European FP7 UFO Project "Ultra-Fast wind sensors for wake-vortex hazards mitigation"
Official EC website (Transport Research & Innovation Portal) for UFO


Official EC website (CORDIS Portal) for UFO


Grant:
ACP2-GA-2012-314237-UFO
T0: 01/11/2012
Duration: 36 months
Total Cost: 6.3 Meuros
EU Contribution: 4.5 Meuros
Industries
- TR6 : Thales Air Systems (FR)
- TSA : Thales Systèmes Aéroportés (FR)

SME
- LEO : Leosphere SME (FR)

National Meteorological Institutes
- KNMI : Royal Netherlands Meteorological Institute (NL)
- DWD : Deutscher Wetterdienst Abteilung Flugmeteorologie (GE)

European Aeronautic Research Laboratories
- DLR : Deutsches Zentrum fuer Luft und Raumfahrt (GE)
- NLR : National Aerospace Laboratory of the Netherlands (NL)
- ONERA : Office National d’Etudes et Recherches Aérospatiales (FR)

European Academic Laboratories
- TUBS : Technische Universitaet Braunschweig (GE)
- UCL : Université catholique de Louvain (B)
- TUD : Delft University of Technology (NL)
- UPMC : Université Paris 6 Pierre et Marie Curie, LATMOS Lab (Institut Simon Laplace) (FR)

Associated Partner for coordination with SESAR and EUROCONTROL
- ERC : EUROCONTROL (WP11.2, WP6.8.1) (EU)
- FM : Munich Airport (Flughafen München) (GE)
- MF : Meteo France (FR)
- ISL : Institut Saint-Louis (FR & GE)
- DGAC/STAC : Civil Aviation Technical Centre (FR)
Weather resilient ATC system should be based on new dedicated systems:

- **ITWS**: Integrated Terminal Weather Systems (SESAR 15.4.9.c)
- **WDSS**: Wake Vortex Decision Support Systems (SESAR P12.2.2)

New sensors requirements:

- High resolution wind monitoring sensors for wind-shear, air turbulence monitoring & wake-vortex transport/decay prediction (FP7 UFO)
- High resolution wake vortex monitoring sensors (SESAR P12.2.2)

New Ultrafast sensor observation assimilation to improve:

- Safety
- Capacity

The key enablers for mitigation of hazards
- Studies of new Ultra Fast Lidar/Radar Wind & EDR monitoring sensors, usable for:
  - Wake-Vortex Hazards Mitigation
  - severe Cross-Wind, Air Turbulence and Wind-Shear.

- **High update rate and high accuracy Sensors:**
  - 2D electronic scanning antenna based on low cost X-band tile
  - New high power laser source of 1.5 micron Lidar 3D scanner

- **New design tools developed through simulators, able to couple:**
  - Atmosphere models
  - Electromagnetic, Radar and LIDAR models.

- **Advanced Doppler signal processing algorithm developed and tested for 3D wind field and EDR monitoring, including sensors resources management**

- **Comparison with following sensors:**
  - C band meteorological radar
  - Upgraded Weather Channel of S band ATC radar
  - ADS-B Downlink

- **Calibration of the ground sensors and the simulators achieved through a set of experimental trials in Munich and Toulouse**
UFO OPERATIONAL GOALS:

- UFO will study dedicated Wind sensors compliant with future Airport Weather operations requirements.

- Safety margin of Wake-Vortex Separations are dependent of Wind/EDR assessment accuracy, UFO will improve the update rate and the accuracy of Wind/EDR assessment:
  - to optimize this Safety Margin
  - to generate Alert in case of abrupt wind changes

- UFO will also improve other wind hazards ultra-fast monitoring capabilities
  - Low Level Wind-Shear
  - Micro-Burst
Volume of Wind/EDR Monitoring: < 500 m in altitude

- SESAR P12.2.2. XP0 Trials at CDG has proved that Wind is:
  - very inhomogeneous
  - very instable

At **low altitude lower than 500 m**

- SESAR P12.2.2. simulation has studied the intensity of the turbulence associated with ground obstructions (perturbation at altitude until 10 time the maximum height of building)

- EDR varies at low altitude due to:
  - Ground Thermal Convective Turbulence
    - Morning, when the earths surface is heated
    - Evening, the cold ground cools the air
Main elements to take into account

