ESA/EDA Workshop on Unmanned Aerial Systems (UAS) and Satellite Services

UAS concept of use & communication challenges

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by

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Outline

- ASD introduction
- UAS WG objectives & Key-challenges
- Brief intro on UAS Concept of Use activities
  - The goals and approach
  - Status & schedule
- Concept of Use & communication challenges
  - How comms can support the possible application
  - What is required and what topics need to be addressed
- Key-summary
Represents 32 Associations
21 Countries
over €120 billion Turnover
over 2000 Companies
over 638,000 Employees
1950    Creation of the “Association Internationale des Constructeurs de Matériel Aérospatial, AICMA” (predecessor of AECMA)

1961    Creation of the organisation of the emerging space industry, EUROSPACE

1976    The European Defence Industries Group, EDIG, is founded.

1991    Opening of the AECMA Brussels Office

2004    AECMA, EDIG and EUROSPACE merged to create

ASD overall mission is to enhance the competitive development of the aeronautic, space and defence industry in Europe, in partnership with European institutions and member associations.
As part of ASD operations we …

- Represent the European aeronautics, space and defence industries to promote their interests and ensure a high priority for issues that are key to our sectors in European public policy.

- Provide early warning on policy issues, assess policy impact, develop common positions and shape relevant policy.

- Offer a single point of contact between industry and relevant stakeholders, in the European institutions and beyond.

- Facilitate industry’s access to EU funding.

- Contribute to the development of SMEs and the Equipment sector within a competitive supply chain.

- Manage statistics and key figures.
Objectives

The growth in UAS operations places significant focus on the maturation of technology, System Development, Production and Through Life Support for the next generation of Air Systems. It is therefore an imperative that specific focus is given to:

- Define an Industrial perspective for UAS concepts of operation such that they provide potential solutions to the state (Defence & Government) and civil operations.

- Provide a consolidated Industrial position for certification and qualification requirements.

- Identify and coordinate of the key enabling Research and Technology required to realise UAS potential and to position European Industry to be leaders in the global market.

- Develop a common position with the key European stakeholders to open the airspace today and account for the future ATM development towards “Single European Sky.”
Terms of Reference

- The Unmanned Aircraft System Working Group handles any issues related to UAS including, but not limited to:
  - Focus on UASs (>150 kg) and control systems/stations
  - Associated Systems
  - Integration into Force/Security/civil infrastructure (land, sea and air operations)
  - Training
  - Support
  - Complete Life Cycle Management
  - Integration into the air space (Certification, qualification and operations)
2009 Key Priorities

- Created a “set” of concepts of operations for UAS’s for Military, Security & civil use

- Established a clear view of the current European & national UAS related activities: goals / outputs; Competition; USA priorities & possible links

- Established mechanisms for response to critical issues (e.g. airworthiness [(A)NPAs], Technology…): e.g. position paper, articles on specific topics in support of ASD key messages

- Created a list of critical UAS technologies & started to lobby (Funding Bodies) for sponsorship
The objectives

- Define a common industry vision at European level on:
  - benefits & applications of UAS in defence, state and commercial sectors
  - concept of use of UAS in supporting the final users in their businesses
  - Non-technical challenges & R&D needs to comply with above objectives

- Share with the final users & involved stakeholders the industry vision in order to:
  - promote this emerging and promising future products
  - have a convergence on objectives and regarding the relevant gaps to be covered
  - make more aware on:
    - non-tech issues (out of industry responsibility) need to be solved as soon as possible
    - R&D activities need to be launched and supported (the industry is engaged and committed but not sustainable if alone)
Rationale & Approach

– Classification framework, types and application sectors

– Benefits, opportunities and perspectives
  • benefits if compared with conventional aircraft
  • explore sectors where the use of UAS adds high value

– High-level CONUSE
  • real users expectation from UAS: applications & required capabilities
  • application requires existing capabilities and/or new ones,
  • capabilities need to be supported by existing and/or new technologies
  • which gaps need to be cover and which R&D activities need to be launched

– CONOPS for integration into the airspace
  • short/medium-term (e.g. Air4All Roadmap)
  • long-term (e.g. SESAR & Nextgen)
Status, schedule & next steps

- The CONUSE paper is a living document …
- a first complete issue of CONUSE paper (Sept 2009)
- organise a meeting (fix) with final user (Oct 2009)
- 2nd doc issue taking into account the above final users comments and recommendations (Nov 2009)
- Identify promotion R&D context (from now)
- Starting from identified and prioritised issues, define R&D proposals for funding (end 2009, beginning 2010)
Concept of Use & communication challenges

**Flexibility** (When and where you want it)
- UAS can offer
  - Search & rescue
  - Communications
  - CBRN
  -……

**Scalability** (to meet your needs)
- Persistence (from minutes to months)
- UAS can offer
  -……

**New Opportunities** (Doing today what was not affordable yesterday)
- Reconnaissance
- Persistence surveillance
- Covert Sensor Insertion
- Battle Management
- Communications

