Wake Vortex Advisory System
System Architecture
Thales Air Systems

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WVAS: Wake Vortex Advisory System

- WVAS system goal is to allow :
  - Air Traffic Controller to
    - Separate all aircraft down, as close as possible, to radar separation minima (e.g. 3 NM)
      - ✓ in favourable meteo conditions (e.g. cross wind)
      - ✓ in all runway configuration (e.g. Independent Parallel runways, CSPR, Single Runways, …)
      - ✓ **without jeopardizing flight safety**
    - address Arrivals and/or Departures
      - ✓ (i.e. ILS interception point, glide slope, taking-off, SID, …)
  - ANSPs / Airports to increase the runways / airports capacity

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WVAS: Wake Vortex Advisory System

- WVAS fits with several configurations:
  - ✓ Stand Alone or Embedded component in any ATC system
  - ✓ Integrated in A-SMGCS product

- WVAS fulfils the Arrivals / Departures environment
  - ✓ For **Approach Control** when integrated in an ATC system
  - ✓ For **Ground Control** when integrated in an A-SMGCS product

WVAS allows to safely minimize spacing between aircraft

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WVAS “Black Box”

Supervisor

Meteo Centre

Meteo Forecast

Local Meteo Sensors

Meteo Nowcast

ATC System

Traffic Situation With AC type

Wake Vortex Detectors

ATC-Wake Detectors

WVAS
"Wake Vortex Advisory System"

Selected Separation Mode and Minima

WV Prediction Vectors

WV Alarms

ATC Operators HMI

- Approach
- Tower
- Ground

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WVAS “Black Box”

- WVAS is composed of several functions:
  - ✓ Separation Mode Planner (ATC-Wake European Project)
  - ✓ Wake Vortex Predictor product (WAKE4D)
  - ✓ WTEA (Wake Turbulence Encounter Advisory) function of Ground Based Safety Nets
  - ✓ Completed with off line suit : Display, Analysis and Replay tool (DART)
- WVAS aims at warning Air Traffic Controllers in displaying on their Working Position :
  - ✓ Wake Vortex Vector or Volume
  - ✓ Distance to preceding aircraft
  - ✓ Wake Turbulence Encounter Advisory
  - ✓ Potential deviation from Wake Vortex Prediction w.r.t real-time Wake Sensors measurements

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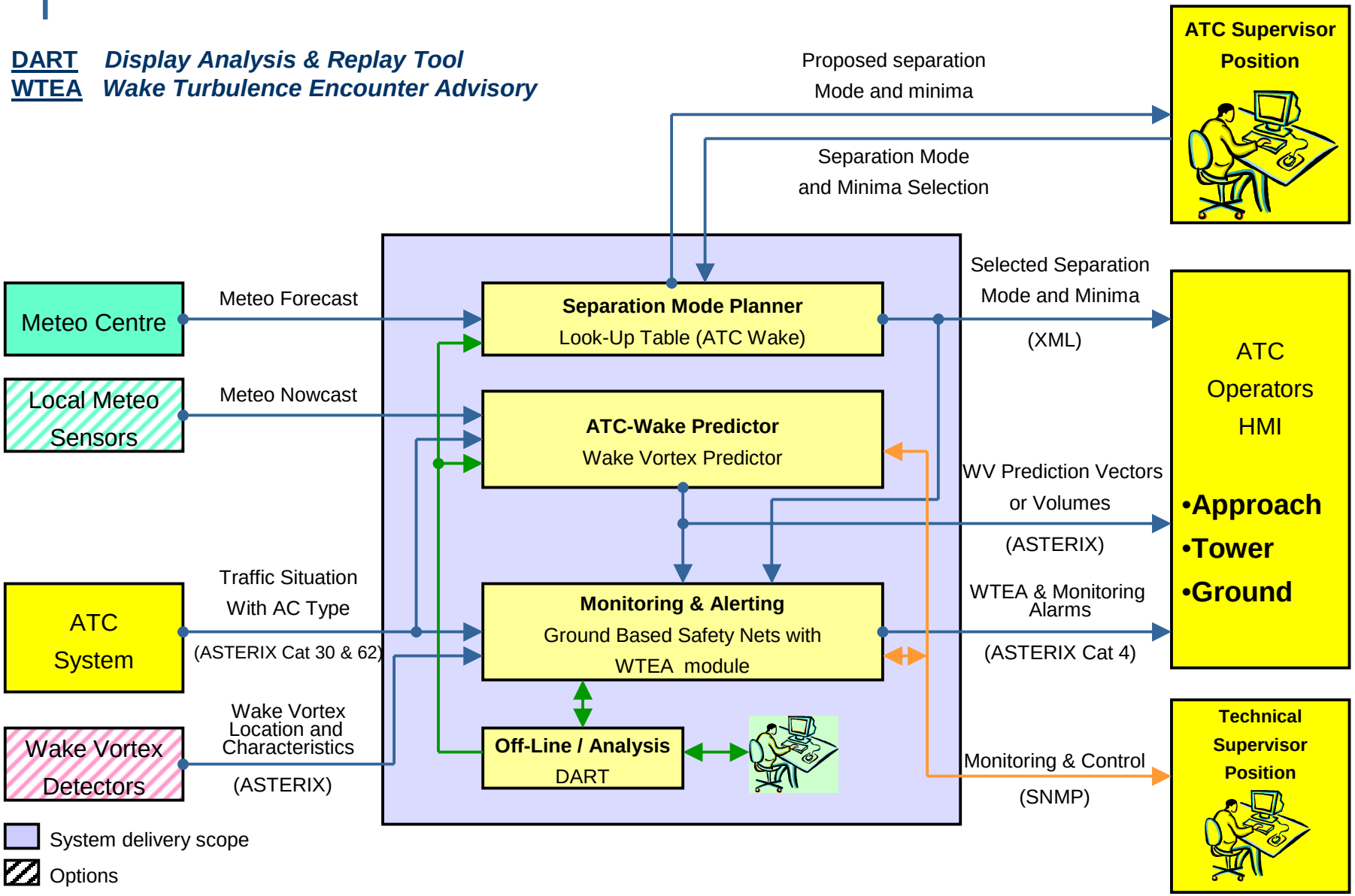
Stand-Alone WVAS

