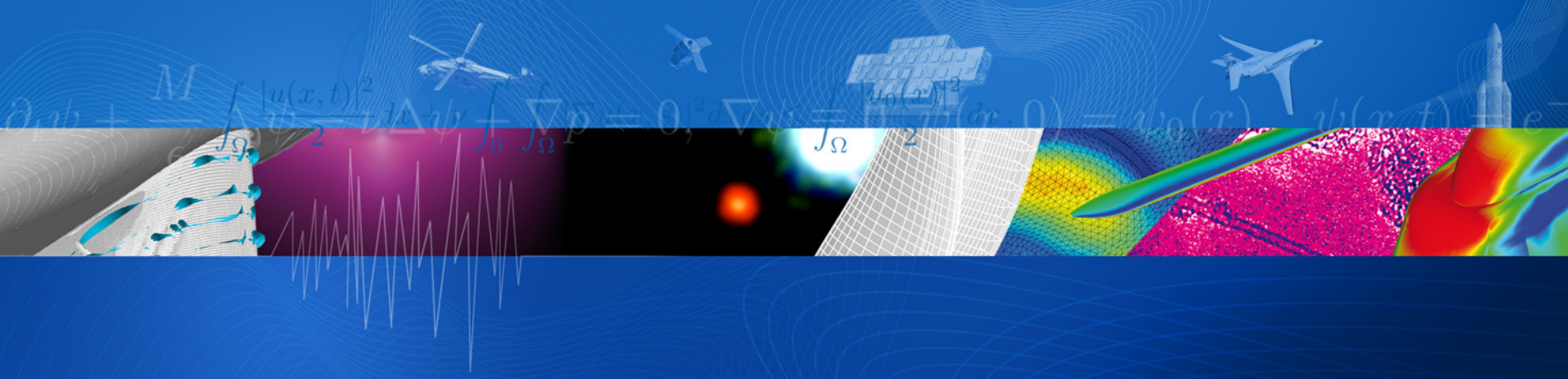

Les problèmes réglementaires soulevés par les drones

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retour sur innovation

Drone: What are we talking about?

- “Drone” used in many languages, not used in regulatory publications
- Unmanned Aerial Vehicle (UAV)
  - Designation not really true as the system is composed of an aircraft, a pilot station and a data link
- Unmanned Aircraft … System (UAS)
  - It is a system, not only an aircraft
  - The aircraft is unmanned
  - The system may be manned or unmanned

Needs for a commonly agreed terminology

- Reference : ICAO UAS Study Group (UASSG)

UAS can be “autonomous” (i.e. they do not allow pilot intervention in the management of the flight)

or

Remotely-piloted aircraft (RPA), which are unmanned aircraft piloted from a Remote pilot station (RPS)

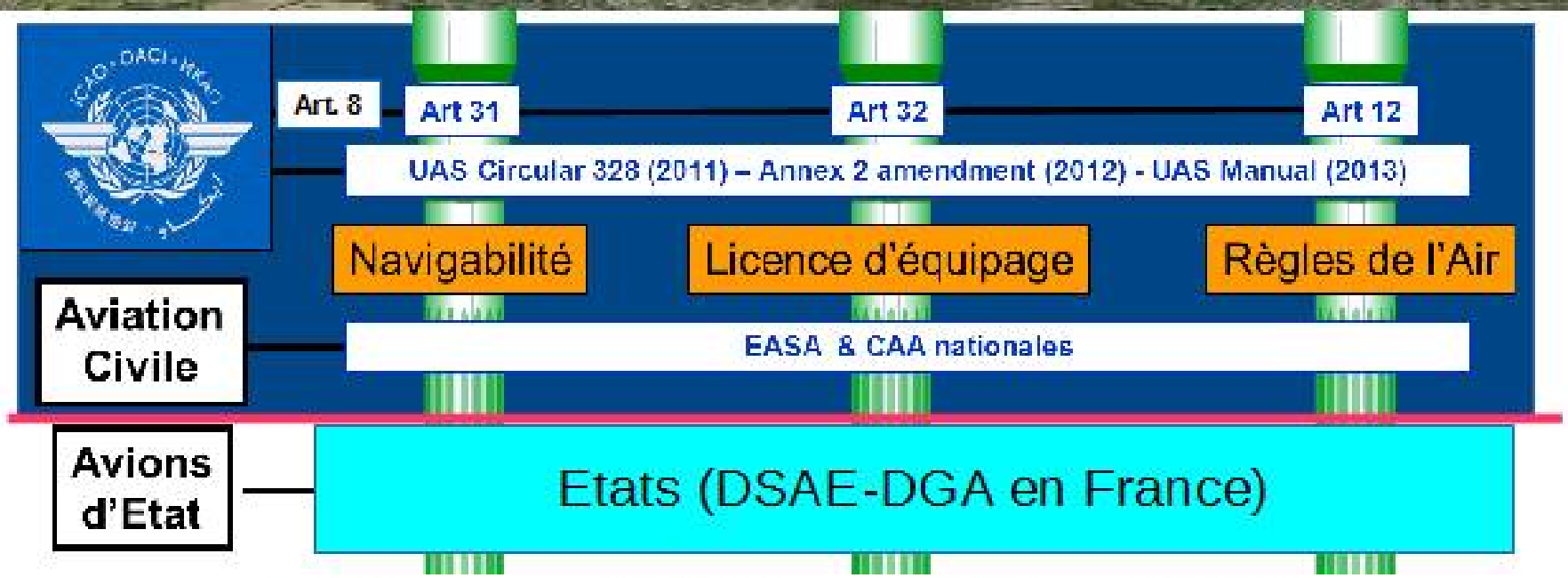
Only the latter are currently considered by ICAO suitable for standardised international civil operations, due to **unclear responsibility** for the autonomous portion of the flight

