

REGIONAL FOCUS

Emergence of Remotely Piloted Aircraft Systems, ATM Integration, Benefits and Hazards in Africa

Part 2 – Training and Integration

Wednesday 25 August 2021

12:00 – 14:00 CAT



Ms. Boni Dibate

Director Africa Affairs

CANSO



Mr. Prosper Zo'o Minto'o

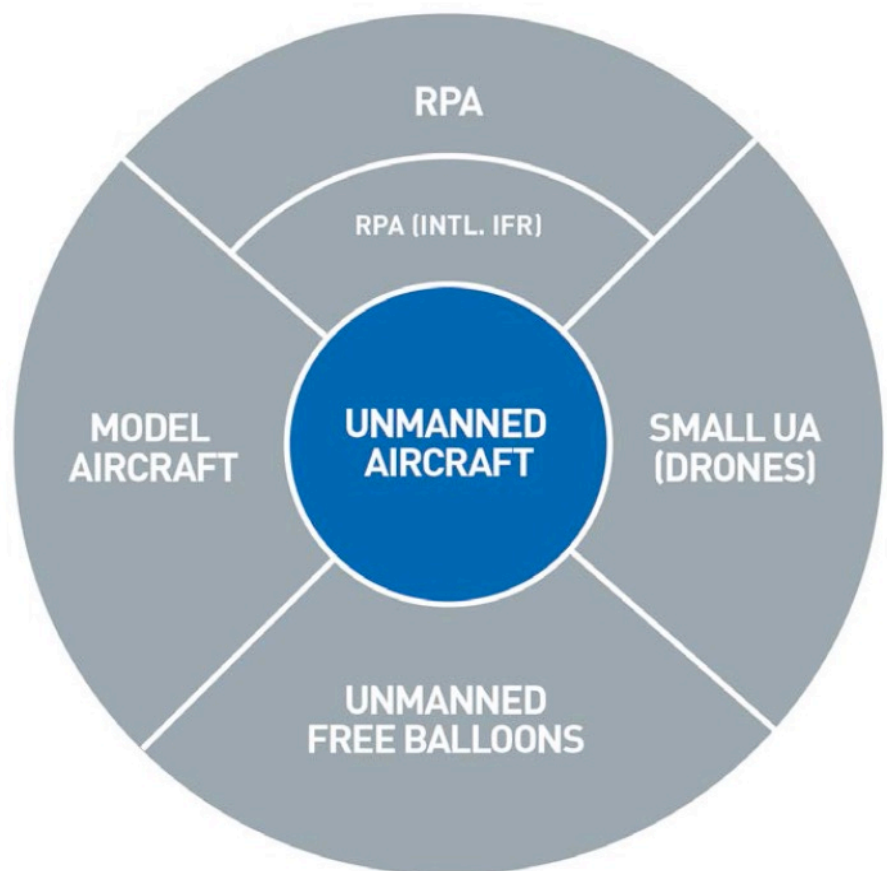
Regional Director

ICAO WACAF

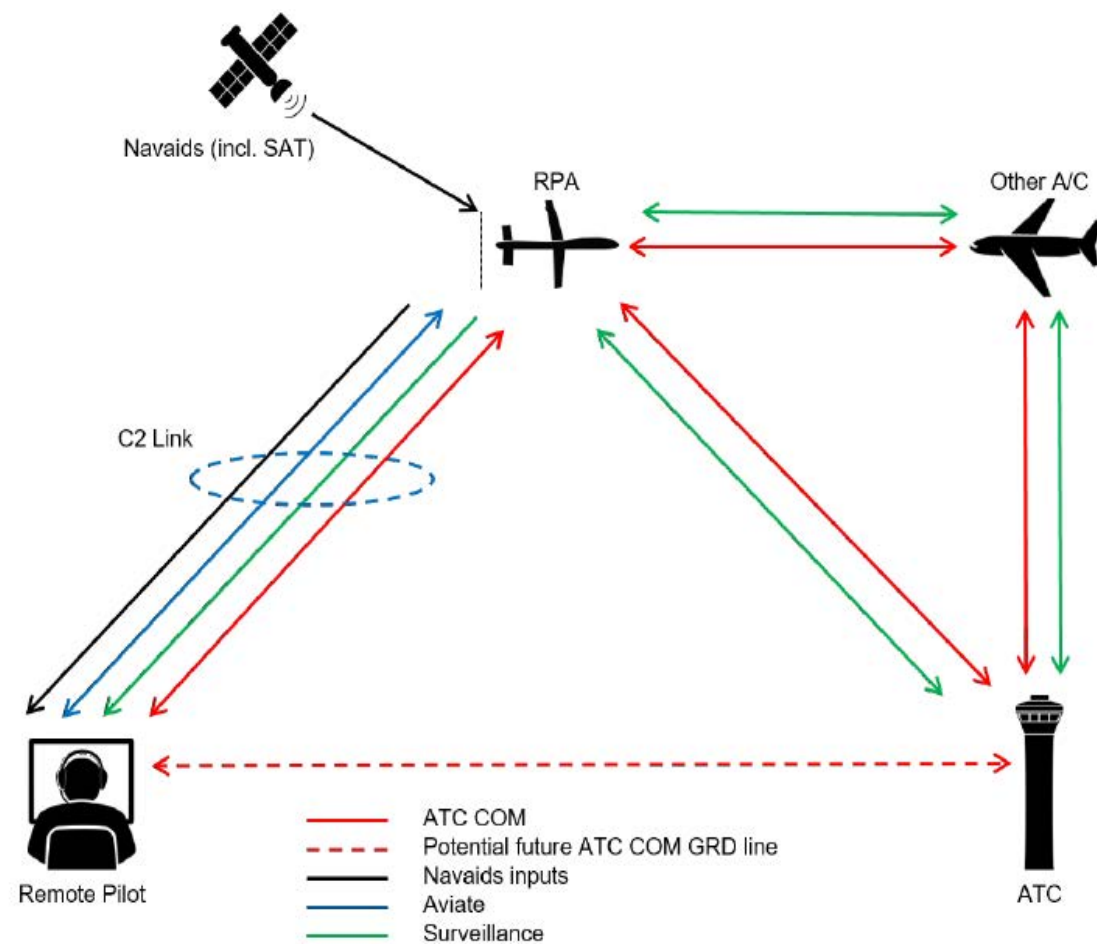
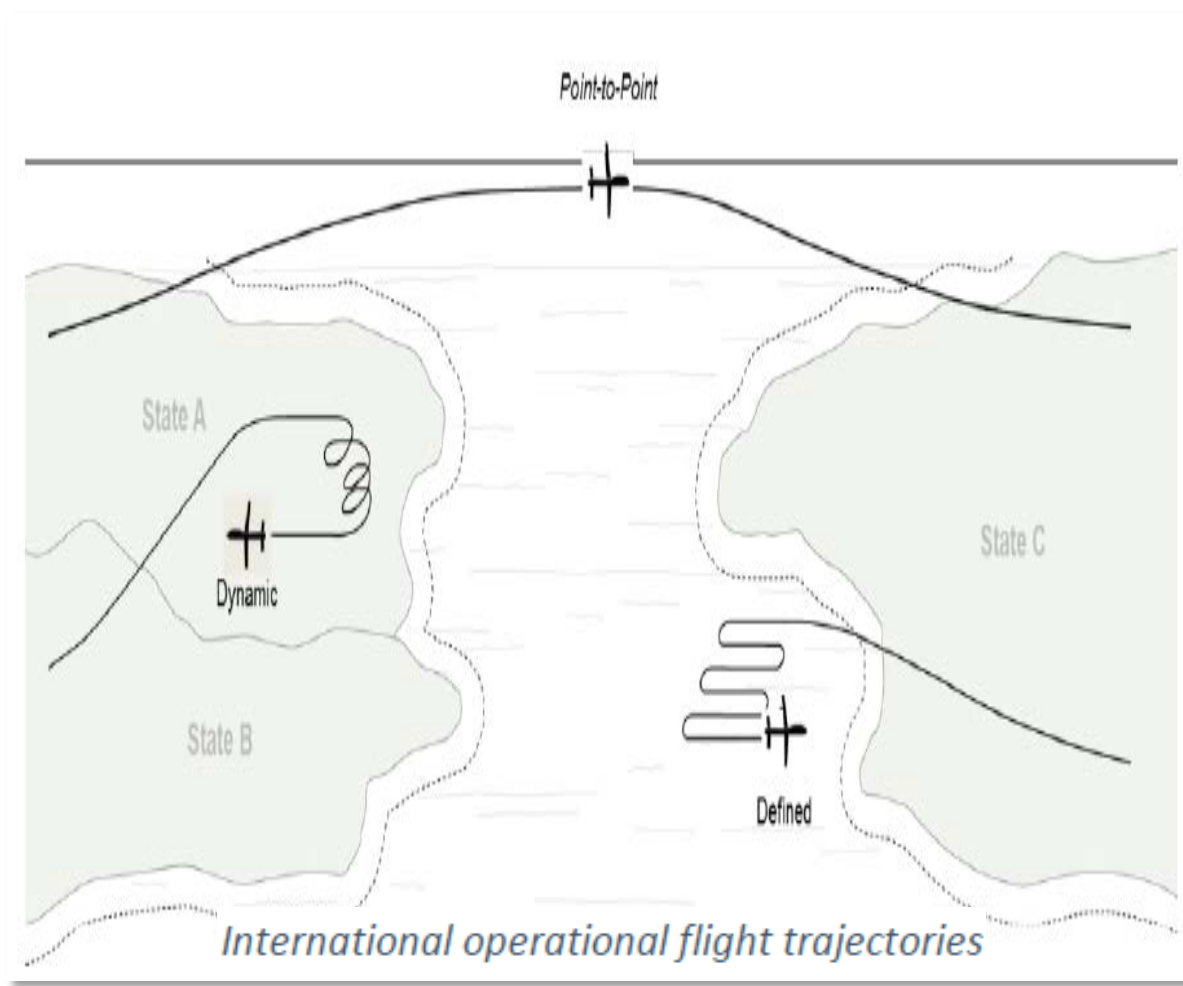


