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armasuisse

# Experiences from RPAS Regulations

**Military Airworthiness Conference 2017**  
**12 October 2017, Athens**

armasuisse Certification Office



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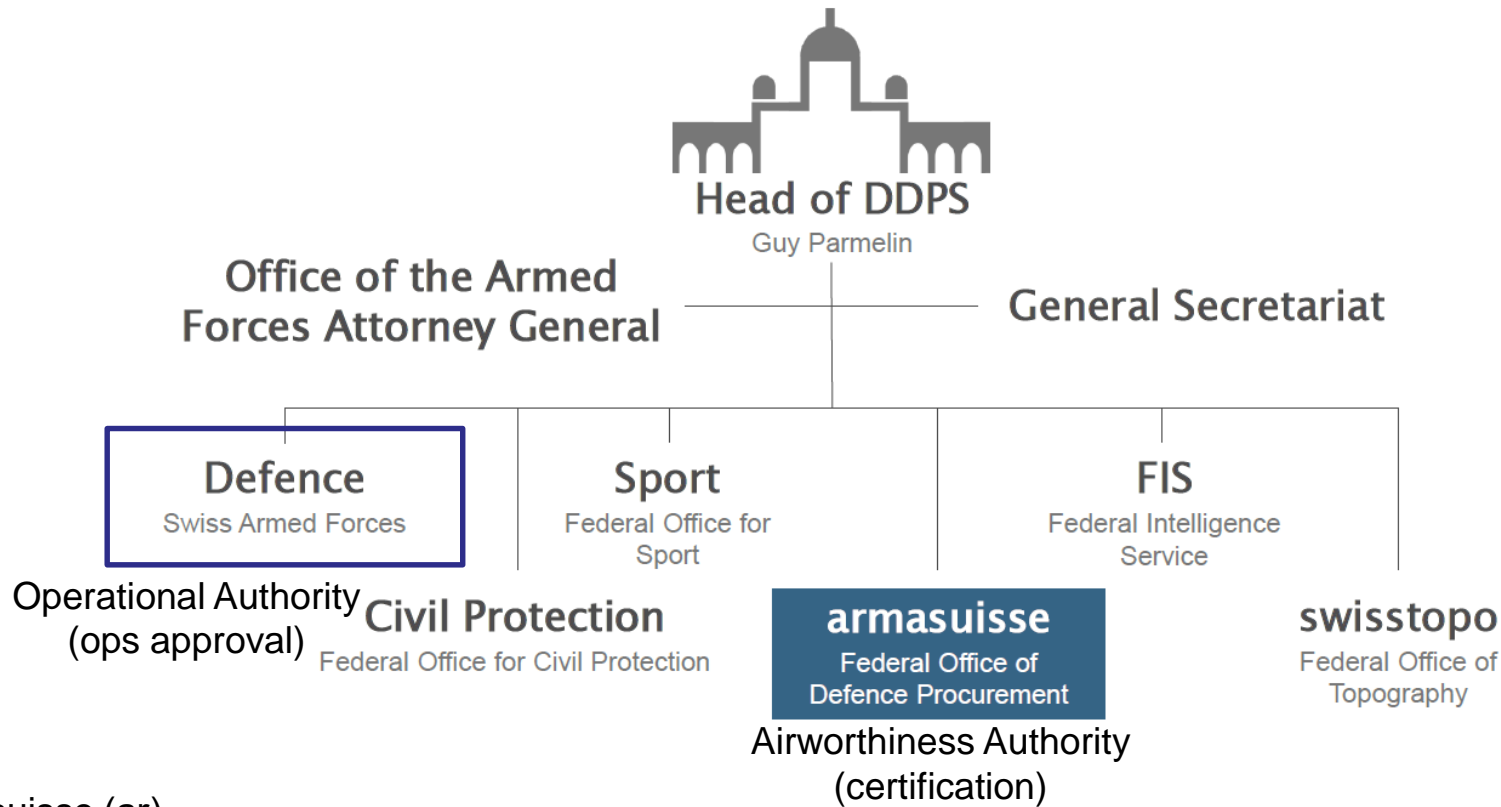
# Summary

This presentation provides an overview of the Swiss Military Airworthiness Program, the different regulations applicable to RPAS, and the current certification activities.

Special emphasis is placed on the Air Traffic Integration aspects of the RPAS certification.



