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Use of drones in Humanitarian Activities

CAPSCA Finland

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International Civil Aviation Organization

Integration of remote technologies in civil aviation – *Brings challenges and opportunities*

State Obligation

Chicago Convention, Article 8

Pilotless Aircraft:

on board

*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**.*

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

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Subject: State's obligation to protect civil aircraft from all "pilotless" aircraft

Action required: Regulatory enforcement action regarding drone activity at international aerodromes

Sir/Madam,

1. I have the honour to refer to the outcome of the Second High-level Safety Conference (HLSC), 2 to 5 February 2015, Montréal, Canada which recommended that ICAO expedite the development of provisions to be used by States to regulate remotely piloted aircraft system (RPAS) operations within their airspace and to educate users regarding the risks associated with their operations. The presence of unauthorized small unmanned aircraft, or "drones", in the vicinity of international civil aerodromes currently poses a serious threat to aircraft operational safety.

2. Your attention is drawn to Article 8 of the *Convention on International Civil Aviation*, signed at Chicago on 7 December 1944 and amended by the ICAO Assembly (Doc 7300), which clearly obliges each Contracting State to ensure that all "pilotless" aircraft obviate danger to civil aircraft. Annex 2 — *Rules of the Air*, defines an aircraft as "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." Please see the enclosed reference material.

3. Annex 2 additionally provides for the protection of persons and property by mandating that "aircraft not be operated in a negligent or reckless manner so as to endanger the life or property of others" and that "aircraft not be operated in such proximity to other aircraft as to create a collision hazard." The Annex also provides for specific operating rules for operations on and in the vicinity of an aerodrome. It is essential that States ensure their existing aircraft regulations address these requirements and apply equally to potential drone and RPAS activity at international aerodromes. If States do not currently have effective regulations in this regard, efforts to establish such regulations should be taken as a matter of urgency.

4. In response to the rapid development of drones, I am pleased to inform you that ICAO has developed an online unmanned aircraft system (UAS) toolkit to assist States with developing national regulations for domestic operations. This material will guide States with implementation of provisions related to the safe operation of unmanned aircraft in their airspace while maintaining the safety of manned aircraft activities and remotely piloted aircraft (RPA). The UAS Toolkit can be found at www.icao.int/rpas.

Accept, Sir/Madam, the assurances of my highest consideration.

Fang Liu
Secretary General

Enclosure:
Reference material

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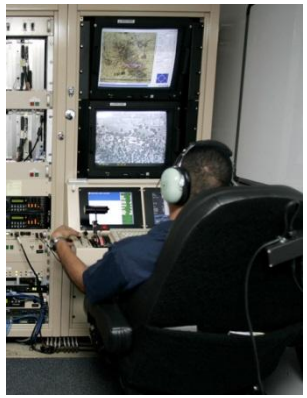
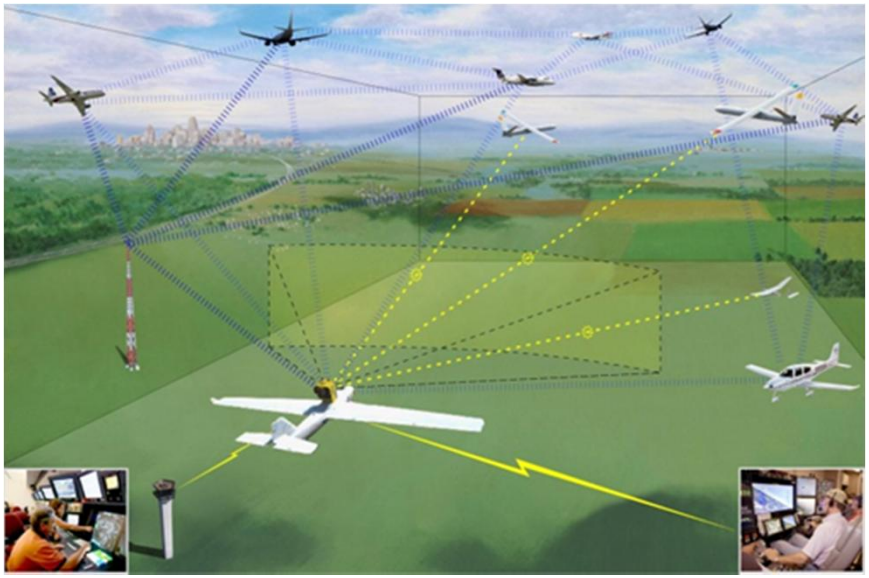
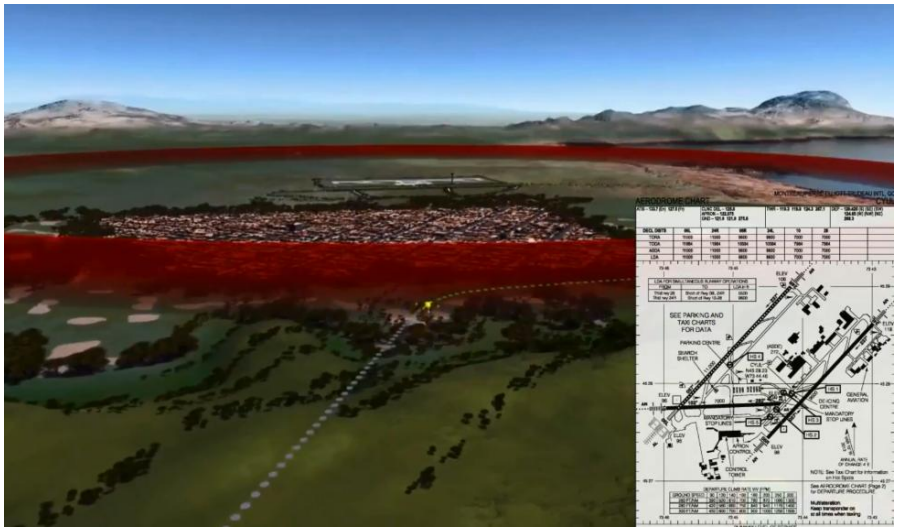
Unmanned Aircraft

