MAWA Airworthiness Conference 2017

Regulating Airworthiness from an EUROMALE perspective

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Presentation outline

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EUROMALE Overview

DEU rational for the initiative

The original DEU intent of the initiative was to develop a Medium Altitude Long Endurance Remotely Piloted Aircraft System (MALE RPAS)

- that provides the capabilities requested by the operators,
- can be safely operated in the German/European airspace,
- is certifiable under the current German/European military regulations using state of the art technology without increasing development and airworthiness certification risks
- fair balance between specified capabilities and cost

EUROMALE Overview

International Definition Study for a MALE RPAS

An international initiative between DEU, ESP, FRA and ITA was launched:

- Aim is to develop the System Requirements for a European MALE RPAS on the basis of the Common Operational Requirements Document (CORD)
- Definition study was initiated in 2016
- Participation states: DEU + ESP + FRA + ITA
- Duration of the study 09/2016 – 09/2018

EUROMALE Overview

Missions / Operation:

- Conflict prevention, Crisis management in low and medium intensity scenarios with a high degree of control of the air space (Air Superiority or Air Supremacy).
- Focus on persistent Intelligence Surveillance and Target Acquisition and Reconnaissance (ISTAR)
- 16-20 h operation after 500 nm transfer (depending on weight and detailed mission)
- Precise and tailored weapons engagement to support primarily ground forces worldwide in a joint and combined environment (unarmed, lightly armed, heavily armed)

EUROMALE Overview

Key parameters:

- Design Data Authority, modularity, real time network, frequency management, robust datalinks, Cyber resilience, robust electronic warfare environment
- **Air Traffic Integration** (High Level Requirements, baseline):
  - Operation in all types of segregated airspace
  - Operation in non-segregated airspace when only cooperative air traffic is allowed
  - Best possible freedom of air traffic integration pending technologies, European regulation and affordability
  - Provisions for a non-cooperative detect-and-avoid system
- **Airworthiness:** the system shall comply with European airworthiness requirements and allow worldwide operations.