# Current Military Aviation System

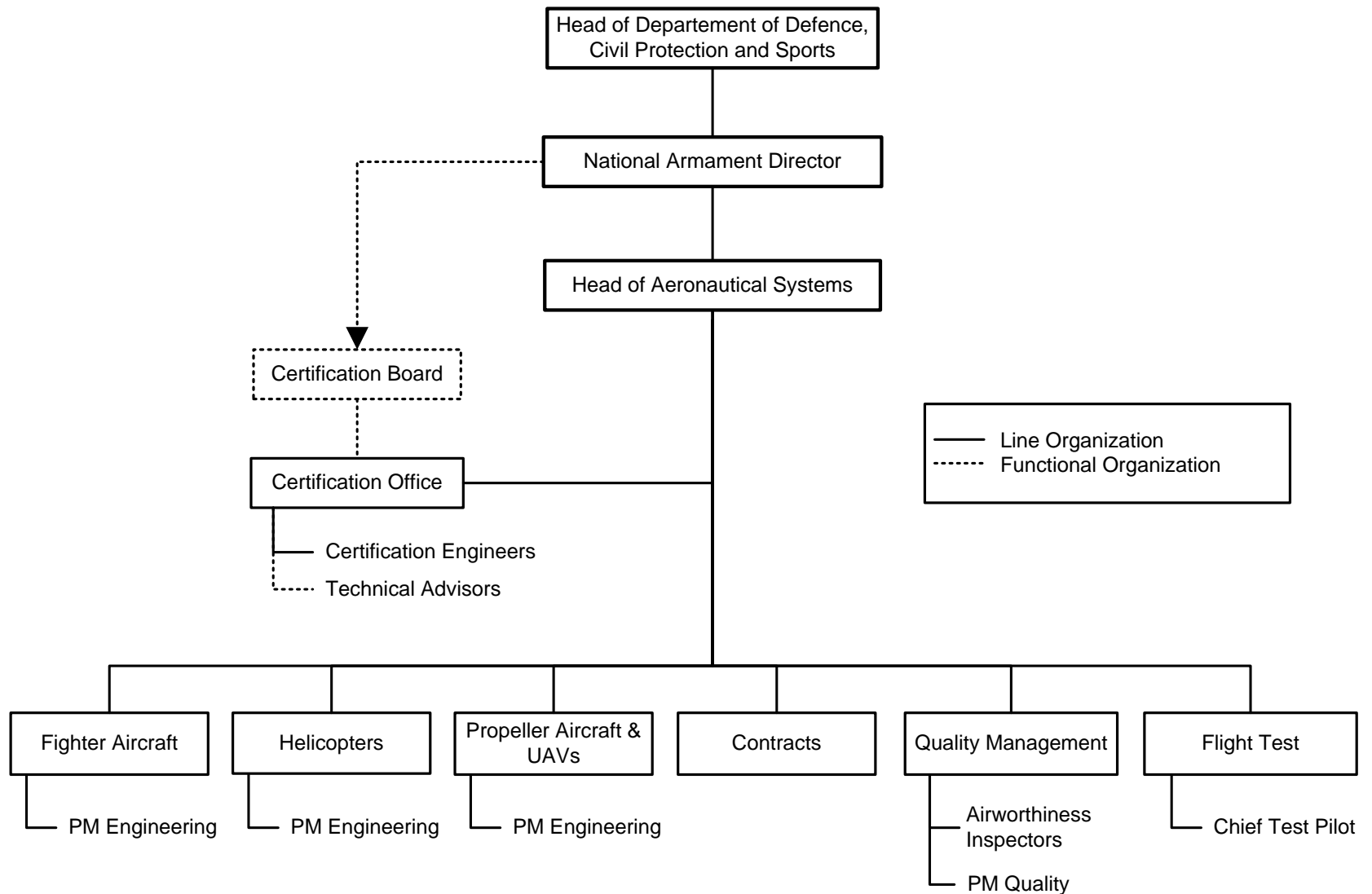


armasuisse (ar)...

- ...is the Swiss MoD procurement agency and the (technical) airworthiness authority for aeronautical systems
- ...issues military type certificates at system level (aircraft+GCS+RCT+GSE+ATOL+...). The certification basis is made of airworthiness/safety (flight-worthy) and functional / performance requirements (mission-worthy, including operational suitability)
- ...approves organizations (design, maintenance and prod.) involved in the Swiss Military Aviation System.
- ...is NOT the ops authority !



# armasuisse – Airworthiness Authority





# Ar Regulations Applicable to RPAS

## **Directive:**

Directive of the National Armament Director on the certification procedure for military aeronautical systems

(Applicability to aeronautical systems, initial certification, continuing airworthiness, changes, requirements to organizations, ar roles and responsibilities)

## **Procedural instructions:**

Aeronautical Systems : Certification Manual

(Initial certification, continuing airworthiness, approval of organizations)

## **Technical Notes Specific to RPAS :**

- Military class I UAV systems certification and ops recommendations
- ar position regarding STANAG 4671.1309 reference to public ground fatalities
- ATOL certification requirements for RPAS class III
- NATO SAA ST white paper : Sense And Avoid (SAA) system certification and operations approval
- Etc.