- Unmanned aircraft include:
  - Free balloons
  - Model aircraft
  - Remotely piloted aircraft
    - Airspace/aerodrome integration requires control
    - Control, in real time, provided by a licensed remote pilot
  - "Drones"



RPA vs “Drone"





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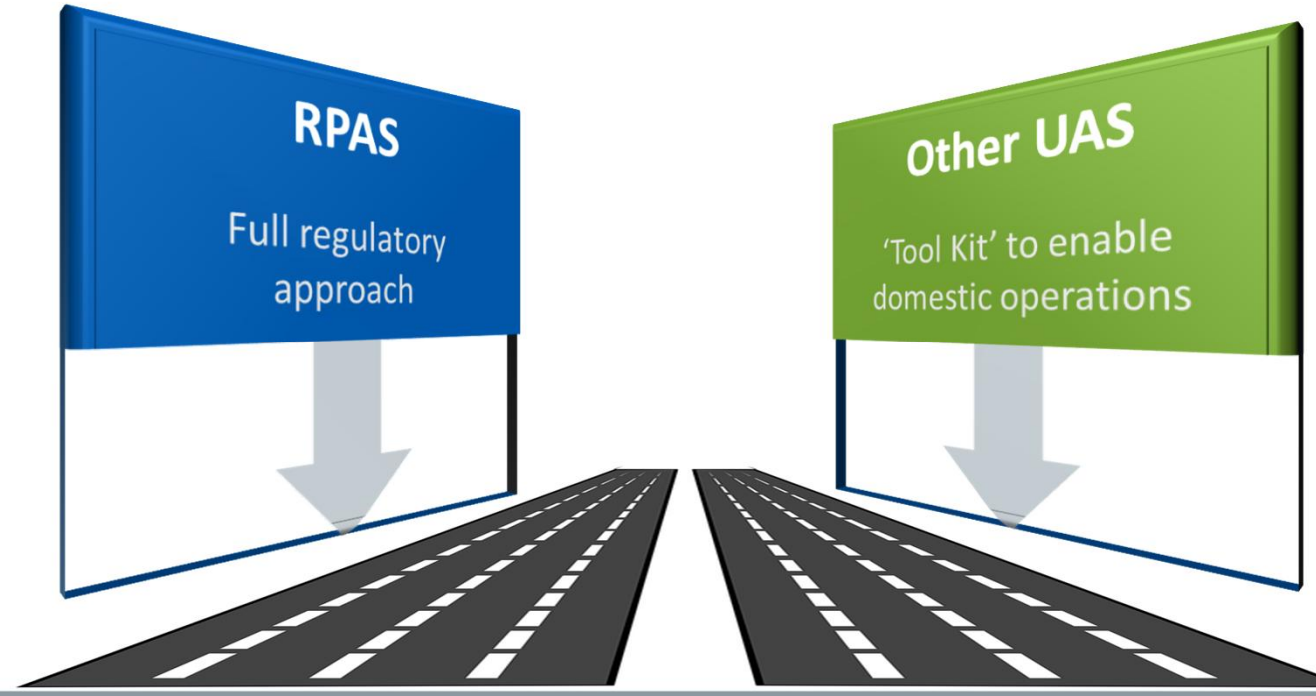
Two Approaches