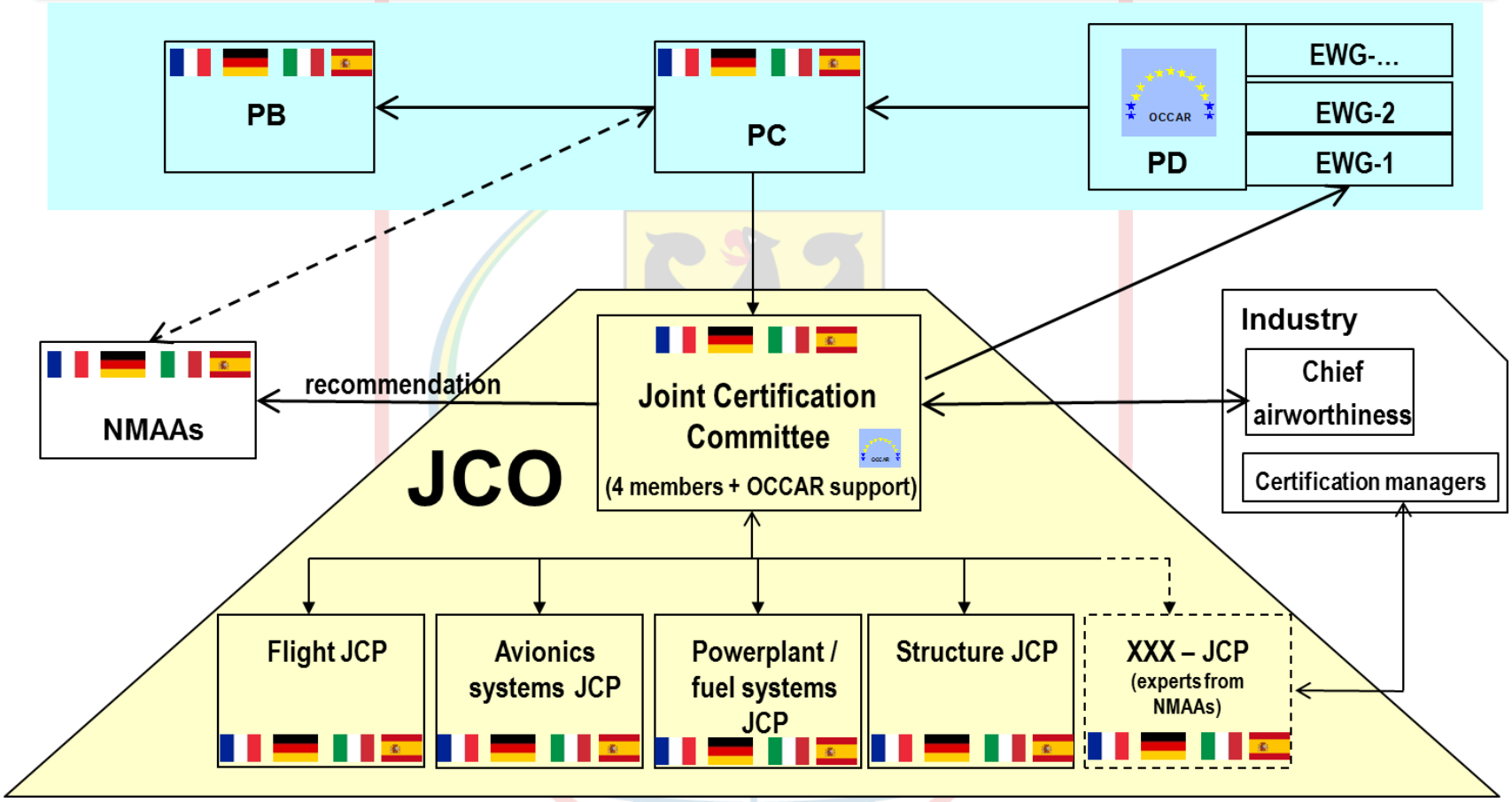
Program Organisation

Organisation structure:

- The EUROMALE definition study and the future program are/(will be) managed by OCCAR[1]
- Program organisation similar to other OCCAR programmes (A400M)
- Conduct of the definition study is supported by 8 Expert Working Groups (EWG) chaired by OCCAR
- Single certification body on Authority and Industry side
  - Joined Certification Organisation **(JCO)** supported by the Joined Certification Committee **(JCC)** and ten Joined Certification Panels **(JCP)** on Authority side
  - Industry's chief of airworthiness supported by its certification managers

[1] **O**rganisation **C**onjointe de **C**oopération en Matière d'**Ar**mement (OCCAR)

Program Organisation



PB: Programme Board
PC: Programme Committee
PD: Programme Division

JCO: Joint Certification Organisation
JCC: Joint Certification Comittee
JCP: Joint Certification Panel

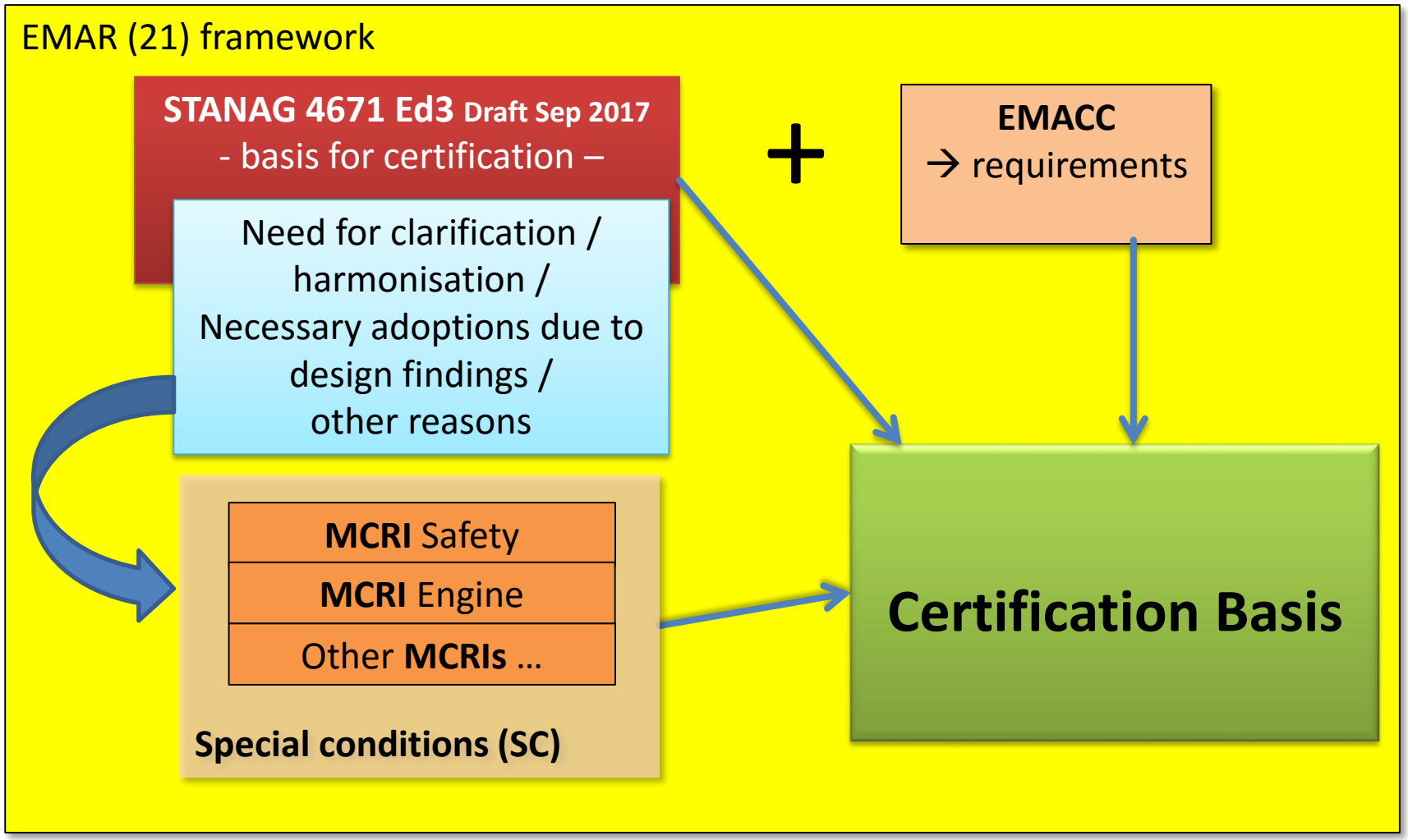
NMAA: National Military Airworthiness Authority
DOA: Design Organisation Approval
MTC: Mitlitary Type Certificate

