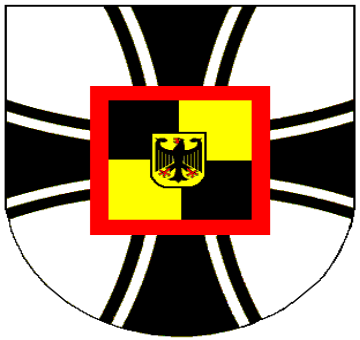
German Ministry of Defense
and
DFS Deutsche Flugsicherung GmbH



Enabling RPAS Operations within German airspace

Part 1, German MoD

- Mr. Matthias Grall

Part 2, DFS, German ANSP

- Mr. Andreas Udovic

Experience

RPAS experience and position derived from:

- 7 EUROHAWK* **test flights** within German airspace
  - ELF, approach procedures available, briefed fire brigades,
  - Coordination and contingency procedures in place,
  - Airspace integration and safety assessment in close coordination with civil partners (e.g. ANSP, regulator, MoT)
- NATO **exercise** Unified Vision 2014
- … and **other** practical RPAS experiences …

MoD as **military** PoC: „spider in the net(work)“

* = EUROHAWK: modified block 20 GLOBALHAWK

Civil-military cooperation in Germany

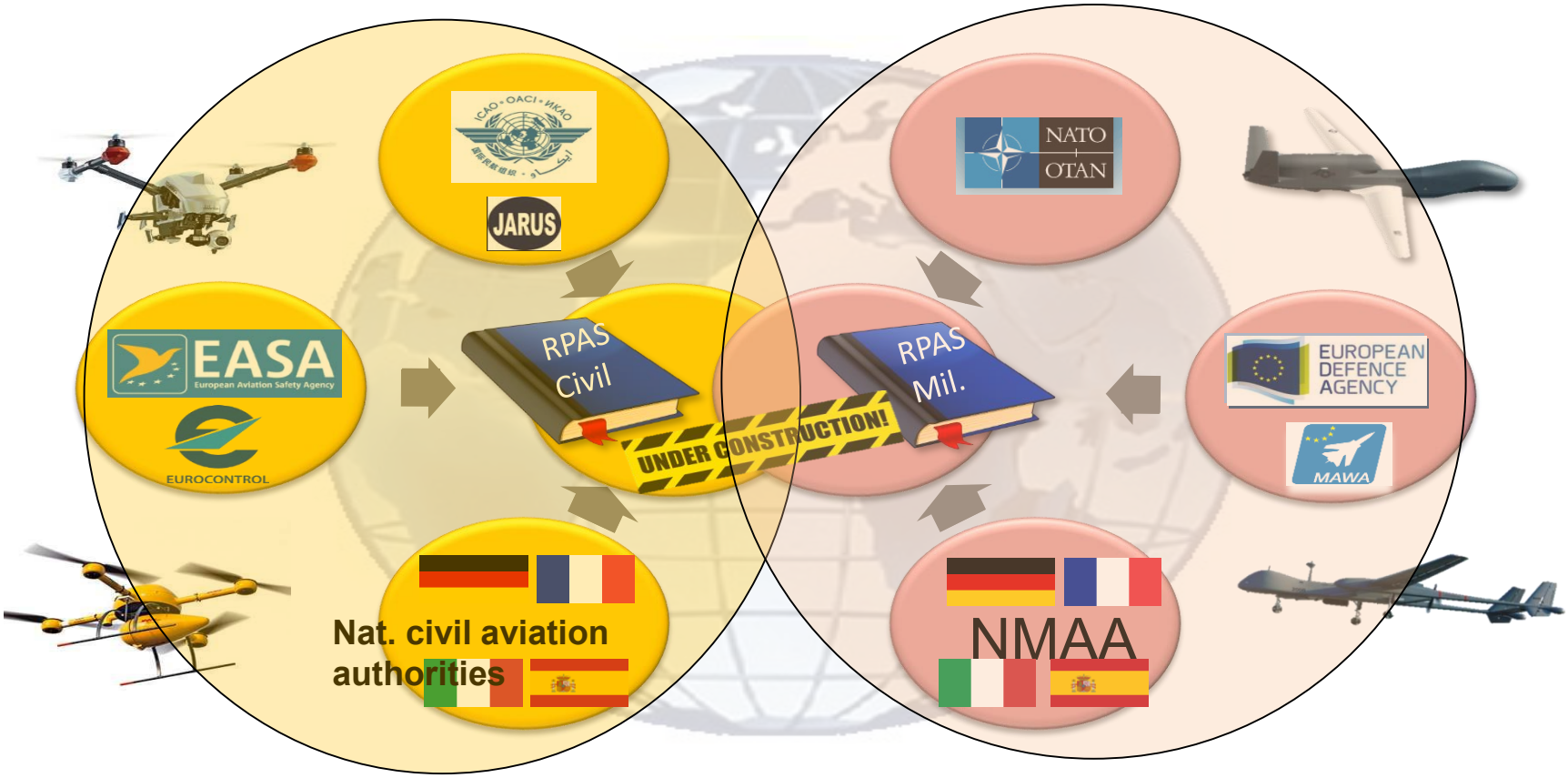
- **The sole entity responsible** for airspace over the German territory **is Ministry of Transport (MoT)**