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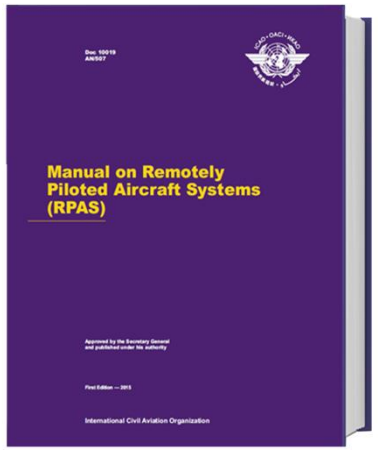
Two Approaches

RPAS - FULL Regulatory Approach

- International IFR operations
- Requirements to initiate international operations:
  - Certificates
    - Airworthiness
    - RPAS Operator
    - Remote pilot licence



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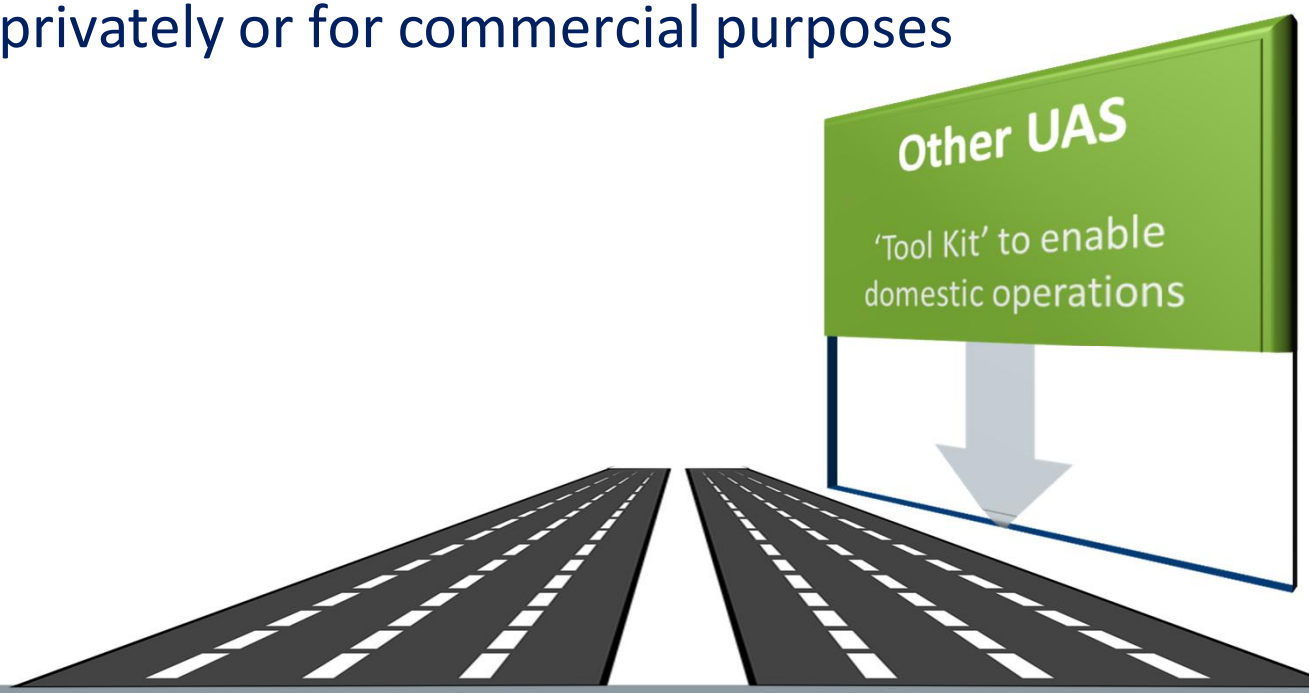
Two Approaches