# RPAS Operations (Today and Tomorrow)

Today (→ 2020)

Tomorrow (2020 →)

Swiss Air Force



ADS-15 (MALE, MTOW 1600 kg)

Class III (> 600 kg)



CONOPS drift + system limitations...

ADS-95 (tactical RPAS, MTOW 275 kg)

Class II (> 150 kg)

Swiss Army



Micro and Mini-UAV's (in evaluation)

Class I



# RPAS Certification

## ADS-95 (Aufklärungs-Drohnen-System RANGER) ...

- ... is a tactical RPAS (MTOW 275 kg) originally procured primarily for army missions (artillery targeting) and was designed accordingly :
  - Mobile system (field operations, grass and snow runways)
  - Tactical range and endurance (150km/6h mission), single payload (EO/IR)
  - Weather limitations: light rain, no icing/lightning protection, ATOL not all weather
  - Limited capability for integration into NAS (no ACAS)
- ... concept of operations has progressively moved to border control and in-country security enforcement (police support).
- ... certification basis was made of tailored FAR23, FAR33 and additional system requirements. System safety was assessed qualitatively.



*Launcher*



*Mission simulator*



*System*



*ATOLS*





# RPAS Certification

## ADS-15 (Hermes 900 HFE) ...

- ...will be initially type certified by CAA Israel. Certification basis (STANAG 4671 Ed 1) and certification plan have been agreed prior by armasuisse.
- ...armasuisse will validate the CAAI TC in parallel and complete the military certification by itself with:
  - items excluded from CAAI TC (like SAA)
  - functional/performance requirements as listed in the Technical Requirements Specifications (TRS)
  - Operational safety, suitability and effectiveness (OSS&E)





# RPAS Certification

- ...has numerous items that need particular review, e.g.
  - emergency parachute (special condition) : will be removed/optional if RPAS demonstrates same level of safety than similar manned aircraft
  - Flight into icing conditions (AC 23.1419,...)
  - Electromagnetic Environment (EME) protection (HIRF, lightning,...)
  - Performance Based Navigation (PBN)
  - C2 link through ground based COM-network
  - ...





# RPAS Certification

## Mini-UAV

For class IA and IB UAS, the certification process has to be tailored :

UAV class	Category	Classification criteria	(Airworthiness) certification- armasuisse authority
IA	MICRO	m < 900 gr AND Impact energy < 66J AND Operations iaw 5.3	Excluded. (only procurement by ar)  Class IA UAV's are assumed to be harmless (not lethal) when colliding with manned aircraft and have low probabilities of ground fatalities if operated in low height.
IB	MINI	900 gr < m < 25 kg OR impact energy > 66 J	Technical Risk Assessment (TRA)
IC	SMALL	25 kg < m < 150 kg	Type Certification / CoA
II	TACTICAL	150 kg < m < 600 kg (rotary) (750 kg fixed wing)	Type Certification / CoA
III	MALE	> 600 kg (750 kg)	Type Certification / CoA

For details: see Military class I UAV systems certification and ops recommendations



# RPAS Air Traffic Integration (ATI)

## RPAS operations...

- ...are defined in the Swiss Air Force (SAF) Operations Manual and are under SAF authority

## ADS-95 operations...

- ...have specific airspace classes-day/night limitations in the NAS (justified through safety assessment performed by Air Navigation Service Provider under SAF authority)

## For ADS-15 operations ...

- ...the objective is to fully integrate the RPAS in the national airspace system (no restrictions)
- ...Air Traffic Integration will occur sequentially, based on the ADS-95 experience and the development phases of SAA (cooperative, non cooperative)



