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

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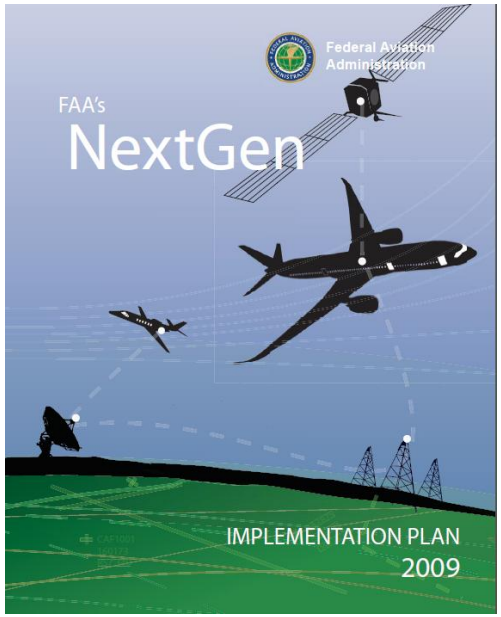
We are all moving to FANS/PBN



PBN

Industry Declaration in support of Performance-based Navigation (PBN)

We, as representatives of the air transportation community,

Affirming our joint responsibility to seek continual improvements to the safety, access, capacity, efficiency and environmental sustainability of the air transportation system,

Recognizing that Performance-based Navigation (PBN) provides a catalyst for these improvements to air traffic operations, while enabling a seamless and cost effective solution throughout the entire flight,

Recognizing the work of ICAO in formulating and publishing globally harmonized Area Navigation (RNAV) and Required Navigation Performance (RNP) provisions, now known as Performance-based Navigation (PBN),

Recalling that Resolution A36-23 of the 36th ICAO General Assembly whereby States are urged to implement PBN procedures in accordance with the established timetable,

We resolve:

To support the timetable set out by ICAO for the global implementation of PBN,

To collectively work to facilitate the implementation of PBN, and

To assist States, regions and other stakeholders in their development and execution of a complete PBN implementation plan.

We call upon:

All leaders of the civil aviation community, to fully support implementation of PBN into the air navigation system according to the ICAO provisions and established timetable.

Roberto Kobeh González, Council President

IATA — Giovanni Bisignani, Director General and CEO

canso — Alexander ter Kulle, Secretary General

IFATCA — Marc Baumgartner, President & CEO

I·F·A·L·P·A — Capt. Carlos Limon, President

ibac — Donald D. Spruston, Director General

François Gayet, Chairman

ACI — Angela Gittens, Director General

FHL — Matthew S. Zuccaro, President

FLIGHT SAFETY FOUNDATION — William R. Voss, President & CEO

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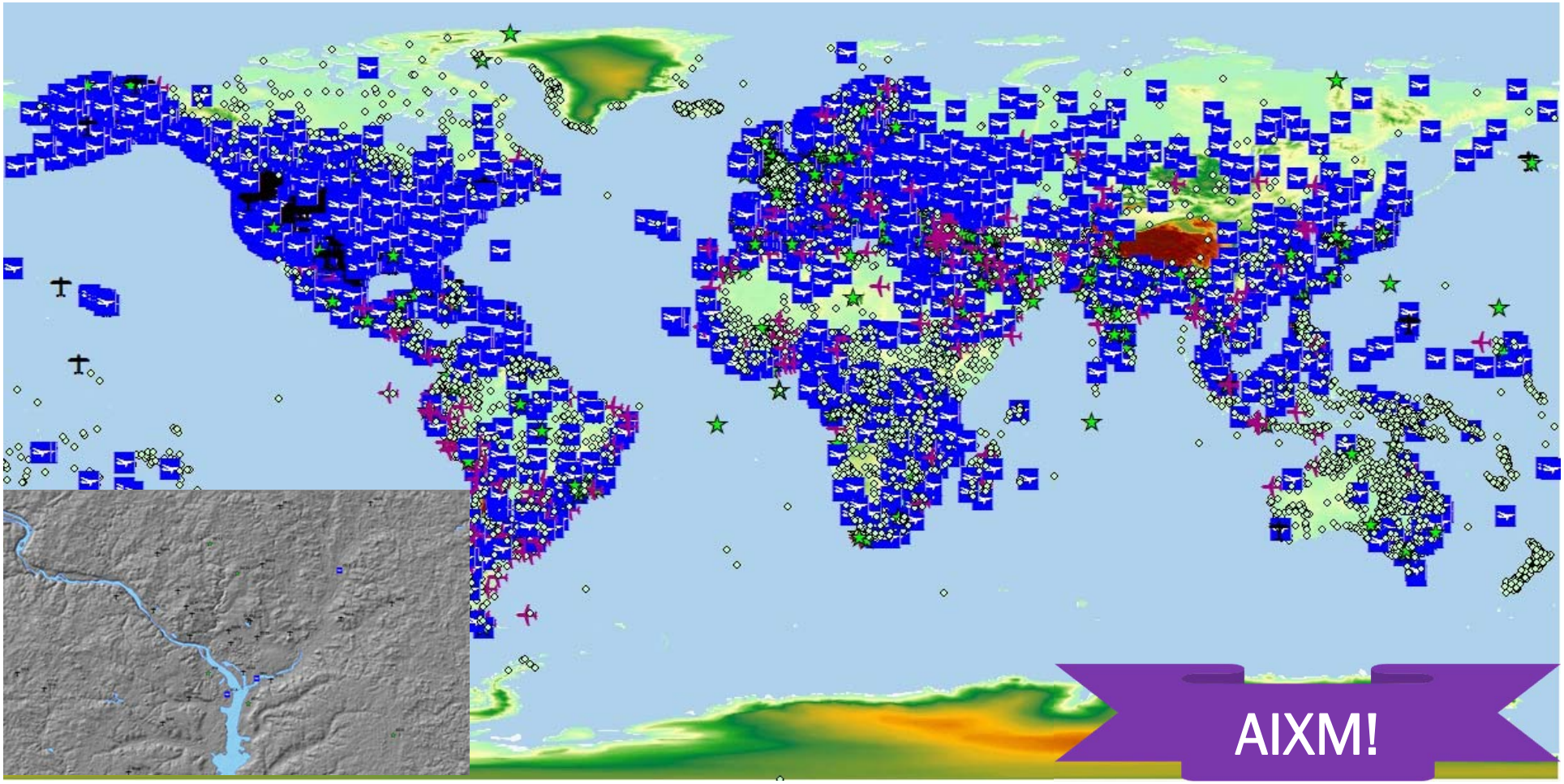
This is a Global challenge – eTOD for all!