DART *Display Analysis & Replay Tool*
WTEA *Wake Turbulence Encounter Advisory*



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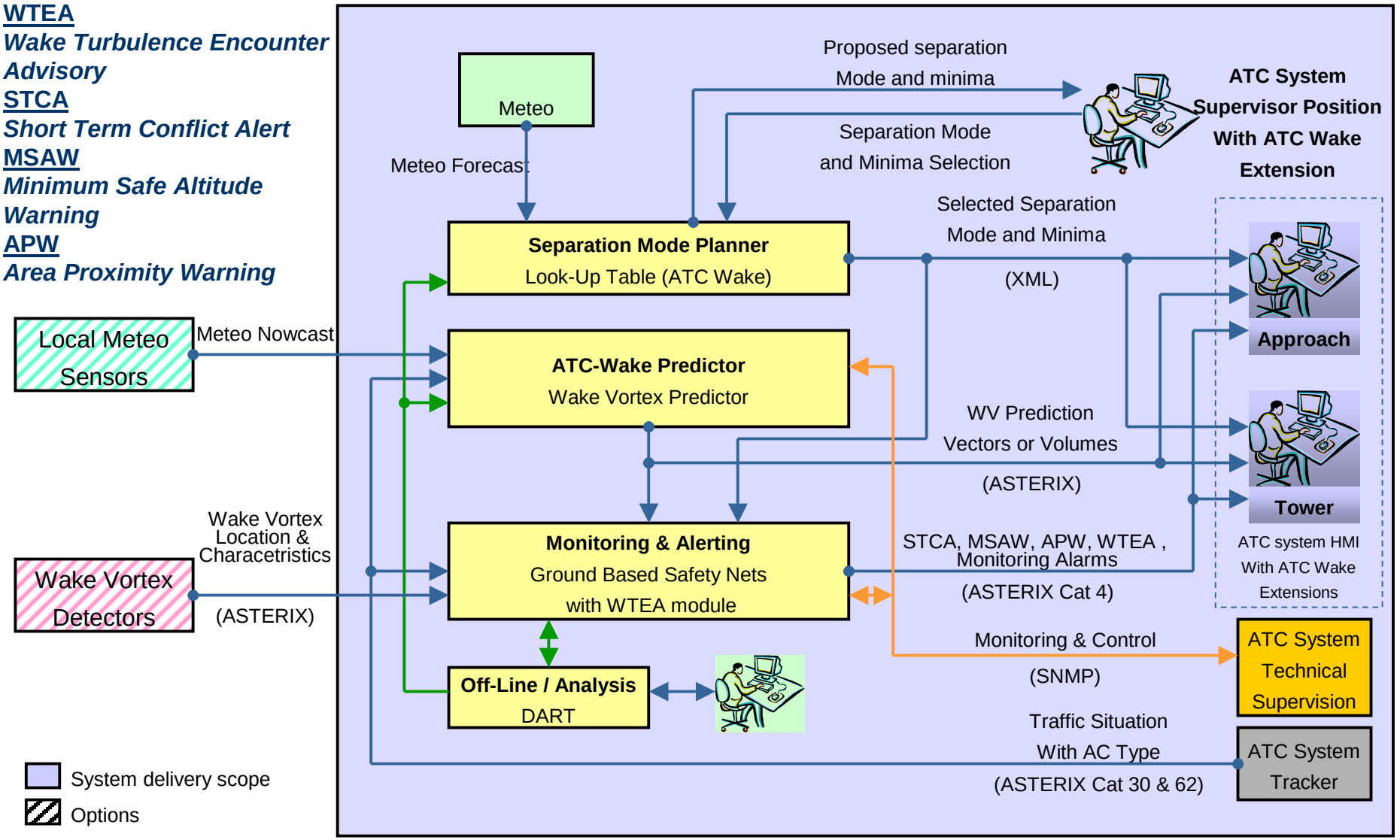
WVAS integrated in an ATC system

