



Daimler-Benz Aerospace

Dornier  
Defence and Civil Systems



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## **EuroGrid: European Geographic Information Display**

### **System for Helicopter Operation**

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The real-time representation of coloured topographical maps with mission-related graphic overlays on a high-resolution display in the cockpit of an aircraft or helicopter, is an indispensable tool for mission preparation in view of the requirements for rapid reaction and command capability. A digital map system is particularly valuable for missions in unknown terrain and for the interaction of various, and sometimes also international forces (rapid reaction forces).

The digital map system's primary function, amongst others, is to provide crew support by reducing

their workload for navigation, communications and planning, overview of the current tactical situation, etc. It also is an important link to other aircraft and ground vehicles, to the ground station and additionally to the command centre responsible for the mission.

In order to comply with these tasks the following requirements are posed on a digital map system. They vary substantially depending on the carrier's mission requirements. The scope of possible requirements is limited by the following types of carriers:



1. Single-seat aircraft
2. Multi-seat aircraft in which the commander or other crew members work with the digital map system in addition to the pilot.

General functions for both types:

- Map change (loading maps from other areas and with other scales)
- Variable zoom
- Real-time map rotation and scrolling
- Dimming / mode for night vision goggles / false colour representation

For single seat aircraft applications the digital map system is primarily used to present the information to the pilot, with the emphasis on:

- Aircraft's own position on the map
- Position of mission-relevant objects
- Direction of movement

- Terrain profiles
- Obstacle display from own library
- Planned mission
- Current situation / mission sequence

For multi seat aircraft applications the digital map system, in addition to the presentation of the information specified above, is an on-board **tactical workplace** which provides similar flexibility and functions to those of a planning station on the ground, such as:

- Planning, editing and storing of mission sequences on the map background
- Generation and editing of mission-relevant situations
- Graphical communications with ground command centres and other participants in the mission (air and ground) in conjunction with C<sup>3</sup>I systems
- Direction finding display



- Graphical issue of orders and target assignment

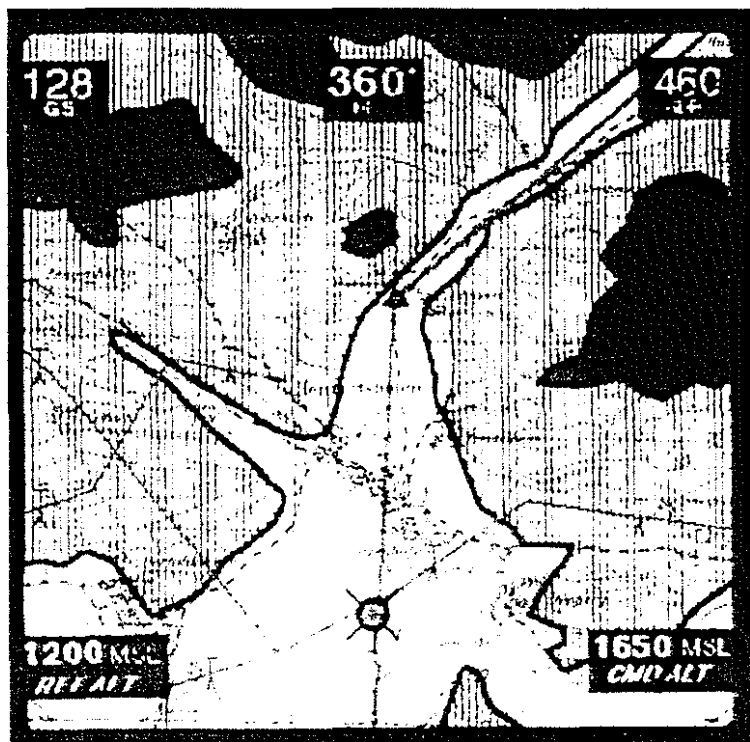


Figure 1: Display of the planned flight path and the aircraft's own position on the map picture including marking of height data

In the TIGER helicopter, the digital map system has the function of a tactical/operational workplace. Dornier, a subsidiary of Daimler-Benz Aerospace, started development of the digital map system DKG in 1988 on behalf of the German Office of Defence Technology and

Procurement. The system is currently undergoing successful functional trials in a BK 117 (AVT) testbed and demonstrator helicopter.

