UAS Forum Sweden –
Att öppna Europas och Sverige luftrum för UAS

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Open the airspace... or?
Open the airspace for small and large RPAS...

Opening the airspace by **integrating** (larger) suitable equipped RPAS into the Air Traffic Management system (ATM), i.e. existing regulated non-segregated airspace (class A-G)

- *Existing* aviation rules and regulation - ATM (well-defined – ICAO, EASA, NSA etc.)
- Pilot in command (from remote)
- Addition of technology w.r.t. remote piloting (e.g. Sense & Avoid)

→ “Business as usual”, with pilot on gnd

Opening specific lower airspace enabling new (commercial and private) operations using small RPAS and at the same time ensuring not to interfere with existing air traffic/ATM (**segregating**).

- New proportionate, risk-based rules
- Operator rather than licensed pilots
- Can’t carry heavy, costly technologies

→ In particular BVLOS VLL (<500ft)
  “completely new to aviation”; calls for new concept of operations, new regulations (not ATM)

Opening the airspace is not one homogeneous exercise…
Integration work at European level

European Roadmap for integration of RPAS into EU ATM (June 2013)
- Regulatory Roadmap (Annex 1)
- R&D Roadmap (Annex 2)
- Societal Impact (Annex 3)

Policy/Institutional level
- EC Directive to SESAR for RPAS R&D, EASA regulation (several 2013+)
- EC communication, e.g. COM207 "A new era for aviation" (April 2014)
- EC Riga declaration: High-Level Principles (March 2015)

Regulatory level
- Launch of EASA rulemaking activity, RPAS in basic regulation update, and involvement in JARUS
- Concept of operations - risk-based approach to RPAS regulation (2015)

Standardization
- EUROCAE WG-73 "UAV Systems" (MOPS, CONOP, OSED)
- Input from e.g. MIDCAS (Sense & Avoid)

European R&D Programs
- EDA Air4All in 2008 and 2009, SIGAT (C2) → initial ideas for a roadmap
- EDA RPAS JIP - MIDCAS, DESRIE, ERA (2009+)
- SESAR/Horizon 2020 (2015+)

At lot has been done, a lot is ongoing, pressure is high… and a lot remains to be done.
EU Roadmap Timeline

Initial Operation ➔
National regulation &
harmonization; limited
operations (IFR in ATC-
airspace first)

Integration ➔ Pan-
European regulation
supported by the
results of R&D activities.

Evolution ➔
All requirements for full
integration are in place
Riga Declaration and EASA (April 2015)

Riga-declaration “RPAS from 2016 onwards”

- Proportionate rules
- EU rulemaking now
- Technology and standards (SESAR + other e.g. EDA)
- Public acceptance (integrity, noise etc.)
- Operator is responsible

EASA risk-based approach to RPAS regulation

- Three levels of certification
  - Open Category
  - Specific Operations Category
  - Certified Category
- Rulemaking timeline
  - Inclusion in EASA Basic Regulation in June 2016 (consultation ongoing)
  - Implementing Rules (IR) for 2016-2021

Address two main goals simultaneously:
Safe integration & acceptance; Foster RPAS business (industries, employment)
EASA ConOps – risk-based certification categories

**OPEN:**
Very low risk operations
No involvement of Aviation Authorities, No airworthiness approval
Limitations: VLOS (500m), below 150m altitude, outside certain areas (e.g. airport & sensitive areas), no overflying of crowds
Industry standards (not for toys <500g)

**SPECIFIC**
Increased risk
Safety risk assessment required
Approved by Aviation Authorities required
Airworthiness and staff competence – case-by-case

**CERTIFIED**
Comparable to manned aviation
Limit between specific and certified not yet defined
Pending criteria is defined, EASA accept application MTOW 150kg
C2 and Detect &Avoid can receive an independent approval
R&D: Key Technologies for RPAS integration

Sense/Detect & Avoid
- Replicating the human ability to see and avoid – aviation cornerstones “rules of the air”
- The RPAS must be capable of detecting and avoiding cooperative and non-cooperative traffic and performing avoidance manoeuvres.
- Avoidance manoeuvres can either be Collision avoidance (CA) and Traffic Avoidance (TrA, also referred to as Self-Separation).
- Note: CA is usually fully automatic and TrA advisories to ensure separation when ATC not present.

Contingency/Emergency Recovery
- E.g. Link-loss, Flight termination

Communication - Command & Control (C2)

Technologies in some case goes beyond current manned equivalents
R&D: SESAR
SINGLE EUROPEAN SKY ATM RESEARCH

SESAR in a nutshell
- Development of the next generation European ATM, in order to achieve the Single European Sky (legislation)
- Together with CleanSky, the EU main aviation programmes
  - SESAR 1: 2100M€ (2008-2016)
- “All” stakeholders, one program
- Objectives include
  - Enabling EU skies to handle 3 times more traffic
  - Improving safety by a factor of 10
  - Cutting ATM costs by 50%
  - Reducing the environmental impact per flight by 10%

RPAS in SESAR
- Objective to implement European RPAS Roadmap, remaining R&D (technology, operations)
- RPAS Definition Phase 2014
  - Defined the remaining R&D work, based on RPAS Roadmap
  - Saab lead Sense/Detect & Avoid
- SESAR 2020
  - Including RPAS in the program from 2016 onwards (to 2021)
  - Initial funding 40M€ for RPAS integration R&D
- Swedish participation by LFV, Saab, (Swedavia not in RPAS work)
- Starting points:
  - EU RPAS integration Roadmap (and link to ICAO ASBU)
  - SESAR RPAS Definition Phase
  - Build on existing work (e.g. MIDCAS)
- Initial focus (TBC)
  - IFR airspace class A-C
  - Initial studies of partial B-VLOS integration (TBC)

Huge programme. Stakeholder acceptance. Drive European & Global standardization.
EDA have been proactive in RPAS integration R&D for many years (Air4All, SIGAT…)

Three main programs ongoing

- **MIDCAS** – Mid-air Collision Avoidance System (50M€, 2009-15)
  - Sense/Detect & Avoid (Saab lead, LFV participation)
- **ERA** – Enhance RPAS Automation (32M€, 2015-18)
  - Automatic take-off and landing
  - Contingency/Emergency Recovery (Saab lead)
- **DESIRE** – Demonstration of Satellite Enabling the Insertion of RPAS in Europe (2012-2013; 2014+)
  - SATCOM datalink demonstrations (no SE involvement)

EDA R&D in RPAS integration: 10 years, over 100M€. No difference between civil and military RPAS w.r.t. integration into ATM!
Opening the airspace for RPAS integration is a heterogeneous exercise.

Europe has done a lot, the roadmap is clear, the pressure is on, time to deliver!

Sweden has the history, knowledge, innovation spirit, suitable operating environment, engaged stakeholders (users, industry, authorities, universities…) to become a leader in the RPAS field.

Remote Technologies goes beyond RPAS – “Be where you want, act where you needed”

youtube.com/watch?v=qQy6cXYx43M
Worlds first rPAS/rTWR integrated demonstration
Joint LFV-Saab program
Flights October 2014
youtube.com/watch?v=qQy6cXYx43M