Droning on about RPAS integration

The integration of Remotely Piloted Aircraft Systems into civil European airspace

Peter Hullah
RPAS-ATM Integration Programme Manager
8th/9th April 2016
IMPACT of RPAS on ATM

- **Negative**
  - **Airports**
    - Many low-level manned operations
    - Runway capacity
  - **See and avoid**
    - Barely works for manned aviation
  - **CNS infrastructure**
    - Requires major investment
  - **Spectrum**
    - Lack of it!
  - **Rules of the air**
    - Out of date
    - How many RPAS operators know them?

- **Positive**
  - **Airports**
    - RPAS as tools
    - Bird control
  - **Detect and avoid**
    - Technology could be used with manned aviation
  - **CNS infrastructure**
    - RPAS as a communication platform
  - **MET**
    - RPAS instead of balloons
EUROCONTROL’s ROLE

- Ensure the safe integration of RPAS into ATM
  - As safe as manned aviation
  - No negative impact on manned operations
  - Transparent to ATC and other airspace users
  - Other airspace users not excluded
    - E.g. with more segregated airspace
EUROCONTROL Activities

- Maintain the big picture
  - Regulatory & standards
    - ICAO
    - JARUS
  - ATM
    - Accommodation
    - Integration
  - R&D
    - SESARJU
    - R&D Dashboard

- Work to date
  - Management of JARUS
  - RPAS-ATM Vision
  - ATM guidance material
  - ATM CONOPS
  - Several studies, projects and simulations
  - R&D definition phase and roadmap
  - R&D Dashboard
Civil UAS Regulation in Europe per State
RPAS VISION

- What do we want from RPAS in our day to day lives?
- Set a marker for 2050
  - RPAS are practically absent from Flightpath2050
- Larger than ATM
  - 2 million RPAS vs. 200 thousand manned aircraft
- Who develops this?
  - You and I!

Essential ingredients

- Political commitment
  - RIGA Declaration
- Public Acceptance
- ATM CONOPS
- Proportional rules
- Performance data & data collection
- Global approach
  - ICAO, JARUS
Social and Institutional Acceptability

- Environment
  - Noise
  - Visual pollution
- Safety
  - People and property on the ground
  - Interaction with other airspace users
    - In all airspace categories
- Privacy and Data/Comms Protection
  - Privacy vs. Policing/Security etc.
  - Security from Hijack vs. Ability to intercept
  - Application/amendment of existing legal provisions
  - Spoofing
  - Ethics
- Regulations
  - Certification of the aircraft
  - Training & certification of the Remote Pilot
  - Rules for different types of RPAS
  - Rules for different types of airspace
  - Identification of owner
- Liability and Insurance
  - 1952 Rome Convention on aircraft-caused damage
  - Liability of Pilot / Operator / Manufacturer / Designer
  - Liability due to failure of space communications
  - Liability limits
  - Premiums high because of lack of data/regulations/standards
  - Need to ensure that everyone has insurance
RPAS have a few safety issues
INTEGRATION or ACCOMMODATION

Time: 08:01:20
Impact on ATM

Around 1000 drone activities measured within the Hamburg CTR
Only Parrot Bebop (due to software update)
RPAS Operations

- Visual Flight Rules (VFR) or Instrument Flight Rules (IFR)
- Radio Line-of-Sight (RLOS)
- Beyond Radio Line-of-Sight (B-RLOS)
  - Satellite communications
- Away from airfields/air routes
- Visual Line-Of-Sight (VLOS)
  - Remote pilot can see the aircraft at all times
- Extended Visual Line-Of-Sight (EVLOS)
  - Remote pilot in contact with an observer who can see the aircraft at all times
- Beyond Visual Line-Of-Sight (B-VLOS)
  - Not visible to Remote Pilot

500ft is the lowest VFR altitude according to ICAO Annex 2

Very Low Level (VLL) Ops
But surely the airspace under 500ft is empty!
EUROCONTROL RPAS ATM CONOPS

- Primarily based on traffic classes
  - Not RPAS categories or airspace classes.
    - These are used as secondary types.

- Traffic classes will therefore be defined for each type of operation as follows:
  - Type of operation
    - Class of traffic
      - Class of airspace
        - Category of RPAS (from EASA CONOPS)
Very Low-Level CONOPS

Class I: Reserved for RPAS (EASA cat A VLOS only);
Class II: Free route (VLOS and BVLOS);
Class III: Organised commercial medium/long haul traffic (BVLOS);
Class IV: Special operations (this category of RPAS traffic conducts very specific types of operation that will be assessed on a case-by-case basis. (VLOS and BVLOS).
Route structure
IFR & VFR (including very high-level operations)

- **Class I**
  - Outside network operations;
    - No negative impact on manned aviation;
  - No SIDs and STARs;
    - Segregation of launch and recovery at airports;
  - Ground operations by towing or wing walking.

- **Class II**
  - IFR operations, including Network, TMA and Airport operations;
  - Capable of flying SIDs and STARs as designed for manned operations.

- **Class III**
  - Very high level operations above FL 600
    - E.g. Facebook’s Aquila and Google’s Loon balloons
PERFORMANCE DATA

- Aviation has millions of hours of flight data to support its safety record
- What about RPAS?
  - No records
  - No data logging
  - Nothing.
- To be able to allow RPAS to operate anywhere near human lives, we need **DATA**
  - Link performance
  - Engine performance
  - Flight hours
  - Mishaps/accidents
  - And much, much more …
Areas of Research and Development

- Detect and Avoid (D&A)
  - See and avoid; ACAS; “be seen”
  - Other hazards – obstacles, weather, wake vortex

- Airspace and airport access
  - Minimum capability threshold for airspace access
  - Separation; Landing & taxiing
  - VLL operations

- Contingency
  - Action on loss of communication
  - No decrease in safety or increase in controller/pilot workload
  - Fault detection and recovery

- Command & Control (C2) datalink
  - Pilot-RPAS; Controller-Pilot
  - Satellite communication (B-RLOS); GPS navigation

- Security
  - Cyber – authentication, encryption, spoofing, jamming etc.
  - Physical – hijacking of pilot on ground; hijacking of control function

- Human factors
  - Situational awareness; attention; fatigue
  - ATC and Pilots
  - ATC acceptance
  - Training needs

Demonstrations and Validation to define best practices
RPAS ATM Integration R&D Roadmap Dashboard

Droning on about RPAS integration
Funding

Known funding for 16 Applied Research projects 25823
Known funding for 25 Technical Development projects 211248
Known funding for 38 Application Validation projects 216543
Total known funding for 79 projects (£000s) 453614

Funding Sources

Number of projects totally or partially funded by each funding authority

<table>
<thead>
<tr>
<th>Source</th>
<th>No. of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Commission</td>
<td>47</td>
</tr>
<tr>
<td>EUROCONTROL</td>
<td>5</td>
</tr>
<tr>
<td>European Defence Agency</td>
<td>6</td>
</tr>
<tr>
<td>European Space Agency</td>
<td>5</td>
</tr>
<tr>
<td>European Global Navigation-Satellite Systems Agency</td>
<td>2</td>
</tr>
<tr>
<td>SESAR Joint Undertaking</td>
<td>10</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
</tr>
<tr>
<td>Sweden</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1</td>
</tr>
</tbody>
</table>

NB: Some projects are jointly funded by more than one organisation
Conclusions

RPAS and their integration will impact all players and elements of our ATM environment – there are pros and cons

Regulation, technology, and standards are underway

EUROCONTROL will ensure that we develop the best integration solutions for our stakeholders while enabling this new industry to reach its maximum potential for Europe

But we need DATA
THANK YOU