- **Wind Hazards Physical Phenomena on airport**
  - Altitude of instable wind/EDR
  - Space/Time scale of wind/turbulence variation

- **WIND/EDR Space/Time Scale with impact on Wake-Vortex Transport/Decay**
  - Air turbulence scale that influence wake-vortex decay
  - Wind scale that impact wake-vortex transport

- **Volume/Update Rate to be explored for Airport**

- **Constraint of Signal Processing**
  - Space/Time sampling for robust Wind/EDR retrieval
  - Space/Time of integration for processing

Numerical simulation of the dissipation rate of TKE in a convective boundary layer, Cheinet and Cumin, JAMC, 2011

**Collaboration with:**
Dr. A. Pier SIEBESMA
Senior Researcher
Regional Climate Section, KNMI
siebesma@knmi.nl
WP1100: E-scaning X-band Radar Technology Study
Packaging and microwave modules trends

C band space TRM

X band TRMs

wideband TRMs

28 and 38 GHz telecom modules

HTCC / LTCC

PCBs + SMT assembly

Silicon substrate

HDI

The Tile Architecture: Trends & Evolutions

2D

3D
Far field measurements

X band low cost 1D tile antenna for surveillance radars
Starting from this definition, we have to add the following elements:

- A cold plate to cool down dissipative components,
- A mechanical fixture,
- A radiating panel (which will act as a mechanical reference plane for our stack-up),
- A command & control board,
- Some distribution layers: RF module power and control, RF Com and calibration signal distribution layers.
Synopsis Selection for UFO (Thales)

- A power & control distribution layer is implemented at the radiating panel level.
- All RF Front-end interconnects are located on one side of the module: once it is soldered on the radiating panel multilayer board, every signal is connected.
- Power and control signals must be propagated by the periphery of the RF Front-end (e.g. through the mechanical fixture structure),
- Possible to set-up a low deflection connector solution,
- Thermal Management medium efficiency
- Reception path RF Losses satisfying

Synopsis Selection based on Packaging / Interconnect / Thermal / RF Losses Managements
WP1200: Lidar with High Power Laser 
source Requirements
Lidar Requirements (Leosphere)

Definition of laser requirements

- **Assumption**
  - Laser developments are based on EDFA fiber laser technology developed at ONERA for previous internal and FTP (CREDOS, FIDELIO) projects.

- **Process**
  - Wind hazards
  - Areas of interest
  - Range
  - Global size
  - Size of eddies
  - Occurrence
  - Life time

- **Lidar specs**
  - Lidar range
  - Scan pattern
  - Range resolution
  - Velocity resolution
  - Measurement time

- **Laser specs**
  - Average laser power
  - Pulse duration
  - Pulse Rep Frequency

- **Constraints**
  - Availability of laser source in 2013
  - Availability of lidar for Spring 2014 campaign
## Definition of lidar requirements

- **2D measurements requirements for Wind / Wind shears / Wake Vortices**: 3 areas of interest

<table>
<thead>
<tr>
<th>Areas of interest</th>
<th>Needs</th>
<th>Hor. range (km)</th>
<th>Vert. range (km)</th>
<th>Spatial scale (m)</th>
<th>Duration (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glide Path</td>
<td>Wind measurements along glide path</td>
<td>10</td>
<td>0.5</td>
<td>100</td>
<td>10-600</td>
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<tr>
<td>360 view</td>
<td>3D Wind measurements</td>
<td>10</td>
<td>0.5</td>
<td>100</td>
<td>30-900</td>
</tr>
<tr>
<td>Critical area</td>
<td>Wake Vortices measurements on runways</td>
<td>2</td>
<td>0.2</td>
<td>20</td>
<td>120-600</td>
</tr>
</tbody>
</table>

