ATC Wake
Integrated Air Traffic Control
Wake Vortex Safety and Capacity System

In air traffic, there is a demand to safely increase aircraft handling capacity. One potential approach is to reduce the separation distance between aircraft at take-off and landing without compromising safety. A major limiting factor is that aircraft generate wake turbulence, which in many weather conditions either dissipate quickly or are transported out of the flight corridor. In these conditions aircraft separations can be reduced without compromising safety.

The ATC-Wake project aims to develop and build an integrated platform for ATC (Air Traffic Control) that would allow variable aircraft separation distances, as opposed to the fixed distances presently applied at airports. The objectives are:
- To evaluate the interoperability of the ATC-Wake system with existing ATC systems currently used at European airports
- To assess the safety and capacity improvements that can be obtained by local installation of the ATC-Wake system at European airports
- To evaluate operational usability and acceptability of the ATC-Wake system
- To make a plan and assess cost elements for implementation and exploitation of ATC-Wake results into the system that can be installed at European airports

For approaches, the aim is to manage aircraft separation distances down to 2.5 nautical miles, in favourable weather conditions, for all aircraft types regardless of size. For departures, the aim is to reduce time separation between departing aircraft to 90 seconds. The ATC-Wake decision support system will help air traffic controllers decide what the aircraft separation should be.

ATC-Wake Operational Concept

Depending on wind conditions influencing wake vortex transport out of so-called arrival or departure critical areas, two aircraft separation modes are defined:
- ICAO Mode with standard aircraft separation;
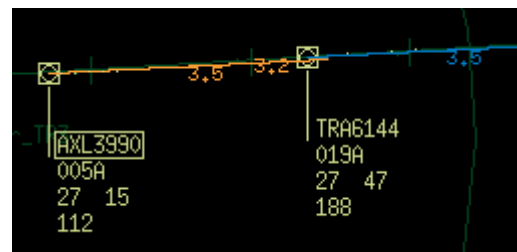- ATC-WAKE Mode with reduced aircraft separation.

Advise to ATC supervisor:
- Separation mode
- Time for transition
- Separation time / distance

Alerting of the controllers in case of:
- Failure of the ATC-Wake system
- Discrepancy between ATC-Wake Prediction and ATC-Wake Detection information

To implement a concept with two modes of operation, the ATC-Wake Operational System includes four new functional components, which are described below.

ATC-Wake System Components

ATC-Wake Separation Mode Planner

Determines the applicable separation mode (ICAO or ATC-WAKE Mode) and advises the ATC supervisor about the aircraft separation to be applied. The advisory also includes the expected time for future mode transitions.

ATC-Wake Predictor

Predicts for individual aircraft the Wake Vortex behaviour (Wake Vortex Vector (WVV)) in pre-defined critical arrival or departure area(s). The WVV is part of the critical area potentially dangerous for following aircraft.

ATC-Wake Detector

Detects for individual aircraft the Wake Vortex position, extent and – if possible – also strength in the pre-defined arrival or departure area(s).

ATC-Wake Monitoring and Alerting

Alerts the Air Traffic Controllers in case of :
- significant deviation between the Wake Vortex detection and Wake Vortex prediction information which raises the risk of Wake Vortex encounter
- failure of one or several ATC-Wake system components