- Domestic operations
- Used privately or for commercial purposes



Other UAS

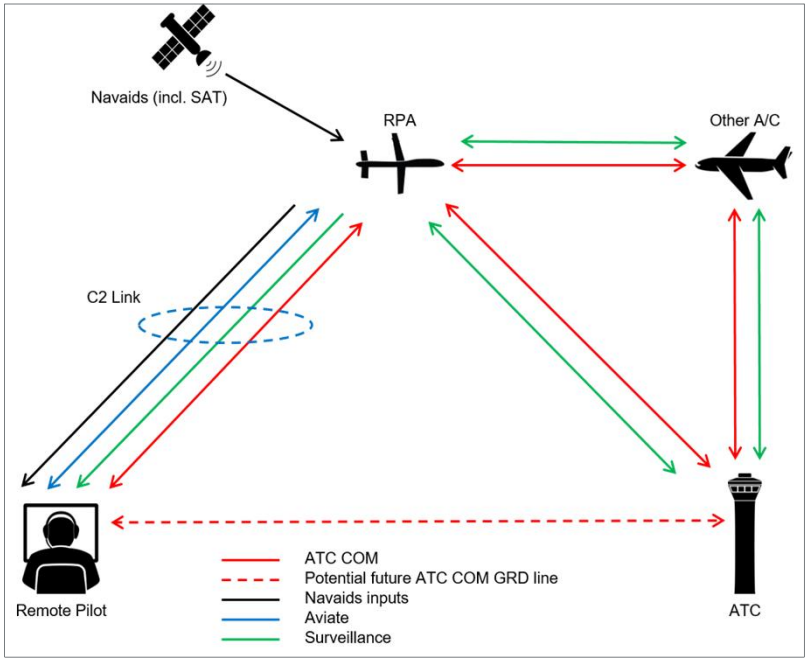
- **Principles of Aviation Regulation Apply!**
  - Airworthiness
  - Rules of the Air
  - Educated operators and remote pilots
  - Safety management

- **Scaled to level of risk posed to others**
  - Certificate of Airworthiness vs consumer product certification
  - Separation standards vs distance from structures
  - Aviation safety-of-life spectrum vs ???
  - Licence vs operational limitations
  - Risk to third parties: 80,000 kg vs 2 kg

Other UAS

- **Toolkit developed by the UAS Advisory Group**
  - General guidance for national regulations
  - Best practices and lessons learned from States
  - Practical examples

RPAS Components



- A **RP** is the person who, within an RPS, manipulates the flight controls during the flight
- **C2 Link** connects the RPS and the RPA for managing the flight, and possibly communicating with ATC
- A **loss of the C2 Link** is considered an emergency condition

We need to balance humanitarian benefits and **safety -** it can only take one event, one accident, or one fatality; to terminate a lot of tremendously important humanitarian work

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Surveillance

- Mapping areas prone to natural disasters or in damage assessment e.g. digital imaging to support emergency preparedness, disaster response or search and rescue.

- Risks include manned aircraft & structures

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Delivery

Drone delivery, particularly in public health contexts in remote regions, or where roads are inaccessible or less safe.

Connectivity issues present risks to the C2 Link, which can be critical, depending on what is being transported; and whether the operation includes flying over people.

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Air transport of UA/ equipment to a site

What do I do about my drone’s lithium batteries?

What do I do about medical equipment with lithium batteries?

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Lithium batteries - safety concerns

Data shows that existing **cargo compartment fire protection systems** are **unable to suppress or extinguish a fire involving significant quantities of lithium batteries**, resulting in reduced time for safe flight to a diversion airport.

International Coordinating Council of Aerospace Industries Associations (ICCAIA)