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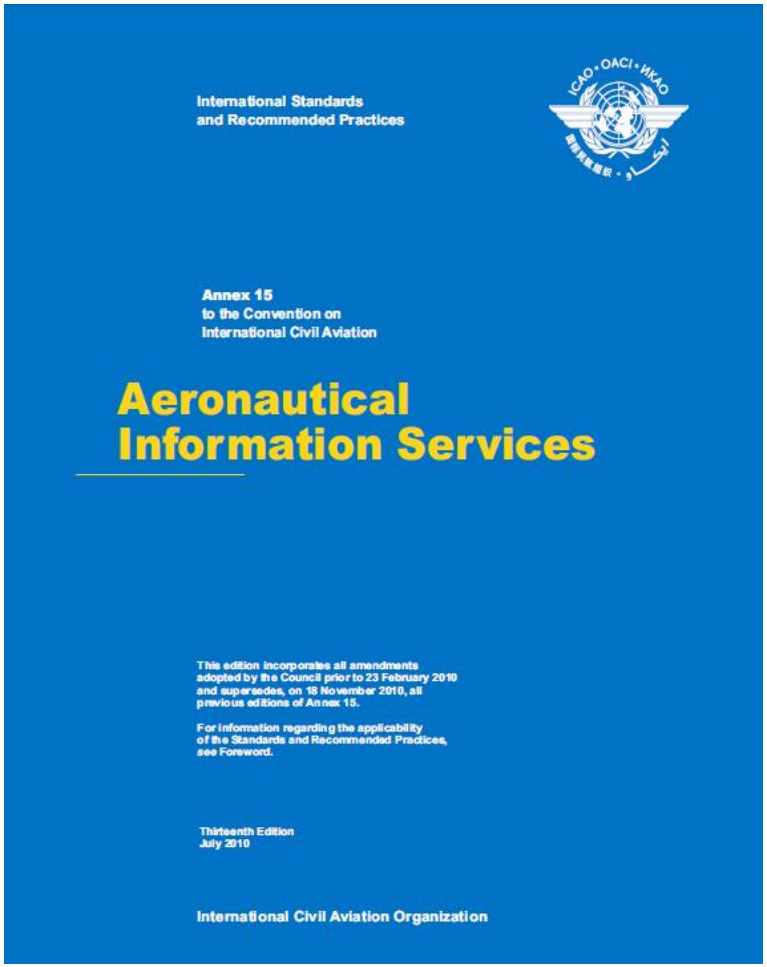
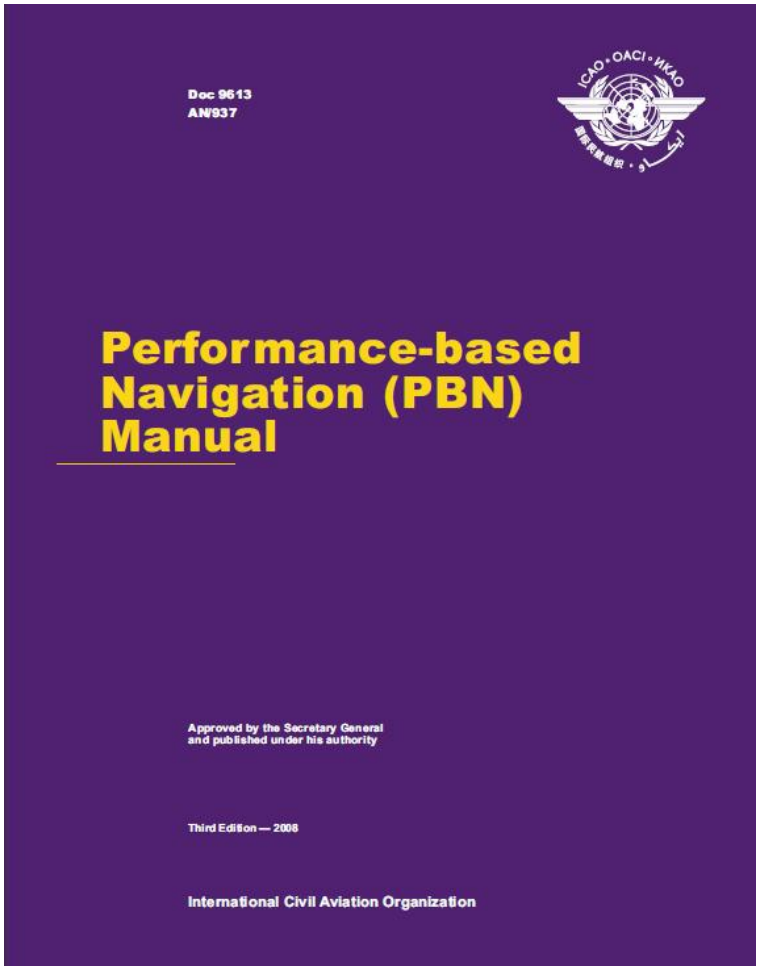
New International Mandates for FANS:





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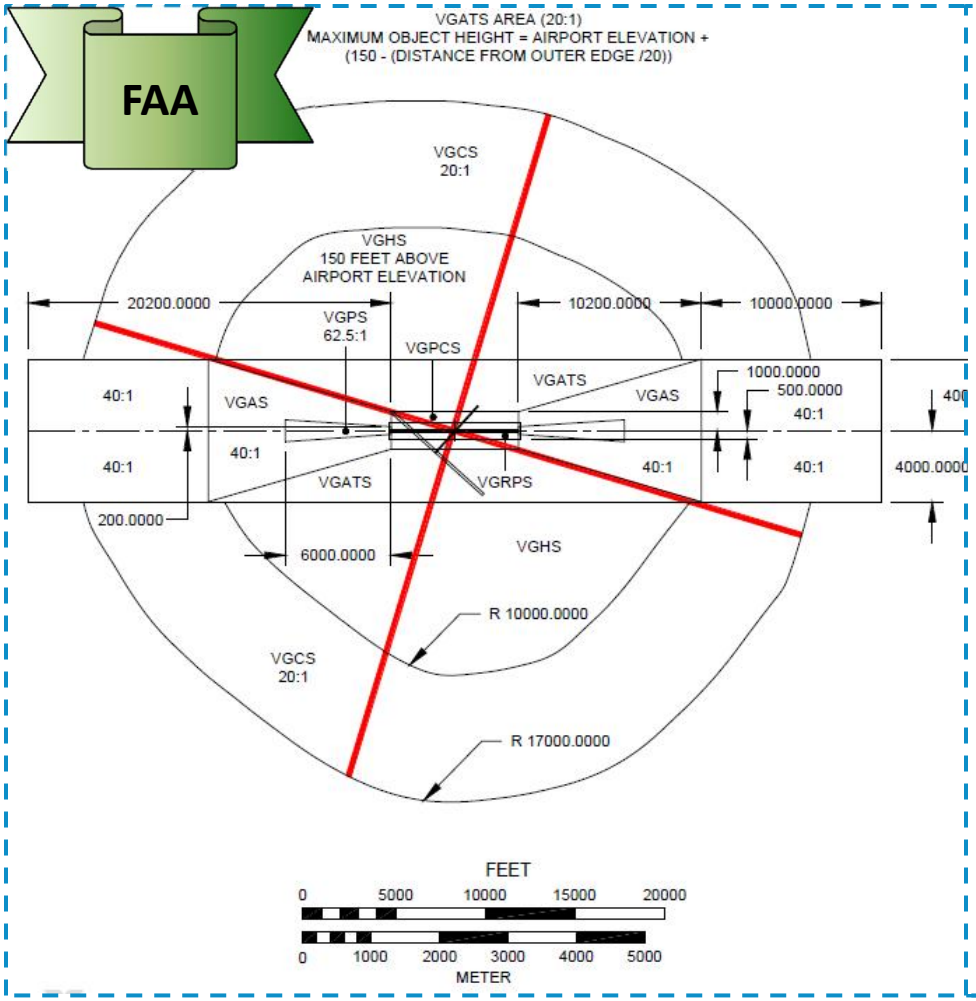
FAA & ICAO differ in eTOD criteria



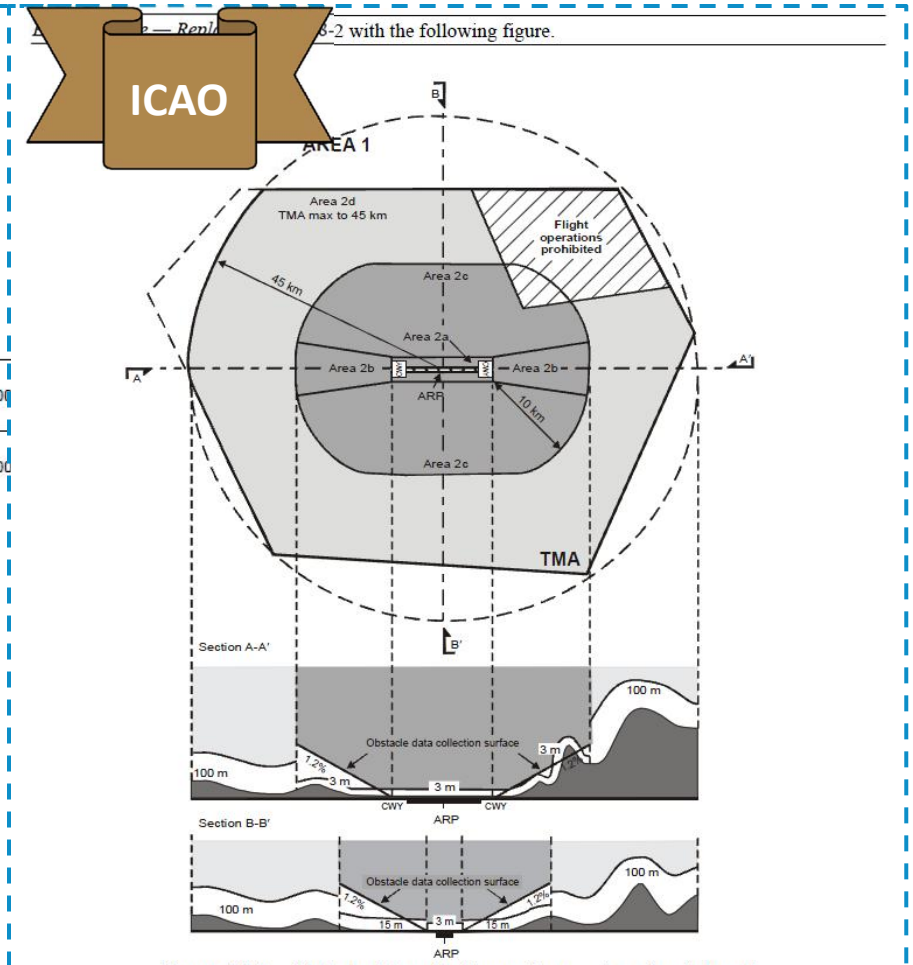


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

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Area-2 VO Criteria: Complete by 2015

Table A8-1. Terrain data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level ~~(1σ)~~	90%	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}	essential 1×10^{-5}
Maintenance period	as required	as required	as required	as required

Table A8-2. Obstacle data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level ~~(1σ)~~	90%	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}	Essential 1×10^{-5}
Maintenance period	as required	as required	as required	as required

Editorial Note.— Replace Figure A8-2 with the following figure.

