3D Visualization Support for Aviation Mission Planning

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About ProLogic

- Small 8(a)-certified software development firm
- Offices in Fairmont, WV and Washington DC area
- Mixed Model Business - *Products and Services*
- Customers include Air Force, Army, NASA
- STK Business Partner - Solution Provider
- ESRI Business Partner, SEDRIS Associate
- Core Competencies
  - Geospatial Technologies
    - GIS, Visualization, Modeling & Simulation
  - Knowledge Management
  - Testing, IV&V
Overview

• USAF uses Portable Flight Planning System (PFPS) to support a broad range of aviation mission planning needs
• ProLogic developed a demo system for mission planning program office (AFMSS) that integrated with PFPS and added 3D Visualization capabilities
• STK is used to provide 3D visualization of
  – PFPS data elements (aircraft routes, annotations, threats)
  – Raster products (terrain, imagery, maps)
  – NIMA DAFIF data (airspaces, airways, navaids, airports)
  – NIMA DVOF data (towers, buildings)
• The system also takes advantage of STK strengths to provide advanced situational awareness
PFPS System

CFPS (Combat Flight Planning Software)

FalconView

RATSuite, TOLD, ARTOOL, CARDWIN, CWDS, TaskView, NOTAM, Weather, etc.

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PFPS Routes

• Route data
  – Planned date
  – Turnpoints
    • Positions
    • Leg Speed/Time
  – Aircraft type
  – Additional data (fuel, etc.)

• STK Implementation
  – Aircraft for model & track
  – Turnpoint markers
PFPS Threats

- PFPS (FalconView) Threats
  - Location
  - Engage Radar (outer)
  - Detect Radar (inner)
  - Visualization of Terrain Mask

- STK Implementation
  - Threat Object
  - Two sensors
  - AzElMask
Raster Data

- Raster Types
  - NIMA
    - CADRG, ADRG
    - CIB
    - DTED
  - Other
    - DEM
    - HREI FOTE Product
    - Local Aerial Imagery (DOQ)

- STK Implementation
  - Image import
  - Terrain import
  - Globe files

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DAFIF Airspaces

- Airspace data
  - Large volumes
    - Closed polygons
    - Min/Max altitude
  - Stacked
    - “inverted wedding cake”

- STK Implementation
  - Extruded polygons
  - Translucent coloring
DAFIF Airports & Runways

• DAFIF Data
  – Airport
    • Position
    • Type
  – Runways
    • End points
    • Length
    • Width

• STK Implementation
  – Airport markers
  – Runway models

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DAFIF Airways

- Airways
  - “Highways in the sky”
  - Floating ribbons
    - Multisegment lines
    - Min/max altitudes
  - Segments connect waypoints

- STK Implementation
  - Extruded airways
  - Translucent coloring

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Vertical Obstructions

- **FCC Data**
  - Antenna Structures
  - Lat, Lon, Elev, Height

- **DVOF Data**
  - Various Types
  - Lat, Lon, Elev, Height

- **STK Implementation**
  - Markers at a distance
  - Scaled models up close

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GPS Availability

- **Goal**
  - Visualize GPS availability for each route during flight

- **STK Implementation**
  - GPS Constellation
  - Chain access to aircraft

[Image of GPS availability visualization]
Route Conflicts

- **Conflict Detection**
  - Route conflict: when vertical or horizontal separation is not maintained
  - Each has a start/end time
  - Conflicts usually symmetric

- **STK Implementation**
  - Custom constraints for access calculations
  - Cylindrical “buffer” model displayed during access
Mission Planning GUI

- Central user interface for Mission Planning tasks
  - Data management
  - Overlay controls
    - toggle visibility
    - filters
  - Analysis (Line-of-sight, route conflicts)
  - Eyepoint control
- Shared simulation clock
- Loads scenarios from XML
Summary

• Leveraged STK/AVO via STK/Connect
• Seamlessly integrated with PFPS to provide a new 3D Visualization window
• Used STK’s “access” calculations to implement GPS prediction, route conflict, threat avoidance, etc.
• Addition of advanced 3D Visualization and analytical capabilities well received by USAF
• Demonstration system could help identify user requirements for 3D Visualization in JMPS (next generation mission planning system)
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