The decision by the French government agency to request a



digital map system for its HAP and HAC has led to the bilateral joint development of **EuroGrid** by the companies Dornier and SEXTANT Avionique. Derived from the DKG the EuroGrid benefits from the specific developments achieved in France with the Multihelicare project as well as the digital map systems used on the Mirage 2000 and Rafale aircraft. These developments mainly concern the use of vector data and associated 3D features.

Especially designed for use on-board the TIGER helicopter, it presents - on two independent multi-function displays - maps in different scales, graphical overlays, and images stored in the sighting system whose lines of sight are projected onto the map. **EuroGrid** is of modular design and can be adapted to different applications by combining the available modules. This modular and flexible architecture is also used in

aircraft with the digital map system functions being adapted to the specific requirements and interfaces. **EuroGrid** is also planned for use in NATO's future NH90 helicopter. The mission data required by **EuroGrid** are prepared and generated in a ground station and then transferred by a mission data transfer system (MDTS) which was developed by Dornier. This MDTS consists of mission data entry unit (MDE) and a solid state data carrier (MDT) and is also used in the Tornado, EF2000 aircraft and the CL289 drone. MDTS is also planned for use in the NH90. This approach ensures a maximum degree of interoperability. Figure 2 depicts the on-board components consisting of the EuroGrid, the data transfer system including mission data entry unit (MDE), the solid state data carrier (MDT) and a map display with superimposed mission planning.

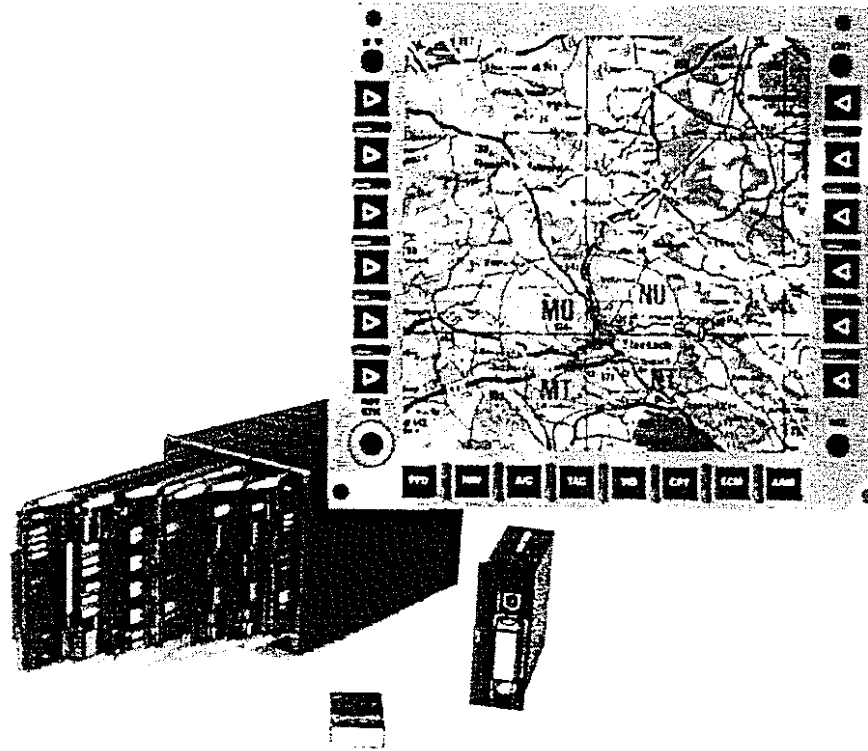


Figure 2: Digital map system with mission data transfer system and solid state data carrier

During the mission, these data can be updated from the ground via data radio and, vice versa, current situation or reconnaissance data can be transmitted from the aircraft to the responsible command centre on the ground.

#### **EuroGrid® - architecture and functionality**

EuroGrid for TIGER contains the following principal modules:

- Main processor for EuroGrid control with
  - \* Control of operations



- \* Graphics overlay management (up to 40 different overlays consisting of max. 200 co-ordinates each) and organisation of thematic classes.
  - \* Support of Man-machine interface (MMI)
  - Geographic processor to process the 2D map image with the graphic overlay and the video output to the cockpit displays, offering the following functions:
    - \* Representation of raster and vector maps in different scales: e.g. 1 : 100 K, 1 : 250 K, 1 : 500 K, 1 : 1 million, 1 : 2 million
    - \* Real-time map display with respect to translation and rotation, i.e. North-Up or Heading Up, including graphic overlays
    - \* Representation of various zooming factors
  - \* Video memory for saving and storing IR and video images
  - Mass memory with up to 255 MB per card for storing all necessary map data and the symbol library
  - Communication processor, controlling different radio devices, such as SEM 91, XK510, PR4G.
- Typical information to be transmitted:
- \* Tactical, navigational and threat graphics
  - \* Graphical issue of order and target assignment
  - \* Position requests and messages
  - \* Text transmission
- Elevation processor for vector map display with the following features:
  - \* Display of shadings including or not colouring of elevations
  - \* Display of ground clearance by colour-marked areas (figure 1)