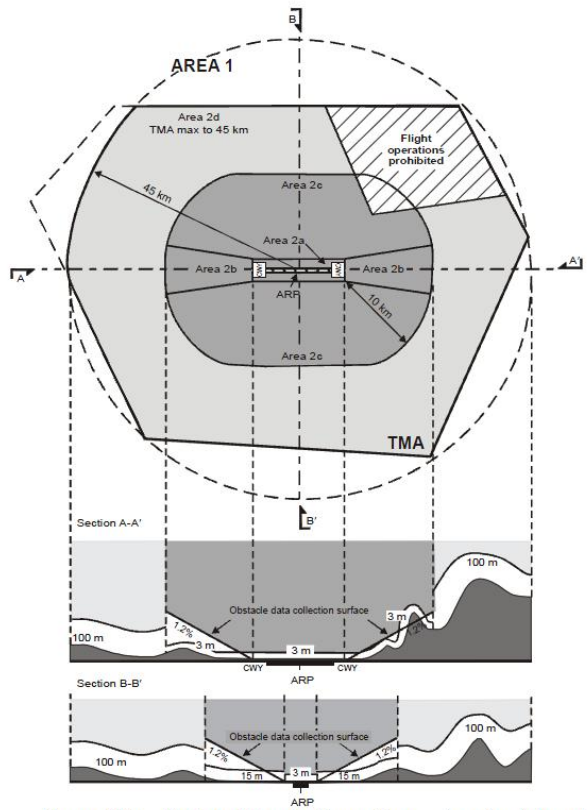

Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

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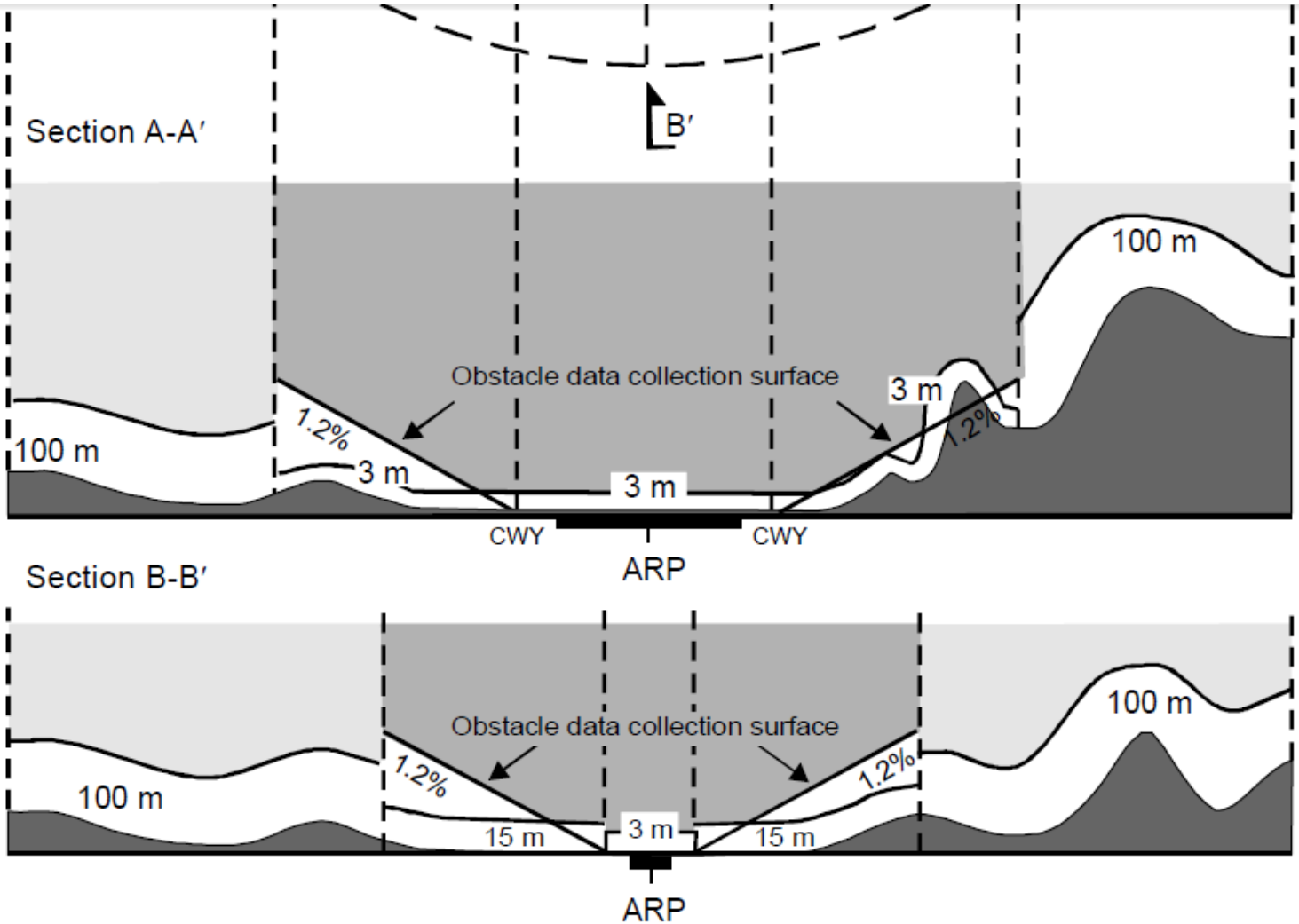
Area-2 VO Criteria: Collect what VO size?



