aerodata®

[precision in special mission]


# AeroMission® –

## the integrated mission management system for airborne applications

www.aerodata.de

## Applications

Aerodata provides special mission aircraft which can be tailored to multiple scenarios like:

- Search & Rescue
- Maritime and Land Surveillance
- Border Patrol
- Law Enforcement and Police Tasks
- Fishery Patrol
- Environmental Protection and Pollution Monitoring
- Disaster Relief
- Medical Transport

## Features

- Integrated common sensor data representation for an optimum situational awareness
- System integrated sensor operation, mission guidance and support of tactical planning
- Support of top cover, on-scene coordination, and drop manoeuvres
- Digital storage and replay of all mission related data
- Automated generation of standard messages or reports including information exchange with aircraft and ground control centre (existing or Aerodata provided)
- Data exchange with electronic flight deck (video, FMS, aircraft data)
- System redundancy and initial, continuous and on request build in tests (BIT)
- Scalable from helicopters to multi-workstation configurations

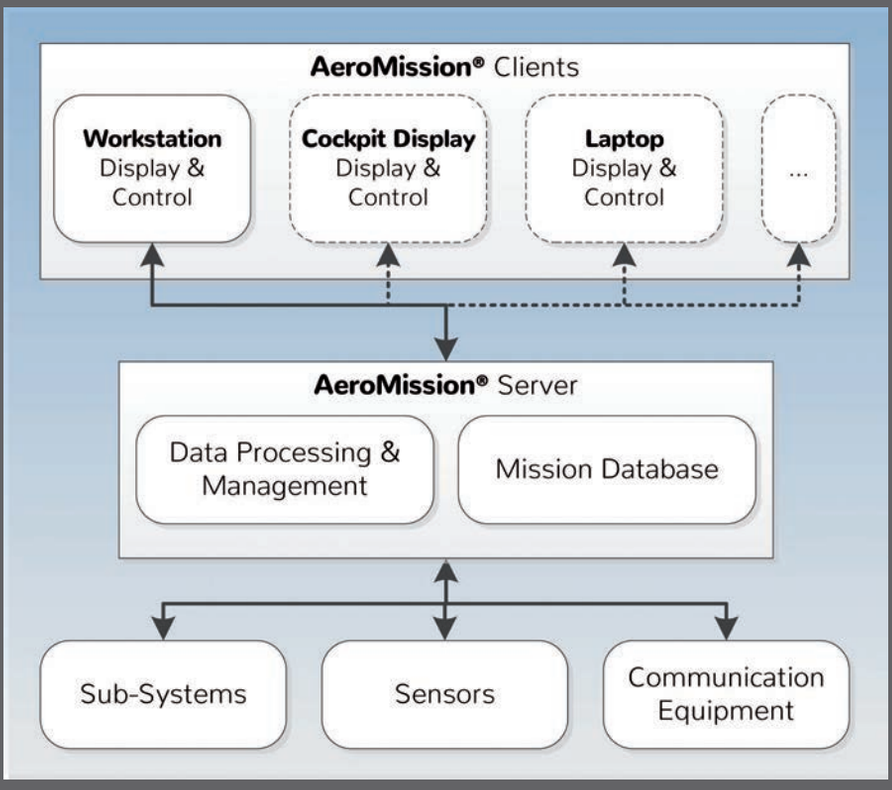
## AeroMission® Architecture

The AeroMission® software is a comprehensive suite for many kinds of special mission applications. The basic philosophy and the relevant features of the system are briefly described below.

## Client / Server Concept

The main element of the mission software is the AeroMission® server. The interface modules, belonging to the mission server,

- gather all incoming data from the different sensors,




Main Software Modules

- provide control of the sensors and other equipment,
- allow data transfer over connected communication means and
- manage the access to the mission data base.

Acquired data is processed by the processing modules to

- create displayable information from the raw data,
- use acquired data in outputs to other equipment,
- fuse data from different sources and
- store data in the mission data base

By connecting to the mission server, several clients, e.g. one or more operator computers, cockpit information displays or laptops can be used as front-ends to the mission management system.

All operator workstations have access to the mission server, allowing to change allocation of operator roles to optimize work share at any time. The number of operator workstations is flexible according to either customers' requirements or the complexity of the respective system.