Key terms

KEY TERMS FOR UNMANNED AVIATION

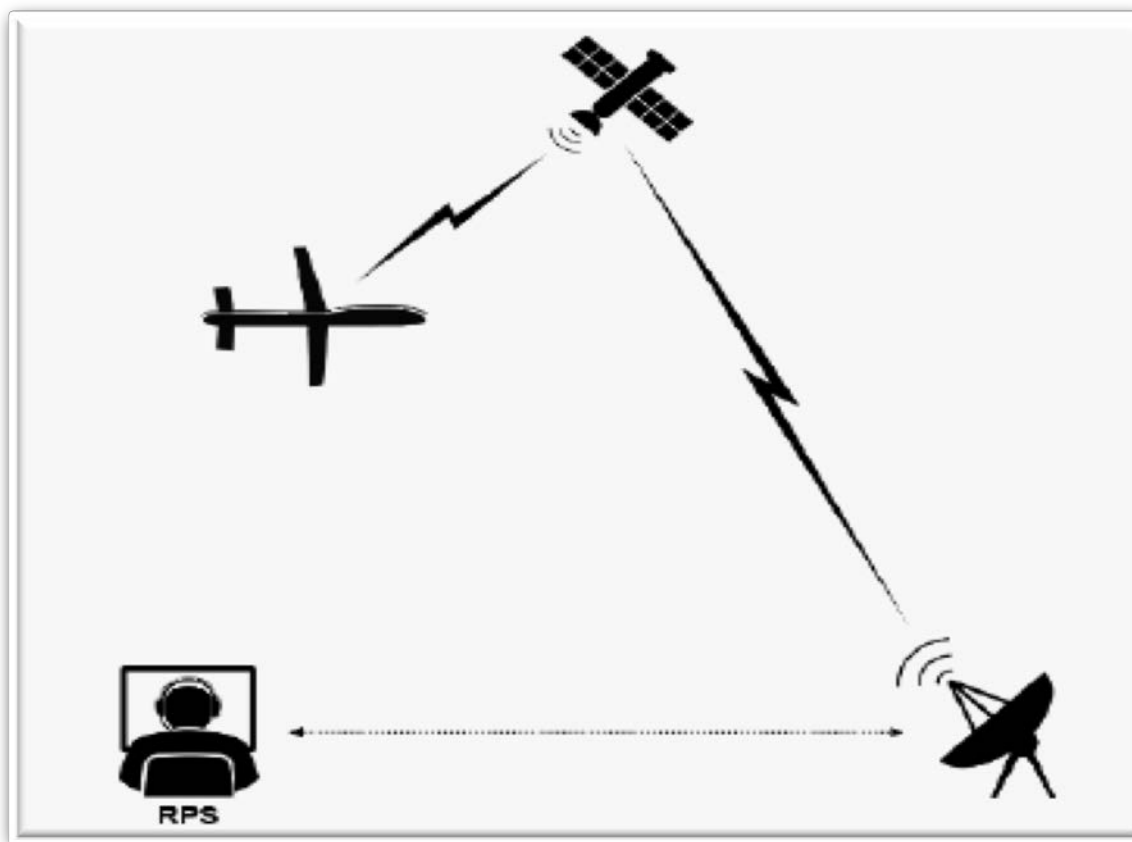


- UA operate as part of an UAS which also includes a RPS, a C2 Link for control and management, and other components.
- UA includes a broad spectrum of aircraft, from drones, unmanned free balloons and model aircraft, to highly complex, piloted aircraft (RPA) operated by licensed aviation professionals
- RPA are a subset of UA, A further subset of RPA is expected to be accommodated and ultimately integrated into the airspace for international, IFR operations which will require full regulatory certification.

