



International Civil Aviation Organization

CNS/MET/SG/6-IP/43

Sixth Meeting of CNS/MET Sub-Group of APANPIRG

Bangkok, Thailand, 15 – 19 July 2002

Agenda Item 6:

Review:

- a) **Strategy for the provision of Precision Approach and Landing Guidance Systems**
- b) **GNSS strategy**
- c) **GNSS implementation**
- d) **GPS measurement campaign**

WGS 84 SURVEY

(Presented by USA)



National Imagery and Mapping Agency

For more information visit www.nima.mil



History



CFIT - Commerce Secretary Ron Brown accident in 1996.

- Implement, as a matter of highest priority, the installation of GPS systems for flight safety on all military aircraft” (SecDef Memorandum, 26 April 96)
 - Develop geo-spatial data to support GPS instrument approach procedures worldwide

History



- “ All military aircraft required to fly DoD Instrument Approach Procedures” (SecDef Memorandum 7 June 96)
 - Validation of current instrument approach information

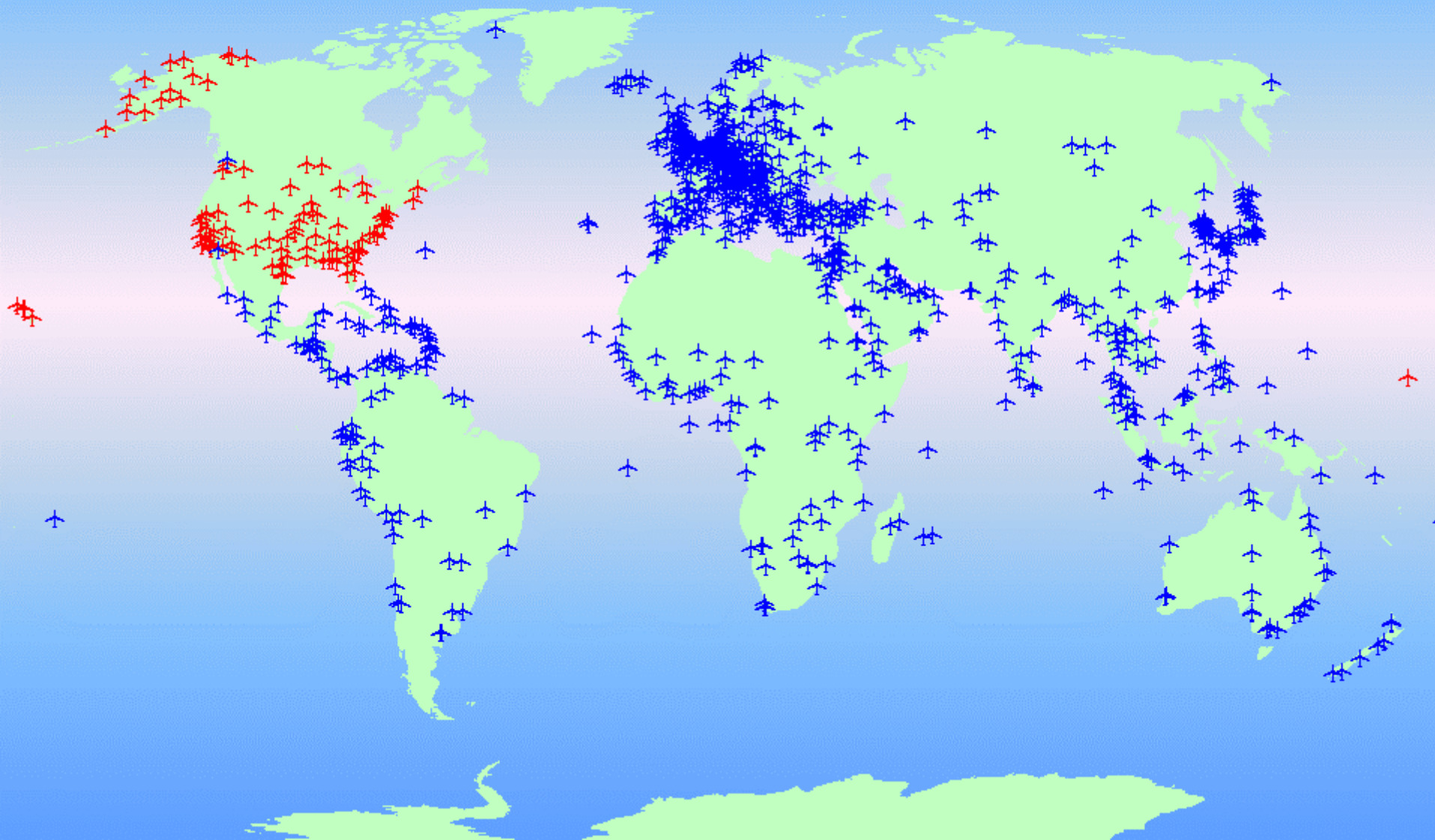
Scope



Support Worldwide DOD aircraft operations

- 142 airfields within the United States including Alaska and Hawaii
- 830 airfields outside of the United States

Areas of Responsibility



Flight Safety



Support & Accelerate GPS operations

- Accurate coordinate information for:
Runways, Navigational Aids and
Obstructions
- Increased accuracy for instrument
approach procedures
- Increased use of airspace
- Increased airport acceptance rate

Requirements



- Airfield Data
- All Navigational Aids
- Obstructions
- Digital Elevation Model surrounding the Airfield.
- Primary and Secondary Airfield Control Stations

Surveys



