ATM Integration Trials in France

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From R&D to operational procedures

2012 French Decrees for small RPAS and VLL flights

Permit to Fly

R&D
Each demand studied
RPAS enabled through segregation
Growing activity
R&D
RPAS integration

2005 2010 2012 2015 2020

Growing activity RPAS integration
Concepts of Operations
Operational procedures
2005 2012 2015 2020
UNMANNED AIRCRAFT SYSTEMS
(HTTP://PAPARAZZI.ENAC.FR)

CIVIL APPLICATIONS FOR SMALL UAS
ENAC UAV Program

RPAS integration in the Airspace

Remote Pilot Station

RPA airworthiness

Concepts of Operations

Communications

Air Traffic Management

RPAS Mission / Flight plan
### RPAS in Air Traffic Management

<table>
<thead>
<tr>
<th>ATM LAYERS</th>
<th>DESCRIPTION</th>
<th>ACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic</td>
<td>Flight planning Flow Control</td>
<td>ATC processing of flight plans</td>
</tr>
<tr>
<td>Separation</td>
<td>Aircraft-to-aircraft separation between RPAS and other traffic</td>
<td>ATC providing separation service when ATC separation service is not provided (D&amp;A)</td>
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<tr>
<td>Collision avoidance</td>
<td>« Last resort » collision avoidance alert and maneuver</td>
<td>RPAS D&amp;A system collision avoidance, resolutions, and maneuvers, TCAS Compatibility</td>
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</tbody>
</table>

**Modelization**
- Reporting Flight Plan
- C² Link
- 4D Nav
- HMI
- Human factors
In October 2013, SESAR JU launched 9 RPAS Demonstrators
French Consortiums

DGAC/DSNA
ENAC
Rockwell Collins France (coordinator)
SAGEM

DGAC/DSNA (coordinator)
ENAC
Airbus Defense&Space
AirbusProsky
SOPRA STERIA
Define Concepts of Operations and Operational Procedures (normal, abnormal, emergency) using today state of the art

- Real time simulations: Validation with simulations using real traffic (registered)
  - with licensed Air Traffic Controllers qualified on the TMA
  - with professional Remote Pilots
- Fast time simulations: “safety” impact of Detect and Avoid and compatibility with TCAS
- Real flights with Optionaly Piloted Vehicles
Design of tailored procedures
Design of a tailored procedure for Toulouse Blagnac
900 000 Fast time Simulation runs

Coordination between an horizontal Detect and Avoid maneuver and a TCAS logic is positive

Without Detect and Avoid
With Detect and Avoid
With cooperative Detect and Avoid

VERSUS

TRACKS<FL195
With TCAS
Without TCAS

Manned aircraft

RPAS
25 real flights on mid-size airport

25 flights inside airport area

Experimentations with tailored procedures for normal, abnormal and emergency situations

Detect and avoid demonstration in segregated area in ODREA
Preliminary findings

- Impact of tailored RPAS procedures is very positive
  - No impact on safety
  - RPAS behavior very similar to light aircraft
- Emergency procedures are acceptable, but could be improved
  - RPAS are more predictable

- During approach phase, latency is penalizing
- Needs for remote pilot specific training and qualification
- Human Factors: How to keep humans involved while monitoring Unmanned systems?
Conclusion

RPAS integration in mid-size airport traffic successfully demonstrated

- Demystification of RPAS towards CAA and ATCos
- Fruitfull collaboration between industry and Civil Aviation

Needs for R&D on

- RPAS Flight planning
- Detect&Avoid & compatibility with TCAS
- Communication Link
- Human Machine Interface & Human Factors
QUESTIONS ?

www.odrea.org  
www.tempaeris.org