



MINISTÈRE DE LA DÉFENSE

# INTEGRATION INTO CIVIL AIRSPACE

## AIRWORTHINESS and SAFETY

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# Report Documentation Page

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# Integration into civil airspace

- Purpose :

- to explore and propose French process and means for integrating UAV into civil airspace.

- Method based on :

- first French experience with Hunter,
- experiences, flights with interim systems (SDTI , SIDM) for testing procedures, improving method, acquiring experience, knowledge and confidence,
- ↳ common civil-military analysis, modification, creation and/or implementation of air regulation text,
- ↳ technical specification for future systems

# Integration into civil airspace

## ● Situation :

- French UAVs (Hunter, Crecerelle) fly in restricted military areas linked by temporary restricted airways,
- flights are reglemented by followings texts :
  - Chicago convention (art 8),
  - OACI R-133-1 : distance between UAVs and other planes
  - RCA1 and RCAM1 : responsibility of pilot,
  - Specific DGAC regulation (25/08/86): UAVs classification, condition for using small UAVs in civilian air space
  - Specific DIRCAM regulation n°750 for using UAVs during militaries exercises in restricted areas.

# Integration into civil airspace

## ● Problems and Challenge :

- restricted areas are inadequate for testing, using futures MALE, HALE systems (great endurance, long range, high altitude flights, payloads) and for training operators,
  - ↪ we must define with civilian authorities, test and agree on specific rules for using UAVs into civil airspace,
  - ↪ we must be and/or become trustful in the system (safety, security, reliability, delay)
  - ↪ we must define (if necessary) specific payloads assuming security constraints, redundancy, “detect and avoid” and others safety functions

# Integration into civil airspace

## ● Background :

- 1999 : DNA and DIRCAM created a joint staff for evaluating UAVs flight condition into airspace, it proposed specific rules for restricted areas only. Analysis for the civil airspace will be done.
- Flight tests Center (CEV) elaborate specific rules allowing the flight of new UAV systems within restricted areas (safety, test and qualification).
- Hunter experiments in CEAM

# Integration into civil airspace

## ● Experiments :

- Interim MALE system (SIDM) could be used
  - to define and test new ATC/ATM procedures with civil and military authorities,
  - to test integration within controlled airspace with other aircraft (pilot attitude, time of response, return home procedure, flight plan.....)
  - to be trustful in safety procedures, mechanism, pilot and ATC operator attitude, reliability, redundancy.....,

# Integration into civil airspace

## ● Studies :

- Analysis Air traffic regulation text (RCA, RCAM...)
- Analysis Airspace Class characteristics, constraints, rules
- Analysis, “airprox”, accidents, incidents (IFR/VFR)
  - ↳ what are the responsibilities of UAV operators ?
  - ↳ what kind of hazards scenarii with UAV ?

to propose

- operational certification and ATC procedures,
- legal text for operator responsibility, formation and training,
- safety equipment (technology, “detect and avoid function”, specification, qualification)

# Requirements for airworthiness and safety for MALE

- **Tailoring review** of JAR 23-25, OPS for MALE and HALE proves that
  - only 40-45% of requirements are directly applicable to UAVs
  - safety system objectives must be defined
  - JAR implies great impacts on design and safety systems
  - additional safety criteria for compliance must be defined on GCS, MMI, data link, flight termination system, software, operational and emergency procedures, ATC control
  - “detect and avoid” functions are a key point for acceptance by civilian authorities

# Requirements for airworthiness and safety

- Procurement services :
  - need to authorise the flight of their own UAV systems
  - need to demonstrate that these UAV will satisfy the same level of security than piloted air-planes
  - do not actually dispose of any legal text (as JAR or FAR texts) dedicated to UAV system to do so
- French position for MALE system :
  - Write a “book of requirements” : list of all items we will have to verify to authorise UAV flights
  - Completely reuse JAR and FAR rules with no modification according to security and safety proofs
  - Ease its acceptance by civilian authorities

# Requirements for airworthiness and safety

## ● Method :

- Take each requirement of JAR and FAR, DO178B.... rules
- Withdraw requirements not applicable to UAV MALE systems
- Allocate requirements upon a generic UAV MALE architecture
- Formally prove the same level of security (new MALE rules = existing JAR and FAR rules)
- Define safety specification for future MALE (design, equipment, safety equipment)

in accordance with civilian authorities