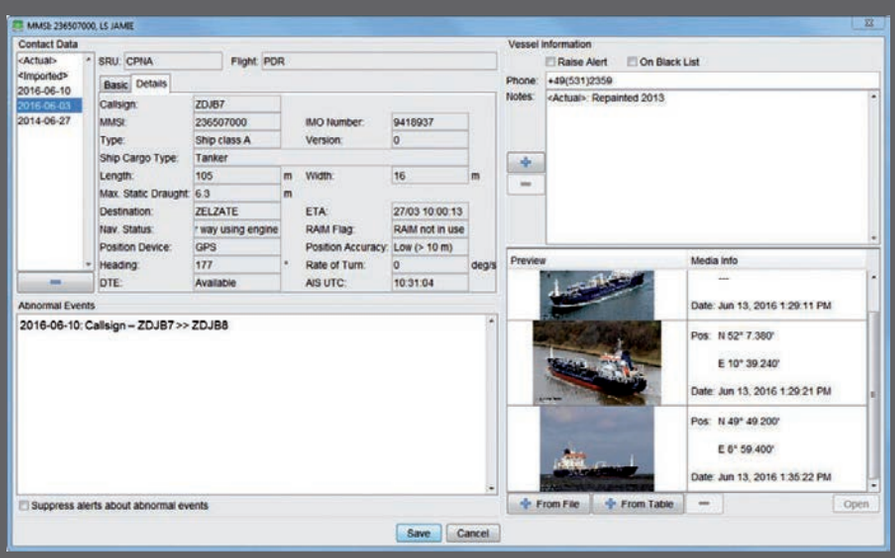
## Sensor Integration

Due to its modular concept, adding new equipment to the mission management software suite is simple. Typical mission sensors handled by the mission management system are all kinds of

- RADAR systems
- EO/IR systems
- AIS transponders
- direction finders
- COMINT
- ELINT
- Oil Pollution Sensors
- ASW

## Voice and Data Communication

V/UHF and HF radios are typical communication equipment. Further, AeroMission® can be equipped with satellite communication systems, based on the Iridium or Inmarsat network, Ku-band data link and with microwave downlink in order to transfer relevant data or media to a ground station. In addition, a communication repeater, allowing relaying of communication of three party communication, is integrated.

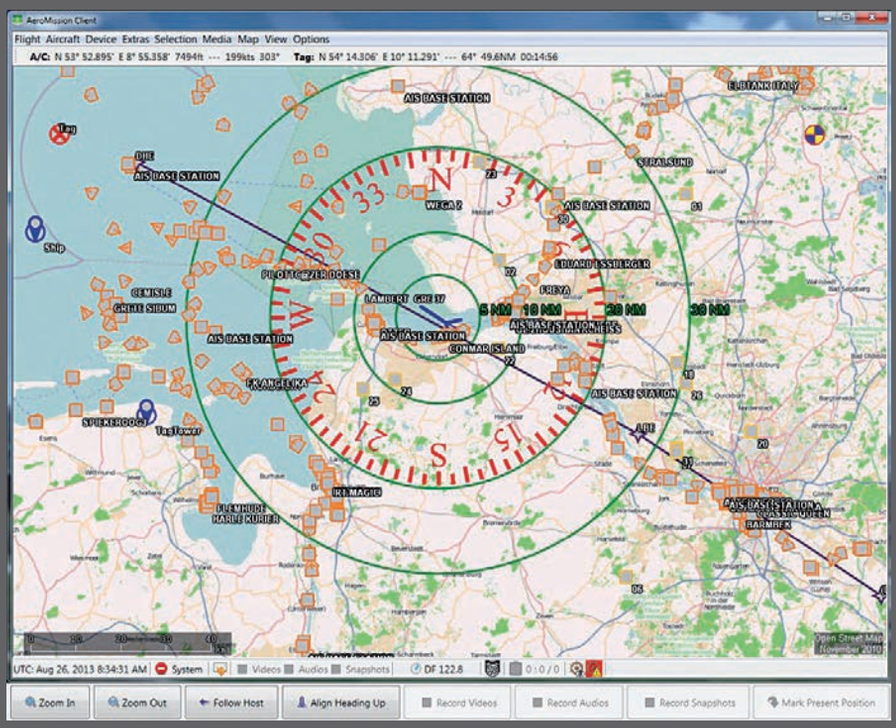



Vessel Data Base

## Mission Database

The mission database stores all mission relevant sensor and aircraft data as well as media recordings, flight plans, incoming and outgoing messages. Depending on the task, several other data base contents are available, e. g.