Surveys are required to obtain the accuracy needed for GPS operations

- National Imagery and Mapping Agency
- Partnerships (FAA and ICAO)
- National Geodetic Survey
- Survey data from host countries
- Commercial contract

Data Collection



Airfields in USA - ground survey teams will collect survey data

- Runway Movement areas, Nav aids & Obstructions
- Data referenced to WGS84
- Photo identifiable points
- Photogrammetric solution

Data Collection



Airfields Outside the United States

- Survey standards comply with ICAO
- Host country survey data if available
- NIMA may provide assistance or equipment to host survey or arrange for survey teams
- Data referenced to WGS84
- Photogrammetric solution

Typical Airfield Survey



- Site/Area Reconnaissance
- GPS Positioning of PACS & SACS
- Runway Features Profile Runway ends & Thresholds
- Nav aids (Visual and Electronic)
- Locate Obstructions
- Photo Control Points

PACS and SACS



Airfield Permanent Reference Monumentation

- Primary Airport Control Station (PACS)
- Secondary Airport Control Station (SACS)
- WGS-84
- Monuments
- Visibility
 - 1000 Meters apart with intervisibility for use with conventional survey equipment
- Horizon
 - Interference/Multipath
- Reference Drawings



Runway Features



What

- Ends
- Corners
- Thresholds & Stopways
- Vertical Profile of the Centerline

How

- Conventional or GPS Surveys
 - Total station or Stop and Go GNSS



NAVAIDS



- **Why**
 - Transition
- **What**
 - Electronic & visual



Vertical Obstructions



An obstruction, is any object that penetrates an obstruction identification surface (OIS), and is the highest object within the area.