*AVAILABLE FOR UFO CONSORTIUM ONLY*
## Definition of lidar requirements

**Measurement specifications**

<table>
<thead>
<tr>
<th>Areas of interest</th>
<th>Needs</th>
<th>Lidar location</th>
<th>Nb lidar</th>
<th>Scenario type</th>
<th>Swept angle (°)</th>
<th>Spatial (m)</th>
<th>Scan duration (s)</th>
<th>Update time (s)</th>
<th>Range (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical profiling</strong></td>
<td>Averaged Wind profiling</td>
<td>Anywhere at airport</td>
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<td></td>
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<td></td>
<td>EDR profiling</td>
<td>Anywhere near airport</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td><strong>GLIDE PATH</strong></td>
<td>Wind measurements along glide path</td>
<td>At the end of each runway</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>EDR measurements along glide path</td>
<td>At the end of each runway</td>
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<tr>
<td></td>
<td>3D Wind measurements along glide path</td>
<td>Anywhere at airport</td>
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<tr>
<td><strong>Weather overview</strong></td>
<td>Wind shears</td>
<td>Anywhere at airport</td>
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<tr>
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<td>Anywhere at airport</td>
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<tr>
<td><strong>Critical area</strong></td>
<td>Wake Vortices measurements on runways</td>
<td>At the end of each runway</td>
<td></td>
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<tr>
<td></td>
<td>EDR measurements cross to runways</td>
<td>At the end of each runway</td>
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<tr>
<td></td>
<td>3D Wake Vortices measurements on runways</td>
<td>At the end of each runway</td>
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</tr>
</tbody>
</table>

AVAILABLE FOR UFO CONSORTIUM ONLY
**Definition of laser requirements**

- **Description of fiber laser technology**

  - Why fiber lasers?
    - compact and robust laser sources
    - high mean power and efficiency
  - MOPA (Master Oscillator Power Amplifier) architecture:

    - **Master Oscillator**
      - 1545 nm
    - **Acousto-Optic modulator**
    - **Pre-Amplifier**
      - 15 µJ
    - **Pump diodes**
    - **Mode Field Adaptation**
    - **Pump Combiner**
      - PM Fiber ➔ PM LMA

  - **Definition of the pulse shape**

    - Increasing of the extractable peak power:
      - By increasing the SBS threshold with a distributed strain to the fiber (Onera’s Patent)
    - > 3 dB gain in peak power and energy
      - (currently limited by available pump power)

  - **Output power limited by Stimulated Brillouin Scattering (SBS)**

    - PM LMA
    - Er/Yb-doped fiber

  - **Peak power vs. Booster pump power**

    - Without strain
    - With distributed strain

- **PM = Polarization Maintaining**
- **LMA = Large Mode Area**
WP2110/2210: LES simulation & Radar/Lidar Simulators
Example of Large-Eddy Simulation (LES) of idealized turbulent atmosphere without humidity already performed at UCL/iMMC

- Pseudo spectral solver, 256^3 grid, fully periodic domain, stable linear mean temperature profile

Objective: to perform simulations in the same setup but with humidity and then also raindrops to create a database to be used by RADAR and LIDAR simulators

The UCL spectral code must be modified to solve the transport equation for the humidity (to be implemented and validated in UFO) and to track raindrops, i.e. particles with drag (to be implemented in UFO)
Connection of the LES simulation with radar observables

**TUD contribution**

- Study the approaches to connect output of UFO partners LES model runs with radar observables
- Based on statistical observed data processing formulate recommendations for simulation settings
Provision and transfer

Provision of LLWAS data (DWD)

LIDAR

Central Processing Unit

Asduv_E (automatic system for met. data transfer at the airports)

DWD OF

Working station at the advisory centres for aviation

UFO partners WP2000

LLWAS
Comparison between CURIE radar and benchmark data

- Agreement to access to radiosonding data from the Météo France balloon (1 launch every 12 hours) from the Trappes site (~3km from Guyancourt site) and to deploy CURIE on the Trappes site

- Study the possibility to jointly use THALES W200S lidar (used for SESAR) in different weather conditions near the CURIE Radar (at Guyancourt or Trappes)

Study the possibility to deploy CURIE on the SIRTA site (Palaiseau)

- In situ instrumentation are available
  - Instrument mast (Sonic anemometer (10hz) at 10 and 30 meters high)
  - Instrument platform (wind lidar sodar)
  - Leosphere Wind Lidar Profiler WLS7
WP2310: ATC Primary Surveillance Radar Weather Channel Processing
S-band PSR Radar Weather Channel Processing

**THALES contribution**
- Weather channel Rouen PSR, definition of algorithms for
  - wind monitoring
  - EDR retrieval
- Provision of data (I, Q) from THALES Rouen facility

