CONTRIBUTING STAKEHOLDERS

MidCas Consortium

By Gérard Mardiné, Co-Chairman

The MIDCAS project was launched in September 2009 following contract signature at the last Paris Air Show in June 2009. Its mission is to demonstrate the baseline of solutions for one of the key challenges which needs to be addressed and solved to open the way to future routine Unmanned Aircraft Systems (UAS) operations into non segregated airspace, namely the avoidance of mid-air collisions with other aircraft.

Background

Military forces are using more and more UAS for a wide range of missions. In parallel, there is an increasing interest for governmental UAS applications like homeland security and civil security missions.
But military home training and ferry flights and other governmental UAS applications are very limited in the context of the densely used European airspace without featuring the capability of flying UAS in non segregated airspace.
It is why the Ministries of Defence of several European countries initiated in 2007 building a project aiming at developing a solution for a UAS MID-air Collision Avoidance System (MIDCAS) to start addressing UAS flight operations aspects in complement to the airworthiness / certification aspects (addressed in STANAG 4671 / USAR) and UAS pilots training aspects (addressed in STANAG 4670).
The European frame was considered the most pertinent one to build such a project as many regulatory and operational issues relative to airspace are similar in Europe. The European Defence Agency (EDA) was asked to coordinate the preparation of the project, including a call for participation to all EDA participating Member States. Five nations (France, Germany, Italy, Spain and Sweden) decided to participate in and to fund MIDCAS on a roughly equal basis, Sweden acting as the project lead nation.

MIDCAS Project Organization

EDA is the contracting authority for the 50 millions Euros and 4 years duration MIDCAS project on behalf of the five contributing nations MoDs which ensure supervision of the project.
The industry team is composed of 13 partners: Saab (Project Leader) from Sweden, Sagem and Thales from France, Diehl BGT Defence, DLR, EADS and ESG from Germany, Alenia, Selex Galileo, Selex Communications, Selex Sistemi integrati and CIRA from Italy and Indra from Spain. Several team members participated in previous subject matter related studies and the consortium gathers all the necessary experience and skills to address the MIDCAS challenges.

Project Scope

The MIDCAS project has been defined with due consideration for the views of the main European stakeholders, especially EUROCONTROL, EASA and EUROCAE Working Group 73: particularly, the consensus on a stepwise approach consisting in dealing first with achievable and affordable UAS flight scenarios and later on with more complex scenarios. It is why MIDCAS addresses the 2 first steps of UAS integration.
- First step covers UAS flying according to IFR flight rules, during the en route phase of flight, UAS being a controlled flight with ATC separation (corresponding to ICAO airspace classes A, B and C).
- Second step covers the extension of first step to giving the UAS a self separation capability allowing UAS IFR flights in ICAO airspace classes D, E and F.
This means that, for these 2 initial steps, aerodrome operations, initial climb and final approach have to remain segregated. MIDCAS considers the present Air Traffic Management (ATM) organization but also includes provisions for compatibility with the future next generation Single European Sky ATM (SESAR) through the use of ADS-B equipment. Covering the requirements for these 2 steps will lead to significant additional UAS flights capabilities compared to segregated operations.
The MIDCAS system, even if not specifically designed for aerodrome operations, could also later be assessed against some aerodrome operational scenarios to help progress towards the next steps of integration.

Project Objectives

MIDCAS aims at demonstrating a solution, called the Generic Sense & Avoid (S&A) Function, which, when incorporated into a UAS, will give it both mid-air collision avoidance and self separation capabilities against cooperative and non-cooperative aircraft.
The engineering process aims at validating the functional and safety required performances of the proposed solution, while ensuring interoperability. It is why MIDCAS basically considers a wide range of candidate sensors (cooperative and non cooperative, active and passive) to be able to demonstrate compliance with the derived intruder detection requirements.
The performances of the Generic S&A function will be demonstrated using simulations consolidated by MIDCAS S&A Demonstrator flight test results.
The design and development in MIDCAS will be performed using a spiral approach with some increments of the functionality. The simulation and demonstration will be used in the different phases of the MIDCAS project to help in the design and validate the developments.
The generic S&A function activities outputs will be used to support the standardization process and their result will form the basis for a MIDCAS future product.
The other major objective of the MIDCAS project is to demonstrate the S&A capability on a UAS. A demonstrator is being developed and will be used to perform tests in the real environment, first (in 2012) in a manned test bed aircraft (CASA C 212) and later on (in 2013) in a host UAS (ALENIA Sky Y).

Sky Y - Alenia Aeronautica, Itay

Support to standardization and stakeholder information

The proposed solution must be acceptable by the aviation community and be compatible with non segregated UAS operations by 2015. Especially safety, interoperability and performance aspects have to be carefully analysed and discussed to ensure seamless integration. It is why the MIDCAS project includes a significant effort to support the relevant standardization activities (EUROCAE WG 73) by providing relevant technical inputs and to inform and get feedback from all interested stakeholders as the development of pertinent and acceptable solutions can only progress in parallel with widely agreed principles, requirements and standards.
MIDCAS project will produce many deliverable documents with free access for the aviation community. Amongst the first of them is the UAS mid-air collision avoidance CONOPS which is obviously a key input for the development of associated technical solutions. A website is being developed to ensure proper dissemination of these documents.

Six dedicated workshops aim at informing and getting feedback from the major aviation stakeholders about MIDCAS project progress and related technical results.
The agenda items addressed during the stakeholders workshops reflect the project progress
WS 1 (EUROCONTROL Brussels 16 February 2010):
General presentation of the project: objectives, methodology and time schedule
WS 2 (EUROCONTROL Brussels, 5 October 2010):
Midair collision avoidance CONOPS and MIDCAS system operational capabilities
WS 3: Safety methodology and simulation capabilities
WS 4: MIDCAS system integration and interface features with the UAS system including functional and HMI aspects
WS 5: Presentation of the overall results of safety and performance studies based on simulations results
WS 6: Presentation of UAS flight tests results and conclusions of the project

Conclusions

MIDCAS project is a structuring European effort to design and validate a S&A solution for UAS with due consideration of safety, performance and interoperability requirements and a significant support to standardization.
The goal is clearly to progress from notional concepts to proven solutions. But this requires that pertinent safety objectives, a key input for the definition of the UAS midair collision avoidance function, are defined. This issue must be addressed in the very short term by the relevant regulatory bodies and aviation authorities.

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