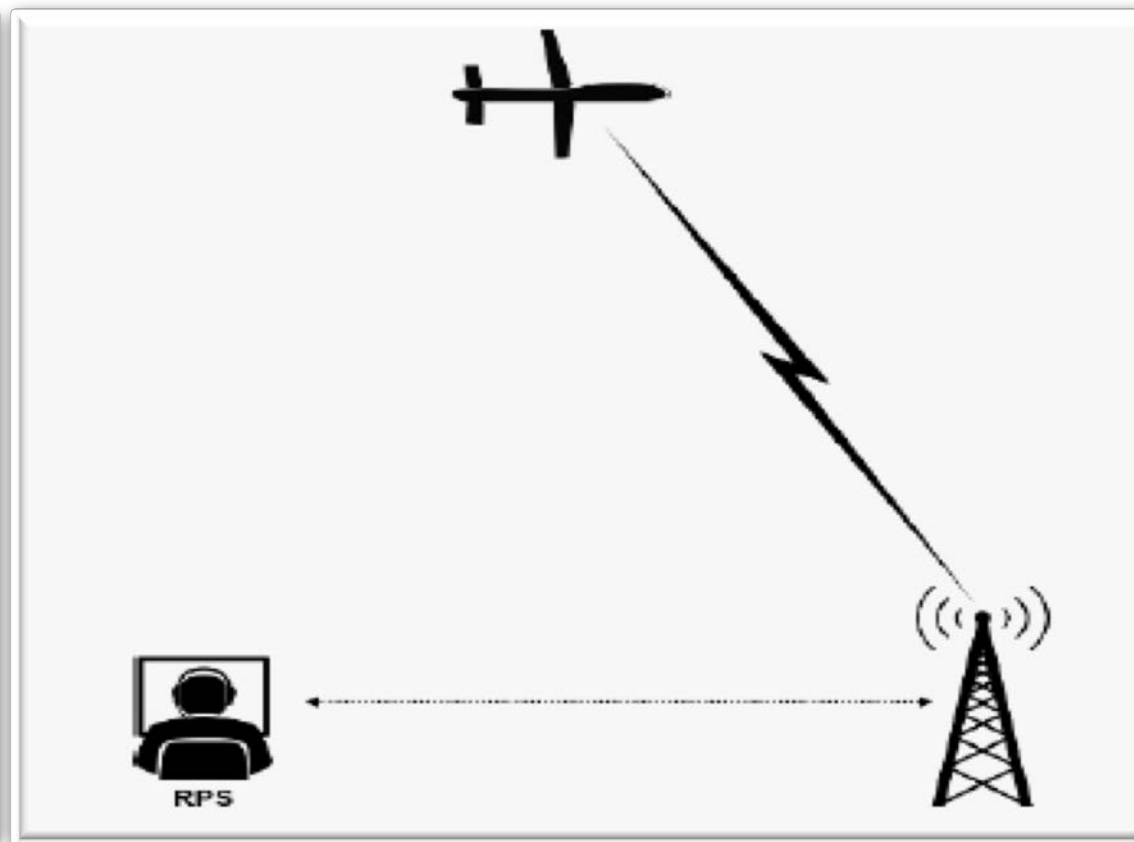




Beyond radio line-of-sight (BRLOS) architecture

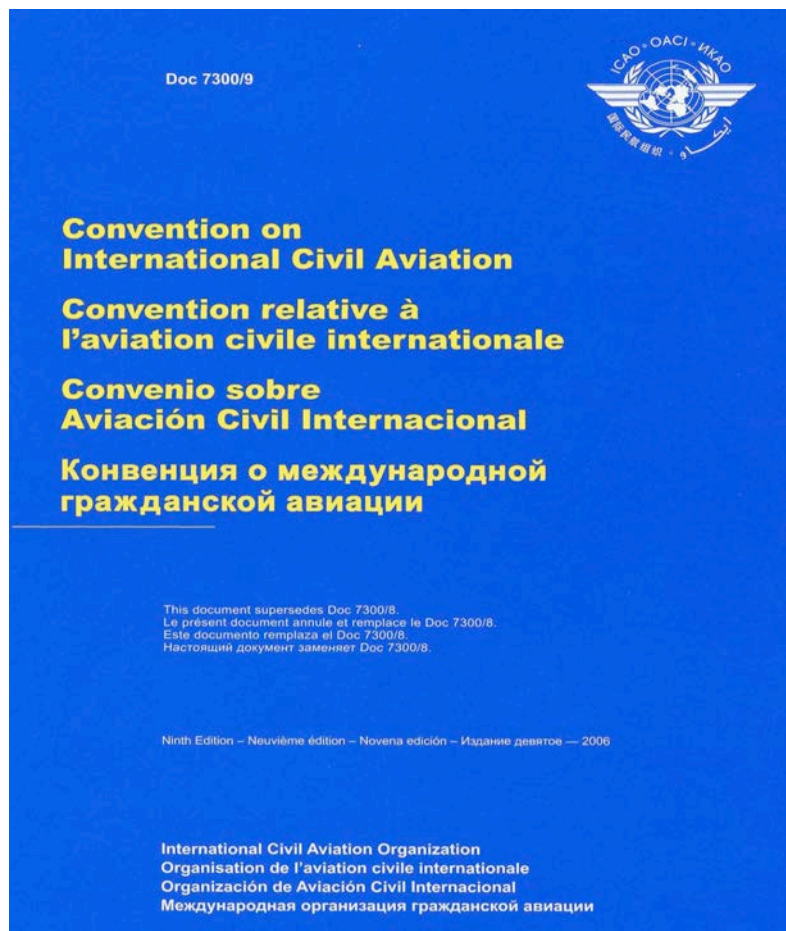


Radio line-of-sight (RLOS) architecture

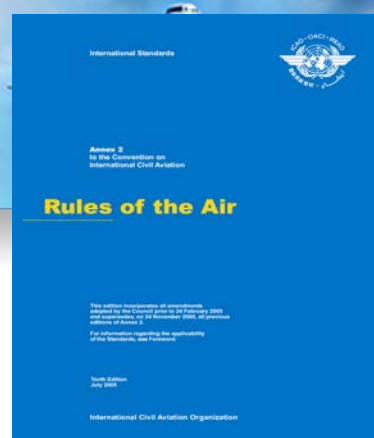




The Chicago Convention (1944)



- Article 8 (Pilotless aircraft)
- Article 12 (Rules of the air)
- Article 15 (Airport and similar charges)
- Article 29 (Documents carried in aircraft)
- Article 31 (Certificates of airworthiness)
- Article 32 (Licenses of personnel)
- Article 33 (Recognition of certificates and licenses)

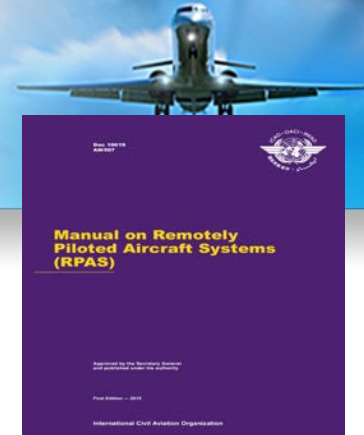


Rules of the air (Annex 2)

General operating rules

An RPAS engaged in international air navigation **shall not be operated without appropriate authorization** from the State from which the take-off of the RPA is made.

