

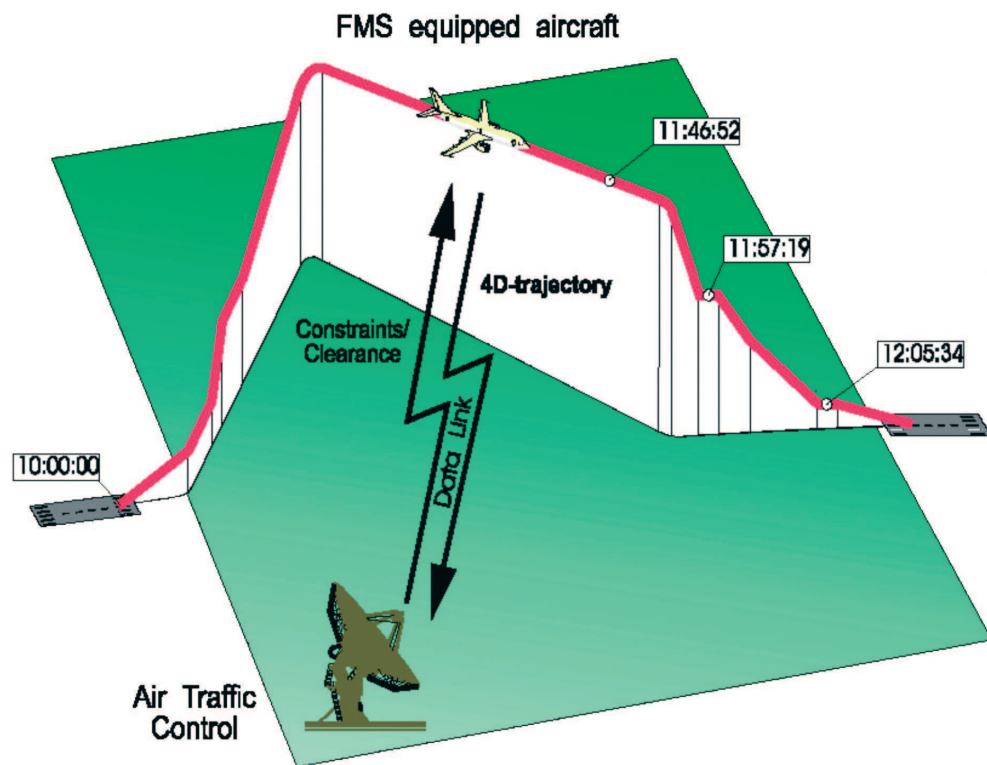
Advanced Flight Management System

A significant improvement in capacity and efficiency of Air Traffic Management can be achieved by the integration of airborne and ground-based systems. On the airborne side the Flight Management System (FMS) plays the most significant role. The strategic trajectory generation as well as the automatic guidance along this trajectory according to schedule is the domain of the conventional FMS. In the future its functionality is extended by cooperative elements, which connect traffic planning modules on the ground to flight planning systems on board the aircraft via data link.

As today's FMS suffer from the poor or not existing interfacing with the aircrew and ATC an Advanced Flight Management System (AFMS) is being realized based on the Experimental FMS developed within the Programme for Harmonized Air traffic management Research in Eurocontrol (PHARE).

The main features of the AFMS are:

- Computation of 4D-trajectories on board considering
 - constraints received via data link from ATC,
 - aircraft performance parameters,
 - economical criteria, etc.
- negotiation of the flight plan with ATC/ATM by means of data link connection,
- 4D-guidance capabilities along the negotiated trajectory, and
- FMS approaches including noise abatement procedures like Low Power Low Drag or Continuous Descent Approaches