- Vessel data for tracking vessel movements and history
- Street address data for locating specific addresses or identification of the street address related to the target position
- Points of interest
- Obstacles
- Address data and contact information like phone numbers or e-mail addresses



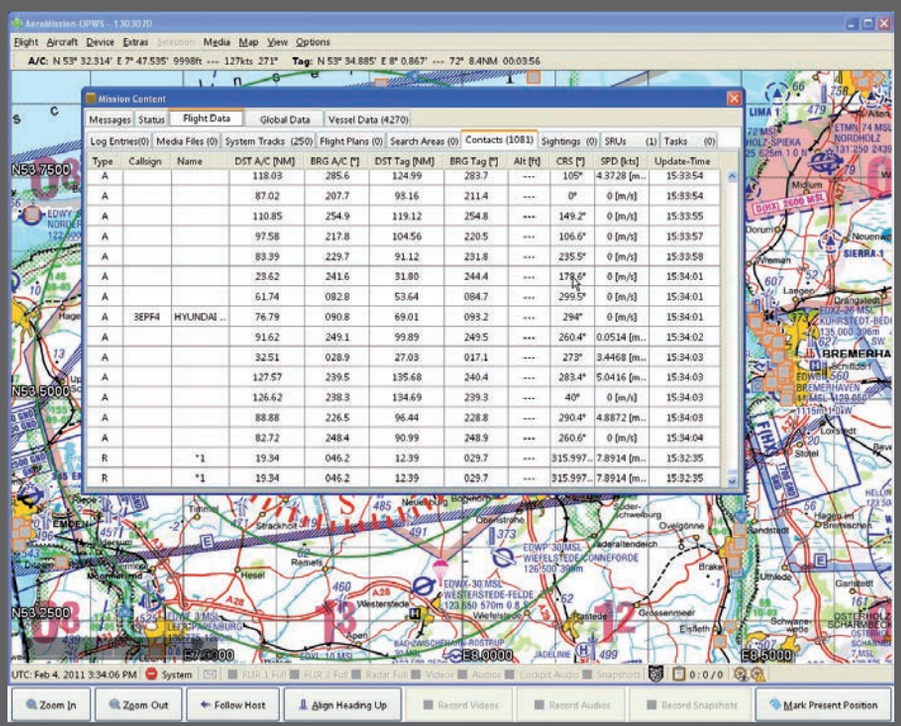

Typical screen layout of the mission control application

## Presentation of Data

The main part of the screen is covered by the mission software client including the moving map.

Access to detailed mission data is provided by tables, too. An implementation example of the corresponding window is shown below.

Radar control and data processing is integrated into AeroMission®. The radar scan as well as the radar tracks are presented as an overlay on the moving map.




