



# *GIS Software, Concepts and Data in Support of Avionic Systems*



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- Airborne moving map systems
  - Introduction
  - Resemblance and differences to GIS systems
- GIS data and moving map systems
  - GIS data – Raster and Vector
  - Applications
- **ESRI software usage**
  - Analysis
  - Preparation
  - Mission Planning
- End Notes - The Next generation

# ***What is a moving map?***

- **A moving map system is part of an avionics system**
- **Avionics systems provides various capabilities**
  - Engine indications
  - Flight instrumentation  
(e.g., Horizontal Situation Indicator (HSI))
  - Flight Management System (FMS)
  - Moving Map System

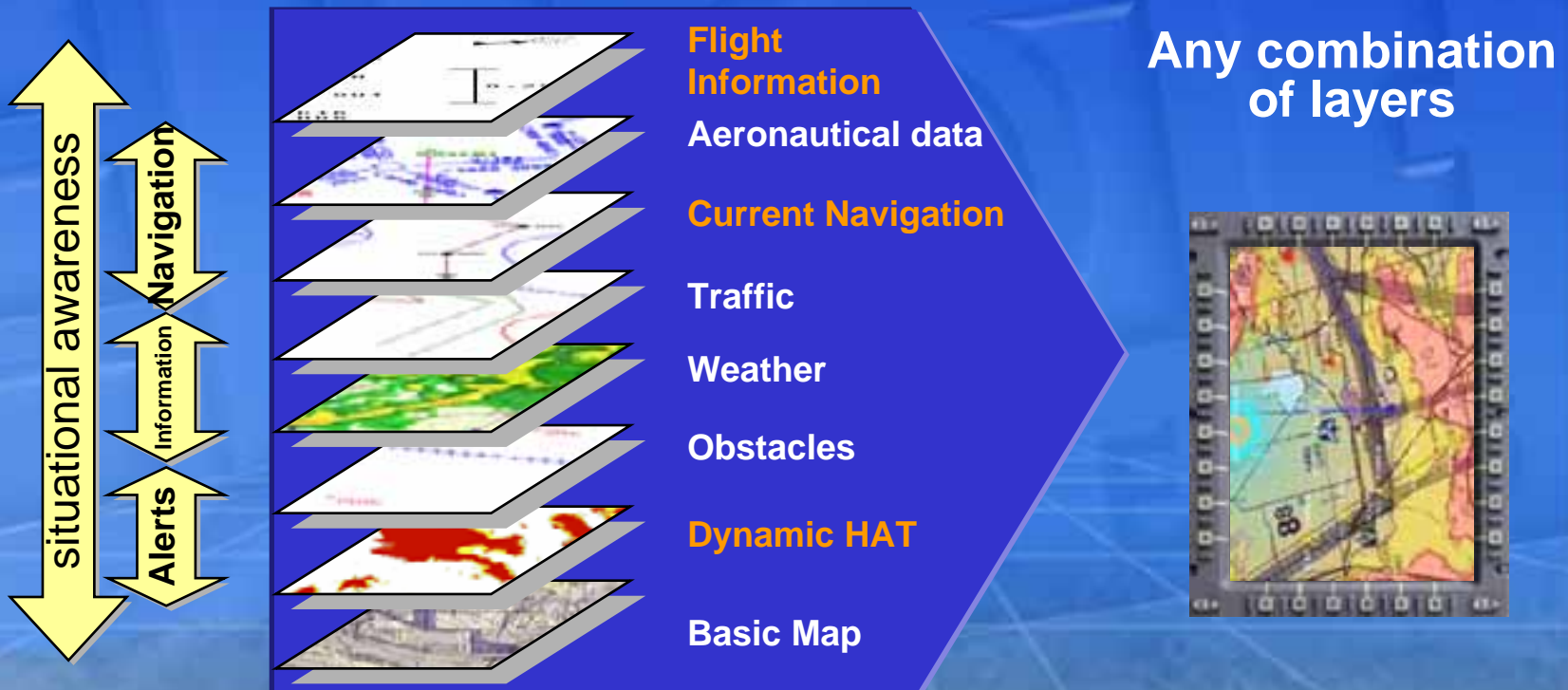
## ● **So what is a moving map system?**

**A Navigational aid to assist the pilot/co-pilot by providing ownship indicator overlaid on base map and additional alert, navigation and information layers**

# Moving Map System (Cont.)

## Moving Map System provides

- Situational Awareness
- Flight Safety
- Mission support



# Moving Map Systems and GIS

## ● Resemblance

- GIS is a System of computer software, hardware, data and processes with man in the loop in order to manage, analyze and present information that is tied to a spatial location
- Moving Map is actually an application of GIS

## ● Differences

- Operating Systems
  - ◆ Real Time (deterministic) OS-s
    - VxWorks
    - Integrity
- CERTIFICATION
- Limited space/resources
- Interaction to on-board real-time sensors

## ● Definition

- A base map is a map portraying background reference information onto which other information is placed.

## ● Topographic (Raster or Vector)

### ■ Raster

- ◆ provides one simple cartographic portrayal of the area
- ◆ Information can't be de-cluttered easily
- ◆ Relatively large storage requirements

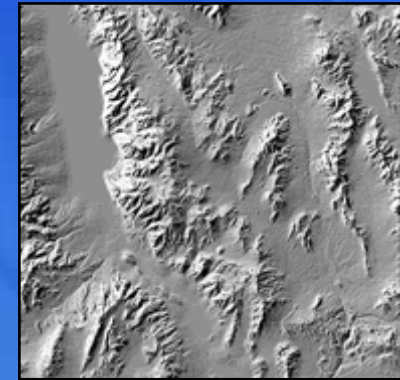
### ■ Vector

- ◆ Requires additional handling for cartographic clarity
- ◆ Information can be de-cluttered easily
- ◆ Relatively small storage requirements

- **Satellite/Aerial Imagery**
  - Provides actual representation of the area
  - Relatively large storage requirements
  - Additional vector information is needed for better orientation

## ● Terrain based

- Terrain Shading
- Hill Shade (Sun Angle Shading)
- Contour Lines
- Height Above Threshold (HAT)
- ...and combinations of all of the above







- **Aeronautical information**
  - Navigational aids
  - Usually in ARINC-424 format
- **Airport Mapping Database (AMDB)**
  - Approaches
  - Runway incursion
- **Weather**
  - Precipitation
  - Lightning
  - Wind
  - etc...

# *Not limited to 2D*



- ArcMap – ArcInfo
  - ◆ Functional Requirements assessment
  - ◆ Prototyping
  - ◆ Data analysis (spatial density)
- 3D analyst extensions
  - ◆ Functional Requirements assessment
  - ◆ 3D Prototyping
- Data Interoperability
  - ◆ Conversion of ARINC-424 to Geodatabase
  - ◆ Export to various defined schemas and formats

## ***End Notes***

- **Moving map systems are becoming the data center for the pilot usage**
- **Capabilities increase**
- **There is a need to balance between capabilities and users requirements**
- **3 dimensional view is becoming a reality**
- **Additional research is still needed**
- **ArcGIS platform provides management, analysis and prototyping for the map system.**

Picture courtesy of ESL

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