EUROMALE Certification

General provisions

- EMAR 21 framework is assumed to be used for initial and continued airworthiness
- As consequence the mechanism for defining the certification base is similar to that applied in civil aviation
- STANAG 4671 (Ed.3 draft Sept. 2014) with special conditions to be used to define the Certification Base
- Certification requirements for the engine(s) shall be derived from CS-E, PART 33 or equivalent with relevant military modifications to be approved by military airworthiness authorities.
- Two sets of software/CEH functional development assurance levels (FDAL) are to be considered:
  - Set 1: B for catastrophic, and C for hazardous failure conditions
  - Set 2: A for catastrophic, and B for hazardous failure conditions

EUROMALE Certification



Airworthiness Certification Challenges

General Issues

- First time use of STANAG 4671 Edition 3
- Different national operational requirements, certification regulations and philosophies (operational freedom, national possibilities) to be harmonised
- Many direct interdependencies between operational requirements, ATI regulations and certification requirements → Strong interaction and harmonisation between EWG
- Participating Nations have a different organisational set up related to certification and operation
- Basic agreement and understanding established but discrepancies in relevant details

Airworthiness Certification Challenges

Safety Certification Challenges

- Agreement on the Safety numbers to be applied (conflict with national regulations)?
- Different certification philosophy among Nations (e.g. P_{cumCAT} versus P_{CAT}) → agreement in „Safety MCRI“ required
  - Is qualitative evidence suitable to be recognised as adequate prove for quantitative requirements? (e.g. product quality improvement)
  - are pure operational requirements having impact on the weapon system safety certification (e.g. mission pre-planning)?

Airworthiness Certification Challenges

Safety Certification Challenges

- FDAL (Functional Design / Development Assurance Levels):
  - Two sets under assessment (Set 1 = BCCDE, Set 2 = ABCDE)
  - FDAL trade-off assessment is focusing on costs and not on safety → discussion expected
- RPAS: Extremely strong interaction between safety and engine related aspects (flight termination area)
  - How to evaluate IFSD (Inflight Shut-Down Rate) / safety figures of existing engines in the framework of overall system safety?
  - What are the consequences in relation to number of engines, RPA design?
  - How to consider flight termination sites in the context of overall safety assessment and national regulations?

Airworthiness Certification Challenges

Safety Certification Challenges

- Support towards finding a compromise from NMAA (National Military Airworthiness Authority) Directors meeting:
  - If certification requirements are not met, suitable mitigations are needed, but:
  - Certification should be met by design (technically, not by operational procedures / restraints)
  - Preplanned crash sites shall not be used as a prerequisite to reach certification (safety figures)

Summary

- Although an existing certification specification and relevant aviation standards are available and accepted, a significant amount of time and effort must be invested to agree the certification base for a complex product (MALE RPAS) in a multinational environment.
- The challenge does not necessarily lay in the overall understanding but in the detailed implementation of distinct requirements.