Example of a track table, providing distance, position and other related data

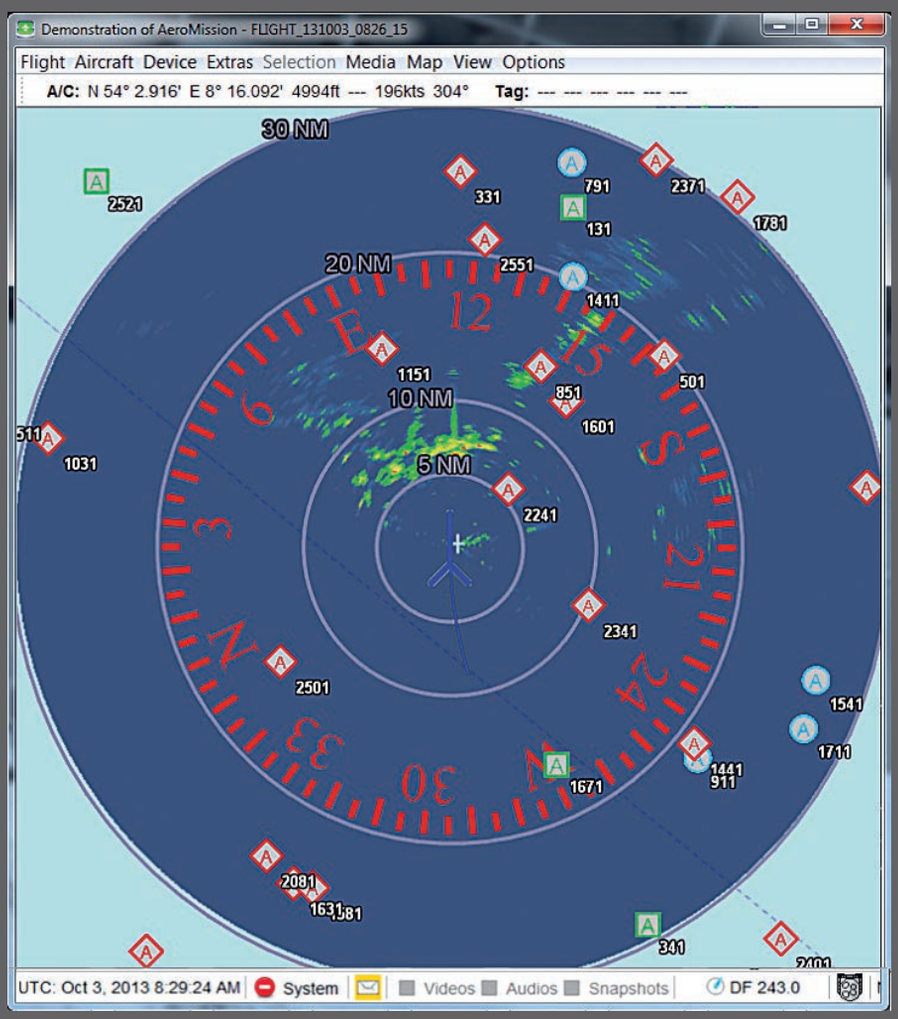
## Moving Map

Central part of the AeroMission® client is a moving map. The chart data used by this moving map can be managed in a central location, allowing to use the same charts on all clients. Usual formats of vector and raster maps are supported, e.g.

- S63 *)
- Jeppesen charts
- VMAP

*) Aerodata is accredited OEM provider

The moving map provides an Aerodata defined set of symbols as well as symbols according to MIL-STD-2525.

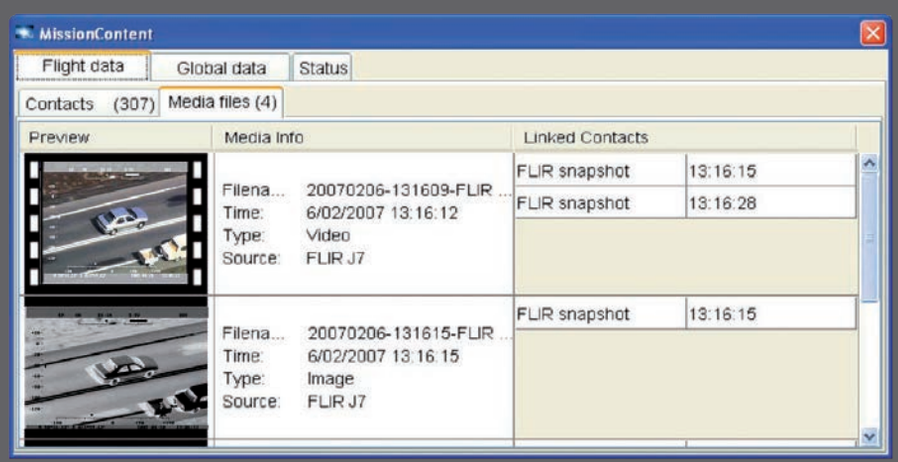



Moving Map with Radar Overlay

## Data Recording

The audio from each independent headset and the EO/IR videos are converted into digital audio/video streams via hardware encoders. The mission computer records the incoming data streams directly on the internal flash disk and on the detachable external hard disk in parallel.

For replay of video and audio data the mission software provides tools to select and replay the recorded audio and video streams. Standard data formats are used in order to allow for easy data import / export.