  (note: also for ICAO delegated airspace over North and Baltic Sea)

- MoT is responsible for CAA and ANSP(s) providing ATS over German territory

- We have **a civil-military integrated system for ATM**
  - e.g. ATC controls OAT and GAT, civil and military air traffic,
  - we have a civil-military airspace management cell (AMC),
  - we have a civil-military decision body for ATM issues

Today‘s regulatory environment



civil world – mil world

Dilemma for Military RPAS

Airspace Integration

Missions, Tension and War

- Mil airspace structure
- Rules of Engagement (ROE)
- SOP for Missions
- Operational Risk Management

→ No specific requirements for an airspace integration

Peace Time Operations

- Airspace structure according civil regulations
- National regulations and harmonized international regulations?
- Cross border procedures and operations?

→ Operational limitations

Dilemma for RPAS AI

Why do today (military) RPAS need **segregated airspace** over the territory of the Federal Republic of Germany?

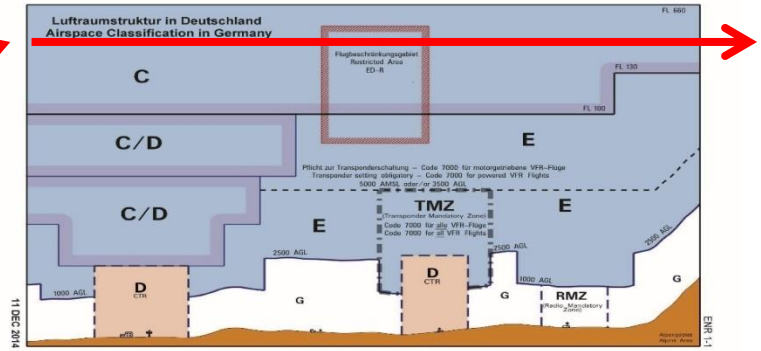
- No compliance to FSAV (= national regulation for navigational/CNS mandatory aircraft on-board equipment),
- No compliance to navigational/RNAV requirements,
- No DAA System (available/approved/certified).

- Therefore German CAA demands restricted airspace.
- MoT provides restricted airspace for RPAS ops to civil and military.

Future Challenge

- Aim: airspace integrated participation for RPAS,
- Harmonized procedures,
- “file and fly“.

Civil-military cooperation is the key.



Part 2, DFS – German ANSP

Mr. Andreas Udovic

Statutory obligation of DFS

DFS is responsible for the

safe | orderly | expeditious

handling of air traffic

Air traffic services

- Air traffic control services
- Alerting services
- Flight information services
- Air traffic advisory services

Additional air navigation services

- Communication services
- Navigation services
- Surveillance services
- Aeronautical information services
- Meteorological services (DWD)

Since 1996: Completion of civil-military integration

Challenge of RPAS Integration

- National and international regulations based on pilot on board of a/c
- “See and Avoid“ basis principal for collision avoidance
- New technology: e.g. C2 Link and detect and avoid with new procedures and challenges (e.g. delay)
- Performance and mission of RPAS
- Integration into high density airspace