Needs for a commonly agreed terminology

- Reference : ICAO UAS Study Group (UASSG)

  - ***Remotely Piloted Aircraft Systems (RPAS)*** are a subset of Unmanned Aircraft System (UAS)
  - ***A Remote pilot (RP)*** is a person charged by **the operator** with duties essential to the operation of a remotely-piloted aircraft and who manipulates the flight controls, as appropriate, during flight time
  - ***A Remote pilot station (RPS)*** is the component of the remotely-piloted aircraft system containing the equipment used to pilot the remotely-piloted aircraft

Three regulatory pillars to make RPAS operation safe



1st pillar: RPAS have to be safe to fly

RPAs have to be safe to fly (non-restrictive list):

1. Fail safe design and construction (Redundant IMU and computers, multi-engine, multi-power sources, multi axis agility…)
2. **Robust data link**
3. Proper software design and implementation (**deterministic behavior**, provisions to lower the risk induced by **data link failures**, to protect against **malicious intrusion** or against jamming…)
4. **Provision against risk of injuring third parties in case of a failure** (parachute? low weight? specific guidance?...)

2nd pillar: RPAS have to be flown safely

RPAs have to be flown safely (non-restrictive list):

1. RP have to be licensed (well educated and trained)
2. RPS design enabling the pilot to have a good situational awareness and to act timely
3. RPA flown within its design limits (see 2. above, operational manual)
4. Operator agreement definition, definition of Safety Management Systems (SMS)

3rd pillar: RPAS have to be operated properly

RPAs have to be operated safely (non-restrictive list):

1. Integration in the airspace
   - See an avoid other traffic
   - See and avoid other hazards
   - Comply with the rules of the air
2. Integration in aerodromes and airports
   - Same as above
3. Integration in the Air Traffic Management environment
   - Interaction with Air Traffic controllers
   - Interaction with other airspace users

Three regulatory pillars to make RPAS operation safe

For all three pillars:

- **EASA and national Civil Aviation Authorities are setting rules and regulations**
  - **MTOM < 150 kg: National CAA**
  - **MTOM > 150 kg: EASA**

- **Industry has to create standards**

RPAS: two important issues

RPAs may be two small to be detected by other aircraft:

- The symmetry in the sense & avoid principle is broken
- Is there a need to change the rules of the air? (small RPAs would always have to avoid other traffic)

Legal implications of autonomy … to be investigated

A RPAS should not be autonomous by design but may become autonomous (data link failure)

Roadmap for the integration of civil RPAS into the European Aviation System (Published June 2013)

ANNEX 3: A study on the societal impact of the integration of civil RPAS into the European Aviation System

It addresses three main topics:

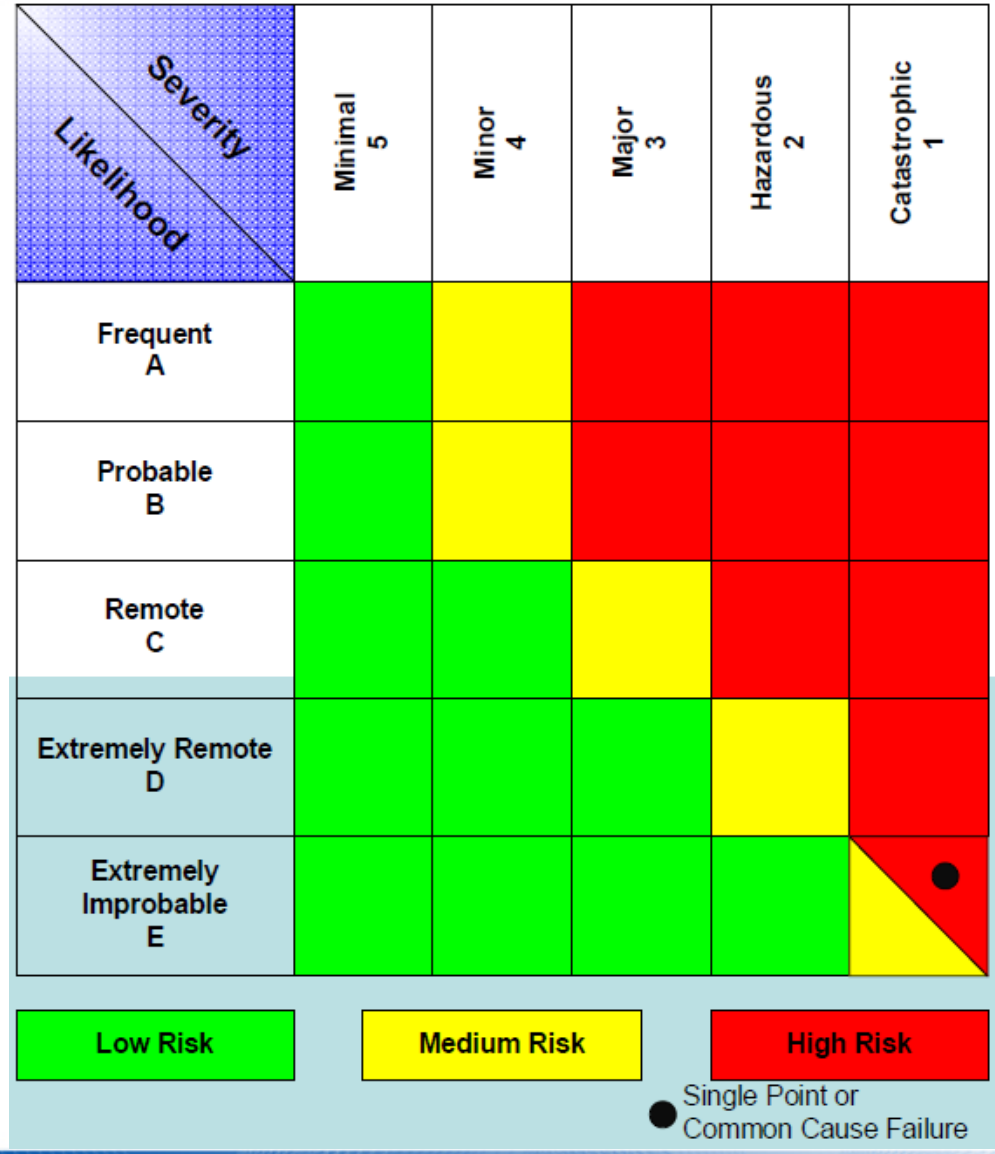
- In case of accident: liability (incl. issues like enforcement, impact of automation) and insurance
- The protection against abusive use: privacy, data protection, security
- Public acceptance of RPAS applications: benefits, acceptable risks/safety

Roadmap for the integration of civil RPAS into the European Aviation System (Published June 2013)

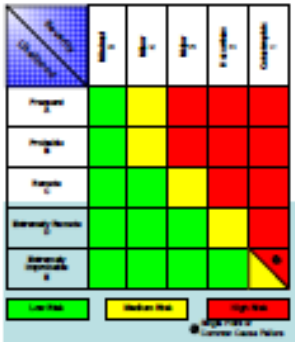
- Information is given on the overall legal framework defining responsibility/liability at national and international levels
- The discussion on the impact of automation on liability allowed clarifying that:
  - RPAS are never autonomous but deterministic (never take a decision by themselves, no randomness is involved in their decision process)
  - In some cases (in degraded mode) the flight might be automatic, following a decision tree embedded in a software designed by a human responsible for its conception

Issue limited to the liability of manufacturers or software producer (problematic in case of open source software)

RPAS regulations
Severity of risk / likelihood of events



RPAS regulations: from none up to similar to manned aircraft's one



RPAS Operation Categorisation

	OPEN ('buy and fly')	SPECIFIC	REGULATED
Airworthiness	Nothing	Risk mitigation	Certificates (TC, CofA)
Licensing	Nothing	Specific Training	Licence
Organisations	None	Industry attestation	Approval (ROC, etc.)
C2	Nothing	Specific Demonstrations	Certified (ETSO?)
D&A	Nothing	Industry attestation	Certified (ETSO?)

Are there any regulatory show-stoppers to develop the RPAS market?

- **Waiting for a more permissive regulatory environment?**
  - Rules are set up by sensible and rational people
  - Sensible and rational people cannot allow to endanger people on ground or in flight

Target levels of safety & security have to be socially acceptable / accepted

Safety and security requirements have to be proportionate to the risks

RPAS technology has still to be improved to extend RPAS types of operation