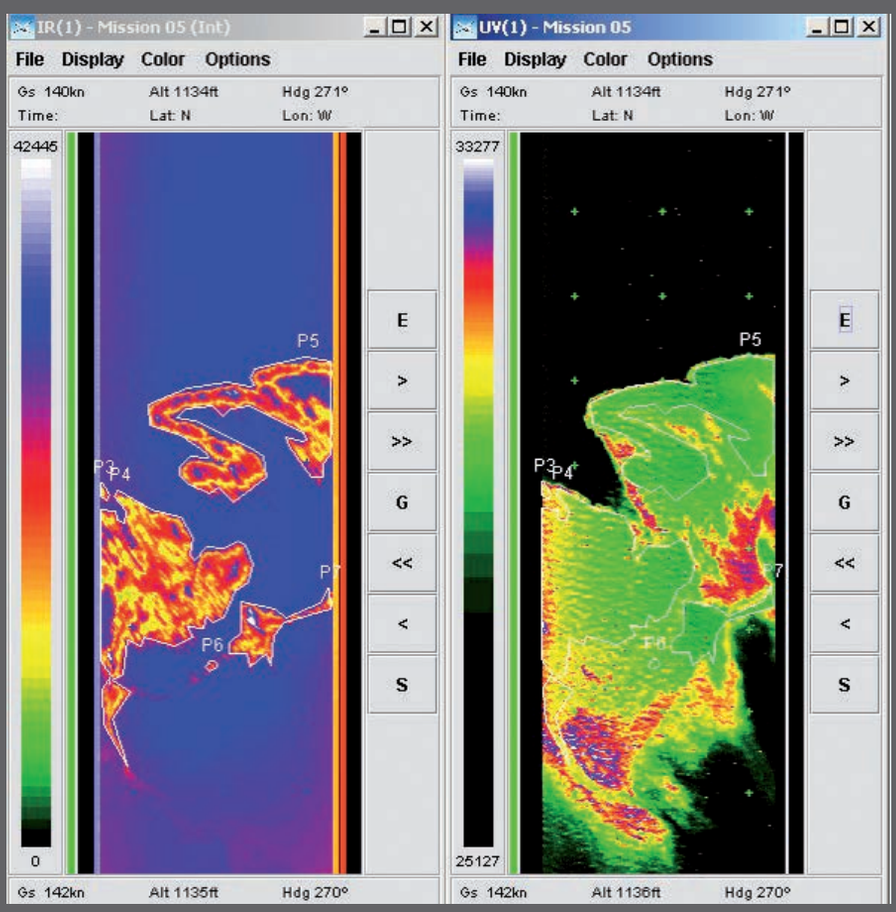

Example for media list

## Pollution Monitoring

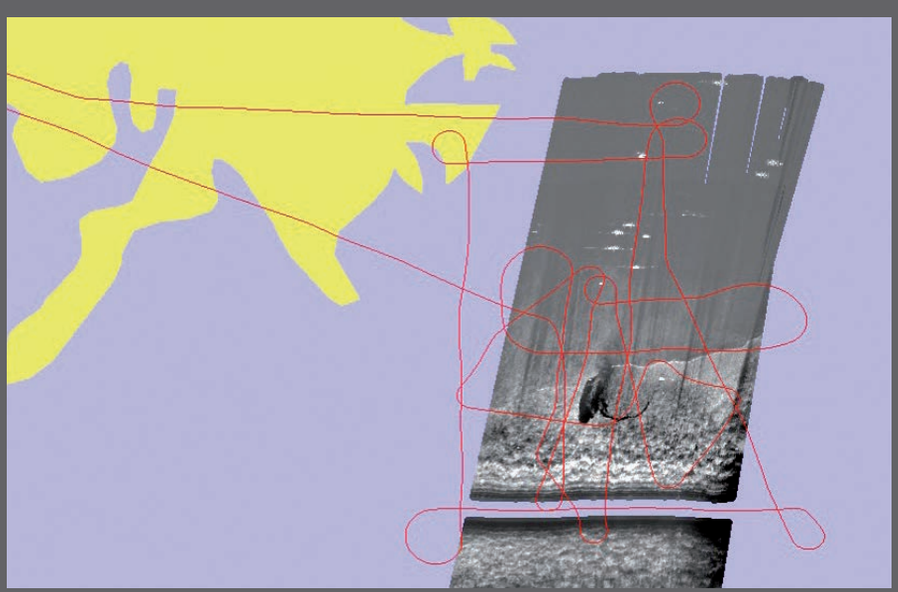
One of the outstanding features of AeroMission® is pollution monitoring with sensor technology from Optimare, a member of the Aerodata Group. In particular, the following sensors are integrated

- Side-Looking Airborne Radar (SLAR)
- IR/UV Line Scanner
- Visible Line Scanner
- Microwave Radiometer
- Laser Fluorosensor

Optimare's Analysis Software enables the operator to analyse the oil spill during flight with regard to oil type, quantity and spatio-temporal properties.



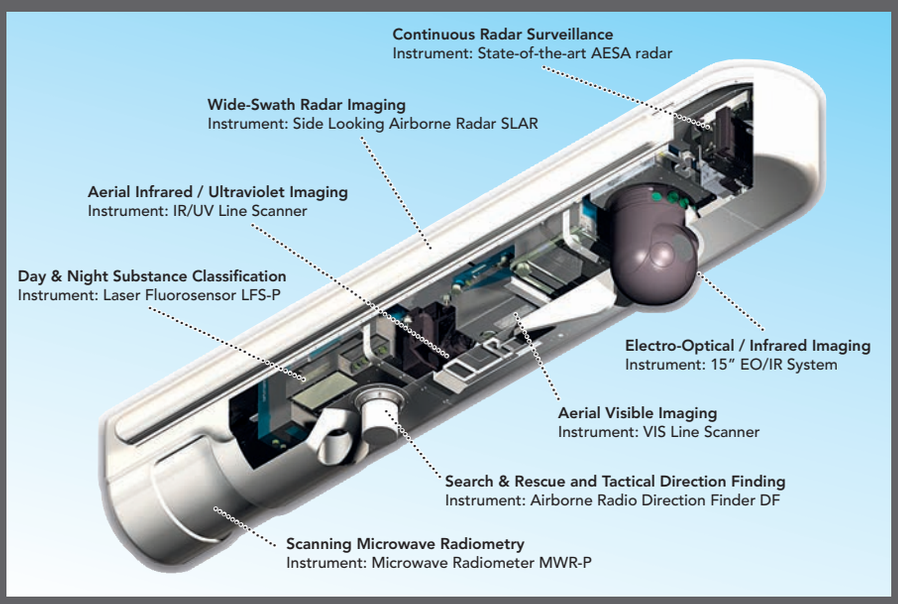

IR/UV image of an oil spill



Geo-referenced SLAR image

## OctoPod

AeroMission® supports OctoPod, a sensor pod mounted under the fuselage of an aircraft. This pod can be fitted with up to eight sensors.