WTEA
Wake Turbulence Encounter Advisory
STCA
Short Term Conflict Alert
MSAW
Minimum Safe Altitude Warning
APW
Area Proximity Warning



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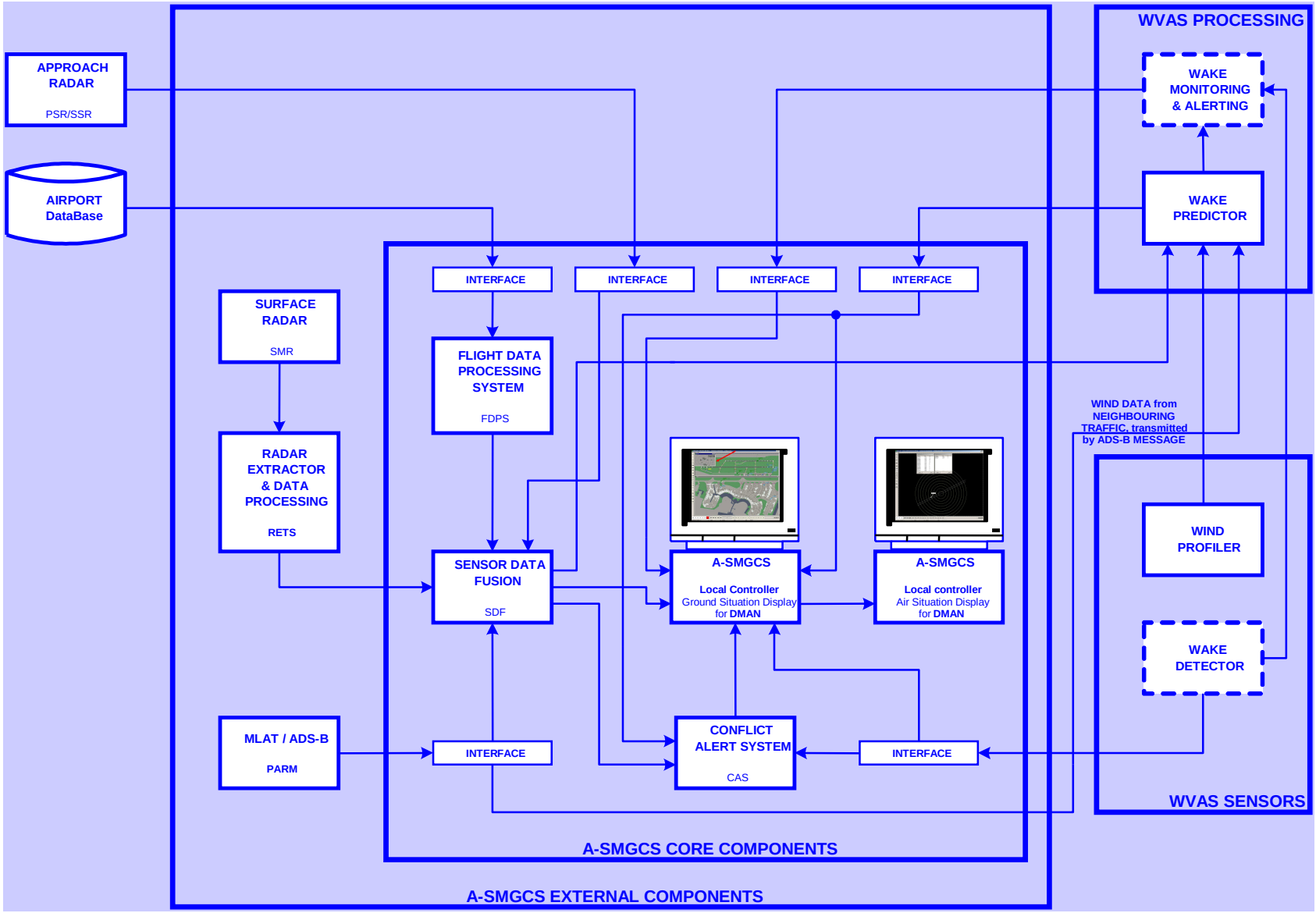
WVAS integrated in A-SMGCS