What

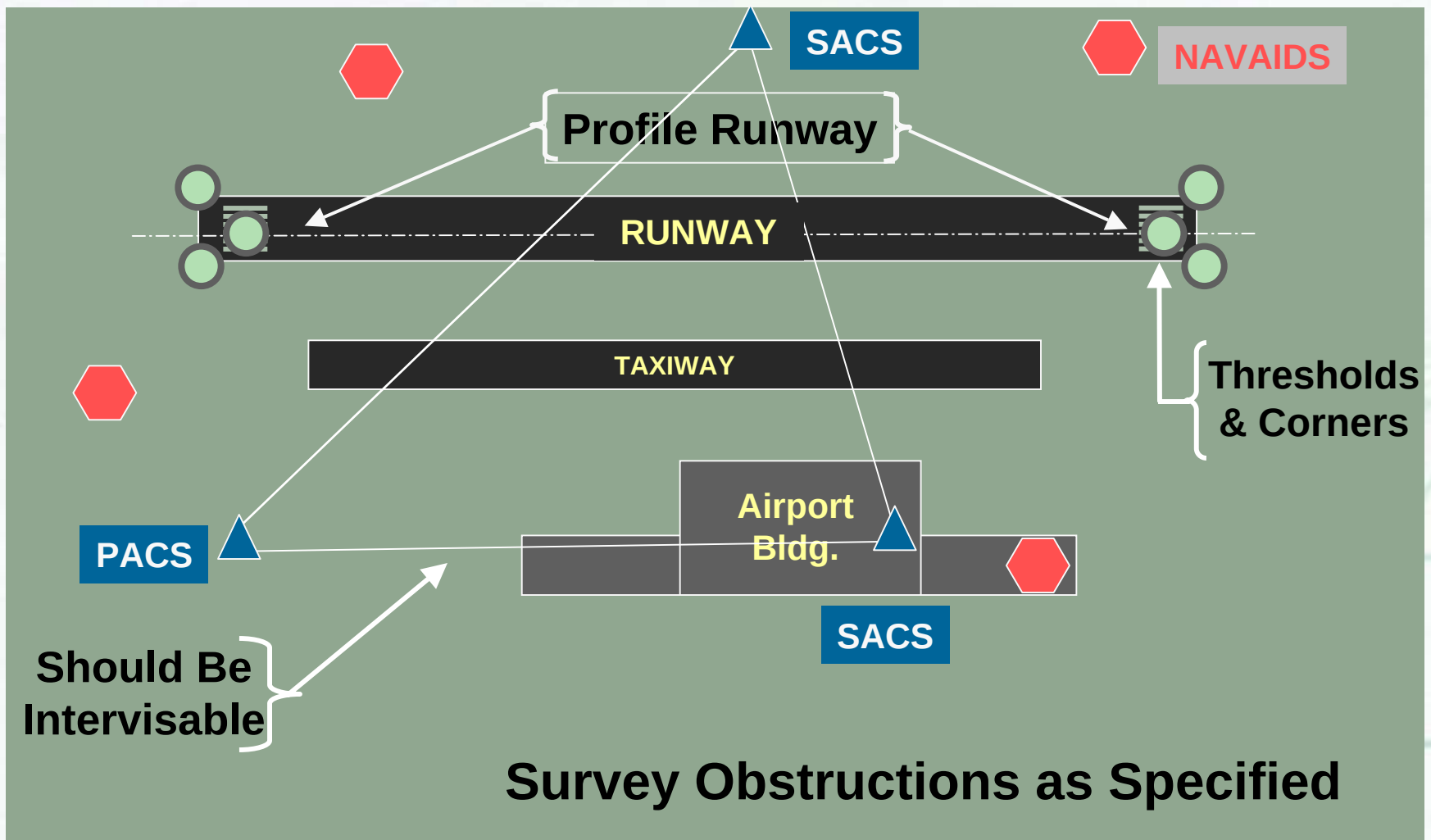
- Topographic Features
- Man-made Features