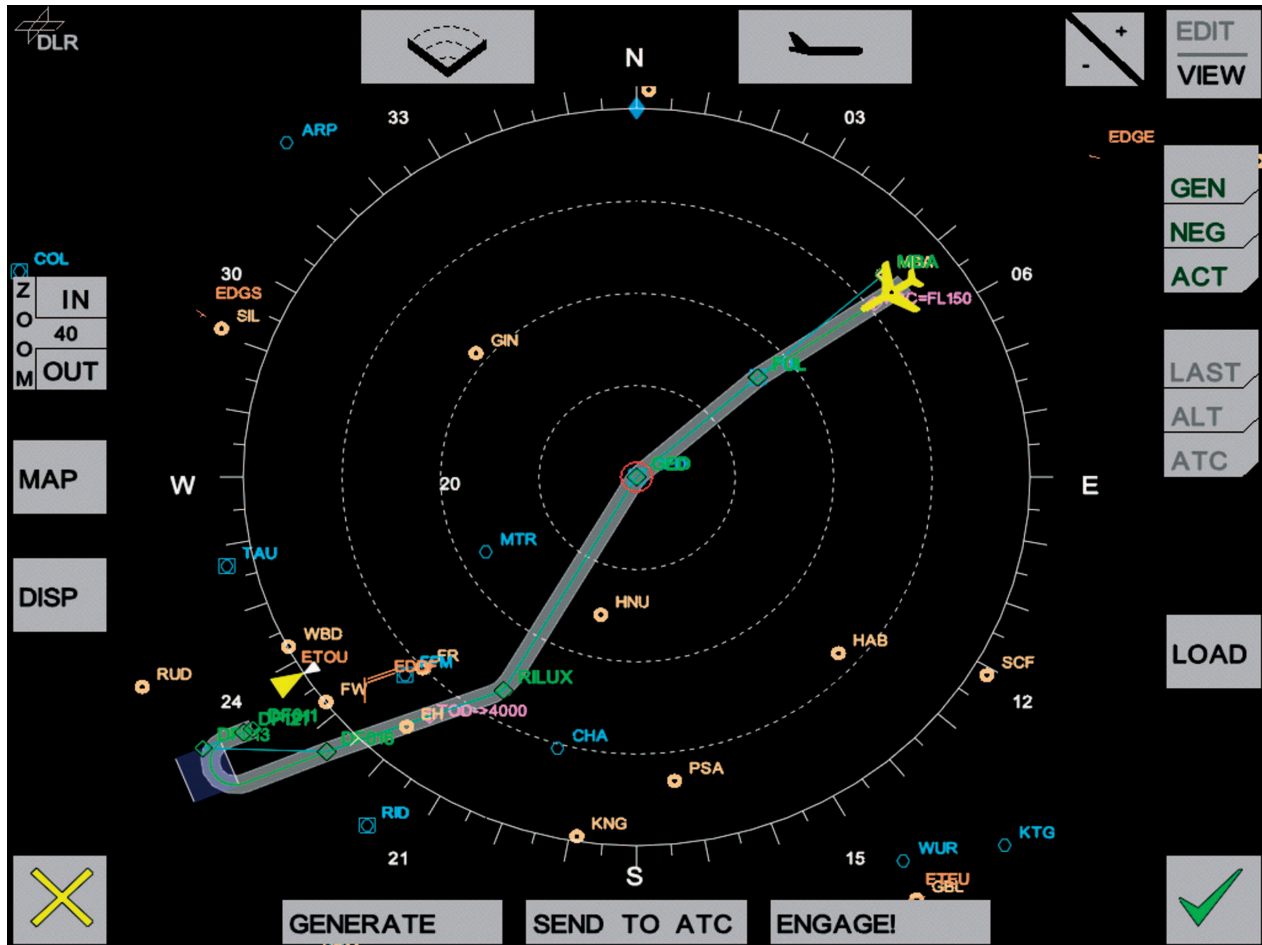


Cooperative flight management

The benefits of this new Flight Management System regarding capacity and safety were validated and demonstrated successfully during intense flight testing on board DLR's Advanced Technology Testing Aircraft System ATTAS.

Airborne Human Machine Interface

For interaction with the AFMS and in order to harmonize the human machine interfaces on the flight deck the Airborne Human Machine Interface (AHMI) is being developed as a first step. The Navigation Display (ND) as essential display of today's cockpits is extended to an "Interactive ND", which now allows the interaction with the AFMS through the introduction of a pointing device like a touch pad or a track ball for example. Furthermore the tactical planning is being transferred to this "Interactive ND".



Interactive Navigation Display in PLAN mode

The Interactive ND can be operated through two separate display modes:

- The PLAN mode supports flight planning and enables the pilot to initialize and edit the constraint list representing the basis for any 4D prediction.
- The MONITOR mode supports the pilot monitoring the flight progress with respect to the active 4D-trajectory and the contract between aircraft and ATC.

In planning mode the interactive ND incorporates four different function sets:

- Basic display parameters, such as the display range, display mode etc.
- constraint list edit functions
- trajectory generation and negotiation
- auxiliary functions, referring to mode and display selection

Each function set is placed on one border of the display. Buttons for ,undo' and ,acknowledge' are placed in the left and right lower corners of the screen. The pointing device characteristics correspond to those of a conventional computer mouse. In case the cursor hits a button or is located in a specified area around a display object, this will be highlighted.

The AHMI already was validated within various simulations and flight tests and was highly appreciated by the majority of the evaluation pilots.

AT-One combines the strength of NLR and DLR in ATM Research

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