- An RPA **shall not be operated across the territory of another State without special authorization issued by each State** in which the flight is to operate.
- An RPAS **shall be operated in accordance with conditions specified by the State of Registry, the State of the Operator, if different, and the State(s) in which the flight is to operate.**
- RPAS **shall meet the performance and equipment carriage requirements for the specific airspace** in which the flight is to operate.



Manual on RPAS (Doc 10019)

- Chapter 2. Introduction to RPAS
- Chapter 3. Special authorization
- Chapter 4. Type certification and airworthiness approvals
- Chapter 5. RPA registration
- Chapter 6. Responsibilities of the RPAS operator
- **Chapter 7. Safety management**
- Chapter 8. Licensing and competencies
- Chapter 9. RPAS operations
- Chapter 10. Detect and avoid (DAA)
- Chapter 11. Command and control (C2) link
- Chapter 12. ATC communications
- Chapter 13. Remote pilot station
- **Chapter 14. Integration of RPAS operations into ATM and ATM procedures**
- Chapter 15. Use of aerodromes



ICAO GANP/5

B1-RPAS

- **Initial integration of remotely piloted aircraft (RPA) into non-segregated airspace**
- Implementation of basic procedures for operating RPA in non-segregated airspace.

B2-RPAS

- **Remotely piloted aircraft (RPA) integration in traffic**
- Implements refined operational procedures that cover lost command and control (C2) link (including a unique squawk code for lost C2 link), as well as enhanced detect and avoid technology.

B3-RPAS

- **Remotely piloted aircraft (RPA) transparent management**
- Continuing to improve the certification process for remotely piloted aircraft (RPA) to operate on the aerodrome surface and in non-segregated airspace just like any other aircraft.

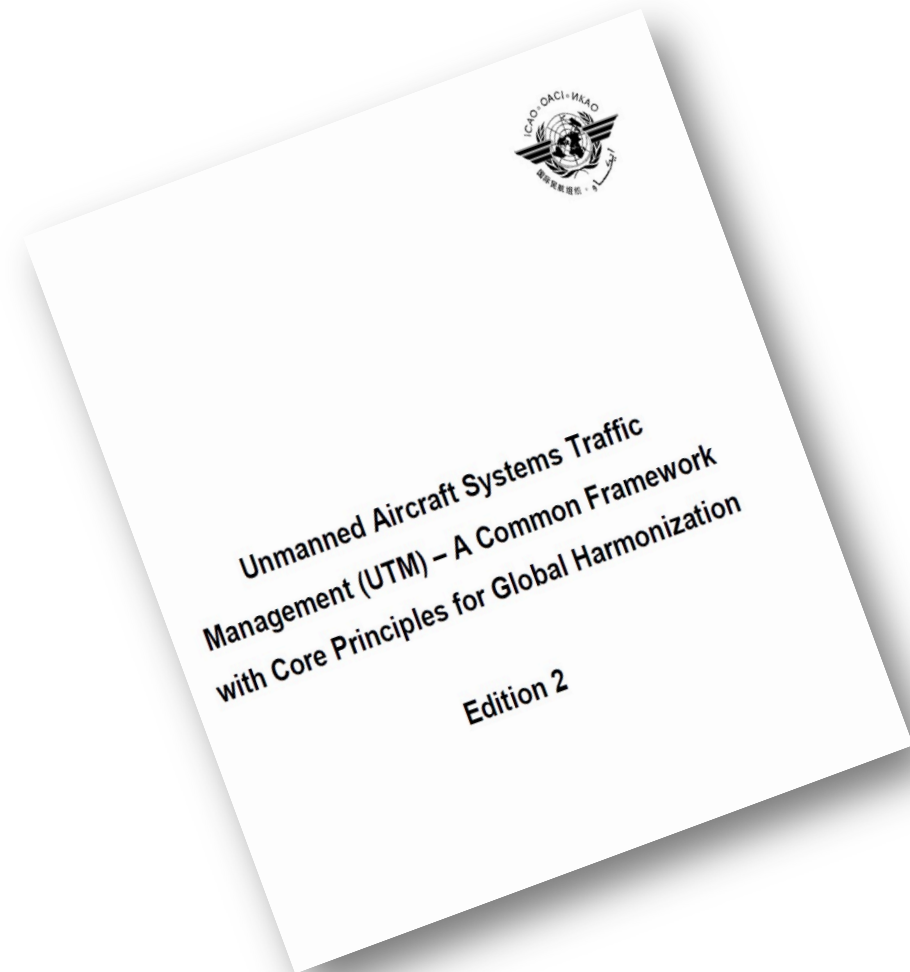


Integration of RPAS into UTM and ATM procedures





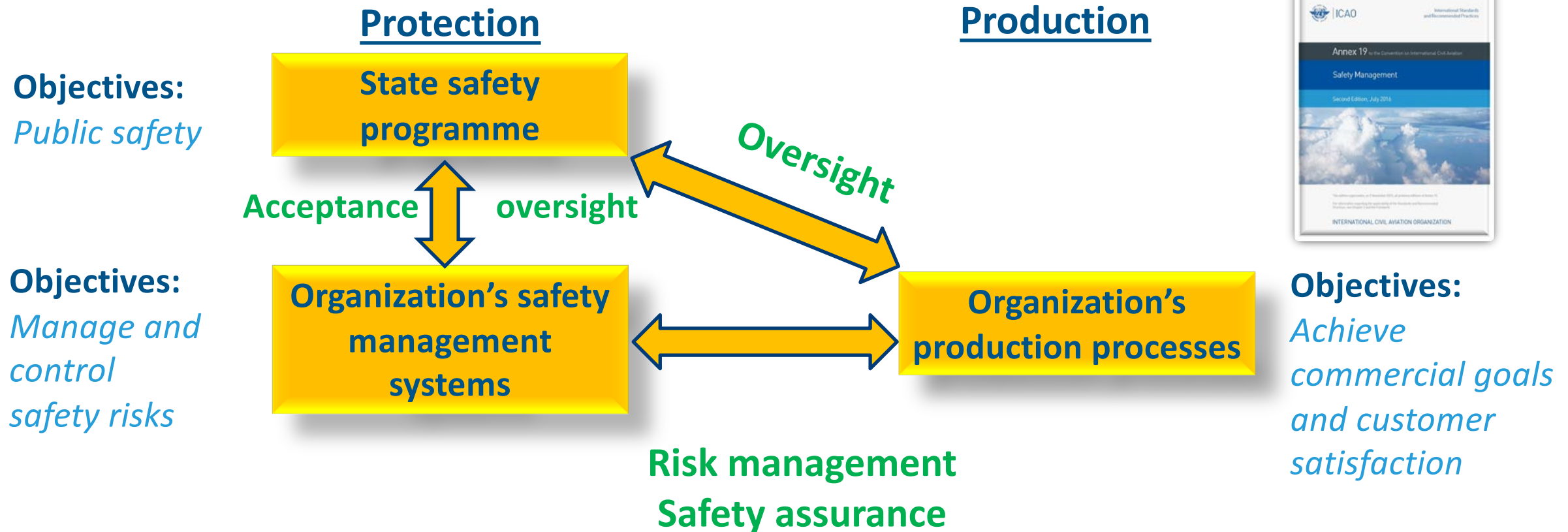
Integration of RPAS into UTM and ATM procedures