How

- Surveys vs.. Imagery
- Economy vs.. Utility



It All Comes Together



Process

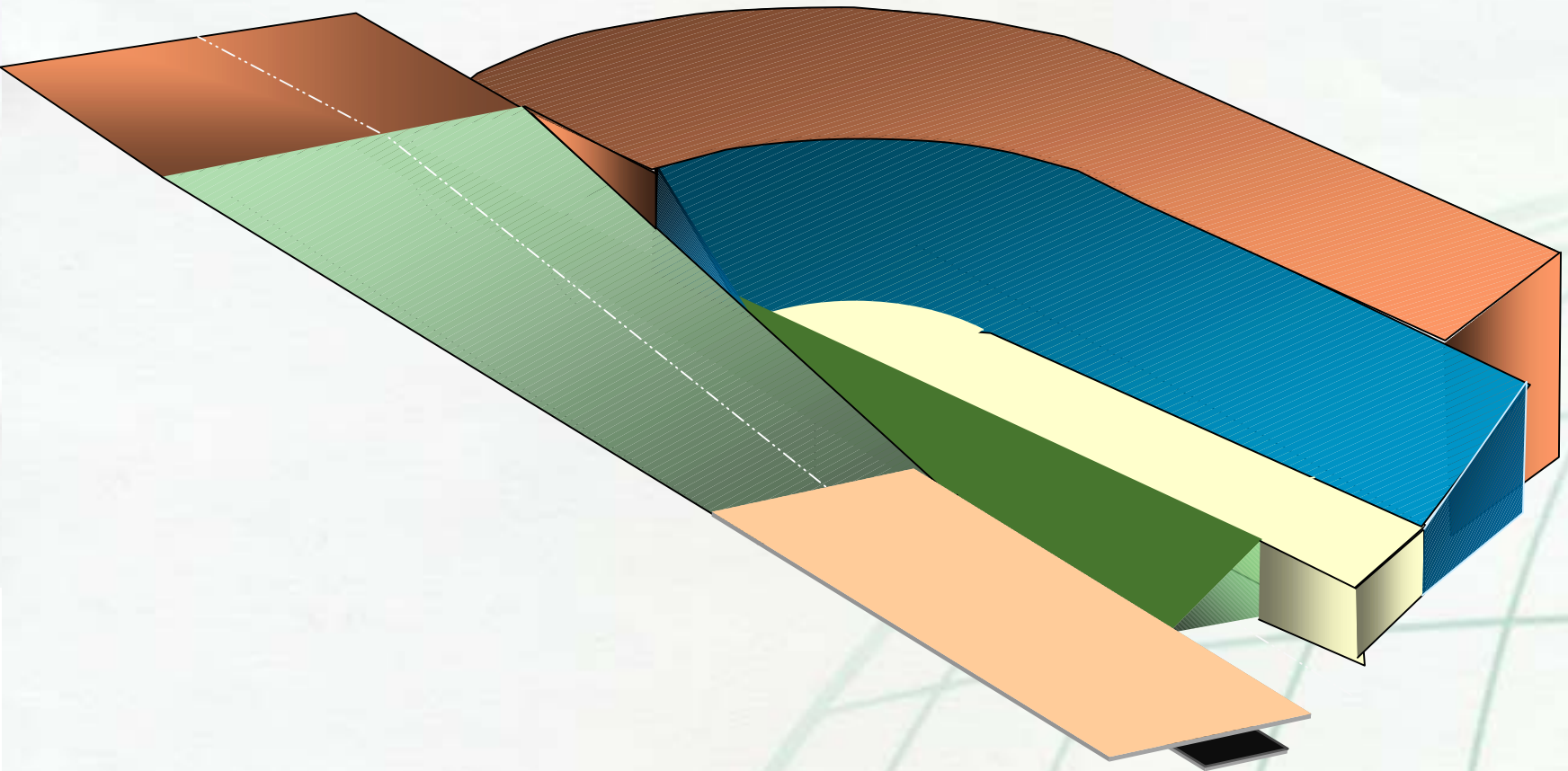


- Field survey teams collect data
- Airfield team process survey data
- NIMA internal production process
- Airfield data processed for output
- Data returned to host country

