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ASSTAR

Advanced Safe Separation Technologies and Algorithms

Specific Targeted Research Project

Sixth Framework Programme, Priority 1.4, Aeronautics and Space

D0.9/3 Period 3 Executive Summary

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Period 3 Executive Summary

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Executive Summary

Background

Air transport throughout the world and particularly in Europe is characterised by major capacity, efficiency and environmental challenges to improve performance. It is time for the 'paradigm change' called for in the Vision 2020 report on Air transport. ASSTAR brought together a powerful team of European ATM researchers, industry and, in particular, airlines and air navigation service providers in order to address this critical issue. The ASSTAR programme researched and validated two specific application areas that have strong potential for near term (2010-2012) operational and environmental improvements. These were:

- The delegation of separation responsibility from a single aircraft during the execution of a conflict resolution manoeuvres in radar controlled airspace (ASAS crossing and passing) in order to reduce controller workload and improve flight efficiency.
- The use of ADS-B to support separation and self-separation operations in non-radar airspace. This will enable more optimal routing including enhanced use of wind corridors and passing and level changes that are currently severely restricted due to the procedural separation standards.

The typical phases of flight and airspace types associated with the different types of clearance are shown in Figure 1.

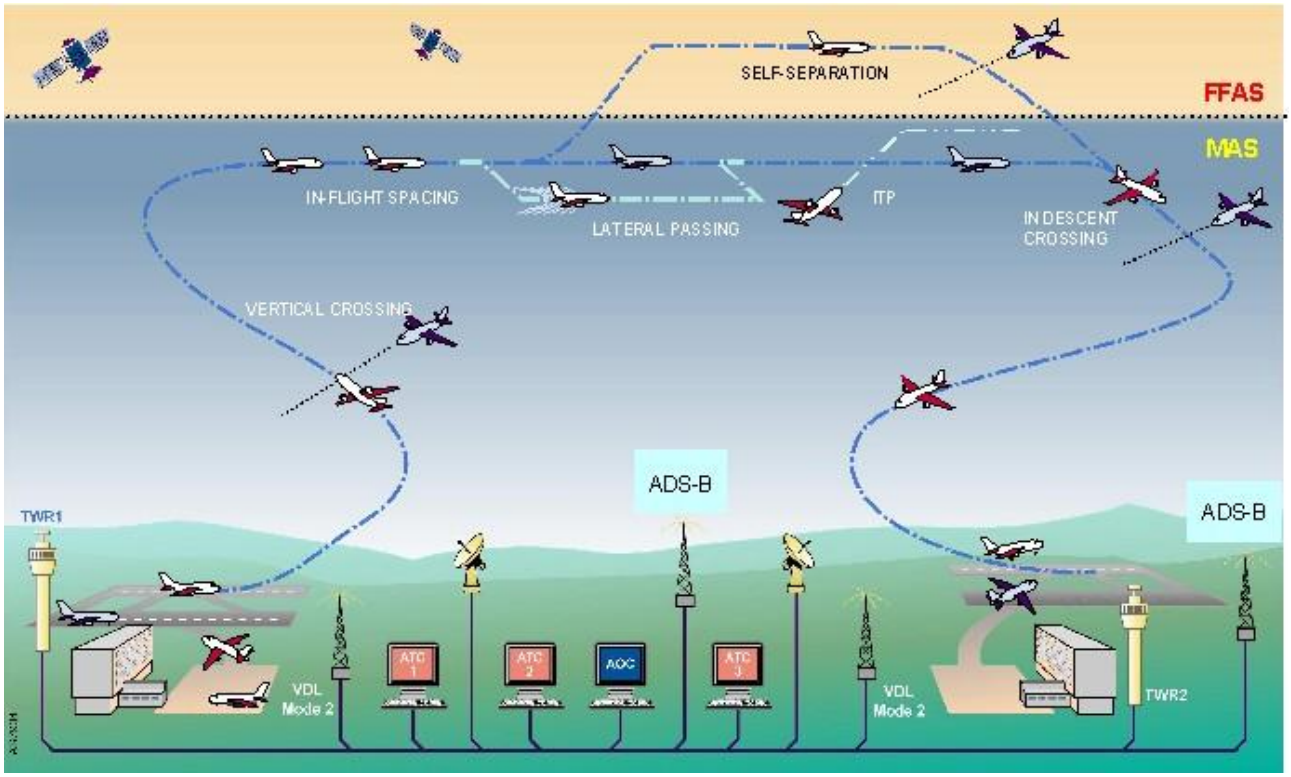

Figure 1: Flight Phases with typical Crossing and Passing Opportunities

Project Objectives

- Establish a number of well-defined ASAS Package 2/3 applications.
- Reach a common endorsement between the airlines and ANSPs of the proposed applications.