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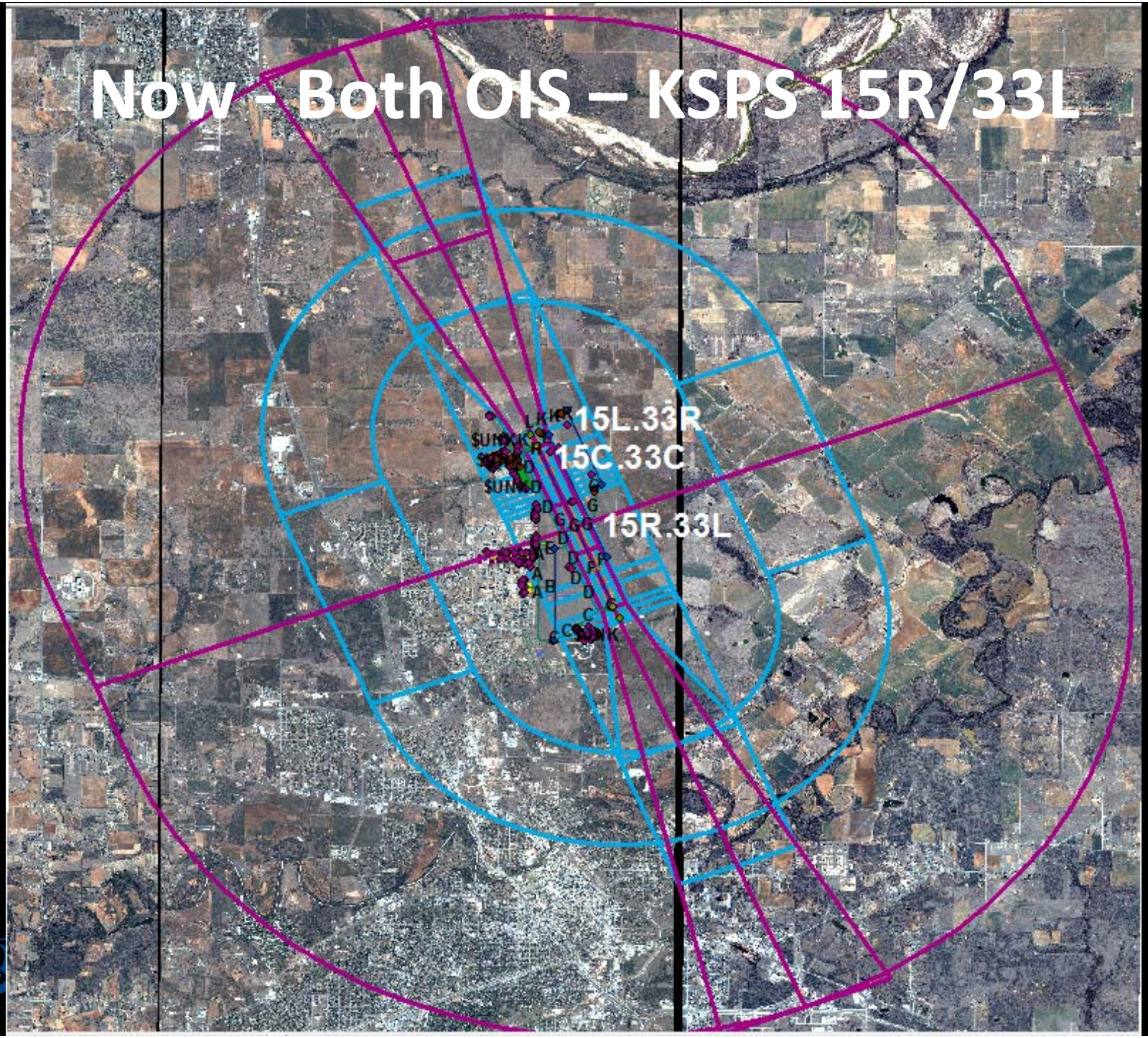
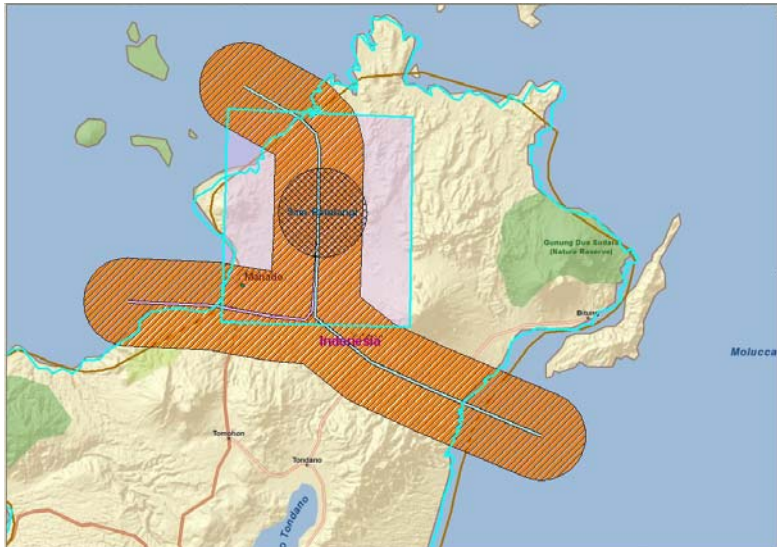
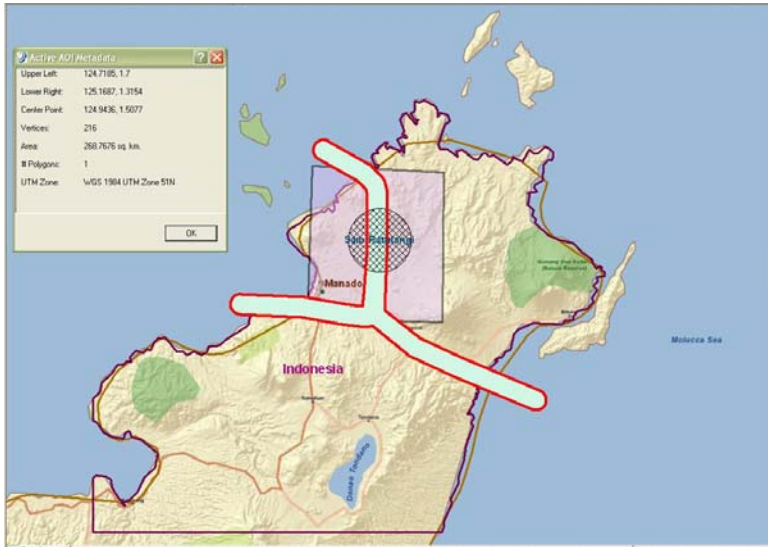
Now - Both OIS – KSPS 15R/33L



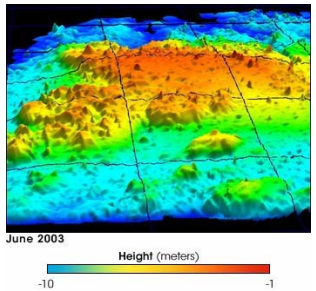
How to acquire Obstacles and Terrain?

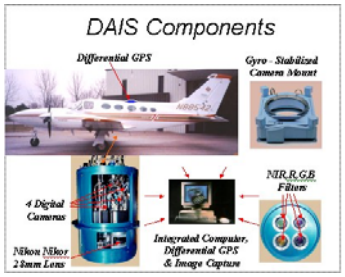
1. Understand your collection AOI requirements. ☑
2. Understand your eTOD Criteria & formats. ☑
3. Choose your collection method(s).
4. Choose Validation Sources
5. Begin with Bare Earth DEM
6. Ensure that Airport Features (Area-3) and eTOD Features (Area-2) have a single position solution.
7. Define & Implement your Obstacle Maintenance Plan.