Safety Management (Annex 19)

State's safety programme (SSP) + Service providers SMS = Integrated safety system





Conclusion

Legal / Regulatory Framework to be developed as a critical element to enable safe, harmonized and seamless RPAS operations based on:

- ICAO comprehensive provisions
 - SARPs
 - PANS
 - Guidance Material
- States' Best Practices



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UNITING AVIATION

NO COUNTRY
LEFT BEHIND



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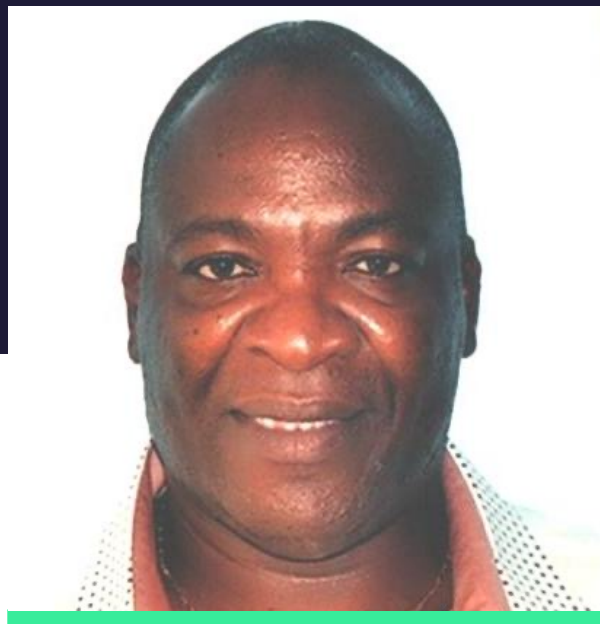
Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU



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Air Traffic Control Specialist / Co-
Chair UAS/Emerging
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FAA / CANSO

UAS/Emerging Technologies Working Group

RPAS Introductory Training Packet



Lance King, Northrop Grumman Corp.

Co-Chair UAS/Emerging Technologies Working Group



John Page, Federal Aviation Administration

Co-Chair UAS/Emerging Technologies Working Group

BACKGROUND



- UAS/ET Working Group identified a need for general UAS training for ANSPs
- First version completed in early 2017, updated in early 2020
- RPAS operators, both civil and State, are seeking greater access to airspace and increasingly interact with air traffic management (ATM) systems.
- Accepting RPAS into the ATM system poses many challenges and, from an ANSP point of view, integration of RPAS in non-segregated airspace is of special interest.

OBJECTIVE AND SCOPE

Objectives

- Provide high level introduction to remotely piloted aircraft systems (RPAS).
- Provide training guidance that can be individually tailored by air navigation service providers (ANSPs).
- All material is intended to recommend topics for discussion. ANSPs are encouraged to adapt the material to develop training programmes that meet national/regional needs

Scope

- Focus of training – RPAS operating instrument flight rules (IFR) in controlled airspace.
- Target audience - ANSP management, ANSP training staff and air traffic service staff.

OUTLINE OF TRAINING

- Introduction
 - Explanation of terms
 - Background
 - RPAS configuration
- Remotely piloted aircraft performance example
- Challenges posed by integration of RPAS operations
- Conducting routine operations
- National/regional regulations and authorisations
- Standards and procedures under development
- Conclusion



EXAMPLE OF TRAINING PACKET/INSTRUCTOR GUIDE

RPAS Configuration

- An RPAS is comprised of a set of configurable elements including an
 - RPA
 - Associated RPS(s),
 - C2 links
 - Any other system elements as may be required, at any point during flight operation.
- The pilot controls the RPA from an RPS, linked by radio which can either be in
 - Direct radio (frequency) line of sight (RLOS/FLOS), or
 - Beyond (frequency) line of sight (BLOS) using satellite or other relays.
- These links are used both for the C2 of the RPA and for communications with air traffic control (ATC) and are potentially vulnerable to disruption

EXAMPLE OF TRAINING PACKET/INSTRUCTOR GUIDE

Regulations and Authorisations

- When developing localised or regional programs, additional material may need to be addressed. This information is not limited to, but could include:
 - Regulations
 - Policies
 - Guidance
 - Procedures
 - Authorisation processes
- Places to find examples of these items include:
 - CANSO ANSP Considerations for RPAS Operations document
 - ICAO Manual on RPAS
 - ICAO UAS Toolkit for very low level operations

22 | RPAS Introductory Training for ANSPs

During the showing of this slide, it may be a good time for the instructor to discuss any national or localised regulations or procedures.

When developing local or regional programmes ANSPs need to consider all aspects of RPAS operations.

TRAINING PACKET INFORMATION

- Packet can be downloaded from CANSO website at

<https://canso.org/network/operations-standing-committee-osc/>

- Updates to the training material will be occurring during next CANSO OSC All-Hands
- If your interested in helping with the Working Group contact Coleen Hawrysko at **Coleen.Hawrysko@CANSO.org**.





THANK YOU





Dr. Mugambi M'Nchebere

Director

EASA

THE ROLE OF TRAINING IN INTEGRATING RPAS INTO EXISTING ATM SYSTEMS

**By
Dr Mugambi G.K. M’Nchebere
Director | EASA and
President, AATO**



Regional Focus: Emergence of Remotely Piloted Aircraft Systems, ATM Integration, Benefits and Hazards in Africa



Definition

What is a Remotely-Piloted Aircraft System?

“A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation.”

ICAO Circular 328 of year 2011
AN/190



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History of Unmanned Aircraft System

Unmanned Aircraft System?

“An aircraft and its associated elements which are operated with no pilot on board”.

ICAO Circular 328 of year 2011
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History of Unmanned Aircraft System

- ▶ The first pilotless vehicles were developed in Britain and the USA during the first world war. Britain's Aerial Target, a small radio-controlled aircraft, was first tested in March 1917 while the American aerial torpedo known as the Kettering Bug first flew in October 1918.