**TUD contribution**
- Usage of PARSAX radar data base to develop Doppler radar signal processing for PSR weather channel
  - wind monitoring
  - EDR retrieval

**DLR contribution**
- Assessment of quality of wind and EDR
  - data from PSR (TR6 Rouen)
  - combination with 3D-volume data from meteorological radars (MeteoFrance)
Positions of Radars

- PSR/SSR Radars, En-route Radar and X-band Radar

X-band Radar
L-band En-Route Radar
S-band PSR Radar
SSR Radar (including Mode S)
Rouen PSR and MeteoFrance weather radar

120 km range rings (arbitrary)

- **Rouen PSR**
  - I and Q data
  - Doppler velocity, spectral width

- **MeteoFrance radars**
  - Abbeville
  - Falaise
  - Trappes
    - reflectivity, Doppler velocity, spectral width
    - VVP/VAD profiles
PSR Radar Weather Channel Processing

- TUD contribution
  - Use TARA observations at CESAR to study several EDR retrieval schemes. Either based on Doppler velocity correlations in time (O’Connor, 2010), or based on Doppler variance (Yanovsky, 2005, unpublished).
  - Use PARSAX radar data to develop new Doppler radar signal processing schemes for PSR weather channel
PSR Radar Weather Channel Processing

- TUD contribution
  - Study algorithms for wind field monitoring. E.g. by using a least squares fit for a linear wind model, applied to the X-band IDRA radar data at Cabauw.

In contours: Doppler velocities. Horizontal wind vectors are obtained via a least squares fit.
WP2320: ADS-B Downlink Study of Weather Data
Preparation of ADS-B Look-a-Like data broadcast for use in flight trials

- hardware for ground and airborne installation
- VHF transmission up to 56,000 Bit/s
- planned data for broadcast
  - current ADS-B
  - future ADS-B (RTCA proposal)
  - UFO partner request (depending on available on-board sensors)
WP3220:
ULTRA FAST WIND SENSORS
WIND/ EDR
DATA FUSION
Data assimilation

LLWAS (DWD)
Selex Systems Integration, 2012

Mode-S* (KNMI)
De Haan & Stoffelen, 2012

POLDI-RAD (DLR)
www.dlr.de, 2013

C-Band Radar (DWD)
DWD, 2012

3D grid information
Projection (Data Cuboid): DLR

Fuzzy logic algorithm
Filter methods

Input
Model
Verification

*Mode-S data:
- Level 1 temperature and wind
- AMDAR BUFR or ASCII format
- FTP server
- 7 MB per day
Model development

- Closing gaps

ITWS → COSMO-MUC → COSMO-DE

- Model adaption

30 min → 3 – 4 h

COSMO-EU  COSMO-MUC  Glideslope
Mode-S EHS Downlink for Fusion

- Wind/EDR Data Fusion preparation
  - Mode-S EHS wind and temperature « Maastricht Upper Air Control » area

Wind and Temperature observations (73.370) valid 2012/08/09 1000 1015 UTC

Observations below FL100 (6.673) valid 2012/08/09 1000 1015 UTC

Example of 15 minutes of derived Wind and Temperature observations from Mode-S EHS data of a day in August 2012 over Western Europe, source MUAC, processed by KNMI
WP4000: TRIALS AT TOULOUSE & MUNICH AIRPORTS
WP4100: Toulouse Airport Trials
Toulouse Blagnac airport

Deployment zone of Radar & Lidar

Flight plan of experimental aircraft

Scale: 7.2 km

Glide slope axis of 32L runway

Weather observation cone

C-Band Weather Radar

Toulouse Blagnac airport
Airport of Toulouse Blagnac: Runways layout

- ATC S-Band Radar STAR2000
- SMGCS X-Band Radar
- Airport Terminal
- Deployment zone of sensors
- 32L runway
- 32R runway

Thales Air Systems   05/04/2013
Toulouse deployment of sensors

SMGCS X-Band Radar

Local for experimental aircraft DO 128-6

Area site of:
- Radar MFR
- Lidar W400S

Area site of Lidar W200S

Runway threshold

Glide slope axis of 32L runway

APRIL 2013
LEOSPHERE 1.5 micron
WAKE-VOXETX LIDAR
W200S

THALES X-BAND SOLID-STARE
ELECTRONIC SCANNING RADAR

LEOSPHERE 1.5 micron
WIND/EDR LIDAR W400S
(with High Power Laser source)
Anemometers on threshold runways