## Automatic Track-to-Track Fusion of Sensor Data

Airborne mission management systems like AeroMission® are usually providing interfaces to a suite of different sensors and present the data of these sensors to one or multiple operators. Modern sensors are highly efficient and can flood a human operator with a lot of information. Extracting the relevant pieces and making the right decisions quickly is the key to successful accomplishment of the mission.

AeroMission® is not only presenting the sensor data, leaving all the workload to the operator, but aims at providing the best possible support to find what he is looking for. One important way to augment the view on the situation is fusing data from separate sensors. For example, an AIS transponder may provide information about a vessel, while the same vessel is detected by the radar.

Fusing the information from both sensors relieves the operator from considering characteristics of separate sensors and instead provides a more transparent and complete view on the detected objects.

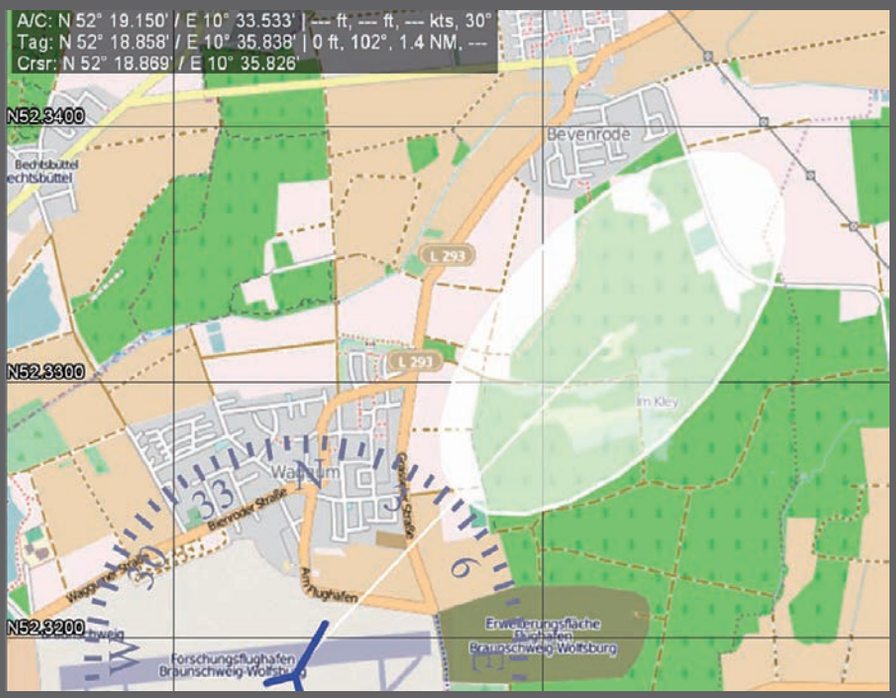
AeroMission® implements track-to-track fusion, utilizing track data from sensors and creating system tracks based on the sensor track data.

In a continuous process, new system tracks are initiated from sensor tracks, while existing system tracks are checked for associations with sensor tracks and updated with new data from the sensors.

## EO/IR Display, Control and Slaving

AeroMission® is providing a maximum of flexibility with regard to the display layout.

Multiple channels of the EO/IR camera are connected, allow-




EO/IR ellipsoid in the moving map (example)

ing to view different sensors in parallel. Each sensor video can be displayed in full-screen or in smaller frames on each of the workstation displays. Short cuts can be defined for quickly changing between different predefined layouts.

The EO/IR sensor can be aimed by AeroMission® to any selected position or object on the moving map.

AeroMission® controls all of these activities automatically. The operator only needs to initiate a specific mode either by a hotkey or a context menu, e.g. by simply clicking on a target (see figure below).

## Reporting and Messages

The data link based reporting and message system is an important feature which allows the creation of an overall situational awareness on the ground and an efficient assignment of the airborne assets by the ground station.

AeroMission® is providing several means for transferring mission data as well between different assets as between assets and a ground station:

- Briefings
- Reports
- Situational Awareness Picture in compact data format

The standardized frame allows the automatic or semi-automatic (on user request) report generation and supports the reduction of the operator workload.

