**BETA**

**Operational Benefit Evaluation by Testing an A-SMGCS**

**Funding:** European (5th RTD Framework Programme)

**Duration:** Jan 2000 - Dec 2002

**Status:** Complete with results

CORDIS RCN : 52039

**Background & policy context:**

Advanced Surface Movement Guidance and Control systems (A-SMGCS) are developed and deployed to cope with airport safety, capacity and efficiency demands. A-SMGCS need to be prototyped in real environments and require the enhancement of procedures for safe and efficient control of aircraft. BETA is a European Commission Fifth Framework project.

The operational Benefit Evaluation by Testing an A-SMGCS (BETA) on real airports is the main objective. The European Commission Directorate for Transport and Energy (DG-TREN) has contracted the BETA consortium to make use of earlier* A-SMGCS results and to measure the operational benefits of an A-SMGCS installed at two major airports: Hamburg and Prague.

On the international level, ICAO and EUROCAE WG41 need validated performance specifications for future A-SMGCS. Earlier, results have been provided in October 2001 to AOPG/PT2 for completion of the European A-SMGCS Manual due by the end of December 2001.

**Objectives:**

The objectives of BETA are:

- showing operational benefits to users at significant airports
- showing A-SMGCS related environmental benefits
- providing A-SMGCS performance data for the ICAO-A-SMGCS Manual while
- identifying airport constraints
- developing an A-SMGCS Operation
- concept for these constraints

**Methodology:**

One of the areas identified as needing to be enhanced by better organisation, tools and adequate operational procedures is the airport. Regarding the air side the solution is known under the international accepted term Advanced Surface Movement Guidance and Control System (A-SMGCS) to be regarded as the link system between landing and take-off.

The A-SMGCS concept is based on a highly integrated modular open system built around existing tower and airport equipment enhanced by new technologies. Improved information exchange in order to provide reliable and consistent data as well as decision support tools (planning support systems, etc.) are part of the concept. Although the human (controller, pilot) is kept in the loop as the decision maker, it is expected that in order to gain the highest benefit from the system there will be changes in the human's role. These changes will require careful evaluation to provide a safe, efficient and smooth transition.

The A-SMGCS architecture, the availability of the technology, the demonstration of the feasibility and the principal potential of benefits for the user groups has been worked out during recent years (e.g. several tasks in the 4th Framework Programme) or have been covered by other current projects. Building upon that work BETA is contributing to the development by showing operational benefits for users in a real operational airport environment. In the context of this project airlines, airports and ATC providers are members of the consortium representing the user groups due to the fact that the primary
benefit of the A-SMGCS implementation will appear there and the indirect beneficial effects (e.g. reduced ticket costs, no missed connecting flight) are transferred to the European citizens through them.

**Parent Programmes:**
*FP5-GROWTH KA2 - Sustainable Mobility and Intermodality*

**Institute type:** Public institution  
**Institute name:** European Commission, Directorate-General for Energy and Transport (DG TREN)  
**Funding type:** Public (EU)

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Flughafen Hamburg GmbH
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Stichting Centrum Voor De Ontwikkeling Van Transport En Logistiek In Europa
Key Results:
The results are expected to support the work of various aeronautical standardisation and harmonisation bodies (AOPG/PT2, EUROCAE WG-41, etc.).

Surveillance
- Non co-operative objects (SMR, NRN, ARMI)
- Co-operative objects
  (SSR, Mode-S Multi Lateration, DGPS-Link)
- Data correlation and fusion
- Display and labelling

Monitoring and Control
- Runway occupancy and incursion alerting
- Restricted area intrusion alerting
- Stop bar crossing alert

Route deviation alert (Phase 2)

Routing and Planning
- Flight plan handling and presentation
- Electronic flight strip data processing
- Handover and Clearance Management
- Departure Management
- Plan Monitoring

Taxi Route Planning (Phase 2)

Controller HMI
- Traffic situation display
- Electronic flight strips
- Support to Runway, Ground, Start-up and

Delivery Controller
- Zoom, pan, inset window
- Departure planning display

Route advisory display (Phase 2)

Guidance
- Using stop bar control
- On board guidance for equipped aircraft
- Clearance delivery for equipped aircraft
Technical Implications

The work is split into three main lines which are followed in parallel:

- Proof of principles
- Equipment development (e.g. HMI extension for the planning system), adaptation and integration
- Infrastructure preparation

In order to cope with the complex task at hand, an incremental system and implementation concept is planned. The project execution is based on a spiral model so that the main lines are executed twice. So that at least two test periods at three test sites are executed.

From the conception work and the test validation work, results on different levels are expected as follows:

- An operational concept to gain efficiency and safety from the A-SMGCS implementation based on new and modified procedures;
- clear indication for the environmental impact reduction through A-SMGCS implementation;
- the A-SMGCS architectures for three airport installations;
- a general test concept and site specific test plans for analysing operational benefits;
- test results of field tests performed at the different test airports with respect to subsystems/systems specifications, operational parameters, quantitative benefits;
- a summary report with recommendations regarding future A-SMGCS implementations on procedures, standardisation issues, implementation strategies, product performances;
- prototype installations of different A-SMGCS levels at three airports (Prague, Hamburg and Braunschweig) with data exchange between the users;
- A-SMGCS experience for controllers and pilots;
- proven A-SMGCS modules from industry and research organisations;
- improved harmonisation of the airport traffic management, at least at the test airports.

So, the output of this project will support the direct implementation process of A-SMGCS, a clear view on the necessary further work, the standardisation process, the user acceptance process and the world market preparation for European companies.

The BETA work performed so far resulted in several lessons learned for the A-SMGCS development. An extension to the current view of the A-SMGCS concept which mainly reflects the following four key functions:

- Surveillance
- Guidance
- Planning
- Control

required. Another key function has to be added to this list:

- Information Management

Policy implications

A uniform information basis is the fundamental principle for data exchange between the different A-SMGCS systems and responsible for airport traffic management in the future. Today every controller’s working position (CWP) has only a minimum of information to control the aircraft within his/her part of responsibility. Very often this is generated several times in a sub-optimal way (e.g. reading data from a system and re-typing the data into another system). Additional information can be requested by telephone or additional computers for example. The complete A-SMGCS system has to ensure the availability of all information which can be selected at the CWP due to its part of controlling because real planning, guidance and control depends on a complete and consistent set of data of all flights from departure to arrival. This was clearly shown during the first tests of BETA.

BETA testing is dedicated to consider the technical system aspects as well as the use of the new technology. To gain performance data in terms of technical specification and in terms of adequate procedures the tests are structured in two main parts: the functional tests and the operational tests. The functional tests are the basis for analysing the technical characteristics of the system parts and the installation conditions. The operational tests will show the benefit for the users by using the BETA system as a (partly prototype) implementation of a complete A-SMGCS in a real operational environment.
**STRIA Roadmaps:** Other specified

**Transport mode:** Air transport

**Transport sectors:** Passenger transport, Freight transport
   Societal/Economic issues,

**Transport policies:** Decarbonisation

**Geo-spatial type:** Infrastructure Node