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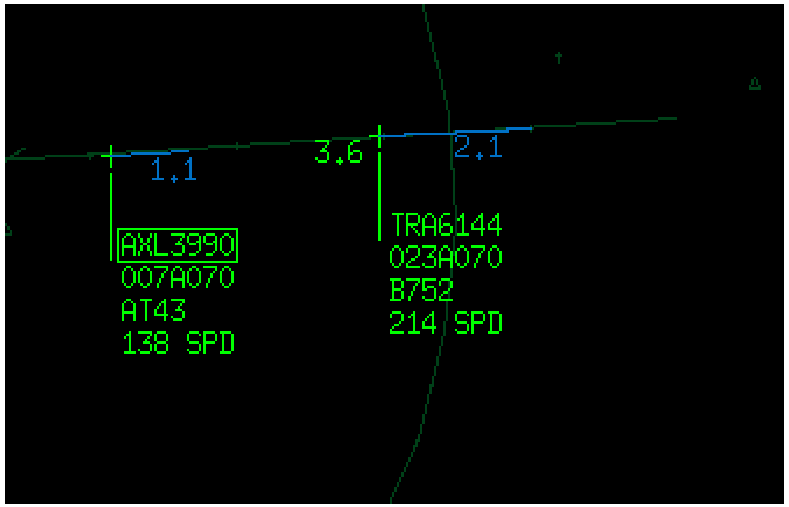
HMI example

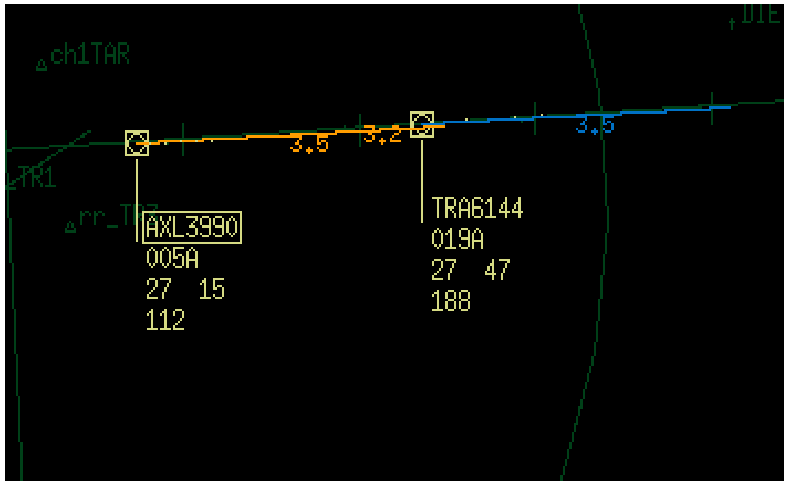


-Projection of the wake vortex on aircraft trajectory (ILS axis in final approach)

-Wake Vortex Vector length (e.g. 1.1 NM)

-Distance between aircraft (e.g. 3.6 NM)

-Track label (Callsign, Altitude, Aircraft type, Speed, …)



- Projection of the wake vortex on aircraft trajectory (colour change)

-Wake Vortex Vector length (e.g. 3.5 NM)

-Distance between aircraft (e.g. 3.2 NM)

-Track label (e.g. Callsign, Altitude (QNH corrected), Speed, …)

WTEA (Wake Turbulence Encounter Advisory)

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WVAS follow-up : Next Steps

- Existing:
  - ATC-Wake European program concept
  - Wake Vortex Sensors (Lidar, Radar, Wind profiler, …)
  - Measurement campaigns (PARIS ORLY 06 and 07, PARIS CDG 08)
  - Ground Based Safety Nets with Wake Turbulence Encounter Advisory functionality specifications
- Further studies ….
  - Wake Vortex Sensors integration / Data fusion & Wake Vortex Tracking: (Real Time Monitoring)
  - Air / Ground Data exchanges (e.g. wind data provided by aircraft thanks to Downlink Aircraft Parameters : ADS-B or Mode-S)
  - Validation of the WVAS system by end users

Thank you for your attention