**Flight Report**

| | | | |
|---|---|---|---|
| Flight ID: | Aug-24-HJ3 | Date/Time: | 2016-08-24 16:22:30 |
| Callsign: | D-IMPA | | |

**Reporting Unit**

| | | | |
|---|---|---|---|
| Callsign: | D-IMPA | | |
| Latitude: | 52.351404 | Longitude: | 11.01002 |
| Speed: | 154.8 kts | Heading: | -107.53 |

Altitude: 9870.85 ft

**Crew Information:**

| | | | |
|---|---|---|---|
| Pilot: | George Wilson | Copilot: | Dan Miller |
| Operator: | Steve Johnson | | |
| Additional Crew: | | | |

Flight time table:

| | | | |
|---|---|---|---|
| Briefing Ack.: | 13:20:45 | Task: | 13:35:20 |
| Task accept: | 13:36:35 | Taxi: | 13:37:40 |
| Departure: | 13:40:22 | Landing: | 16:15:20 |
| On Task: | | Off Task: | |
| Engine on: | 13:12:43 | Engine Off: | 16:19:35 |
| Total hours: | 3:06:52 | | |

Typical report in pdf format

## Mission Planning

Flight plans and search patterns received from the ground station or the FMS are presented in a dedicated layer on the map.

The operator can create flight plans interactively using the moving map.

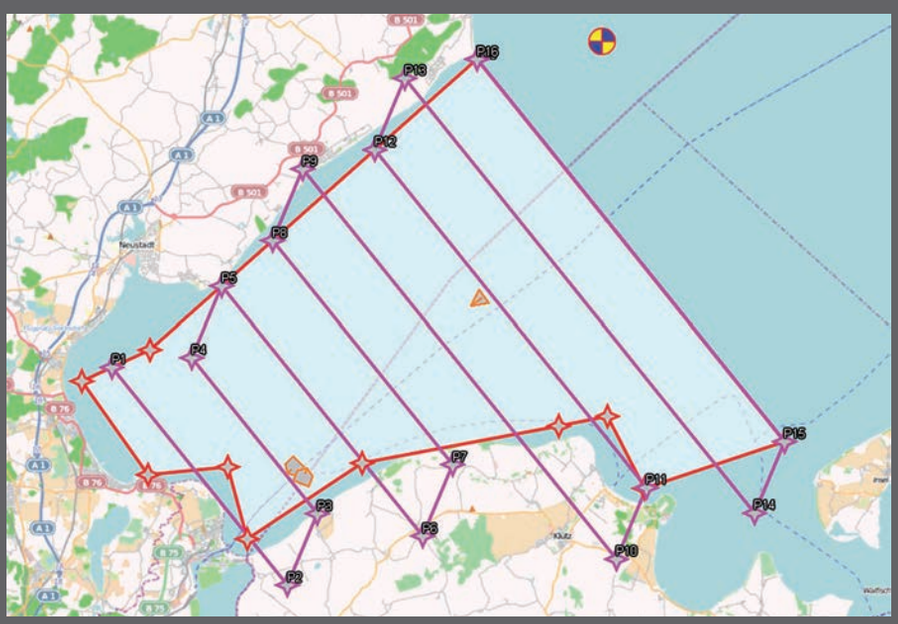
The mission management system provides further capabilities to create standard search pattern easily. Once generated, the flight plan can be stored for future use or directly sent to a connected FMS or to ground for confirmation purposes.

Intercept waypoints and flight plans can be created by the mission management system.

The functionalities available for flight planning may vary depending on the capabilities of the interfaced FMS.

Apart from the general capability for the generation of search patterns (for creating search patterns expanding square, sector search, parallel search), search areas can automatically be filled with parallel search pattern.

AeroMission® also supports drop manoeuvres. Various types of flight plans for dropping can be selected considering target position, wind speed and wind direction.




Automatically created search pattern for a given search area

## Operator Consoles

Depending on the aircraft type, AeroMission® is implemented on dedicated operator consoles. Below, some examples are given for fixed wing aircraft and helicopters.

Operator Console for King Air aircraft

Operator Console for helicopters

## Cockpit Information Display

In order to provide mission information to the pilots, client processes on the AeroMission® server feed cockpit displays with moving map and videos.

Comparable to the operator console, the pilots can select maps and charts, target layers and sensor output to be displayed.

As an alternative, homing guidance can be provided on an AeroMission® client (Cockpit Information Display) in the cockpit.