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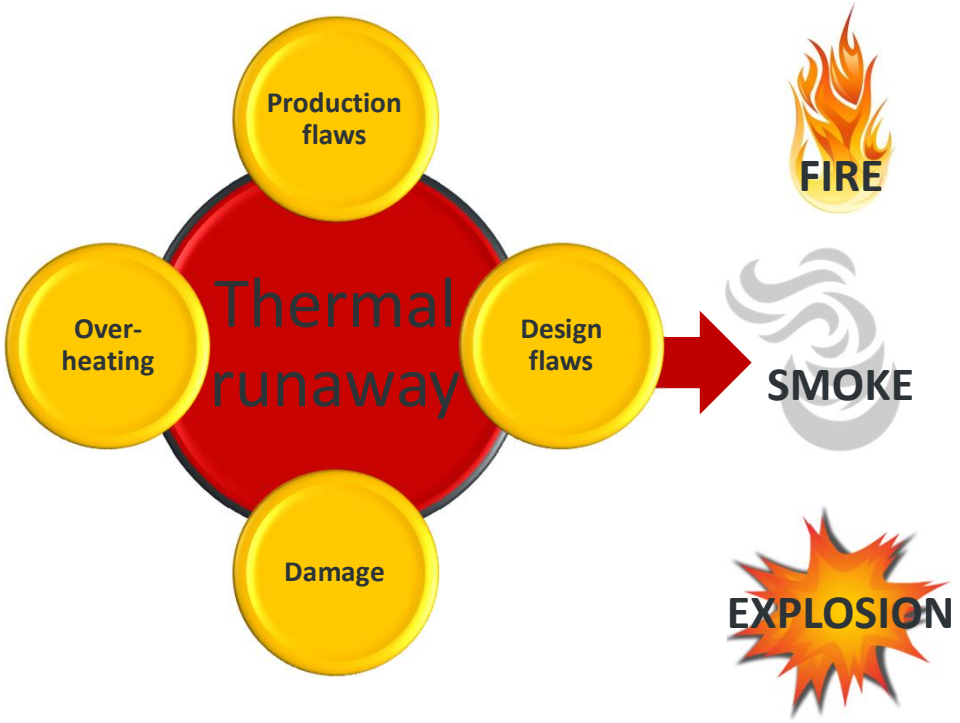
Lithium Batteries — Hazards

- Ignition source
- Source of fuel for existing fire
- Release of flammable gases creating pressure pulse
- **Degree of risk dependent** on battery size, density, chemistry, design and manufacturer – many incidents due to poorly manufactured or counterfeit batteries



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Lithium batteries

- If contained in/packed with drones:
  - ❑ Must be transported as cargo (not in baggage)
  - ❑ 5 kg limit on passenger aircraft
  - ❑ 35 kg limit on cargo aircraft

- If batteries only:
  - ❑ FORBIDDEN as cargo on passenger aircraft
  - ❑ 35 kg limit on cargo aircraft

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Safe Transport of Dangerous Goods by Air

- Annex 18 – *The Safe Transport of Dangerous Goods by Air* - applicable to all international civil aircraft operations and recommended for domestic civil aircraft operations
- *Technical Instructions* provide detailed provisions for the safe transport of infectious substances, biological products (including vaccines) and patient specimens…. as well as lithium batteries
- Should be classified, packed, marked, labelled and documented as provided for in the Technical Instruction
- Consideration must be given to **environmental conditions** which may impact on packaging used in drone operations e.g. rain

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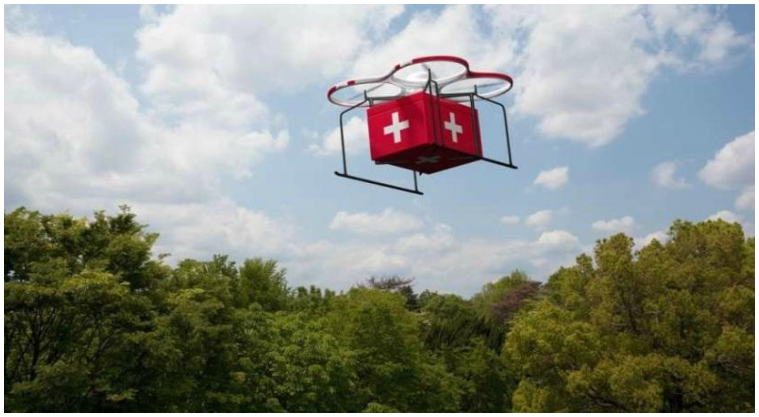
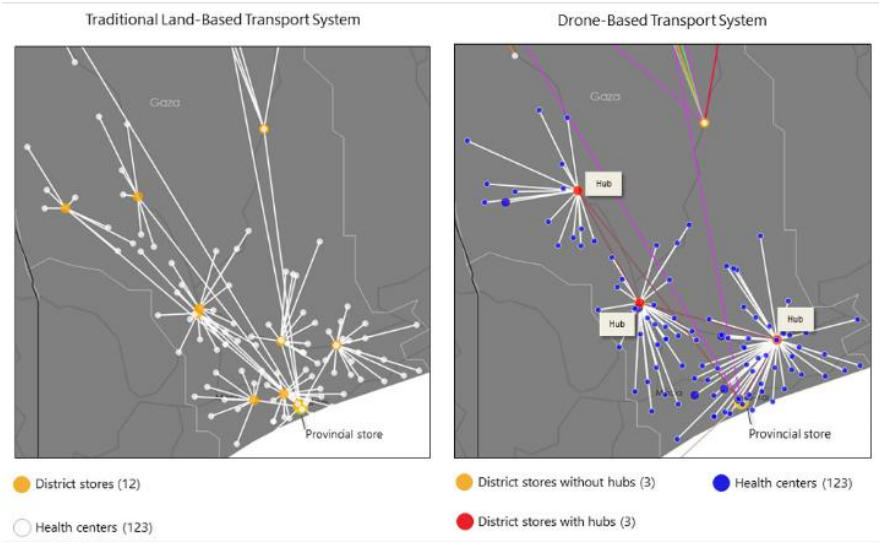
Delivery of blood, vaccines, medical specimens

