ARTES Applications Workshop

DeSIRE

(Demonstration of Satellites enabling the Insertion of RPAS in Europe)

AO-1-7082/12/NL/CP ARTES 20 DEMONSTRATION OF THE USE OF SATELLITES COMPLEMENTING UNMANNED AIRCRAFT SYSTEMS (UAS) INTEGRATED IN NON-SEGREGATED AIRSPACE

April 19th, 2013









Project Overview

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INTRODUCTION

The DeSIRE (Demonstration of Satellites enabling the Insertion of RPAS in Europe) demonstration project is a joint ESA (European Space Agency)- EDA (European Defense Agency)

Objective: demonstrating the safe insertion of Remotely Piloted Aircraft Systems (RPAS) in non-segregated airspace using satellite capabilities for RPAS command and control, ATC communications and Mission data transfer to ground, in order to satisfy the needs of potential user communities.

The demonstration will be carried out in Spain using a MALE RPA (Heron I) providing airborne maritime surveillance services to the Spanish Users involved in the project.



PROJECT OBJECTIVES

- Demonstrate to <u>end-users</u> the potential of satellite-based UAS services in order to foster their adoption for commercial and government / institutional applications.
- Demonstrate to <u>stakeholders</u> that UAS using satellites can be safely flown in non-segregated airspace, and provide inputs / support the regulatory initiatives.
- Demonstrate the benefits that satellites can offer in providing Safety Communications (C2, ATC and P/L), and promote the utilization of UAS-based solutions using satellites among the relevant end-user communities and stakeholders.



DeSIRE CONSORTIUM

Companies from 6 different EU countries (Spain, Germany, Netherlands, France, Italy and Luxemburg) with extensive and complementary expertise, capabilities and network contacts



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DEMO CONCEPT DeSIRE System Architecture

Data rate:

FWD (Ground to UAV):

Command and Control (C2): 7 kbps Payload (commands): 7 kbps ATC voice: 4.8 kbps

RTN: (UAV to Ground)

Command and Control (Telemetry, status): 7 kbps Payload (data) and ATC Voice: > 3 Mbps **Bable Contracts total in the both of the second se**



DEMO CONCEPT: The mission SIVE system: UAS for maritime borders surveillance



Spanish SIVE system (*Sistema Integrado de Vigilancia Exterior*) operation is under Guardia Civil responsibilities:

- Detect any boat or ship approaching to the coast;
- Identify the type of the ship in order to check possible emergency situations or illegal actions;
- To coordinate, in case of necessity, the surveillance of suspicious ships;
- To coordinate interception and/ or support operations for those ships requiring it



RPAS Elements list

Segment	Description		
	Remotely Piloted Station (RPS)		
Ground Segment	Operational Payload Analysis Centre (OPAC)		
	LOS Ground Data Terminal		
	BLOS Ground Data Terminal		
	SIVE		
	Ground Based Surveillance		
Space Segment	BLOS: Satellite Services in Ku-Band		
User Segment	Remotely Piloted Aircraft (RPA)		
	Airborne Data Terminal		
	LOS ADT		
	BLOS ADT		
	Payload		
	EO/IR camera		
	Maritime Patrol Radar		
	ATC relay		











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User Segment

Remotely Piloted Aircraft (RPA): Heron I





Performances Ce Ra Pe Ma Ta	Speed	Max. Level	231 kmh @ 20000 ft
		Loiter/Mission	130-148 kmh @ 20000 ft
		Stall	~75 kmh @ MSL
		Max. Rate of Climb	650 ft/min @ MSL
	Ceiling		Service: 26500 ft
			Max. Operating Altitud: 30000 ft
	LOS Mission Radius		200 km
	Range		>1000 km
	Persistence		12 h @ 1000 km from RPS
			~40 h with MOSP payload
	Max. Endu	rance	~16 h with MOSP+MMR
			Demonstrated max. 52h
	Take-off run distance		420 m (ISA @ sea level)
			620 m (ISA @ 3300 m)



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User Segment

Remotely Piloted Aircraft (RPA): Heron I

Airborne Data Terminal (ADT)



✓ Beyond Line of Sight ADT



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Demonstration Airport

Overall location of San Javier airport (Spain)





Operational Areas

Area 1 – Civil Controlled Area







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Airspace Classes

- Airspace class C. Day and night IFR (Instrument Fligh Rules) flights.
- "ZeroConflict" (FAA) airspace concept. Part of Flight will be performed in nonsegregated airspace (green zone) arounded by predefined secure zone (yellow zone) and very near to restringent area (red zone) where the RPA can entry whenever.





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Demo Description

- Permanent communication will be maintained with ATC through RPA via ATC voice relay.
- Availability of backup line (e.g dedicated telephone line, etc) to directly communicate ATC with GCS
- From takeoff phase, RPA will follow all instructions in a same way as any manned aircraft up to reach the operational segregate airspace zone.
- The contingency plan will be provided to ATCo for emergency case (e.g. communication fault)
- Coordination between civil and military ATCos for the transition between the military and civil controlled portions of airspace used.
- Handover between LOS and BLOS communication will be performed during the flights test without affecting the communications with ATC
- Use of satellite transponder during overall mission



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Demo Description

- Four demonstration flights (of 6 hours each) to be carried out from 22nd to 25th of April 2013
- Several tests will be conducted in segregated airspace, however some of them will be performed in non-segregated airspace in order to demonstrate the feasibility of the RPA in controlled airspace.
- Demonstration of maritime surveillance missions during day and night
- 1 flight to take place in Class C temporarily controlled



PROJECT OUTCOMES

DeSIRE Expected Main Benefits

- One of the major hurdles the RPAS community has to face for integrating RPAS into non-segregated airspace is to ensure sufficient availability, continuity and integrity and appropriate latency for the C2/ATC data link(s) under all circumstances.
- To ensure that this objective will be achieved, EASA (European Aviation Safety Agency) and EUROCONTROL are involved in the project and provide guidance.
- From the user perspective:
 - Understand, implement and validate user CONOPS for this specific case
 - Collect the feedback from the users (Spanish Guardia Civil) related to the quality of the maritime surveillance service/data provided wrt their needs

DeSIRE will be a key demonstration, providing a common understanding and a harmonised approach to operational concepts, to users, regulators and other stakeholders on how satellite data links can support RPAS insertion in non-segregated space.



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PROJECT OUTCOMES DeSIRE Space Added Value

- Satellite communication systems can provide a significant added value to RPAS missions and will be a key technology for their future operation within non-segregated airspace. The capability of offering global, broadband and safe communications for BLOS operations (both for payload and safety communications) must be highlighted among all satellite services of interest for RPAS.
- Satellite navigation also plays an important role for UAS. With satellite navigation the UAS can be navigated without using ground based navigation systems as reference. Payload data can also be precisely geo-referenced.







More info at: http://iap.esa.int/projects/security/DeSIRE

Thank you !

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