*First pilotless British
made aircraft that first
flew in 1917.*

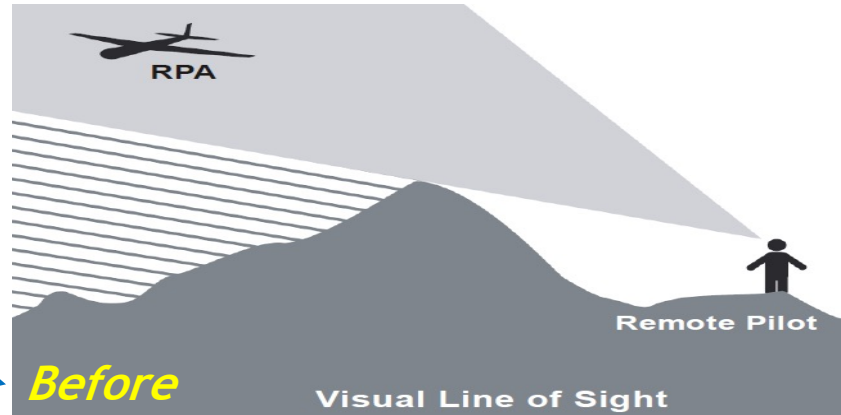


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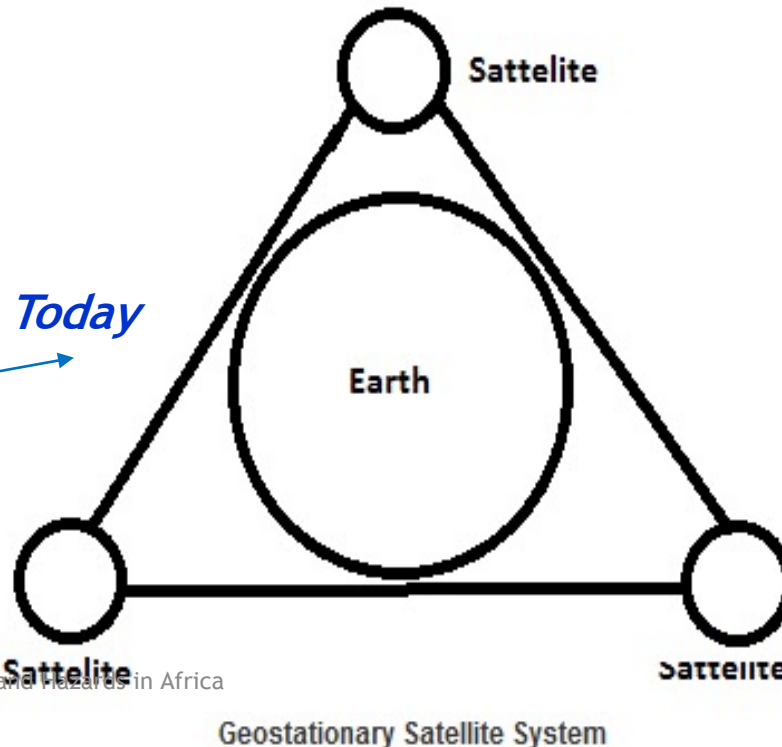


History of Unmanned Aircraft System

- ▶ Previously UAS only operated on visual line of sight (VLOS).



- ▶ With the advent of satellite communication UAS can operate away from line of sight
- ▶ today.



Where is the world today?

Look at this.



The Dilemma

1. Despite the many near collisions and actual collisions with civil aircraft incidents reported, less than half of the ICAO contracting states have passed the regulations or legislation to manage the operations of UAS within their states.
2. Due to their size, the UAS equipment are not easy to detect using the conventional ATC surveillance systems.
3. Majority of UAS equipment in individual ownership are not registered.
4. The enforcement authorities such as the police don't understand the regulations on the registration, operation and certification of UAS equipment.



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Categorization of UAS

- **Unmanned aircraft systems are categorized according to the risk they pose to the civil aviation, Public and property**

CATEGORY A- (Low risk).

This category of operations poses low or minimal risk to the public, property and manned aviation.

E g- UAS Systems used for filming and photography

ICAO Circular 328 of year 2011-AN/190



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Categorization of UAS

- **Unmanned aircraft systems are categorized according to the risk they pose to the civil aviation industry**

CATEGORY B (Medium Risk/Regulated Lower Risk).

Operations under this category pose medium risk to the public, property and manned aviation.

E g- UAS used in agricultural activities such as crop spraying

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Categorization of UAS

- **Unmanned aircraft systems are categorized according to the risk they pose to the civil aviation industry**

CATEGORY C (High Risk)

This Category of operations poses high risk to safety of individuals, property and manned aviation.

E g- UAS such as the ones used for reconnaissance/spying and aerial military attacks.

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Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

i) **Spraying crops**



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

ii) **Filming and photography – have replaced both the cameramen and the pilots who previously used helicopters.**



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

iii) **Reconnaissance/Spying**



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

iv) Aerial Military Attacks



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

v) Offloading Cargo in ports



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

vi) **Parcel Deliveries**



Why the Craze for Unmanned Aircraft Systems

- **Unmanned aircraft systems are today being used for:**
 - vii) Police Security Surveillance**



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

viii) Putting out fires



Why the Craze for Unmanned Aircraft Systems

► **Unmanned aircraft systems are today being used for:**

ix) Power lines, bridges and buildings inspections



Why the Craze for Unmanned Aircraft Systems

► Many industries are choosing to use UAS because of:

- i) Low operating costs
- ii) Ease of Operation/Requires minimum preparation
- iii) Uses cheaper energy e g solar energy and electricity chargeable batteries.
- iv) Low initial cost of purchase
- v) Convenience of operation- can be operated at any time of the day unless regulations/laws require otherwise.



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Risks from UAS Operations

- i) Straying of UAS into controlled aircraft flight paths creating a risk of loss of separation and a possibility of collision.
- ii) Deliberate violation of restricted, prohibited and danger areas.
- iii) Loss of communication/link with the command centre posing the risk of collision with aircraft, buildings and installations.
- iv) Inability by the Civil Aviation Authorities/Governments to regulate the UAS operations.



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Risks from UAS Operations

- v) Lack of awareness by the citizenship on the existence of regulations to govern ownership, certification, classification and operations of UAS
- vi) Unregistered UAS operated by unknown persons
- vii) Violation of people's/organization's privacy
- viii) Acts of sabotage by criminal & terrorist groups
- ix) Management of Airworthiness UAS
- x) Certification and Classification of UAS
- xi) Piloting/Operating a UAS without the correct license and approvals



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Risks from UAS Operations

- xii) Environmental protection- The operations of UAS including discharges from the UAS and disposal upon decommissioning may pose a risk to the environment.
- xiii) Communication with ATC units via voice or other technologies such as CPDLC is not developed yet.
- xiv) Failure by the Civil Aviation Authorities/Governments to prescribe the minimum equipment list (MEL) to be carried in a UAS.
- xv) Inability by ATM units to detect the operation/presence of UAS in a given area/place.



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Risks from UAS Operations

- xvi) Loss of control of UAS that can lead to accidents/incidents during strong winds, storm or cyclones.



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ROLE OF TRAINING IN INTEGRATING RPAS INTO EXISTING ATM SYSTEMS

- i) Take lead in training ATM personnel in airspace design to create specific routes/flight paths for RPAS.
- ii) Design programs to train ATM personnel on interpretation of applicable ICAO standards and recommended practices regarding RPAS operations.
- iii) Design programs to train ATM personnel on existing regulations within the state regarding RPAS operations.



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ROLE OF TRAINING IN INTEGRATING RPAS INTO EXISTING ATM SYSTEMS

- iv) Design programs to train both operators and ATC officers on safety culture in the aviation industry.
- v) Design programs to train RPAS/UAS safety inspectors.
- vi) Design programs to train RPAS/UAS airworthiness inspectors.
- vii) Design programs to train ATM personnel on UAS accident and incident investigations.