- Different parts of the world including the US, Africa, Bhutan, Papua New Guinea and others
- Advantages: Rapid delivery, potential cost saving, improved vaccine availability, earlier confirmation of diagnosis during outbreaks





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Drones & Public health aviation

- Need **procedures for drones in public health**
- Consideration of factors both from an **aviation and medical** perspective
- **Regulatory issues** e.g. all vaccines and treatment products currently being used in the Ebola outbreak in the DRC are experimental and needed specific authorization by the State
- Incorporating drone use into **emergency preparedness and response plans**
- Designation of **roles and responsibilities** based on in-country capacity
- Operational **costs, availability of drones and trained** drone operators
- **Coordinated transport** of hazardous medical supplies
- Management of **hazardous medical waste**
- Etc.

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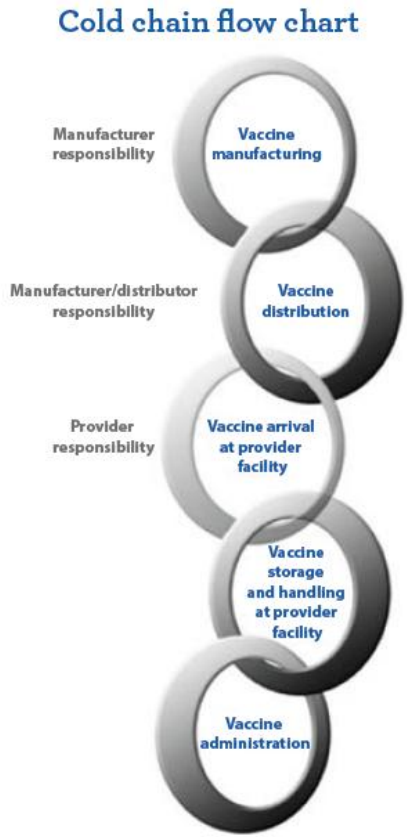
Packaging and cold chain

- Due to **hazardous nature** of good being shipped
- **Temperatur**e sensitivity
- Sensitivity to **light and ultraviolet light**
- Different requirements for different types of vaccines, blood, etc.
- Most commercially available soft-sided coolers are poorly **insulated** and not suitable
- Note that "Transport" has a different meaning than "shipping," which usually involves a professional carrier and a longer distance and time period for moving vaccines between locations



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Procedures not followed/drone crash

- **Vaccines** can lose potency and become **ineffective**
- Individuals & communities **unprotected** from serious disease
- Some single dose vaccines do not contain preservatives, leading to **growth of microbes** & causing instead of preventing disease
- Some vaccines are **live attenuated viruses** that could cause disease
- Medical samples **quality deteriorates** – can't be used for analysis
- Medical samples may contain infectious agents **– time dependent and environment-dependent - depends on which body fluid it is in, volume of the body fluid, concentration of the virus within it, temperature, acidity, and exposure to sunlight and humidity**

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Procedures not followed/drone crash

- **Unused** injection equipment could cause **injuries**
- **Medical waste** (different requirements for different classes) can pose a **risk** to individuals or a community
- Could contain **flammable products**
- Loss, breakage, theft
- Bioterrorism

