IMS4 AWDSS

Aviation Weather Decision Support System

In order to provide the air traffic controllers and meteorologists with the accurate operational information the IMS4 AWDSS processes the real-time data from various sources: local AWOS, ARWIS and LLWAS systems, weather radars, surface observations from the WMO/ICAO exchange networks, meteorological satellites, profilers, etc.

Integration of all weather data

Integration of all existing weather information

Alert of phenomena affecting the airport operations

Detection and nowcasting algorithms and forecasting models

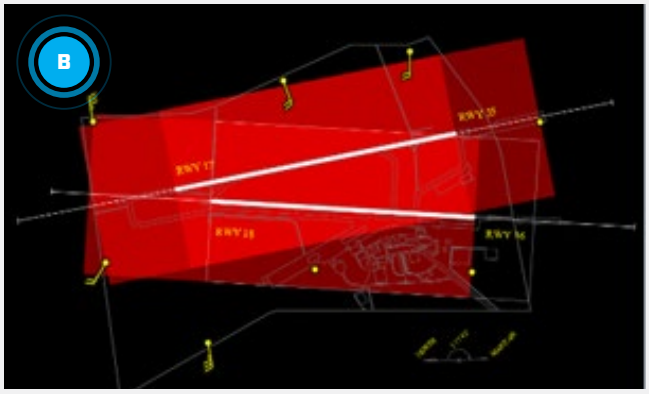
Data integration from multiple sources

The collaborative, net-centric and combined picture incorporating seamlessly all aviation relevant weather sources will enable various users at the airport to have access to all relevant informationcommon situational awareness needed for tactical decision support during the flight phases:

- Take off
- Departure
- Metering/descent
- Final approach
- Landing

Having employed the state-of-the-art algorithms and models, the system evaluates the general situation, area, airport specific, stakeholder specific and runway oriented alerts, using the color status signalization to visualize the hazards, if any and displays stakeholder specific actions (advisories) related to the particular weather hazard.

The current as well as anticipated operational situation (nowcasting, short term and long term time horizon) may be characterized by the alerts of the hazardous phenomena,



AWOS Display (above), RWY State Display (left), LLWAS Expert Display (right)

current/anticipated airport/runway operational category, NATO color code or in the other way compliant with the operational procedures of the particular airport.

Local AWOS/ARWIS Data

The local AWOS and ARWIS system are the source of the accurate real time meteorological data: temperature/dew point, wind, pressure, visibility/cloudbase, precipitation, runway temperature and runway state in compliance with the new ICAO Global Reporting Format. Additional sensors like soil thermometers and soil moisture probes as well as cameras may provide the auxiliary information to the models and algorithms.

Data from WMO/ICAO Exchange Networks

Having the interface to the AFTN/AMHS/GTS Exchange networks the AWDSS receives and processes the METAR/SPECI observations and TAF forecasts, thus providing the operators with the screen displaying the current as well as anticipated operational situation at the neighboring airports.

Low Level Windshear

An integrated UCAR Phase III compliant IMS4 LLWAS, radar or lidar-based windshear detection system (or an interface to the 3rd party one) provides the AWDSS with the low level windshears gain or loss or the microbursts alerts.

NWP Model

The IMS Model Suite is capable to integrate local high-resolution models (WRF, ALADIN, COSMO etc.), global models (e.g. GFS or other available to a customer) and ensemble models. IMS Model Suite can run the 3D regional weather prediction model (WRF):

- Core of system is non-hydrostatic model (high resolution available)
- Configurable resolution (e.g. 10 km) for whole domain
- Configurable resolution for nested subdomains (e.g. airport area and vicinity, complex topography region)
- Numerical outputs in WMO format FM-92 GRIB
- Efficient use of hardware resources
- Built-in communication modules for real-time import of all data necessary for initialization of the WRF model.

The local high resolution model (WRF, ALADIN, COSMO, etc.) output is used as an input by other models and algorithms.

Fog Detection and Forecasting

The fog detection and forecasting is the product of the IMS4 Model Suite toolchain:

- 3D regional weather prediction model produces high resolution weather data (~1 km)
- 1D fog prediction model calculates the fog forecast based on high resolution weather data (nowcasting and short term forecasting)
- Data mining models option adaptively improves results by „learning“ from previous situations (advanced statistical post processing)

Satellite images are helpful for manned fog nowcasting service.

Thunderstorm

The thunderstorm algorithms address the thunderstorm identification (threshold based algorithms), tracking and forecasting (or better nowcasting) based on extrapolation of recent storm movements.

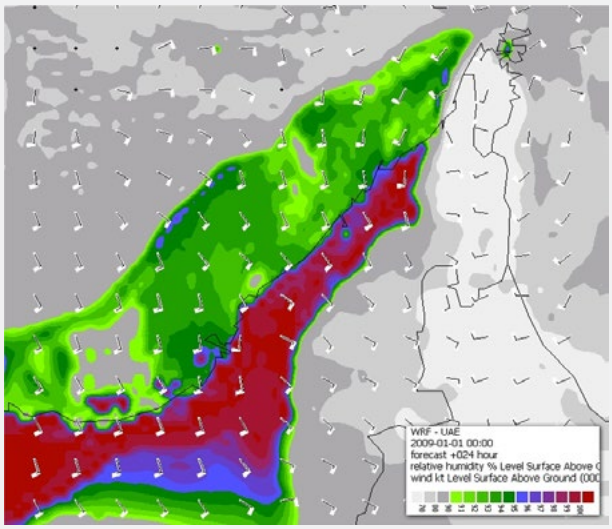
Microburst Detection Algorithm

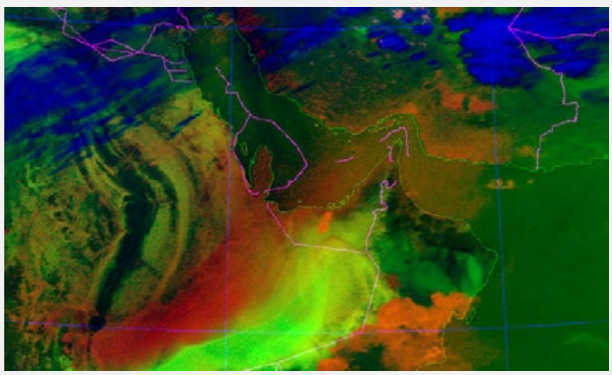
The algorithm allows to detect microburst form Doppler weather radar data or LIDAR data. The processed inputs are:

- Reflectivity
- Doppler velocity
- Polarimetric data are not necessary, but if available, they increase the quality of results

Output is image with microbursts positions which is overlaid with airport map.

Lorem





Gust Front Detection Algorithm

This algorithm allows to detect gust fronts form Doppler weather radar data or LIDAR data. The inputs are:

- Reflectivity
- Doppler velocity
- Polarimetric data are not necessary, but if available, they increase the quality of results

Output is image with gust front position and wind speed values accompanying the front, that is overlaid with airport map.

IMS4 AWDSS IT Infrastructure

Depending on the system configuration, the IMS4 AWDSS runs on the several Linux duplicated servers dedicated to data acquisition and communication, servers running the models and algorithms and web/presentation servers, or the system can be installed in a private cloud environment.