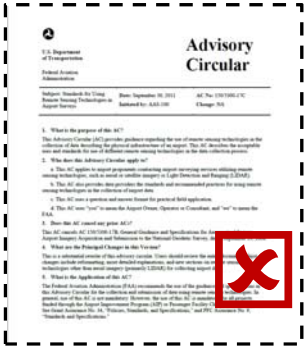


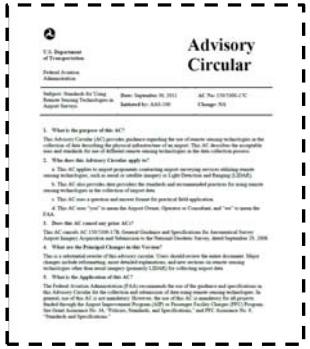
What are the collection methods?

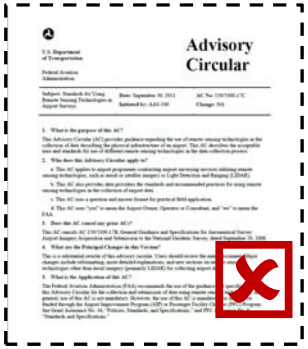


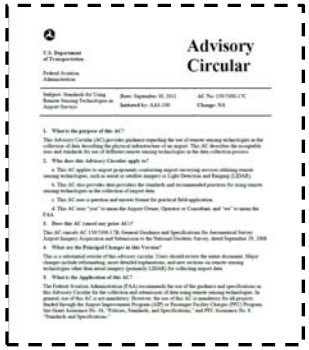


Satellite | **LIDAR** | **SAR/IF-SAR** | **Aerial**









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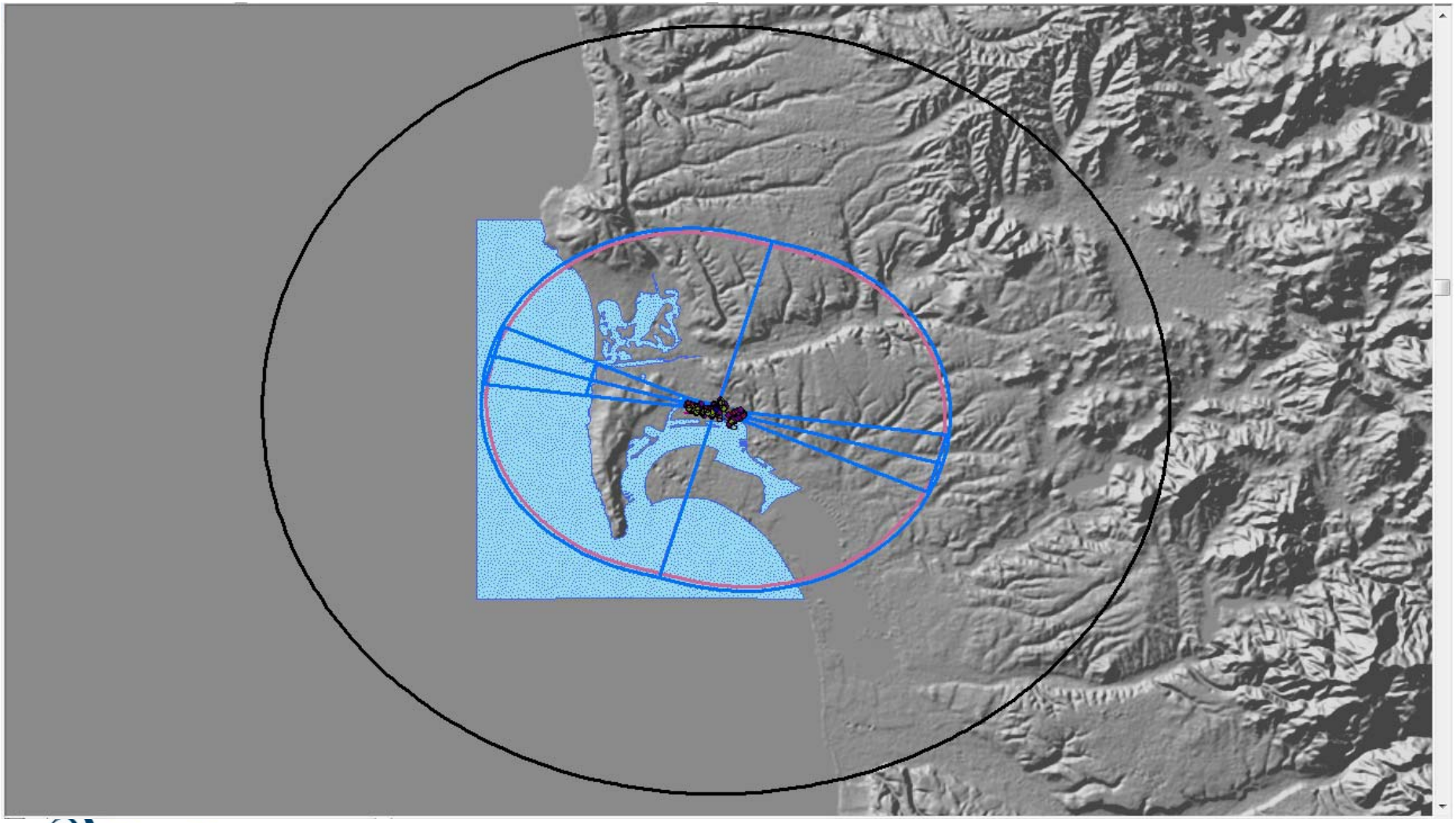
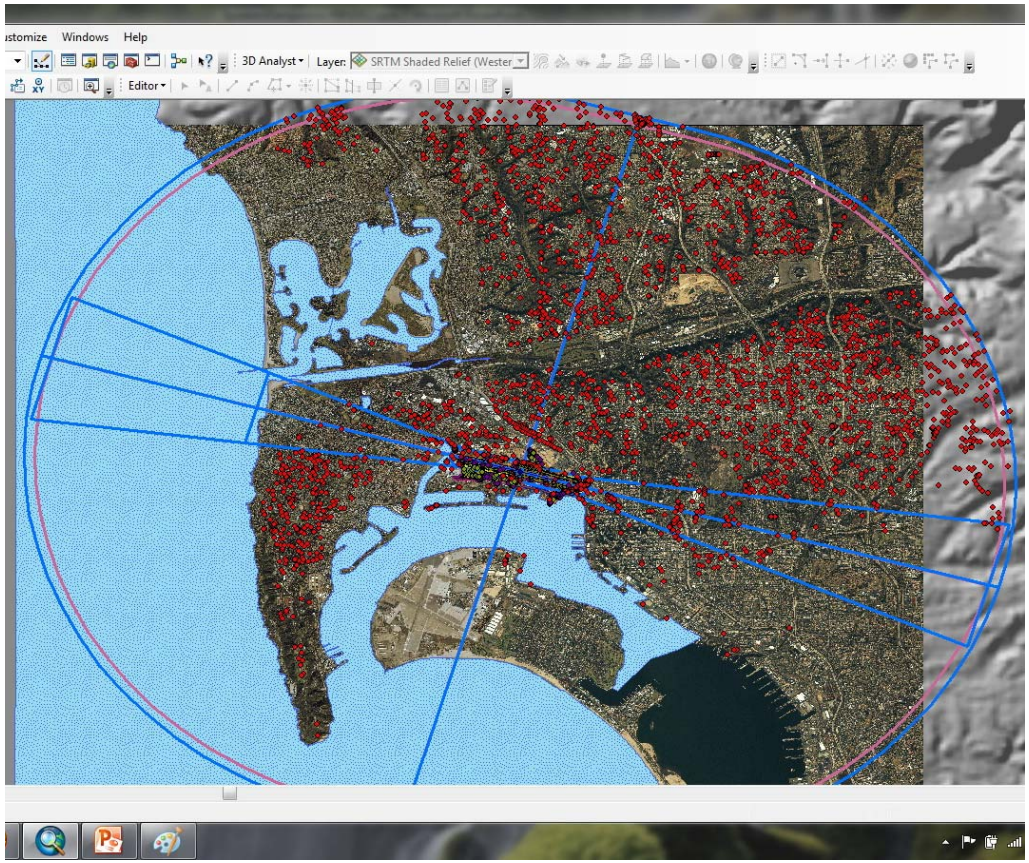
An real-world example – KSAN:



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**



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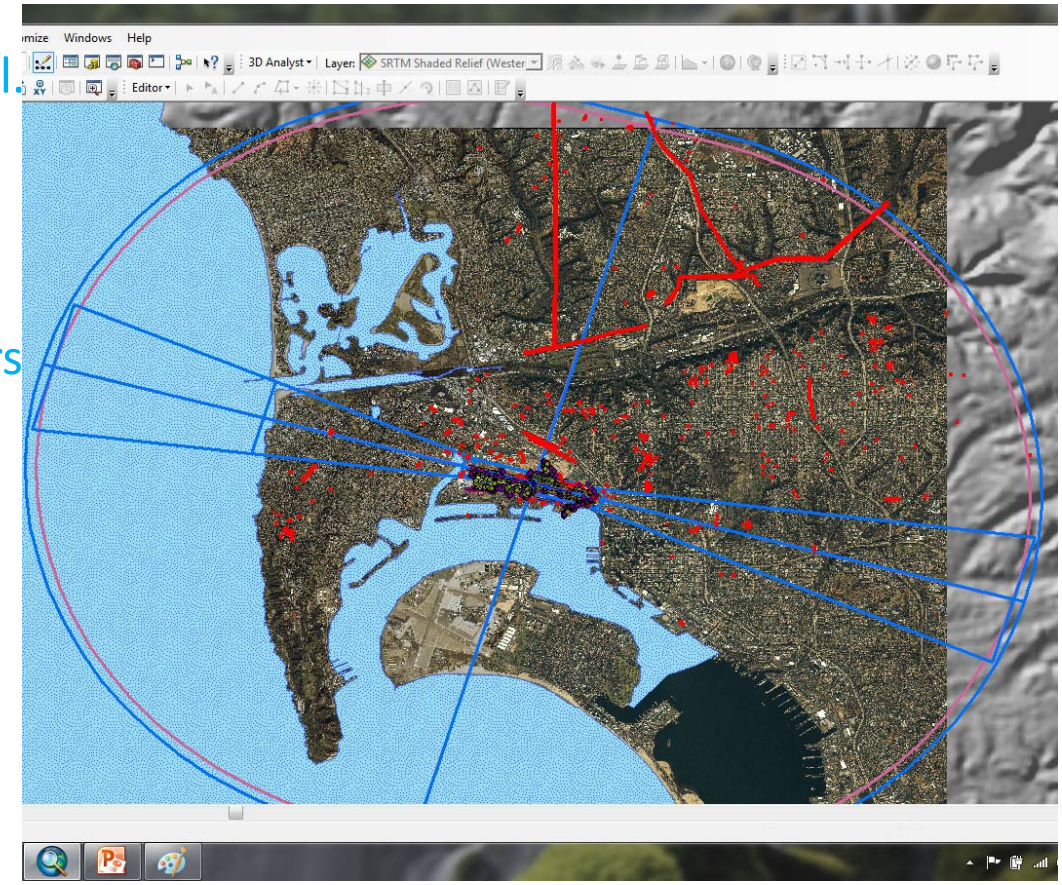
Line Obstacle Challenges

