UAV In Civil Airspace - Outcast or Friend

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Abstract: One of the most prominent aspects of the changing world environment in aeronautics is the rapidly progressing introduction of UAVs. Various countries aim to introduce UAV systems in civil airspace in the timeframe 2010-2012. Therefore a demonstration of safe operation is required: maintaining separation and avoidance of collisions with other traffic during UAV operations. “Sense and avoid” or “detect and avoid” are hot topics for unmanned vehicles because this is the primary responsibility of any pilot according to the ICAO rules, and a key aspect that currently restricts UAV operations outside segregated airspace. For UAVs, where the ‘pilot’ is operating remotely and lacks visual clues, a solution needs to be found with at least an equivalent level of safety.

The challenge to find a feasible solution in the 2010 timeframe was addressed in the Netherlands with the National Technology Project OUTCAST1. OUTCAST investigates a concept based on existing technology like ACAS in combination with the EO/IR camera that will be available on most types of UAV. The viability of the concept depends on the ICAO mandate for carriage of Mode S transponders on all IFR and VFR flights after 31 March 2008. The investigation had to be performed by flight testing a demonstration system, installed on a ‘manned’ aircraft, in a representative air traffic environment.

The project started in April 2004 and now progressed into the fourth phase: Data Analysis & Reporting. The NLR Citation II laboratory aircraft was equipped with all the required sensors, including the Toplite II EO/IR payload (EOP) from Rafael (Israel) installed in the nose of the aircraft. The functionality of a UAV crew “ground” control station was emulated in the aircraft by installing two working positions, one for the UAV pilot and a second one for the Payload Operator. This set up together with the facilities for the communication with the pilots in the cockpit and the servers for the different application programs formed the Demonstrator Hardware Architecture. Finally a data acquisition system for recording of all the test parameters and signals was added. Also aircraft from the RNLAF were equipped with a position reporting system because in most flight test scenarios ‘intruder’ aircraft need to be introduced.

The paper describes the hardware required for the flight tests, the path to certification of the installation of the EOP, an example of the one-to-one scenarios for the flight tests and the first results of the initial flights with the system.