- Organise regular user workshops to ensure the involvement of key users at the detailed level.
- Organise public user forums to achieve wider dissemination and elicit responses from a broad representation of the Air Transport community.

ASSTAR consortium partners

Company/Organisation	Short Name	Company/Organisation	Short Name
Direction des Services de la Navigation Aérienne	DSNA	BAE Systems	BAE Systems
National Aerospace Laboratory	NLR	Sistemi Innovativi per il Controllo del Traffico Aereo	SICTA
THALES AVIONICS	THAV	EUROCONTROL	EEC
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University of Zilina	ZU	Technological Educational Institute of Piraeus	TEI-P
EGIS AVIA (Sofréavia)	SOF	National Air Traffic Services	NATS

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Description of Work

The ASSTAR programme was separated in eight work packages as illustrated in Figure 2.

The ASSTAR programme began with the identification of crossing or passing scenarios with potential benefit to end-users. These scenarios have been used to direct project activity in two different types of airspace, radar and non-radar. The specific focus for the non-radar airspace is the North Atlantic Oceanic Track System. More detailed descriptions of the scenarios and associated applications were developed to support fast-time and real-time simulations of the proposed procedures. Feedback from the simulations was used to refine the procedures and enable change proposals to ICAO documentation to be developed. In parallel with the simulation activities, a separate work package performed a safety assessment to determine key implementation requirements. This enabled to assess the impact of the new procedures on both ground infrastructure and airborne equipment.

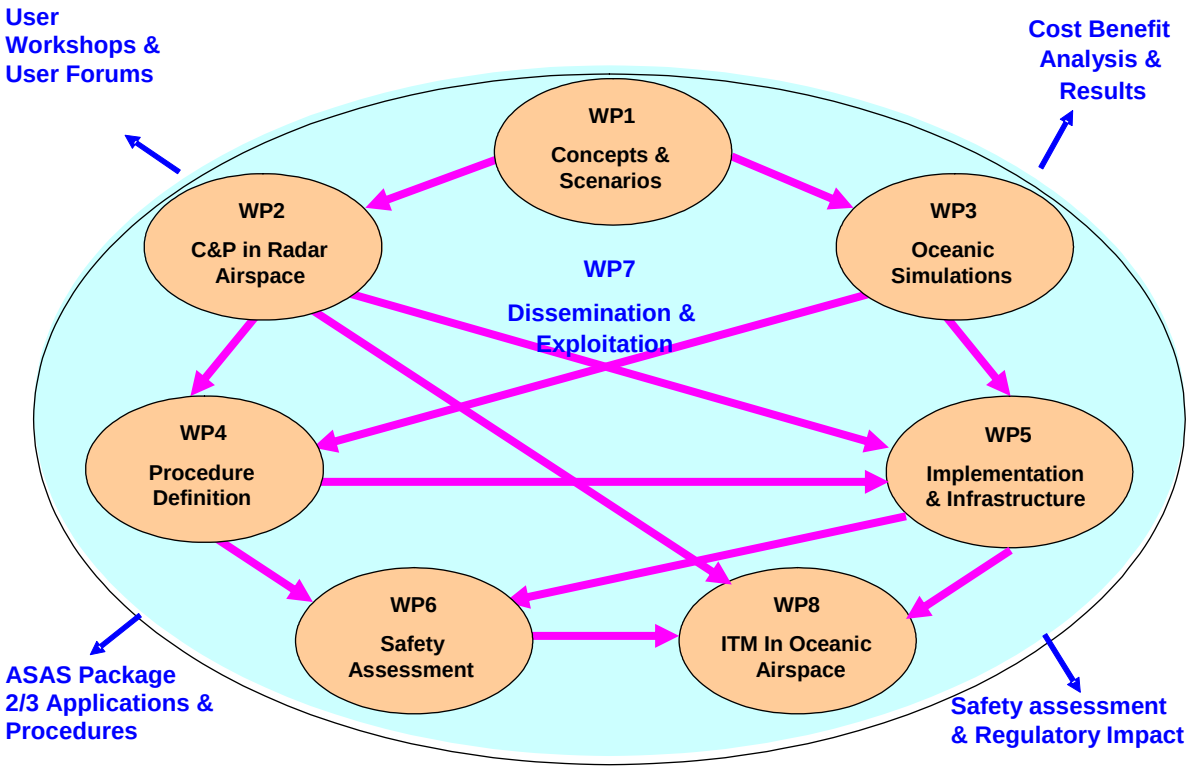

Figure 2: Relationship between work packages

Expected Results

The expected results from ASSTAR were in-depth understanding of selected crossing and passing applications and input to proposed standards for global implementation for these applications. The proposed standards would include:

- Operational Procedures
- Operational performance requirements
- Safety requirements
- Interoperability requirements

Work Performed since T0

During the first reporting period, the consortium has identified a set of crossing and passing scenarios, with the assistance of end-users, which may provide benefits to the end-users. More detailed definitions of these scenarios and the associated applications were developed to enable the planning for real-time and fast-time simulations to be started.

A safety policy and plan has been defined for analysis of the proposed procedures in the next reporting period.

An initial assessment of the functional requirements for the procedures has been performed to support the more detailed analysis of the expected impact of implementation on airborne and ground equipment.

During the second reporting period, the consortium progressed the technical work with preparation and execution of fast time simulations and the operational work for real time simulations based on an operational procedure consolidating the various operational scenarios developed in period #1.

The ASSTAR website was available to public and private access since March 06 and figure 3 shows the home page of http://www.asstar.org

Figure 3: ASSTAR website home page

The number of visits increased regularly since the beginning and the cumulated number of visits went from one thousand in 2006 to fifteen hundreds in 2007 mostly from Europe.

During the third and final reporting period, the consortium completed the technical work on the various ASAS applications, including some preliminary assessment of a new oceanic application, ASEP-ITM for which a specific work package, i.e. WP8, was created in 2007. It is pointed out that all deliverables listed in the description of work were produced by the consortium, in particular:

- the validation report for the ASEP-LCP application,
- the report of the real time simulations for ASEP-ITF and SSEP-FFT,
- the draft procedure for inclusion in the PANS-ATM and in the PANS-OPS,
- the cost-benefits analysis from a user perspective, and
- the safety assessment of all the applications under study.

Although the project was launched well before the SESAR programme, it was possible to address some objectives and issues related to the SESAR concept of operations in the ASSTAR final report.

In particular, the final report of the ASSTAR project highlighted the following factors:

- When compared to SESAR objectives for the new separation modes, ASSTAR simulation results support the dual aspects of providing reduction of controller workload and potentially offering capacity gains.
- Cooperative separation must be compatible with current ATM practices and ASSTAR propositions for new procedures in current ATM are suitable for inclusion in ICAO PANS-ATM and ICAO PANS-OPS.
- ASSTAR evaluated benefits from a user perspective.
- The transfer of responsibility raises safety concerns and ASSTAR proposed airborne functional architecture with high safety requirements.

The following table provides an overview of the main preliminary findings expressed with +/- values compared to current operations for the different fields in which potential benefits of ASAS applications have been assessed.

Application	ATCO workload	ATM efficiency	Flight Crew workload	Aircraft efficiency
ASEP-Crossing & Passing	-	=	TBD	+
ASEP-In Trail Procedure	=	=	TBD	++
ASEP-In Trail Follow	=	+	+	++
ASEP-In Trail Merge	+	++	TBD	+
SSEP-“Free Flight” Track	–	+	+	++

For ASEP-Crossing & Passing, the main focus of operational benefits resides in the ATCO workload reduction while the aircraft can fly a more efficient route even in a conflict resolution path. Without real-time simulations, it is not possible to precisely assess the effect on flight crew workload.

For ASEP-In Trail Procedure, the main operational benefits are related to aircraft efficiency, while no impact is readily apparent for ATM.

For ASEP-In Trail Follow, in addition to aircraft efficiency, some benefits to ATM efficiency are due to enhanced usage of available flight levels as well as improved traffic flow management.

For ASEP-In Trail Merge, the ATM and the aircraft efficiency are increased compensating the probable increase in ATCO workload.

For SSEP-“Free Flight” Track, the benefits brought by the addition of one Self-Separation-Track affect both the ATM and the aircraft efficiency, while reducing the ATCO workload. The slight increase in flight crew workload is based on the results of real time simulations.

A series of issues requiring R&D work were identified:

- Airborne separation minima must be established and compatibility with ground separation minima evaluated.
- Combination of ASEP applications should be evaluated to increase operational benefits

The ASSTAR project was completed on 30 November 2007.

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