C-Band weather radar of METEO-FRANCE

The X-Band radar (on airport at 5km) data will be compared with the C-Band weather radar.
MHRPS (Mesoscale High Resolution Prediction System) (MF)

- Meteo-France will ingest Radar/Lidar data in MHRPS for Wind/EDR Forcasting
- MHRPS:
  - Domain: 100km x 100km
  - Spatial Resolution: 500m x 500m
  - Global Model Inputs: 500km x 500km at 2.5km
  - Format: Grib 2
- WVDSS Profile Request:
  - Lat x Long (interpolated profiles)
  - 113 levels in altitude
  - 50 levels under 3000m
- Data (per MET point)

**MHRPS EDR in horizontal Plane**

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### HEADER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Description</th>
<th>Class</th>
</tr>
</thead>
<tbody>
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<td>REQ type</td>
<td>-</td>
<td>Type of REQ («Predictor», «SMP», ...)</td>
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<td></td>
<td>Note: the parameters for</td>
<td></td>
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<tr>
<td>Data type</td>
<td>-</td>
<td>Origin of data («MHRPS» or «SINTEF»)</td>
<td>XML</td>
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### DATA (per Met. Point)

<table>
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<th>Unit</th>
<th>Description</th>
<th>Class</th>
</tr>
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<td>T</td>
<td>s</td>
<td>Time where Met. data is needed of the point #1 (POSIX timestamp)</td>
<td>XML</td>
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<tr>
<td>LAT #1</td>
<td>degree</td>
<td>WGS84 latitude coordinate of the point #1</td>
<td>XML</td>
</tr>
<tr>
<td>LONG #1</td>
<td>degree</td>
<td>WGS84 longitude coordinate of the point #1</td>
<td>XML</td>
</tr>
<tr>
<td>HEIGHT #1</td>
<td>m</td>
<td>WGS84 height coordinate of the point #1</td>
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<tr>
<td>U</td>
<td>m/s</td>
<td>West wind component of the point #1</td>
<td>XML</td>
</tr>
<tr>
<td>Sigma_U</td>
<td>m/s</td>
<td>Accuracy of previous parameter of the point #1</td>
<td>XML</td>
</tr>
<tr>
<td>V</td>
<td>m/s</td>
<td>South wind component of the point #1</td>
<td>XML</td>
</tr>
<tr>
<td>Sigma_V</td>
<td>m/s</td>
<td>Accuracy of previous parameter of the point #1</td>
<td>XML</td>
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<tr>
<td>W</td>
<td>m/s</td>
<td>Upward wind component of the point #1</td>
<td>XML</td>
</tr>
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<td>Sigma_W</td>
<td>m/s</td>
<td>Accuracy of previous parameter of the point #1</td>
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</tr>
<tr>
<td>Tv</td>
<td>K</td>
<td>Virtual potential temperature of the point #1</td>
<td>XML</td>
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<tr>
<td>Sigma_Tv</td>
<td>K</td>
<td>Accuracy of previous parameter of the point #1</td>
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<tr>
<td>TKE</td>
<td>m²/s²</td>
<td>Turbulent kinetic energy of the point #1</td>
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<tr>
<td>Sigma_TKE</td>
<td>m²/s²</td>
<td>Accuracy of previous parameter of the point #1</td>
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<td>m²/s³</td>
<td>Eddy Dissipation Rate of the point #1</td>
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<tr>
<td>Sigma_EDR</td>
<td>m²/s³</td>
<td>Accuracy of previous parameter of the point #1</td>
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<td>PS</td>
<td>Pa</td>
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<td>Sigma_PS</td>
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<tr>
<td>Hu</td>
<td>%</td>
<td>Humidity of the point #1</td>
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<tr>
<td>Sigma_Hu</td>
<td>%</td>
<td>Accuracy of previous parameter of the point #1</td>
<td>XML</td>
</tr>
</tbody>
</table>
**High Resolution Numerical Weather Prediction Model**

- Non-hydrostatic numerical weather prediction model
  - Horizontal resolution: 500m
  - Target update cycle: 15 minutes