- 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**



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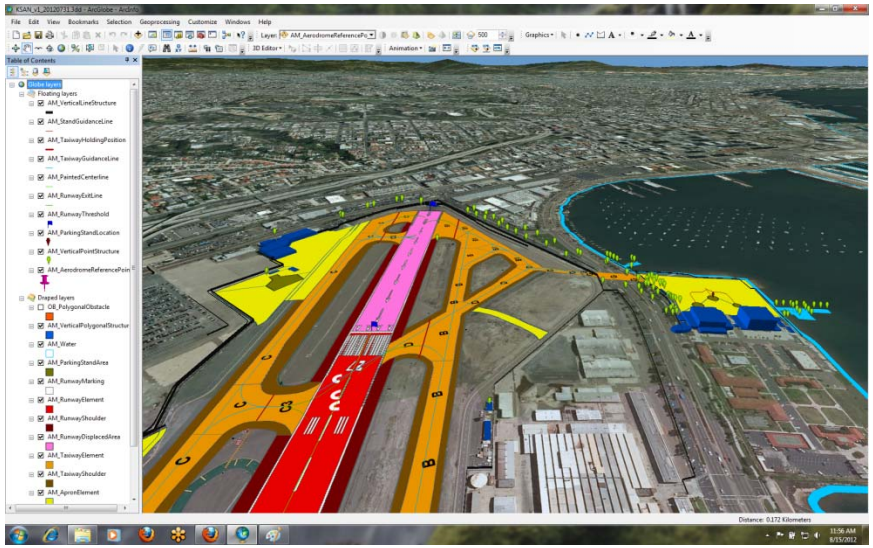
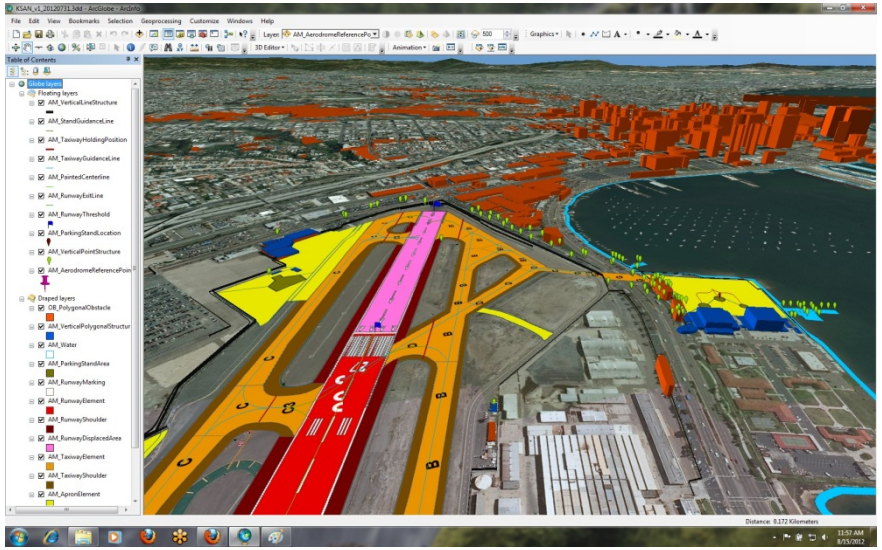
Polygonal Obstacle Challenges

- 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.**





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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.**

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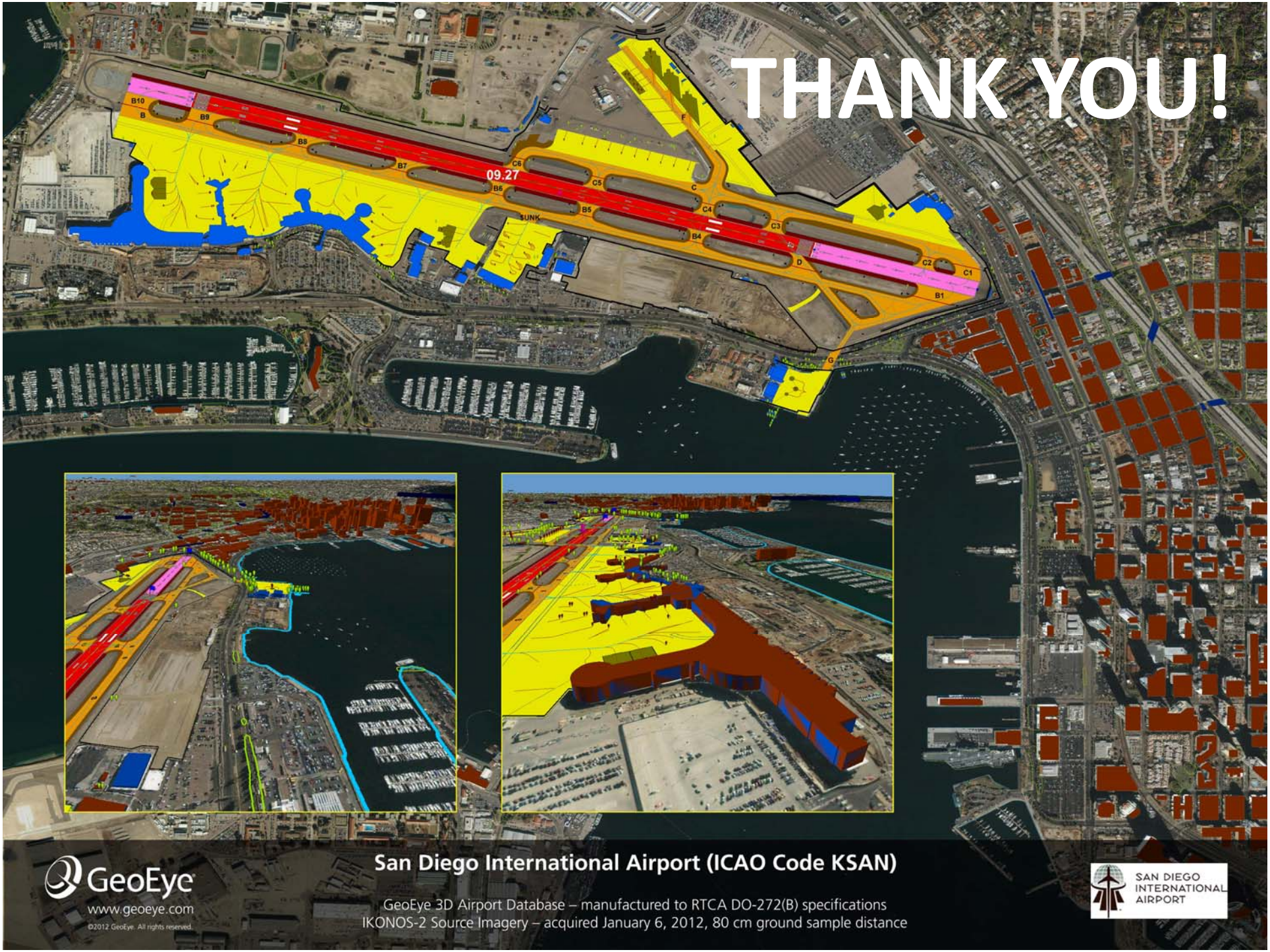
THANK YOU!
09.27
B10
B
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C1
B1
F
G
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GeoEye 3D Airport Database – manufactured to RTCA DO-272(B) specifications
IKONOS-2 Source Imagery – acquired January 6, 2012, 80 cm ground sample distance
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