RPAS for homeland security applications

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Agenda

• RPAS, what is it ?

• Homeland security, what is it ?

• RPAS for Homeland security

• RPAS Industry capabilities and Industry needs

• Conclusion
RPAS : what is it ?
RPAS: what is it?

It is a flying robot, controlled to perform
- a certain job, the mission
- with dedicated tools, the payload
- at a certain distance, the range
- during a certain time, the endurance

How it looks like?

It is a system of systems.
RPAS: what is it?

Theory of evolution since prehistoric times:

- **First generation**
  - automatic air vehicle used as a target for training purpose
  - no mission payload and simple radio link based on TV emitter
- **Second generation**
  - designed for military intelligence
  - aircraft design focused on a specific payload
  - specific military designed datalink
- **Third generation**
  - selection or design of safe aerial platform
  - Architecture designed for Multi payload and interchangeable payloads
  - Digital and interoperable datalink

Military world has generated this story, reason why military experience and achievements are still relevant to address the domain.

But we enter currently in a new era, driven by civilian use and flight in non-segregated airspace rationale.
RPAS missions : military

Battlefield Intelligence (IMINT, SIGINT, COMINT).
All weather, Day/Night Surveillance & Reconnaissance.
Target detection, localization, identification. Artillery designation and assessment.
Battle damages assessment.
Electronic Warfare (incl. Jamming), SEAD operations support.
Ballistic missile detection & tracking.
Early Warning.
Naval / amphibious operations support.
Laser designation for cooperative engagement.
Search & Rescue operations support.
Flight Path Reconnaissance.
Camp / troops protection.
Abandoned sensors delivery.
Urban guerrilla support.
Proof images recording & delivery.
Effects / Weapons delivery.
Weather monitoring. NRBC detection & measurement.
Tactical communication relay.
Troops re-supply. MEDEVAC & logistic transport.
Law Enforcement / Treaty respect.
Combat.
RPAS missions : non military

TV, movies, advertising
Power lines monitoring. Pipelines monitoring
Agriculture applications (maturity measurement, disease detection, chemical treatment,...)
Meteorological survey or operations (counter hail or frost spraying, storm monitoring)
Tower, Bridges, Damps concrete inspection
Animals monitoring in parks and reserves
Antennas propagation measurement
Forest fire surveillance and monitoring
Highways, Railways security and control
Maritime pollution detection and tracking
Air quality sampling and measurement (NRBC)
Cartography data gathering
Fishery areas monitoring and control
Oilfields, including offshore, surveillance
Magnetic holes detection and cartography for mining
Police, Customs, Emergency crews operations support.
Border surveillance, Maritime Patrol, counter piracy operations support.
Tunnels, Chimney, Buildings inspection
Natural disaster management support
Properties aerial photography
Large infrastructure surveillance
Major events monitoring
Search and rescue
…and so many more!
Homeland Security: what is it?
RPAS missions: Homeland Security

National assets protection
- Nuclear Plant, Power Lines, Damp, Bridges, Tunnels, Windmill inspection and maintenance
- Offshore platforms, mines and pipelines surveillance

Border Control
- Terrestrial, Littoral, Maritime.

Security
- Large events monitoring: Olympic games, World championships, entertainment exhibitions, Royal events
- Critical events monitoring: international summit, elections
- Counter piracy

Emergency services
- Natural disaster management operations support (flood, earthquake, snow avalanche)
- Crisis communication network service

Polices activities
- Illegal activities monitoring, Vehicle tracking
- Demonstrations, suburbs riots, jails monitoring

Economical activities
- Fishery areas control, wildlife park monitoring, Agriculture, Winery, Forests monitoring
- Diamonds and stone mines detection and protection
- Pollution search and track, Nuclear Chemical Biological and Radiological measurement & monitoring
- Airlines routes safety monitoring (volcano ashes sampling)
RPAS for Homeland Security
RPAS types for Homeland Security

- EuroHawk
- Talarion
- Harfang
- Baracuda
- Atlante
- Tanan-300
- Copter 4
- Copter City
- Tracker
RPAS types for Homeland Security

Current status regarding RPAS Certification

- **Designed to be certified**
  Means that the system was fully designed according an existing Technical Reference Code and that a certification is one of the design driver. Current developments. Full military certification is targeted. FAA / EASA certification is expected when dedicated RPAS Codes and certification will exist.