- Data fusion of testbed campaign data
  - All available high quality wind/temperature/EDR observations
    - Sources: Lidar/Radar/Mode-S EHS

![Cloud Ice Loading](image-url)
**Experimental aircraft equipped with probes & ADS-B (TUBS)**

**Dornier 128-6:**
- Wingspan: 15.5 m
- Length: 13.8 m
- Typical Speed: 70 m/s
- T/O Weight: 4350 kg

### Sensor Specifications

<table>
<thead>
<tr>
<th>Sensor</th>
<th>measured parameter</th>
<th>location of sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosemount 5-hole probe</td>
<td>static pressure air speed vector</td>
<td>nose boom</td>
</tr>
<tr>
<td>Setra Pressure Transducer</td>
<td>static pressure air speed vector</td>
<td>nose boom</td>
</tr>
<tr>
<td>optional Optech 501 Laser Altimeter</td>
<td>height</td>
<td>bottom of fuselage</td>
</tr>
<tr>
<td>NovAtel OEM-3 GPS-Card</td>
<td>timing for complete system navigation</td>
<td>antenna on top of fuselage</td>
</tr>
<tr>
<td>AeroNav</td>
<td>navigation</td>
<td>antenna on top fuselage</td>
</tr>
<tr>
<td>Honeywell LASERNAV</td>
<td>navigation attitude body motion</td>
<td>near centre of gravity of the aircraft</td>
</tr>
<tr>
<td>Sperry Radar Altimeter</td>
<td>radar height</td>
<td>bottom of fuselage</td>
</tr>
<tr>
<td>Filtering Units</td>
<td>filtering anti-aliasing for analog input</td>
<td>onboard</td>
</tr>
<tr>
<td>32bit PC based computer</td>
<td>data acquisition and real-time processing</td>
<td>onboard</td>
</tr>
<tr>
<td>optional KT4 Sensor</td>
<td>surface temperature of the earth</td>
<td>bottom of fuselage</td>
</tr>
<tr>
<td>DLR 5-hole probe</td>
<td>static pressure air speed vector</td>
<td>vertical stabilizer</td>
</tr>
</tbody>
</table>

- **P&G potentiometers**: rudder, elevator and aileron deflection
- **Air Inlet**: inlet for trace gas measurement
- **Lyman-Alpha**: humidity of air (fast)
- **Rosemount Temperature sensor**: temperature of air (slow)
- **Rosemount Temperature sensor**: temperature of air (fast)
- **Humicap**: humidity of air
- **Meteorolabor Dew Point Mirror**: humidity of air
- **DLR 5-hole probes**: static pressure air speed vector at each wing tip
- **IFF temperature sensor**: temperature of air (fast) at each wing tip
Do 128-6 experimental aircraft

- + 19' racks for additional installations
- basic installation for UFO:
  - GPS/INS @1000Hz Navigation Grade
  - new five hole prope @TBD Hz
    - frequency will be adapted based on UFO EDR determination study
Mode-S EHS radars in France (DSNA)

- Toulouse Airport
  - Research radar not operational
- Installation of Mode-S EHS ATC radar in Auch
  - Foreseen summer 2014

When data becomes available:

- KNMI will process raw into meteorological observations
- Update frequency?
- Latency?
WP4200: Munich Airport Trials
LLWAS (Windtracer Doppler LIDAR and X-Band Doppler RADAR) installation

WP start: M18 (01 May 2014)
Location

Position: 48°20'49.66"E, 11°47'32.85"N,
Height: P20 + 5 m = 28.36 m + 5 m = 33.36 m AGL
References

Field Trials at Munich Airport (DWD/DLR)

Hagen (DLR), 2013

DWD, 2013

www.dlr.de, 2013

DWD, 2013

References

DWD, 2013

Selex Systems Integration, 2012

Selex Systems Integration, 2012

DWD, 2013
Scan strategy

- synchronal operation
- like from one sensor
- wind information in each weather situation
- 5 elevation scans
- 3D wind field: every 5 min
WP5000: Requirements & Safety Case