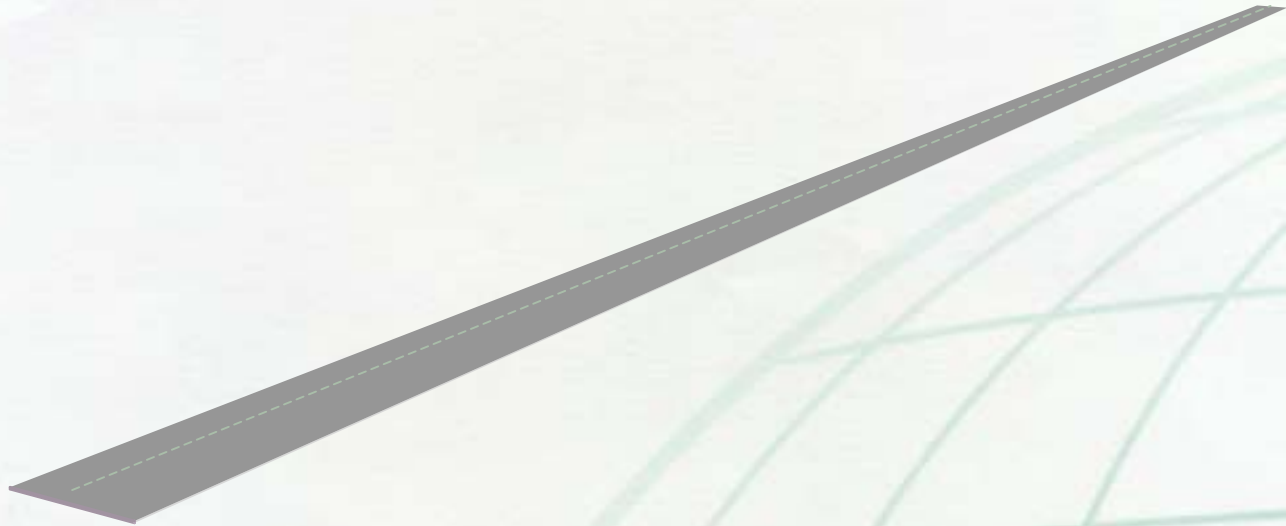
OIS



Obstruction Identification Surface (OIS)



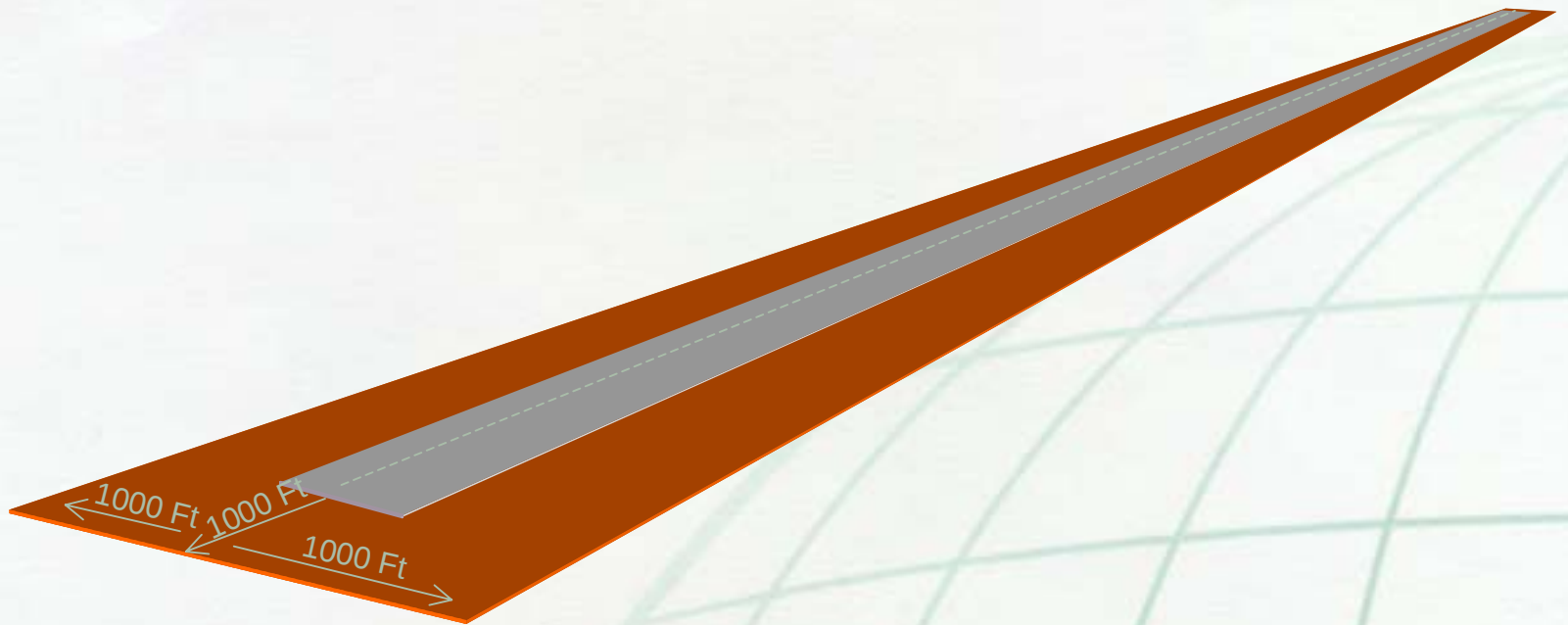
Runway



Primary Surface



Primary Surface (1000 Ft Clear Zone)



