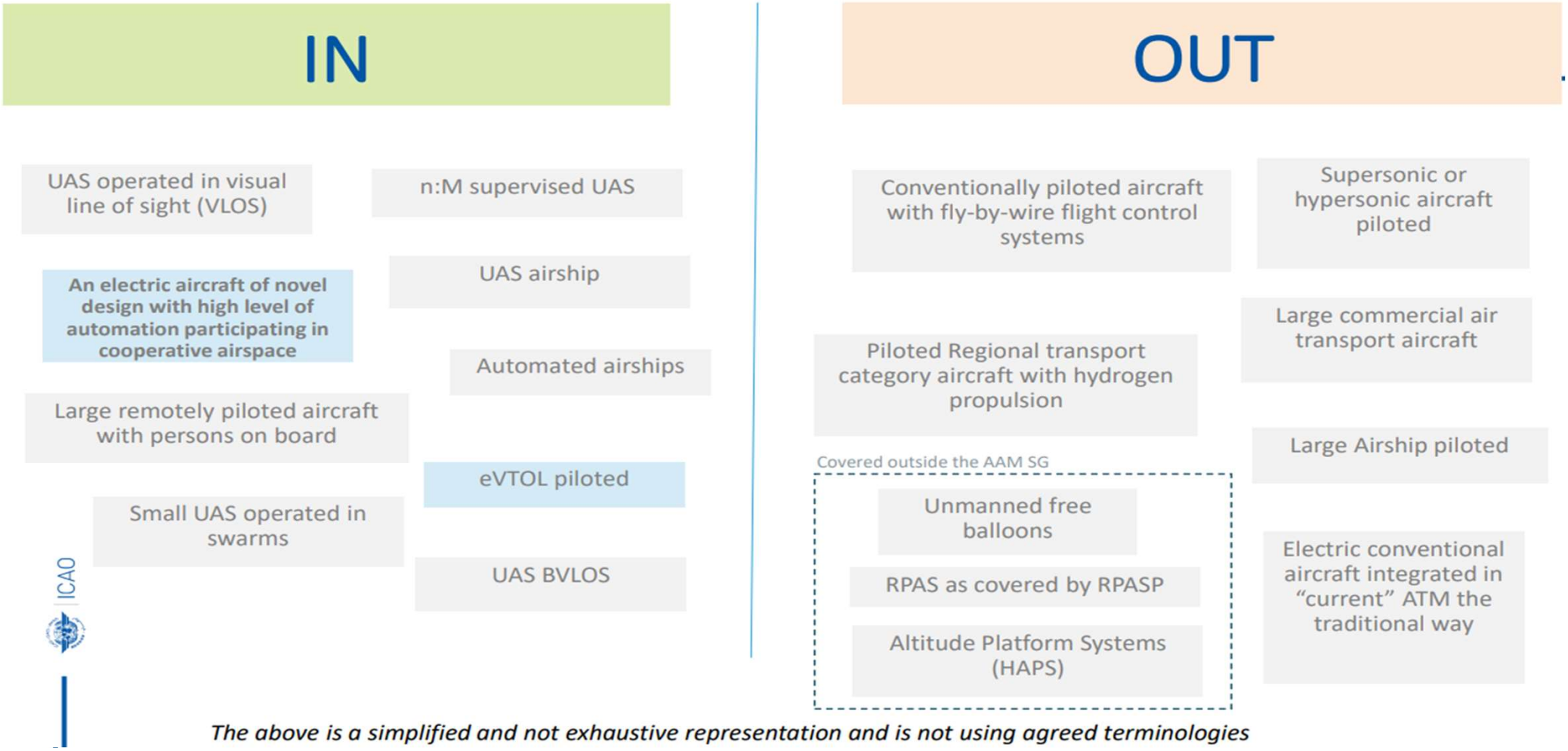
AAM is composed of a wide range of technologies, services, operations, aircraft, and use cases, and, for the purpose of delineating the AAM VISION and the scope of the AAM SG's gap analysis and recommendations for future work, covers :

the operations of aircraft **without a pilot onboard**, requiring in most instances novel services and infrastructure to support or scale the operations;

the operations of aircraft **with a pilot onboard**, that have a combination of novel design, operations, propulsion methods, and increasing levels of automation that feature the following: new human machine interfaces, pilot training, airworthiness standards. Additionally, these operations require novel services and infrastructure necessary to support or scale.

# ADVANCED AIR MOBILITY (AAM)





# ADVANCED AIR MOBILITY (AAM)



- In other words:
  - More than eVTOLs;
  - An ecosystem rather than an aircraft;
  - Includes UAS, UTM and all sorts of operations;
  - Impact on flight rules, roles and responsibilities of the pilot;
  - Not addressing the technology evolution of commercial-type aircraft, nor high-altitude operations.

# ADVANCED AIR MOBILITY (AAM) - *CALL TO ACTION*



**Calling for collaboration in key areas**

- ✓ **Understanding AAM**
- ✓ **Building AAM Infrastructure**
- ✓ **Supporting, Governing and Regulating AAM**

**Specific priorities**

- ✓ **Regulatory interoperability and adaptability, airspace integration, multilevel cooperation, and support for innovation**

**AAM 2024** ICAO'S FIRST ADVANCED AIR MOBILITY SYMPOSIUM

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AAM 2024 ICAO'S FIRST ADVANCED AIR MOBILITY SYMPOSIUM

# AAM International Call to Action

***Paving the Way for the Future of Aviation with Advanced Air Mobility***

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SAFE SKIES.
SUSTAINABLE FUTURE.


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AAM 2024
ICAO'S FIRST ADVANCED
AIR MOBILITY SYMPOSIUM
9 — 12 September 2024
ICAO Headquarters, Montréal, Canada
On ICAO TV
Event Sponsor
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AIR CANADA
In collaboration with
CAAM


*"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".*

*Call to Action AAM 2024*

# Thank You


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