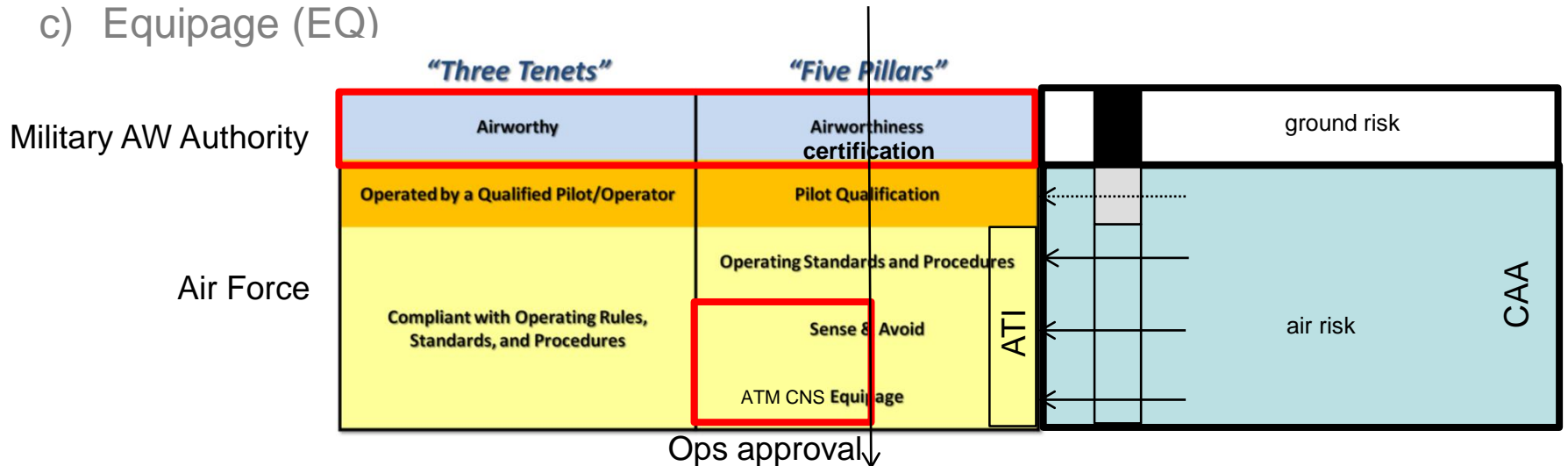
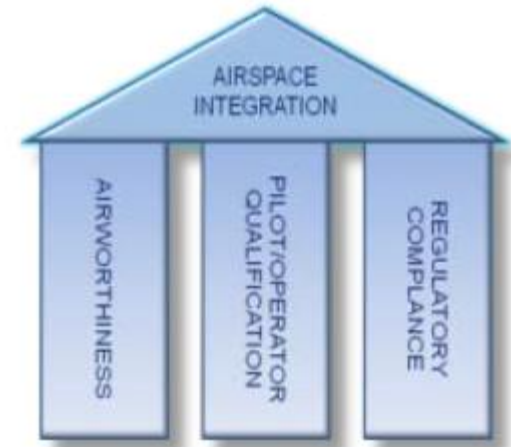


# RPAS Air Traffic Integration (ATI)

From US DOD, UAS airspace integration plan, 2011

Three Tenets:

1. Airworthy
2. Operated by a Qualified Pilot/Operator
3. Compliant with Operating Rules, Standards, and Procedures
  - a) Operating Standards and Procedures (OSP)
  - b) Sense & Avoid (SAA)
  - c) Equipage (EQ)





# RPAS Air Traffic Integration (ATI)

Civil Aviation Authority

Checking acceptable  
DAA performance iaw  
agreed metrics/criteria

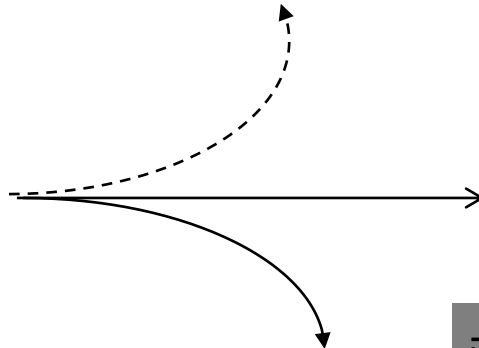


Military Ops Authority (Operator, Air Force)

Showing of SAA **performance**  
through airspace simulations and  
flight tests



AIRSPACE LEVEL



Civil Aviation Authority (CAA) (national or international)  
Aircraft TC

DAA TSO (MOPS) incl. **design** requirements

National Military Airworthiness Authority  
RPA System MTC

SAA **performance** specifications

Confidentiality (radar, EW, ..)

SYSTEM LEVEL

*See also ar white paper for NATO SAA ST : SAA  
system certification and operations approval*



# RPAS Air Traffic Integration (ATI)

Military Authorities shall agree with Civilian Authorities how to demonstrate SAA performance and comply with agreed Technical Performance Metrics (TPM's)/criteria **at airspace level**, not at system (or sub-system) level.

Compliance at system level would imply integrating a SAA system compliant with a civilian TSO into a military platform according to civilian AC's.

This is one possibility to comply but probably not the most effective for military systems (performance based requirements shall be preferred against design requirements).



# Experiences from RPAS Regulations

STANAG 4671 Ed1 shall be completed to cover RPAS specific issues (e.g. PBN, ATOL, etc..)

“Traditional” airworthiness certification is not applicable for class I UAS and has to be tailored.

SAA certification and ops approval (ATI) : (civilian) prescriptive design requirements should be avoided. SAA performance at airspace level (verified through agreed TPM’s and criteria) shall be preferred. Military authorities shall have a common position towards civilian authorities (coordination with NATO?).





# Questions ?

