The German Aerospace Center (DLR) launched the project TARMAC (Taxi and Ramp Management and Control) as contribution to the A-SMGCS (Advanced Surface Movement Guidance and Control System) development in November 1997. The project will last to the end of 2001.

The following DLR institutions are cooperating in this project:

- Institute of Flight Guidance,
- Institute of Radio Frequency Techniques,
- Institute of Communications Technology,
- Computer Department.

Representatives from airports, airlines and the German ATC authority have been monitoring the work from the very beginning in order to ensure solutions meeting user needs instead of technology driven designs. To allow a fast transition from solutions to operational products, the project is accompanied by a quality assurance team.

Objectives

The main objectives of the TARMAC project are:

- to develop new solutions, system components and procedures for an integrated A-SMGCS,
- to verify the A-SMGCS concept as an efficiency and safety improvement approach,
- to deliver validated parameters for the standardisation bodies (e.g. ICAO, EUROCONTROL),
- to show user needs driven technical solutions,
- to develop, test and optimise key elements of an A-SMGCS (also for industrial products),
- to verify economic configurations for all categories of airports.

Furthermore, TARMAC demonstration and test environment allows in the final project phase:

- cost benefit analysis and development of optimised operational procedures for A-SMGCS.
Background of DLR

DLR started its A-SMGCS work in the late eighties. The DLR approach has always been a top-down approach, starting with the user’s operational requirements and ending at a technical concept for a modular integrated A-SMGCS. The concept has been introduced into discussion with industry, national and international aeronautical bodies. The actual level of standardisation is still highly compatible with the DLR draft of 1989. In parallel to the conceptual work, subsystems have been developed and demonstrated. Currently DLR is participating in the European DEFAMM project.

TARMAC-PL (Planning and Controller Machine Interface)

In this work package planning systems are developed that assist tower as well as some new developments made by industry, national and international aeronautical bodies. The actual level of standardisation is still highly compatible with the DLR draft of 1989. In parallel to the conceptual work, subsystems have been developed and demonstrated. Currently DLR is participating in the European DEFAMM project.

TARMAC-CNS (Communication, Navigation, Surveillance)

This work package provides an integrated multi sensor and communication system for continuous automatic determination of the traffic situation at the airport. This means tracking and identification of all objects within the approach area, runways, taxiways and aprons as well as high level description of the operational state of the objects and conflict assessment. This system can act as a situation server for a large variety of client applications within the airport.

The core is an intelligent data fusion system, that combines and enhances significantly the information coming from the sensors. The multi sensor set is highly modular. A large variety of sensor types can be integrated. No specific “basic” sensor is required. The sensor selection depends on the customer’s requirements. Different levels of functionality and redundancy are supported. Consultancy on sensor selection can be provided by DLR. This modular system approach also allows modifications of the sensor set after its implementation at an airport.

To demonstrate the system capabilities and the outstanding modularity in the TARMAC experiments some existing sensors are integrated as well as some new developments made by DLR and industry.

Conventional sensors are:

- The DGPS (Differential Global Positioning System) gives very accurate information on the position, speed and identity of those traffic objects equipped with a DGPS and an automatic data link. In the demonstrator the Swedish GP&C system is used transmitting the object data by a STDMA data link.
- The VHF direction finder is available at all airports. It delivers positional information on the traffic objects. A future option is automatic object identification based on speech recognition.
- The SSR Mode S multilateration system is a system that uses the existing SSR Mode S transponder on board equipped aircraft. The position is determined using multilateration techniques.
- The FOS (Fibre Optic Sensor) is a new sensor technology. It works without any electrical components, therefore it is immune to electrical interference and not effected by e.g. lightning. It is available in different configurations. The FOS can be used as replacement for induction loops or as an optical microphone with object classification capability.
- The NRN (Near Range Radar Network) is a distributed non-cooperative radar system with extremely low RF power emission (6 W, 9GHz, sector antenna). It overcomes shadowing problems of conventional central radars. It detects all objects in its coverage area with an accuracy of 3m. The NRN features automatic target extraction.
- The ARMI (Aircraft Registration Mark Identification) is a TV camera based automatic target extraction.
- The D-AVS (Dellnon-illuminating Vehicle Sensor) is a sensor that works on data from existing, future and any existing or any future system.

Main features are:

- The VHF direction finder is available at all airports. It delivers positional information on the traffic objects. A future option is automatic object identification based on speech recognition.
- The SSR Mode S multilateration system is a system that uses the existing SSR Mode S transponder on board equipped aircraft. The position is determined using multilateration techniques.
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