ATC-Wake Users and Functional Flow

The Figure below shows all relations between the ATC-Wake Users, the ATC-Wake system components, and the existing systems presently used at airports.
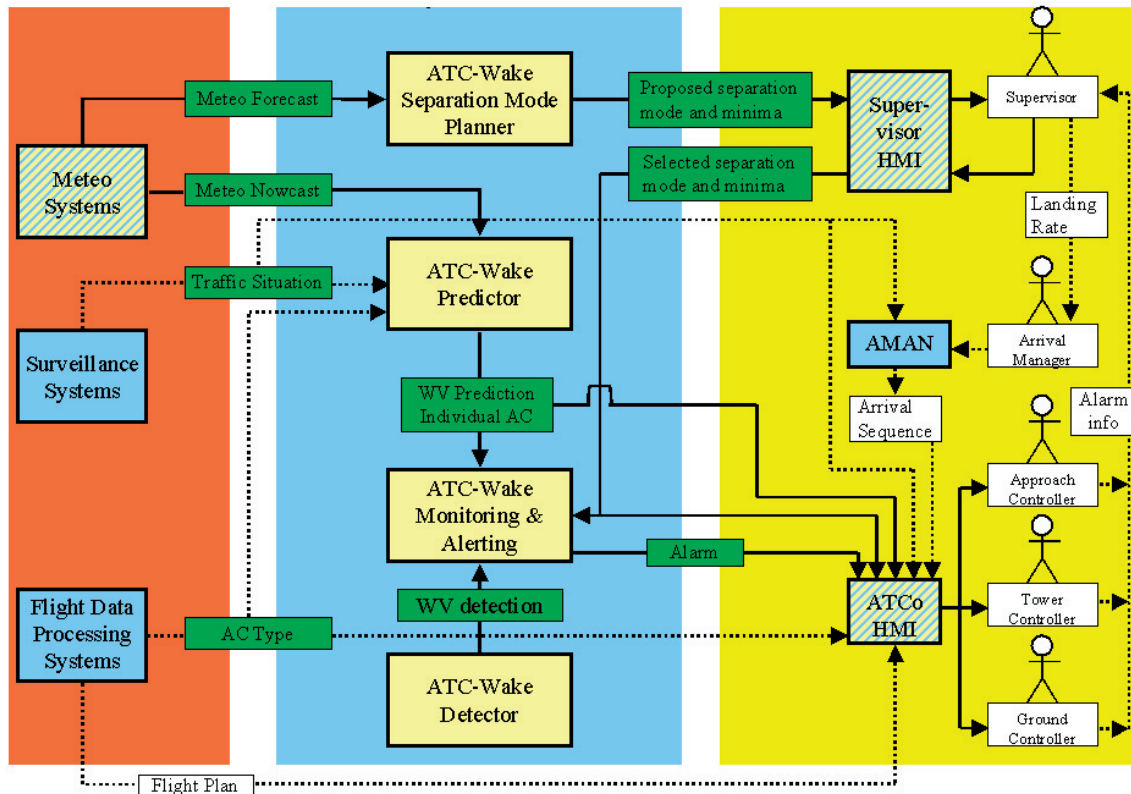
The ATC-Wake System is based on adaptations to the Human Machine Interfaces of the ATC supervisor, the Arrival Manager, Approach Controller, Tower Controller, and Ground Controller. Four use cases are identified:
• Separation mode planning
• Transition between ICAO and ATC-Wake separation mode
• Approach phase
• Departure phase

The ATC-Wake System is validated through real-time simulation experiments with the NLR Air Traffic Control Research Simulators (NARSIM Radar and Tower).

ATC Wake Consortium and User Group

The consortium consists of two industrial companies (Thales A.D. and Thales Avionics), two research institutes (NLR and DLR), one European agency (EUROCONTROL), and one academic insitute (Université Catholique de Louvain). ATC-Wake benefits from a User Group of organizations interested in exploitation of the project results.

ATC-Wake Consortium Overview

NLR	National Aerospace Laboratory
EEC	Eurocontrol Experimental Centre
DLR	German Aerospace Centre
TAD	Thales Air Defence
TAV	Thales Avionics
UCL	Université Catholique de Louvain

ATC-Wake User Group Overview

DFS	German Air Navigation Services
NATS	National Air Traffic Services Ltd
ASD	Aerospace and Defence Industries Association of Europe
Airbus	Aircraft manufacturing
FAA/EUROCONTROL	Cooperative Effort "Action Plan 14 Wake Vortex"
Thales ATM	Thales Air Traffic Management
NASA	National Aeronautics and Space Administration
Transport Canada	Canada's Civil Aviation Authorities
Nav Canada	Canada's Civil Air Navigation Service
LVNL	Air Traffic Control The Netherlands

For more information

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http://www.nlr.nl/public/hosted-sites/atc-wake