GIS Software, Concepts and Data in Support of Avionic Systems

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Topics

- 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 ownership indicator overlaid on base map and additional alert, navigation and information layers.
Moving Map System provides

- Situational Awareness
- Flight Safety
- Mission support

Any combination of layers:

- Flight Information
- Aeronautical data
- Current Navigation
- Traffic
- Weather
- Obstacles
- Dynamic HAT
- Basic Map
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
GIS Data – Base Maps

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

Images courtesy of ESL
GIS Data (Cont.)

- **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

Images courtesy of ESL
ESRI Software Usage

- **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
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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