PROJECT

OPAL

Optimisation Platform for Airports, including Land-side

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

**Duration:** May 2000 - Oct 2002

**Status:** Complete with results

Background & policy context:

The ever-increasing growth in demand showed the vulnerability of the entire air transport infrastructure: airports are becoming the prime and foremost choking points within the system. Growth in air-traffic demand is not expected to slow down. Despite a recent dip due to the incidents on September 11, 2001, air traffic demand is foreseen to increase by about 4% per year for the next 15 years. To cope with this growth, airport capacity must increase. However, this will put severe pressure on maintaining current safety and noise levels. Society also forces airports to increase safety and to reduce the burden of their operations on the environment.

To increase airport capacity while maintaining current safety levels and reducing the burden on the environment, airports may change their infrastructure through the construction of new runways and terminals, and/or they may change airport processes. Such changes are likely to have a huge impact on the overall airport process (i.e., on both the airport airside and the airport landside). To study these impacts and to preclude the start of unnecessary (and sometimes irreversible) changes and a waste of resources, major airport stakeholders (e.g., airlines, air traffic service providers, and airport operators) put forward a need for some sort of tool to evaluate the overall airport process at workshops on airport capacity problems held at the European Commission (EC) in 1998.

Major airport stakeholders experienced a lack of insight in the integrated set of airport processes and the individual process interdependencies. For instance, to increase capacity one might think of increasing runway capacity by new air traffic control measures. Traditionally, only dedicated airside models were used to evaluate the effects of those measures on the airside capacity, however, the subsequent increased passenger flows within the terminal or consequences on security measures could not simultaneously be studied. Landside models, if existent, had no link whatsoever with the airside models at hand. This precluded a study of the entire airport process, and thus precluded an optimisation of the entire airport efficiency taking into account safety and noise levels.

The European Commission (Directorate General for Transport and Energy) recognised the need for a platform that will allow airport stakeholders to evaluate.

Objectives:

The objective of the OPAL project was to provide a generic concept for the development of a decision support facility for total airport performance analysis, and to build a first version of such a facility: the OPAL platform. To achieve these objectives, the technical activities were subdivided into five work packages (WPs), each with its own (more specific) objectives:

- **Operational concept for OPAL** - The objective of this was to provide user requirements and an operational concept for OPAL, and to define scenarios for the evaluation phase.

- **Design of OPAL** - The objective of this was to provide a specification and architecture of the OPAL platform, a design of its components (viz., model base, database, scenario manager, optimisation and diagnosis tool, and human-machine interface) and the design of simulator/tool enhancements, all based on the user requirements and operational concept from before.
Building of OPAL - The objective of this was to build the OPAL platform according to the design from before, to integrate the platform’s components, and to test this platform from a functional viewpoint.

Validation and calibration of OPAL - The objective of this was to validate and to calibrate the OPAL platform as built in before.

Evaluation of OPAL - The objective of this was to evaluate the OPAL platform, both from a user-acceptance viewpoint and a socio-economic impact viewpoint.

Methodology:

WP1: Operational concept for OPAL

• Task 1.1: Description of total airports

The purpose this task was to provide a description of total airports in terms of processes and actors of passenger, baggage, freight and aircraft flows. The landside part of a total airport was considered to be the airport terminal(s). The airside of a total airport was considered to be the airfield and terminal manoeuvring area (TMA). As a result, the boundaries of a total airport were formed by the check-in/check-out at the landside and the TMA entry/exit at the airside.

• Task 1.2: Inventory of performance models for airports

The objective of this task was to provide a review of the state-of-the-art and state-of-practice of analytical and simulation tools addressing the airport airside or landside. The review considered tools addressing capacity, delay, safety, security, efficiency, cost effectiveness, and environment. The goal was to identify the areas of applicability of each category of tools as well as potential gaps and overlaps arising between these, and to address issues such as data needs, modelling accuracy, speed, and user friendliness of each model/tool.

• Task 1.3: Definition of operational concept

The objective of this task was to provide a definition of an operational concept. This definition was provided in terms of a system overview and user requirements. The system overview and user requirements were based on outcomes of interviews with several foreseen users of the OPAL platform.

• Task 1.4: Definition of test scenarios

The objective this task was to define scenarios for evaluating tool combinations through the OPAL platform for one or more of the airports considered (viz., Amsterdam-Schiphol, Athens-Spata, Frankfurt, Madrid-Barajas, Palma de Mallorca, and Toulouse-Blagnac) and to propose tools for the scenarios. The scenario descriptions gave an exemplary view on the use of the OPAL platform. The definitions of scenarios for an airport were performed by the partners who will perform the validation, calibration, or evaluation of this airport in WP4 and WP5.

WP2: Design of OPAL

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)

Partners:
Organisation: National Aerospace Laboratory (NLR)
Contact country: Netherlands

Key Results:

Complying with the objectives of the OPAL project, the two main results are:

1. A concept for an integrated computational platform for total airport performance analysis;

2. A first version of a computational platform for total airport performance analysis (called the OPAL platform) according to this concept, which was demonstrated for 6 major European airports: Amsterdam-Schiphol, Athens-Spata, Frankfurt, Madrid-Barajas, Palma de Mallorca and Toulouse-Blagnac.

The concept for the computational platform is characterised by the following technical specifications:

- The platform connects a variety of existing airport modelling tools in a distributed and heterogeneous computer environment; (the OPAL platform connects the tools CBM, INM, MACAD, MACS, Pax/Bax, PowerSim, SIMMOD, SLAM, TAAM, TOPAZ-TAXIR, TRIPAC, and Witness-MODA);
- The platform uses a dedicated database for data exchange between tools (i.e., output data of one
tool that is used as input data of another tool is stored in a dedicated database by the former tool; the latter tool retrieves these data from this database;

- The platform supports secured communications;
- The platform is expandable by new / other tools than those used in the OPAL platform (the OPAL platform has demonstrated this through the integration of EUROCONTROL's CAMACA tool).

The implementation of the OPAL platform indicated:

- All applicable tool combinations have been successfully integrated and connected in the OPAL platform;

  The proper functioning of the particular tool combinations has been documented and the estimated results provided reasonable valid evidence (average or above average performance in most socio-economic indicators) for all airports and the specified scenario configurations. All applicable tool combinations examined have proved to properly function through the OPAL platform and accurately reflect reality in terms of their output / results, albeit by accepting some irreducible minimum of deviations from reality that are attributed to the inherent complexity in fully reflecting the actual airport operations and airport / scenario configurations.

As a result, the OPAL platform will be able to run scenarios pertaining capacity and delays by total airport operations, and to integrate these results with tools for assessing safety, environment and cost-benefit. Herewith, the platform will be able to support airport strategic and operational planning decisions that will guide future airport enhancements and developments and boosting the efficiency of total airport

**Technical Implications**

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**Policy implications**

See key results
Related Projects:
THENA - THEmatic Network on Airport activities

ONESKY - One Non-National European Sky

BETA - Operational Benefit Evaluation by Testing an A-SMGCS

V-PLANET - The Virtual PLANET

THEATRE - THEmatic network on Air TRansport for ATM validation activitiEs

BETA - Operational Benefit Evaluation by Testing an A-SMGCS

ASTER - AVIATION SAFETY TARGETS FOR EFFECTIVE REGULATION

GATE TO GATE - Validation of a European ATM Gate to Gate Operational Concept for 2005-2010

Documents:
- Opal Final Report.pdf (Final report)

STRIA Roadmaps: Network and traffic management systems
Transport mode: Air transport
Transport sectors: Passenger transport, Freight transport
Geo-spatial type: Infrastructure Node