- **Designed to be certifiable**
  Means that a dedicated and valid Technical Reference Code was not available at the development time of the system, but that the system was fully designed according a military Code or a draft of Code or elements of Code or according a set of company design rules based on certification knowledge. A full military certification is expected and future civilian certification is possible with restrictions (segregated air space) and/or system adaptation.

- **Designed to be safe**
  Means that the system was designed according the best knowledge related to certification but no relevant Code was existing at all at the design time. Military certification is possible with restrictions.
RPAS types for Homeland Security

EUROHAWK – HALE RPAS

HALE MISSIONS

• Maritime pollution detection and tracking
• Cartography data gathering
• Fishery areas monitoring and control
• Oilfields, including offshore, surveillance
• Police, Customs, Emergency crews operations support.
• Border surveillance, Maritime Patrol.
• Natural disaster management support
• Large infrastructure surveillance
• Major events monitoring
• Search and rescue

AIRWORTHINESS

• Flight domain: Intercontinental
• Design level: designed to be certifiable
• Reference Codes: International
• Certification: military
• Operated by: military operators

CHARACTERISTICS

• Wing Span 40 m
• MTOW 14 000 kg
• Max speed 350 ktas
• Max altitude >60 000 ft
• Endurance >30 h
• Flight Range 22 000 km
RPAS types for Homeland Security

TALARION – MALE+ RPAS

CHARACTERISTICS (preliminary)

- Wing Span: 28 m
- MTOW: 8,000 kg
- Max speed: 200 ktas
- Max altitude: >43,000 ft
- Endurance: >24 h
- Flight Range: >9,000 km

MALE+ MISSIONS

- Maritime pollution detection and tracking
- Cartography data gathering
- Fishery areas monitoring and control
- Oilfields, including offshore, surveillance
- Police, Customs, Emergency crews operations support.
- Border surveillance, Maritime Patrol
- Natural disaster management support
- Large infrastructure surveillance
- Major events monitoring
- Search and rescue

AIRWORTHINESS

- Flight domain: Continental
- Design level: designed to be certified
- Reference Codes: International
- Certification: military
RPAS types for Homeland Security

BARRACUDA – UxAS

CHARACTERISTICS

- Wing Span: 7 m
- MTOW: 3,000 kg
- Max speed: >500 ktas
- Max altitude: >20,000 ft
- Endurance: >2 h
- Range: 300 km

UxAS MISSIONS

- Meteorological survey or operations (storm monitoring)
- Maritime pollution detection and tracking
- Air quality sampling and measurement (NRBC)
- Cartography data gathering
- Border surveillance (Air space)
- Search and rescue

AIRWORTHINESS

- Flight domain: Regional
- Design level: designed to be certifiable
- Reference Codes: International
- Certification: military
HARFANG (SIDM) – MALE RPAS

MALE MISSIONS

- Maritime pollution detection and tracking
- Cartography data gathering
- Fishery areas monitoring and control
- Oilfields, including offshore, surveillance
- Police, Customs, Emergency crews operations support.
- Border surveillance, Maritime Patrol, Counter Piracy
- Natural disaster management support
- Large infrastructure surveillance
- Major events monitoring
- Search and rescue

AIRWORTHINESS

- Flight domain: Continental
- Design level: designed to be certifiable
- Reference Codes: International
- Certification: military (owner of French TC)
- Operated by: military operators

CHARACTERISTICS

- Wing Span: 16 m
- MTOW: 1200 kg
- Max speed: 110 ktas
- Max altitude: >25,000 ft
- Endurance: 24 h
- Flight Range: >4000 km
RPAS types for Homeland Security

ATLANTE – Tactical RPAS

CHARACTERISTICS

- Wing Span: 8 m
- MTOW: 500 kg
- Max speed: 120 ktas
- Max altitude: >18 000 ft
- Endurance: >10 h
- Range: >150 km