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THE ROLE OF TRAINING IN INTEGRATING RPAS INTO EXISTING ATM SYSTEMS

The End

Asante Sana



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Ms. Tendani Ndou

Principal

ATNS Aviation Training Academy

OUTLINE

- Who we are
- Over the horizon
- UAV Skills development
- RPAS Management Components
- Components Affecting Safe ATM Operations
- Operationalize the company strategy
- ATNS RPAS Management Programme
- Aspects to consider
- Conclusion

WHO WE ARE

- Premium training brand that offers Air Traffic Services, Engineering and a wide range of aviation and safety related courses throughout the African continent and selected international markets.
- Geographically located at the southern tip of the beautiful continent of Africa.
- Major contributing partner towards ensuring aviation safety in Africa through our training efforts and commitment to world best practises.
- TRAINAIR PLUS Full Member, ICAO Regional Training Centre of Excellence and IATA Regional training provider.
- Founding member of the Association of Aviation Training Organisations (AATO) in the continent



OVER THE HORIZON

- Captivating and shaping the future of aviation by embracing innovative advancement within the realm of the ATM community.
- Any potential benefit or hazards attributable to an emergence of any technology can be realized through targeted training to better equip the ATM Community.
- Introduction of training offerings on how to integrate and manage RPAS should be central to the safety conversation and become the embraced change.
- Training Academies should respond swiftly to these developments and zoom in on how to adequately contribute to the knowledge bank and respond to safety issues or risks that could be attributed to the emergence of RPAS.

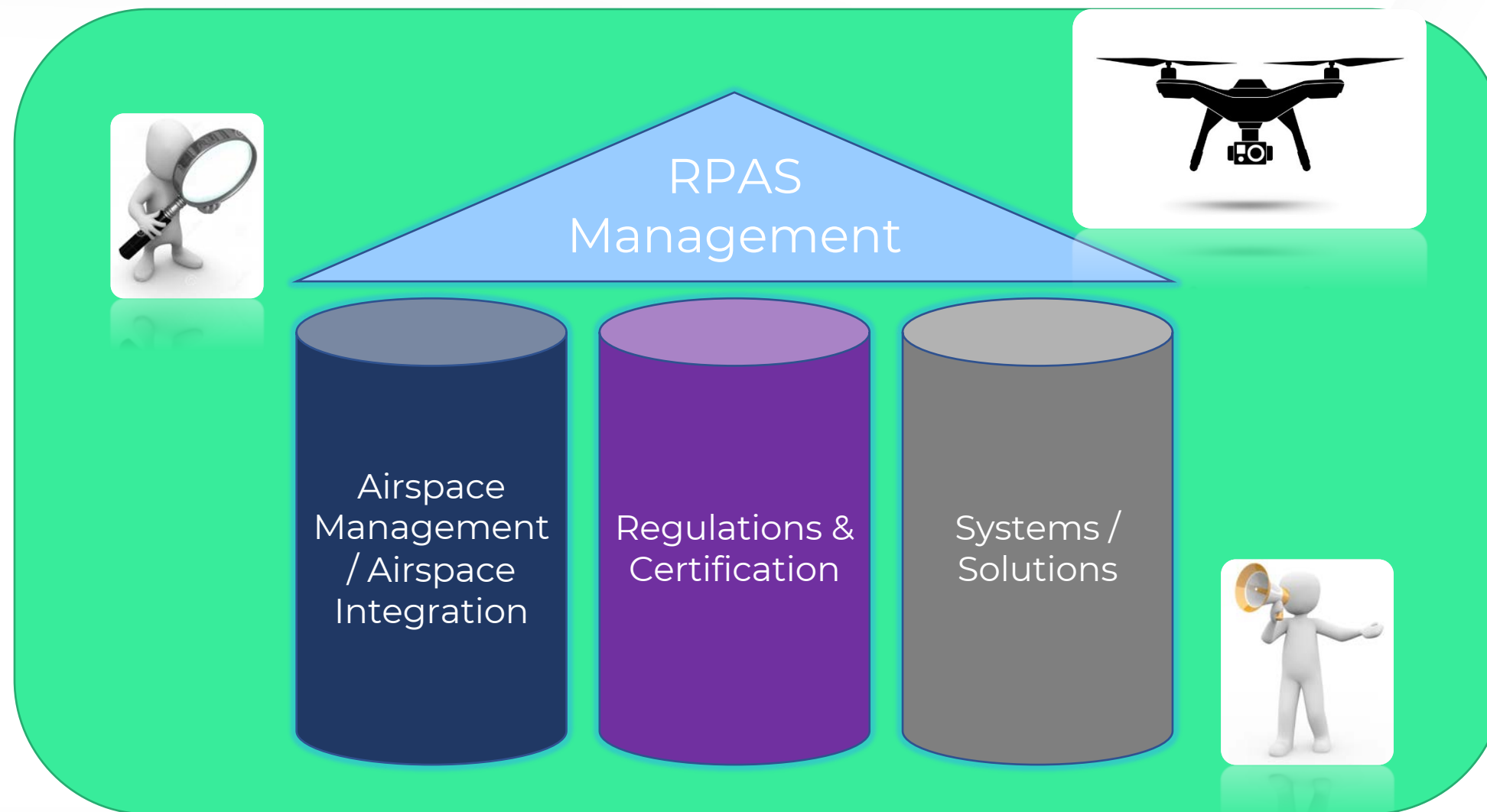


UAV SKILLS DEVELOPMENT

- Currently, there are limited RPAS scoped Approved Training Organisation (ATOs) registered with South African Civil Aviation Authority
- Within the African continent, the drone industry continues to expand as application continues in diverse industries including agriculture, mining, construction and municipalities, as well as for security purposes,
- There is a subsequent demand for drone pilots and other drone- related job functions.
- This has resulted in ATNS ATA pursuing the RPAS training product line as part of our product diversification (strategic objective).



RPAS MANAGEMENT COMPONENTS



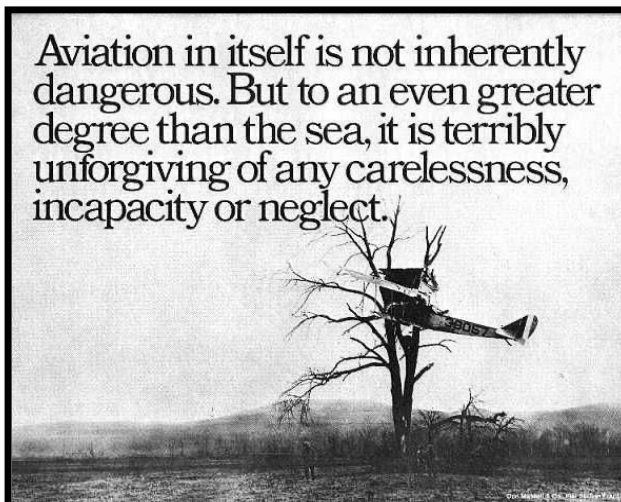
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COMPONENTS AFFECTING SAFE ATM OPERATIONS