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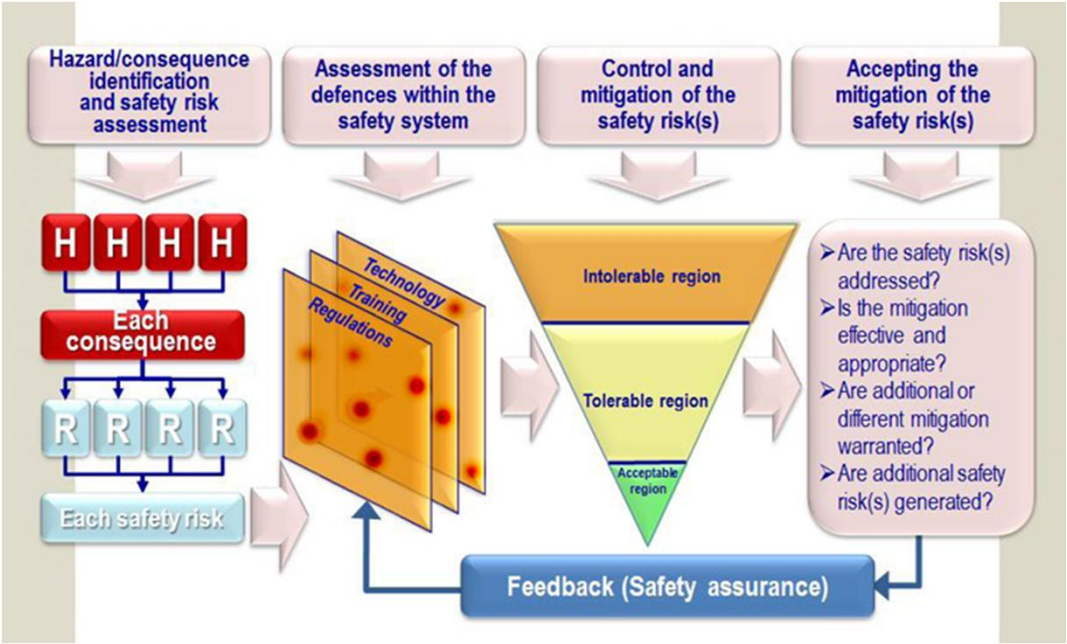
Safety Management

Annex 19 – *Safety Management*, supports the continued evolution of a proactive safety strategy which requires States to implement a State safety programme (SSP), including:

- Developing and maintaining a process to assess safety risks associated with identified hazards;
- Developing and maintaining a process to manage safety risks; and
- Requiring operators of aeroplanes or helicopters authorized to conduct ***international commercial air transport*** to implement a Safety Management System (SMS) in accordance with the framework provided in Appendix 2 to Annex 19.

Operation-centric, risk-based approach



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SMS Framework

COMPONENT	ELEMENT
1. Safety policy and objectives	1.1 Management commitment
	1.2 Safety accountability and responsibilities
	1.3 Appointment of key safety personnel
	1.4 Coordination of emergency response planning
	1.5 SMS documentation
2. Safety risk management	2.1 Hazard identification
	2.2 Safety risk assessment and mitigation
3. Safety assurance	3.1 Safety performance monitoring and measurement
	3.2 The management of change
	3.3 Continuous improvement of the SMS
4. Safety promotion	4.1 Training and education
	4.2 Safety communication

- 4 components
- 12 elements
- Commensurate with size and complexity of its services
- Need to address interfaces
- Guidance found in 4th ed *Safety Management Manual* (Doc 9859)

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Operational considerations

Obtaining the "**Special Authorization" from Civil Aviation Authority (CAA)**

- RPAS Operator Certificate
- Certificate of Airworthiness or alternative
- Remote pilot licences
- C2 Link system appropriate for region + radio station licence
- Detect and avoid (DAA) capability
- Airspace (segregated or traffic management)
- Flight planning
- Environmental and meteorological considerations
- Safety Management System – hazard and risk analysis + mitigation plans
- *Request for Authorization Form* available on the ICAO UAS Toolkit website

KEY POINTS TO REMEMBER

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Final thoughts

01

Unmanned industry is evolving at unprecedented pace

02

The complexity of unmanned aviation challenges the traditional aviation regulatory system

03

Harmonized performance-based regulations needed to support growth innovations

04

Regular **information exchange** between States, industry and other stakeholders necessary throughout development process

05

Harmonized performance-based regulations are needed to support growth and encourage innovations

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