Geographic Information Systems (GIS) in Traffic Safety - NTSB

Panel #3 – AVIATION SAFETY PANEL
Tuesday December 4th, 13:15 TO 15:00
Dejan Damjanovic

CHALLENGES IN TERRAIN & OBSTACLE IDENTIFICATION
We are all moving to FANS/PBN
This is a Global challenge – eTOD for all!
New International Mandates for FANS:

Aeronautical Information Services

FAA & ICAO differ in eTOD criteria

Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2
## Area-2 VO Criteria: Complete by 2015

### Table A8-1. Terrain data numerical requirements

<table>
<thead>
<tr>
<th></th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post spacing</td>
<td>3 arc seconds (approx. 90 m)</td>
<td>1 arc second (approx. 30 m)</td>
<td>0.6 arc seconds (approx. 20 m)</td>
<td>0.3 arc seconds (approx. 9 m)</td>
</tr>
<tr>
<td>Vertical accuracy</td>
<td>30 m</td>
<td>3 m</td>
<td>0.5 m</td>
<td>1 m</td>
</tr>
<tr>
<td>Vertical resolution</td>
<td>1 m</td>
<td>0.1 m</td>
<td>0.01 m</td>
<td>0.1 m</td>
</tr>
<tr>
<td>Horizontal accuracy</td>
<td>50 m</td>
<td>5 m</td>
<td>0.5 m</td>
<td>2.5 m</td>
</tr>
<tr>
<td>Confidence level (4σ)</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
</tr>
<tr>
<td>Data classification</td>
<td>routine</td>
<td>essential</td>
<td>essential</td>
<td>essential</td>
</tr>
<tr>
<td>Integrity level</td>
<td>$1 \times 10^{-3}$</td>
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</tr>
<tr>
<td>Maintenance period</td>
<td>as required</td>
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**Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2**
Area-2 VO Criteria: Collect what VO size?
Now - Both OIS – KSPS 15R/33L
How to acquire Obstacles and Terrain?

1. Understand your collection AOI requirements.
   - ✓
2. Understand your eTOD Criteria & formats.
   - ✓
3. Choose your collection method(s).
4. Choose Validation Sources
5. Begin with Bare Earth DEM
6. Ensure that Airport Features (Area-3) and eTOD Features (Area-2) have a single position solution.
What are the collection methods?

- Satellite
- LIDAR
- SAR/IF-SAR
- Aerial
An real-world example – KSAN:
Point Obstacle Challenges

• Must understand difference between man-made and natural
• Ensuring placement of Point(s) onto DEM to identify Base & Height.
• Correct identification of top of trees.
• Choice of highest elevation within groupings of points.
• For KSAN – **2,763 Points**
Line Obstacle Challenges

- Must understand difference between man-made and natural.
- Ensuring placement of Line(s) onto DEM to identify Base & Height.
- Must integrate powerline towers (Points) with powerlines (Line)
- Must choose clumps of trees between line features and polygonal features.
- For KSAN – **483 Lines**
Polygonal Obstacle Challenges

- Must understand difference between man-made structures and natural terrain.
- Ensuring placement of Polygon(s) onto DEM to identify Base & Height.
- Must choose clumps of trees between line features and polygonal features.
- Must understand highest point within a polygon – clumps of buildings, clumps of trees, terrain that protrudes.
- For KSAN – 3,177 Polygons.
Some Conclusions from people who do this!

Things to keep in mind when acquiring this type of data:

• Understand all the collection technology available, and don’t make assumptions about technologies that you are less familiar with.
• Understand what AIXM means to provide a single, global “lingua franca” for Aeronautical Information Exchange
• Understand how to validate or cross-reference your collected data with published sources, and how you intend to resolve differences.
• Understand how you intend to maintain this data once you have collected it the first time – FOREVER.
THANK YOU!

San Diego International Airport (ICAO Code KSAN)

GeoEye 3D Airport Database – manufactured to RTCA DO-272(B) specifications
IKONOS-2 Source Imagery – acquired January 6, 2012, 80 cm ground sample distance