TUAS MISSIONS

- Agriculture applications (maturity measurement, disease detection, chemical treatment, etc.)
- Meteorological survey or operations (counter hail or frost spraying, storm monitoring)
- Animals monitoring in parks and reserves
- Forest fire surveillance and monitoring
- Maritime pollution detection and tracking
- Fishery areas monitoring and control
- Oilfields, including offshore, surveillance
- Border surveillance, Search and rescue

AIRWORTHINESS

- Flight domain: Regional
- Design level: designed to be certified
- Reference Codes: International
- Certification: military
VTUAS MISSIONS

- Power lines monitoring, Pipelines monitoring
- Agriculture applications
- Tower, Bridges, Damps concrete inspection
- Highways, Railways security and control
- Maritime pollution detection and tracking
- Oilfields, including offshore, surveillance
- Police, Customs, Emergency crews operations support.
- Border surveillance, Maritime Patrol, counter piracy.
- Windmills, Chimney, Buildings inspection
- Natural disaster management support, Search and rescue
- Large infrastructure surveillance, Major events monitoring

AIRWORTHINESS

- Flight domain: Regional
- Design level: designed to be certified
- Reference Codes: International
- Certification: military

CHARACTERISTICS

- Rotor Span: 5 m
- MTOW: 300 kg
- Max speed: 60 ktas
- Max altitude: >15,000 ft
- Endurance: >8 h
- Range: >150 km

TANAN – mid-range VTRPAS

DEFENDING WORLD SECURITY
RPAS types for Homeland Security

Tracker & DVF – Mini-RPAS

CHARACTERISTICS

- Wing Span: 3.4 m
- MTOW: 8 and 10 kg
- Max speed: >90 km/h
- Max altitude: >10,000 ft
- Endurance: 1½ and 2 h
- Range: 20 and 40 km

AIRWORTHINESS

- Flight domain: Local
- Design level: designed to be safe
- Reference Codes: National (International on going)
- Certification: military (owner of French TC)
- Operated by: governmental or military operators

- Animals monitoring in parks and reserves
- Highways, Railways security and control
- Air quality sampling and measurement (NRBC)
- Fishery areas monitoring and control
- Police, Customs, Emergency crews operations
- Border surveillance, counter piracy operations support
- Natural disaster management support
- Large infrastructure surveillance
- Major events monitoring
- Search and rescue
RPAS types for Homeland Security

Copter 4 – Mini-VTRPAS

CHARACTERISTICS

- Rotor Span: 2 m
- MTOW: 30 kg
- Max speed: >50 km/h
- Max altitude: >5000 ft
- Endurance: >1¼ h
- Range: >40 km

AIRWORTHINESS

- Flight domain: Local
- Design level: designed to be safe
- Reference Codes: National (International ongoing)
- Certification: military
- Operated by: civilian, governmental or military operators

- Power lines monitoring
- Pipelines monitoring
- Agriculture applications
- Tower, Bridges, Damps concrete inspection
- Antennas propagation measurement
- Police, Customs, Emergency crews operations
- Border surveillance, Search and rescue
- Buildings inspection
- Natural disaster management support
- Large infrastructure surveillance
RPAS types for Homeland Security

Copter City – Mini-VTRPAS

CHARACTERISTICS

- Rotor Span: 2 m
- MTOW: 13 kg
- Max speed: >40 km/h
- Max altitude: >1 000 ft
- Endurance: >30mn
- Range: >15 km

AIRWORTHINESS

- Flight domain: Local
- Design level: designed to be safe
- Reference Codes: National (International on going)
- Certification: military
- Operated by: civilian or governmental operators

- Power lines monitoring.
- Agriculture applications
- Tower, Bridges, Damps concrete inspection
- Animals monitoring in parks and reserves
- Antennas propagation measurement
- Air quality sampling and measurement (NRBC)
- Police, Emergency crews operations support.
- Tunnels, Chimney, Buildings inspection. Large infrastructure surveillance
- Natural disaster management support
- Properties aerial photography
Industry capabilities and Industry needs
RPAS Industry capabilities & Industry needs

The leading companies in RPAS are able to:

- Deliver safe systems according the Chicago Convention principles
  - safe design, providing the required level of **aircraft airworthiness**
  - safe training, delivering and sustaining **flight crew licences**
  - safe operations, giving through the RPAS functions the means to fully comply with the **rules of the air**
  - safe maintenance, guarantying sustained reliability and insuring **continuous airworthiness**