\* Display of the terrain profile over the planned flight path

These requirements lead to the following architecture for EuroGrid TIGER (figure 3).

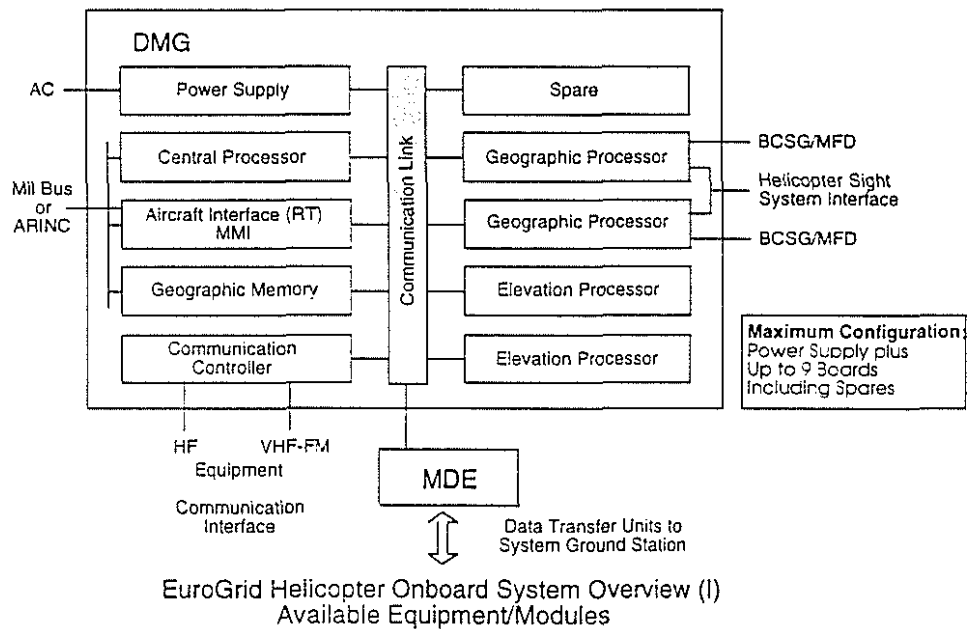


Figure 3: Architecture of EuroGrid - TIGER

Airborne digital map systems in aircraft or helicopters are complemented by suitable ground stations or systems which have to fulfil the following primary functions:

- Map mission data preparation / map logistics
- Operational mission support and mission planning



## Map data preparation

The steps preceding the use of digital maps are the procurement of suitable map material and the generation of map data in suitable form for the map system. The "Map Preparation System" (**MAPS**) is developed for this purpose and generates map data for digital map systems from diverse sources.

Such source data may be available in the following forms:

- as hardcopy map or film
- as digital raster data from national and allied mapping agencies
- as digital vector data, for instance DCW, VMap or other sources.

MAPS or equivalent systems have been (or will be) used for various other programmes. Depending of the operational concept they may be used as a "stand - alone" system or integrated in larger C<sup>3</sup>I systems.

## Operational mission support and mission planning

The optimum operational use of a digital map system onboard of aircraft or helicopters requires the following ground station functions for mission support and mission planning:

- Timely planning of complex missions on the map background taking into account aircraft/helicopter performance and including route planning and the planning of operational sequences in the mission area
- Compatibility with the corresponding C<sup>3</sup>I system
- Display of the tactical situation by graphical symbols
- Task planning support





- Support for mission organisation, control and monitoring
- Planning and control of available resources: manpower and material
- Data output on the solid state data carrier of the data transfer system

Both companies Dornier and Sextant are currently involved in mission planning systems for helicopters and have teamed in the definition of these functions for the Tiger helicopter. The associated ground systems for French and German forces will (of course) incorporate these EuroGrid support functions.



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Further information is available at

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