**Military Applications**
- CBRN
- SEAD/DEAD
- Signals Intelligence
- Decoy/Pathfinder
- Met information
- Geographic information
- Weaponization/Strike
- Combat Search and Rescue
- Mine Detection/Countermeasures
- Close Air Support
- Electronic Warfare
- Information Warfare
- Counter CCD
-……

**Non-Military Applications**
- Disast relief
- Pollution monitoring
- Power & pipeline monitoring
- Police & Paramilitary
- Herd management
- Search & rescue
- Agriculture
- Communications & media
- Border surveillance
- Fisheries protection
- Atmospheric monitoring
- Oceanographic monitoring
- Fire fighting
- Delivery services
- Research
-……

The opportunities …
Yes, but …
Concept of Use & communication challenges (cont)

Application vs capabilities

Cluster application & capability

→ Orbiting
  Capability to maintain position in a dedicated area for reasons other than SMC

→ Transport
  carry of goods and/or people from one location to another (payload not expendable)

→ Surveillance, Monitoring, Control (SMC)
  maintain position in a dedicated area where to detect, analyse and collect/disseminate mission information

→ Payload delivery
  deliver a non-reusable payload

Some examples

act as comm satellites advertising purposes

Express mail delivery
Cargo loads & People transport

Defence, law enforcement, agriculture,

Logistic equipment
Insecticide/fertilising/weather/fuel Weapon

What’s comms system role?
Concept of Use & communication challenges (cont)

Application vs capabilities

Operative needs in summary

- take/off & landing from different airfield types, with/without launch recovery system,
- reach the operational area to perform the mission task through
- Return to base

Main capabilities required

- civil and military aircraft interoperability & fully access to non segregated airspace
- operate in LOS and BLOS, detect, receive, process and disseminate the mission info
- long endurance, low fuel consumption
- multi-ship operation & shift command & control
- miniaturised sensors with low power and low weight
- rapid deployment and flexibility
- all weather operations
- high precision navigation for delivery efficiency reducing collateral damages
- formation flight and cooperative attack
- transmit and receive mission data from different air and ground assets

Surveillance, monitoring, control
  e.g. sensors/system

Payload delivery
  e.g. onboard system

Orbiting
  e.g. comms systems

Transport
  Air vehicle
Concept of Use & communication challenges (cont)

Application vs capabilities vs technologies

One cluster may support different sectors

One cluster may require different capabilities

One capability may require different technologies

The same technology can support several users

Communication technologies is a transversal enabler

It is one of key – priority for the Industry
From UAV to UAS there is a crucial technology enabler: the comm system

- Communication is one of most important system of UAS
- Several applications may be offered to final users if comms
  - are available and enough mature to be deployed
  - can allow:
    - Command and control (C2) in line of sight and beyond line of sight
      - To manage the UA in the entire mission phases in normal & emergency conditions
    - ATC interface
      - To interact with ground traffic controller for airspace access & management scopes
    - Mission
      - To perform the mission task that for several applications requires the capability to receive, transmit and disseminate an important mission data volume
UAS Communication principles

C2
• Link between CS & UA
  • Direct link in LoS
  • Indirect link bridge with sat/ 3rd part

ATC interface
• Link between CS & ATC

In the long term the UAS shall be an active/passive node of SWIM through an important data sharing (network info service)

Mission
• Link between UA, mission station and other flight assets
• Link between UA, mission station and surface assets
UAS Communication principles (cont)

- **C2**
  - LOS - Communication link allowing the control station ("UAS pilot") to assume command & control of the UA
  - BLOS can support
    - long range and long endurance mission
    - May also assure a redundancy in LOS configuration

- **ATC interface**
  - Short/medium term - Comm link between the ATC centre and the control station
  - Long term – short / medium term + link with comm network service

- **Mission**
  - In LOS and BLOS receive/transmit an high volume of mission information from/to other air/surface assets, directly or via mission station

  **But …**
UAS Communication challenges

- **C2 & ATC interface must guarantee**
  - Secure and sustainable communications: safety, continuity and quality of service, integrity, interoperability, …
  - Minimise the TX/RX delay for ATC scope

- **Mission**
  - Wide band data link able to TX/RX high data volume & high rate

- **Common**
  - Radio bandwidth allocation
    - Includes both the provisions to be made through the different relevant committees but also the protocols to be considered
    - Tightly connected to global spectrum allocation (WRC 11)
    - C2 link likely to migrate to aeronautic services bands
  - Affordability: low weight/room, low consumptions & low cost
  - Operational procedure are to be defined and validated
Key- summary

- The Industry recognise the importance of Comm as
  - key-enabler to assure a full UAS exploitation with significant benefits for the final users
  - transversal key-enabler to support different sectors
  - key-priority
- The Industry is appreciating the ESA/EDA Initiative that will allow to
  - progress in the Satcom technology/service considered at Very High Added Value
  - have a convergence at European level in a Joint Defence/Civil sector
- In this frame, the Industry
  - is ready to support studies and demonstrations on this matter
  - Can offer consolidated experience and knowledge covering at different level the necessary expertises
Thank you for your attention

Questions?

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