- Offer to Governmental and private users new tools to improve
  - state and citizens security and safety regarding large spectrum of risks and threaten
  - Environment and critical assets monitoring and protection

- Support economic growth
  - allowing new businesses creation thanks to regulations compliant products at affordable prices
  - creating thousands of jobs (e.g. MALE RPAS potential is 10 000 jobs in EU)
RPAS Industry capabilities & Industry needs

The leading companies are supporting improvements in:

- **Common and worldwide shared corpus of laws and rules**
  - FAA and EASA are working to support this goal with the contribution of all stakeholders:
    - governmental or inter-governmental agencies
    - RPAS business associations
    - national authorities
    - small and large companies

- **Dedicated and focused corpus on RPAS**
  - legal questions about operators framework are still open
  - General aviation lethal criteria related to catastrophic failure occurrence is still questioned (relatively to the real ratio between death and casualty on ground versus on board, recorded over the last 40 years \([10^2 ?]\))
  - Autonomous See and Avoid function is becoming more and more credible on the technical side, but still unacceptable from the authorities point of view.
  - IFR versus See & Avoid compliance
  - ...
RPAS Industry capabilities & Industry needs

The business needs dedicated, coherent, and stable framework.

This table is (trying to) summarizing Certification EU landscape in the near future, comparing

- market segmentation
- some industrial or economical categorizations
- military certification codes segmentation (NATO)
- civilian certification codes segmentation (EU)

all based on MTOW criteria, but with overlapping and inconsistencies.

Forecast and strategic decisions are not so easy....
RPAS Industry capabilities & Industry needs
Conclusion
Conclusion

• **RPAS in Airspace is a reality**
  – 5000 RPAS are currently flying worldwide
  – best RPAS recorded or are going to record 1 000 000 flight hours

• **RPAS certification today is only military**
  – non military codes are still non existing
  – case by case certification negotiated with civilian authorities is possible, but leads to flight in “segregated” air space
  – military regulators (mainly NATO) have large experience and could help to civilian RPAS capable codes elaboration. Re-use of this legacy could save time and risks.

• **RPAS technologies may contribute to improve aircrafts capabilities**:
  – autonomous “detect & avoid” and related flight automatic management
  – automatic taxiing
  – system healthy self management and remote black box
  – Flight laws dynamic modifications management

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**ONE CERTIFICATION FOR ONE SKY FOR RPAS IS A GLOBAL INTEREST**
President Obama signs FAA bill into law; work on unmanned integration into airspace, GPS-based air traffic management to begin

February 14, 2012
By Courtney Howard
Executive Editor

ARLINGTON, Va., 14 Feb. 2012, President Obama has signed the Federal Aviation Administration (FAA) Modernization and Reform Act 2012—with funding and provisions for granting military, commercial, and privately-owned unmanned aerial vehicles (UAVs) greater access to U.S. airspace and air traffic management systems modernization—into law.

The bill includes “important provisions on the integration of unmanned aircraft systems (UAS) into the national airspace system,” according to an Association for Unmanned Vehicle Systems International (AUVSI) spokesperson; in fact, public airspace in the U.S. is expected to open to unmanned drone flights within four years. The bill will also help speed the switch to an air traffic control system based on GPS (global positioning system) technology, rather than on radar.

The bill authorizes $63.4 billion in FAA funding over four years, of which roughly $11 billion will be employed in air traffic management (ATM) modernization. FAA staff has until June 2015 to develop new arrival procedures at 35 of the busiest U.S. airports. The NextGen system is expected to help the FAA accommodate projected growth in air traffic over the next decade.

The airline industry, including aircraft owners and airline operators, will be expected to install satellite technology onboard airplanes. The GPS-based technology will actively and accurately update aircraft location and enhance pilots’ situational awareness, such that they can see the location of both their own aircraft and of other planes equipped with the technology.

“In recognition of how fast UAS technology is advancing, in addition to the huge potential civil and commercial market, Congress included language requiring the FAA to expedite the safe integration of UAS into the national airspace. Congress set a deadline of 30 Sept. 2015 for full integration,” continues the AUVSI spokesperson.
RPAS for Homeland Security

Thank you for your attention.

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