- Because the UFO ultra fast wind sensors are foreseen to be integrated within the SESAR system architecture developed in:
  - SESAR P12.2.2 “Runway wake vortex detection, prediction and decision support tools”
  - SESAR P15.4.9 “Ground weather monitoring system”
- it is relevant to maintain a close relation with the safety work in SESAR WP16 “R&D Transversal areas” and in particular:
  - SESAR P16.6.1 “Safety support and coordination function”.
- Consistency of UFO and SESAR results will be achieved by developing:
  - a Functional Hazard Assessment (FHA)
  - a Preliminary System Safety Assessment (PSSA)

  with the methodologies provided by SESAR.
- The FHA will be employed in the early stages of the project, based on an initial concept for use of the ultrafast meteo sensors.
- This is followed by a PSSA, based on an initial UFO system architecture consistent with SESAR P12.2.2 and P15.4.9c architectures.
- The results will be made available for inclusion in the overall SESAR Safety Case.
Connection to SESAR WP 11.2

SESAR WP 11.2 (Federating project)

- Time: 5 April 2012 – 31 December 2015
- Deliverables:
  - Requirements for MET Information
  - MET Information Systems Development, Verification & Validation
    - Definition of operational and performance requirements (reports)
    - Prototype development and verification (prototypes, reports)
    - Support to Pre-Operational validation (support to validation exercises, reports).
  - Step 1 completed, Step 2 ongoing until 2014, Step 3 in 2014/15
- WP Leader:
  - Rosalind Lapsley (EUMET / UK Met Office)
  - 11.2.1 (Operational Requirements): Jonathan Dutton (UK Met Office)
  - 11.2.2 (Meteorological Products, Validations, 4D weather cube): Jean-Louis Brenguier (Météo France)
QUESTION?

Publication in “the Parliament Magazine”, Special Issue “SESAR”


European FP7 UFO Project
Ultra-Fast wind sensOrs for wake-vortex hazards mitigation

Frederic Barbeasco, Fabrice Orlandi & Philippe Juge,
Thales Air Systems, Limours, France

Electromagnetic, Radar and EISAR models, transonic, advanced/multi-sensor signal processing algorithms will be developed and tested for 3D wind field and EISAR monitoring, including the algorithm for the recognition management of different sources. Comparison with already existing sensors as C band meteorology at radar and B band VWS radars, but just ACD at EISAR data will be studied.

Installation of the ground sensors (Radar 2, VWS radar, C band radar with EISAR data) and the simulators will be achieved through a set of experimental flights on Munich and Luxembourg airports.

In Luxembourg, an aircraft equipped with airborne pod/grounded is able to use comparison and ACD at EISAR data.

Coordination with SESAR, through ECOSMART, an associated partner of Luxair airport as ESST at the UFO UFSM conference, will be finalized.

DGAC/CEST will be in charge of on-site with SESAR data and AIDA for safety rates.

Clear skies ahead?

What a safe, efficient and modern air-space management programme, the EU risks falling behind in international competition, argues Jacqueline Foster

More than 10 years ago I worked on the original single European Sky Legislation (SES). With more than 20 years experience in the industry, I am all too aware of the challenges faced by the sector to keep up with a rapidly changing global market. It is important that we find a way to support this sector by giving it the best possible tools to operate on a global scale, allowing European air carriers to maintain their market share.

In 2012, I chaired an ‘initiative report’ to address the lack of progress made on the implementation of the legislation, bringing together all the interested parties, from manufacturer to airline. The report was sent to the aviation minister, with the aim that the commission and the member states take action before the skies above Europe had ground to a halt due to over-capacity caused by lack of political will.

The SES legislation set out to ensure the safe and efficient use of European airspace, directly by the requirements of the airspace user and the need to provide for ever increasing air traffic, not only within the 37 member states but also throughout the European common aviation area. European airspace is among the busiest in the world, but the current air traffic management system is extremely inefficient, with the management of airspace largely reflecting national boundaries. Significant areas are reserved for military use - even where this is not required - forcing civil aircraft to fly in long, meandering routes. Furthermore, the creation of functional airspace blocks (FABs) is still work in progress and only one of the nine FABs (UK, Ireland and the Danish-Polish FAB), is operational. The remaining member states have missed the deadline of December 2012 by a mile. This is really unacceptable.

Member states have been committed to these changes for at least 10 years and they know what would be required to achieve the SES. We simply cannot allow the vested interests of some to hold the progress, while we continue to lose business and revenue.

While the restructuring of airspace is one important aspect of the SES, another is the single European sky traffic management centre (SESC), the project intended to bring...