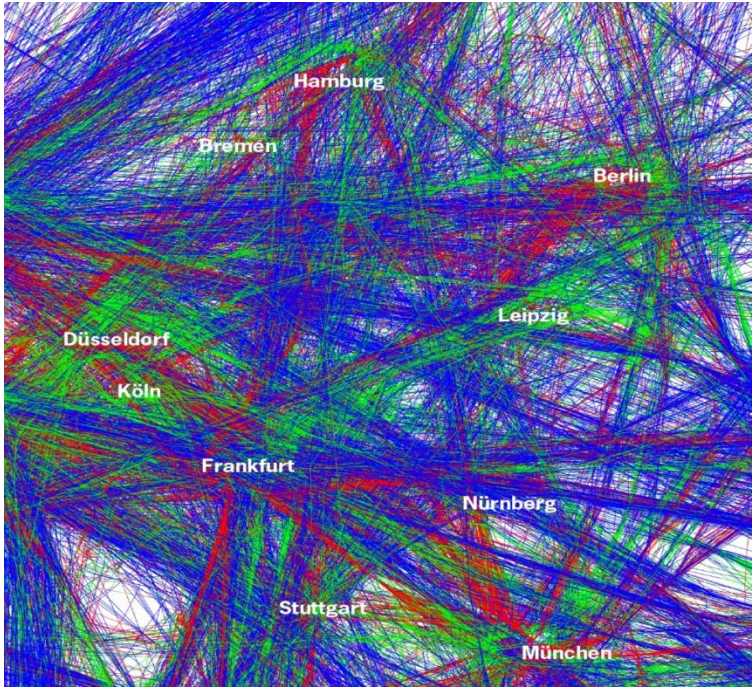
Aircraft movements in Germany

One day in January 2018

Climbs

Transit flights

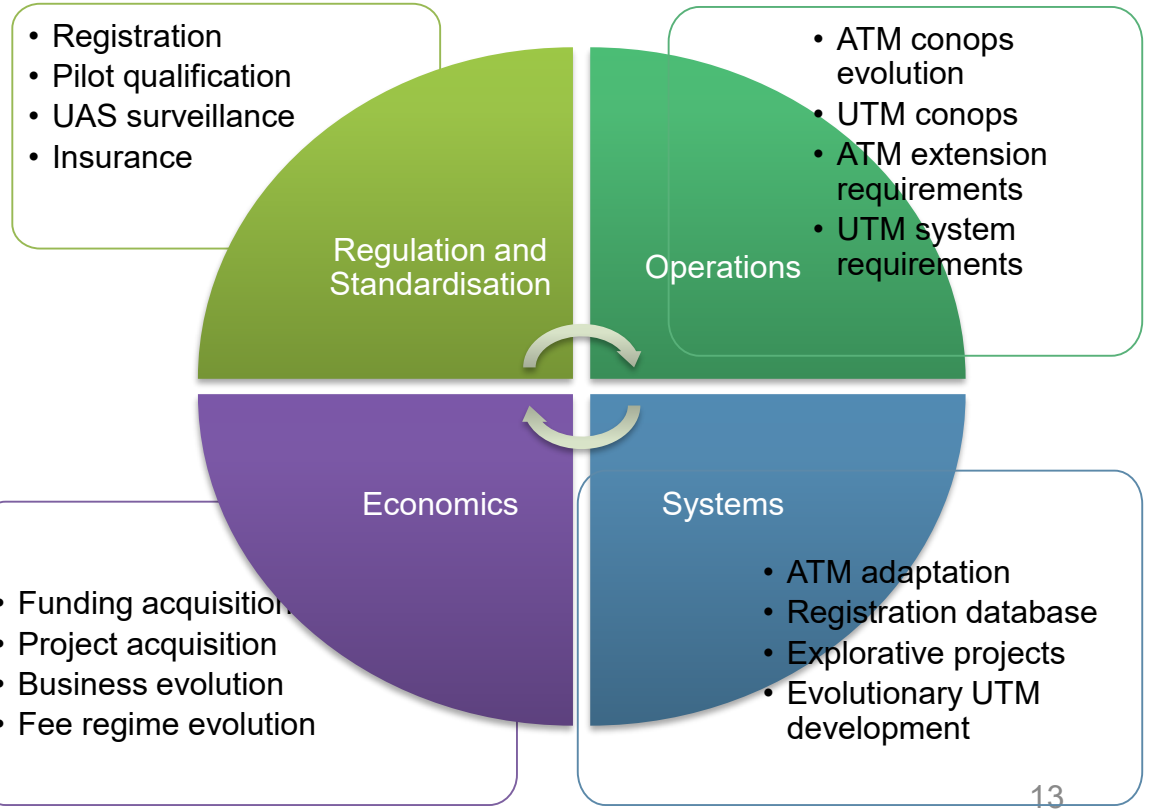
Descents



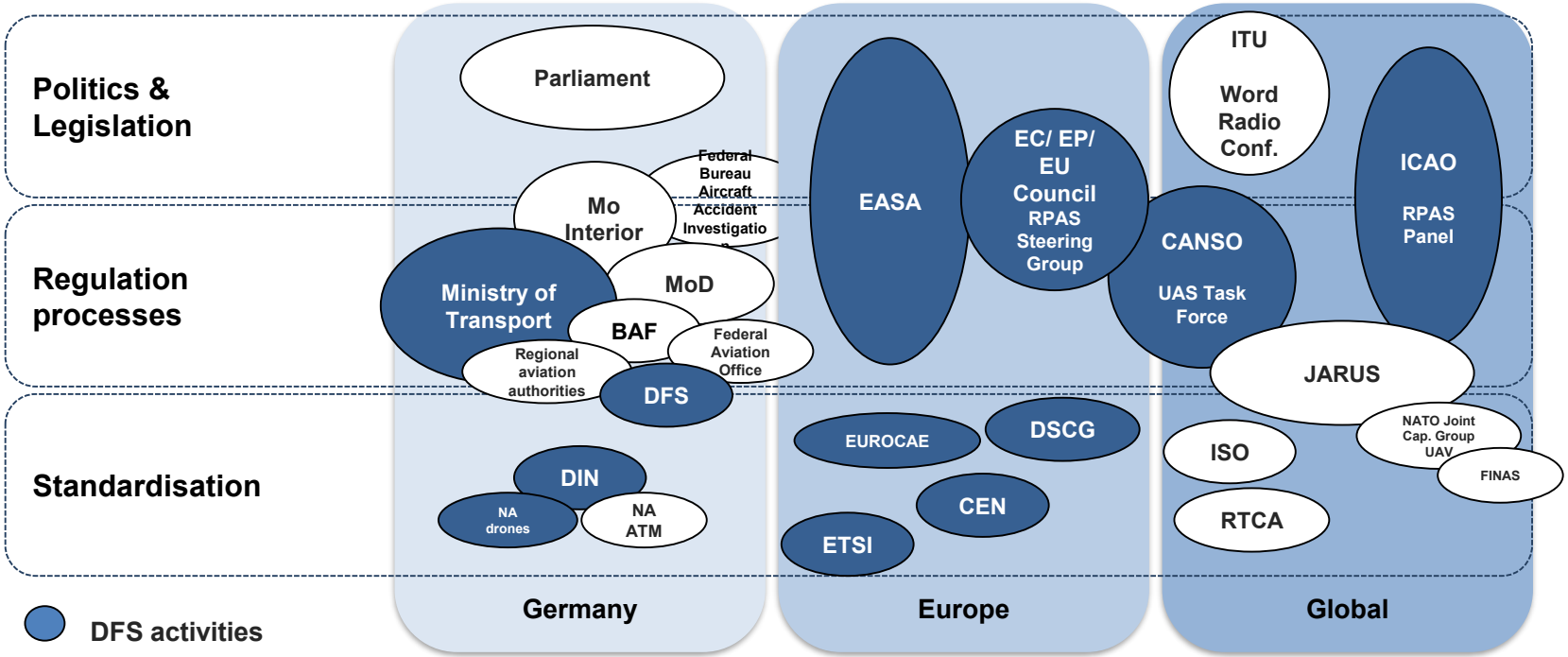
January 2018

“Pro-active“ 4-fold strategy paradigm in DFS: Safe and fair integration of UAS into air traffic system

- **Regulation**
  - National registration, pilot qualification, insurance, and UAS identification for surveillance required (-> EASA, U-Space)
- **Operations**
  - Risk and and performance based, operation centric, proportional measures (-> EASA, SORA)
  - Affect both ATM and UTM
- **Systems**
  - ATM systems have to be adapted/enhanced
  - UTM systems have to be built, UTM as „a system of systems“ (-> GUTMA) cloud-based architectures to be expected
- **Economics**
  - Existing fee regimes will not work Self-service, SaaS and UPP expected



A large number of committees and organisations is involved in regulating the new emerging market



DFS RPAS Projects

Since 2003 different projects together with MoD was conducted

- WASLA/HALE II and III
  - Real-time simulation: Lost C2 Link, r/t delay, emergencies
- VUSIL I and II
  - Validation of ground based detect and avoid system
- Integration of Euro Hawk outside segregated airspace
  - Development of procedures, contingency for Lost C2 Link
- Global Hawk flights in Germany
  - Standard procedures for flights

DFS – operational requirements

See and avoid

See and Avoid one core principle in aviation and has to be fulfilled by RPAS → Detect and avoid

Lost C2 Link an related procedure

The Lost C2 Link procedure defined by ICAO (e.g. squawk 7400) shall be fulfilled by the RPAS.

Performance of RPAS

Low performance or RPAS can create capacity problems in the ATM system.

Thank you for you attention!

Questions