Compliance



Careless



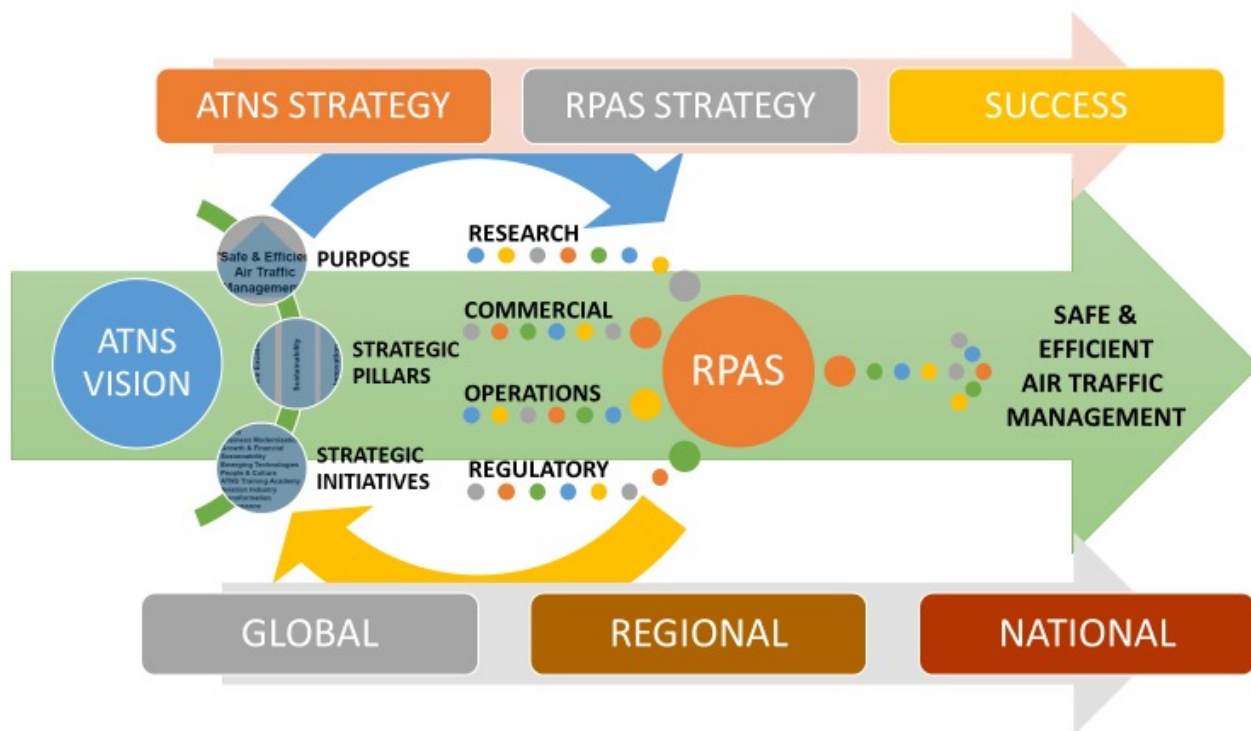
Criminal



SAFE ATM



OPERATIONALIZE THE COMPANY STRATEGY



- As an ANSP, the ultimate purpose is “safe & efficient Air Traffic Management”
- Each and every consideration within the RPAS management program will continuously consider the company strategy.
- Global, Regional and National Regulations, Roadmaps and Plans are considered throughout the program.
- By ensuring all projects are measured against the strategic pillars and initiatives the project will be guided towards the ultimate goal.

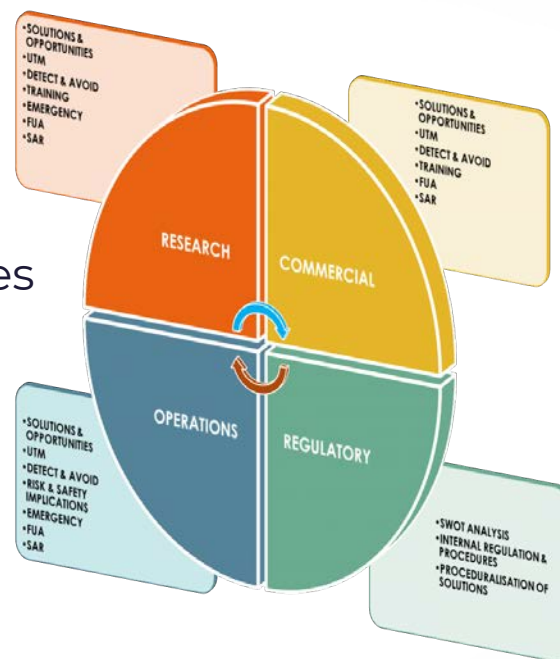
ATNS RPAS MANAGEMENT PROGRAMME

RESEARCH PILLAR

- Research & Develop:
 - Solutions & Opportunities
 - UTM elements
 - Detect & Avoid
 - Search & Rescue capabilities

COMMERCIAL PILLAR

- Commercially Offer:
 - RPAS Solutions & Opportunities
 - UTM elements
 - Detect & Avoid solutions
 - Training
 - Search & Rescue capabilities



OPERATIONS PILLAR

INTEGRATE:

- Solutions & Opportunities
- UTM elements
- Detect & Avoid solutions
- Search & Rescue capabilities

REGULATORY PILLAR

- Conduct SWOT analysis on current Regulations (Part 101)
- Ensure Alignment between solutions & systems Developed & the Integration with effective processes & procedures

ASPECTS TO CONSIDER

- Drones **are here with us and will remain** for the foreseeable future.
- **Rapid changes in drone technology** hold enormous promise for the future use of airspace and aviation at large as the digital transformation expands skyward.
- This requires a **step-change** in the way **airspace** is managed.
- Essentially, there will be a move from several thousand conventional aircraft in the sky every day to potentially hundreds of thousands of **highly connected and automated aerial vehicles**, offering advanced data-driven services and operating everywhere, including in cities.
- **Illegal use of drones** presents a safety concern and a security risk.
- **Operating outside of Civil Aviation Authority guidelines** or the allocated radio frequencies increases the **potential for accidents**, including **collisions in the airspace, posing a risk to the community**.
- Drones' **ability to carry objects** may also lead to potential risks for national security.
- One of the most significant safety risks, as well as risk to the continued growth of the industry, is that **posed by recreational/hobby UAS operators**.
- This is a **community-wide issue** and not just an issue for the aviation industry. This risk is best addressed through community **education and awareness**.

CONCLUSION

- Understanding RPAS requirements supported by comprehensive Training/Education is required in all spheres of the Aviation as well as non-aviation industry.
- Specific systems/solutions will be required to be developed for RPAS collision avoidance, surface management and integration with IFR traffic, supported by robust regulations.
- RPAS Management requires Industry involvement of all stakeholders in a Collaborative Decision Making (CDM) Environment.
- A Robust regulatory framework is required to support RPAS operations to ensure safe and efficient operations for all airspace users.
- **Irrespective of what you deploy, training will always be required and ATOs remain an integral part of these conversations.**





THANK YOU





QUESTIONS AND ANSWERS



Mr. Daniel Nartey

Area Controller and OJTI

Ghana CAA



Ms. Boni Dibate

Director Africa Affairs

CANSO



THANK YOU