Typical view of an AeroMission® Cockpit Information Display

Display of optical EO/IR sensor on ProLine 21. MFD and additional CockpitInformation Display

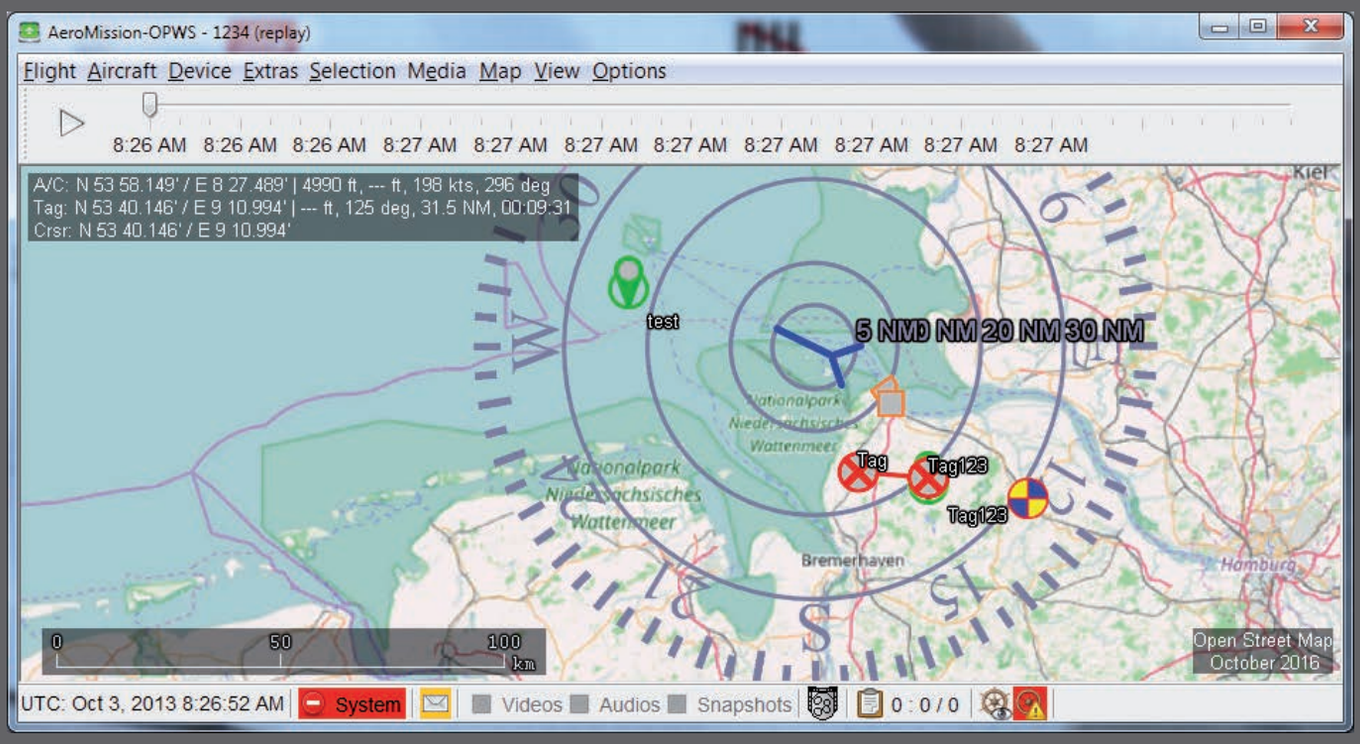
## Ground Station

A variety of ground station modules completes the AeroMission® concept.

These modules consist of a fixed main control centre and mobile components like micro wave data and/or SatCom voice/data communication. At any ground computer the same moving map system as in the aircraft is installed. Thus, replay, archiving and post processing of missions are possible. In addition, the ground station provides a simulation and training mode. In this mode, a time slider can be used to scroll forward and backward in a mission. In simulation mode, a trainer can

- Determine the flight path of the simulated aircraft
- Modify various simulation aircraft parameters like altitude or speed
- Create simulated sensor tracks and modify their sensor parameters including speed and course

The AeroMission software is able to read pre-defined simulation scenarios from text files to allow training of specific situations. The scenario defines the aircraft path and the simulated sensor contacts. The trainer may manually add or modify simulated data as required.




Reprocessing time slider

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**Abbreviations**

| | |
|---|---|
| AIS | Automatic Information System |
| ASW | Anti-Submarine Warfare |
| COMINT | Communication Intelligence |
| ELINT | Electronic Intelligence |
| EO/IR | Electro-Optical / Infra-Red |
| IR/UV | Infra-Red / Ultra-Violet |
| SatCom | Satellite communication |
| SLAR | Side Looking Airborne Radar |

Aerodata AG · Hermann-Blenk-Straße 34-46 · 38108 Braunschweig/Germany
Phone + 49 531/2359-0 · Fax + 49 531/2359-158 · E-Mail: AeroMission@aerodata.de

www.aerodata.de