Transitional

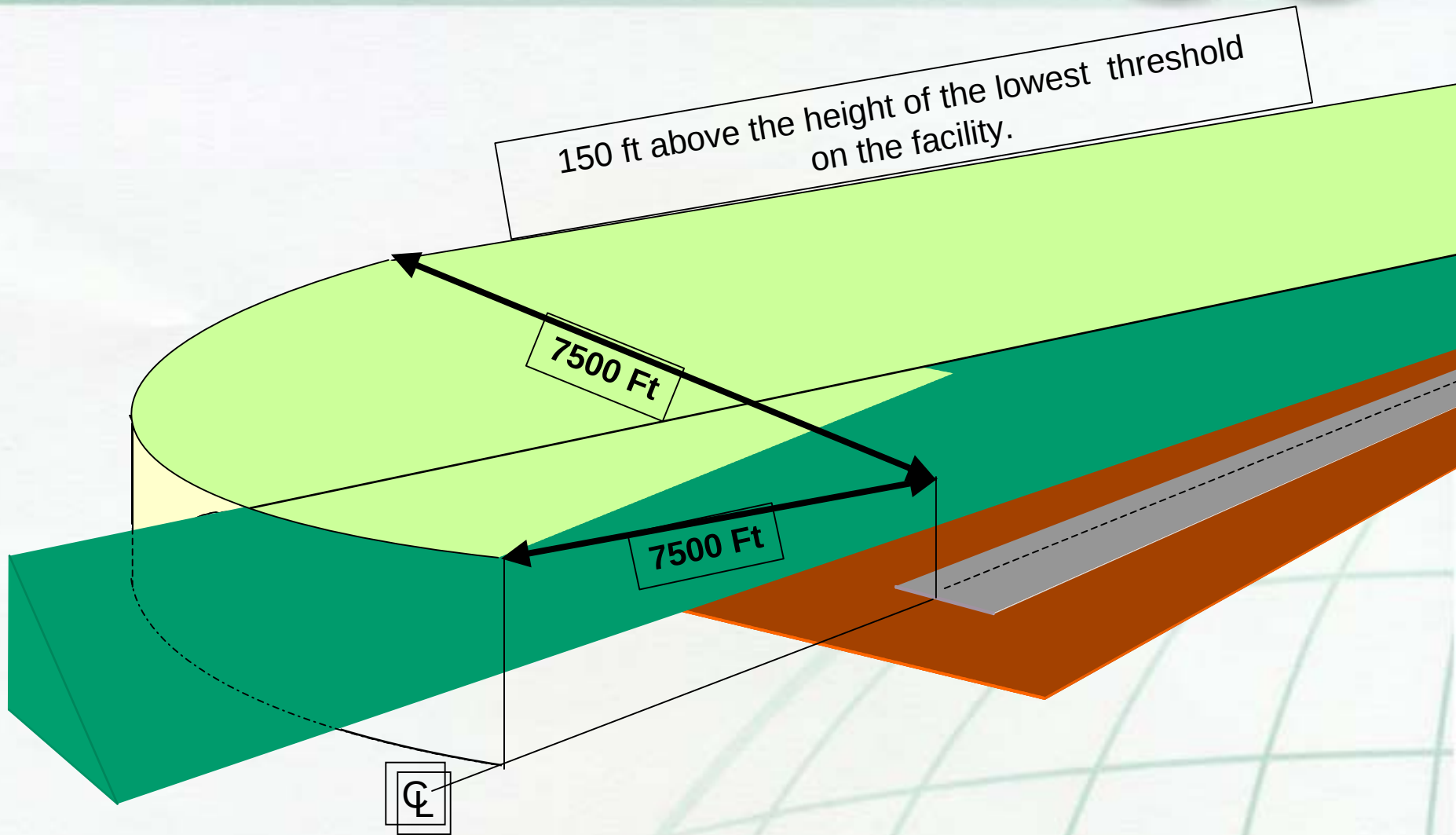


150 Ft above the lowest threshold on the facility

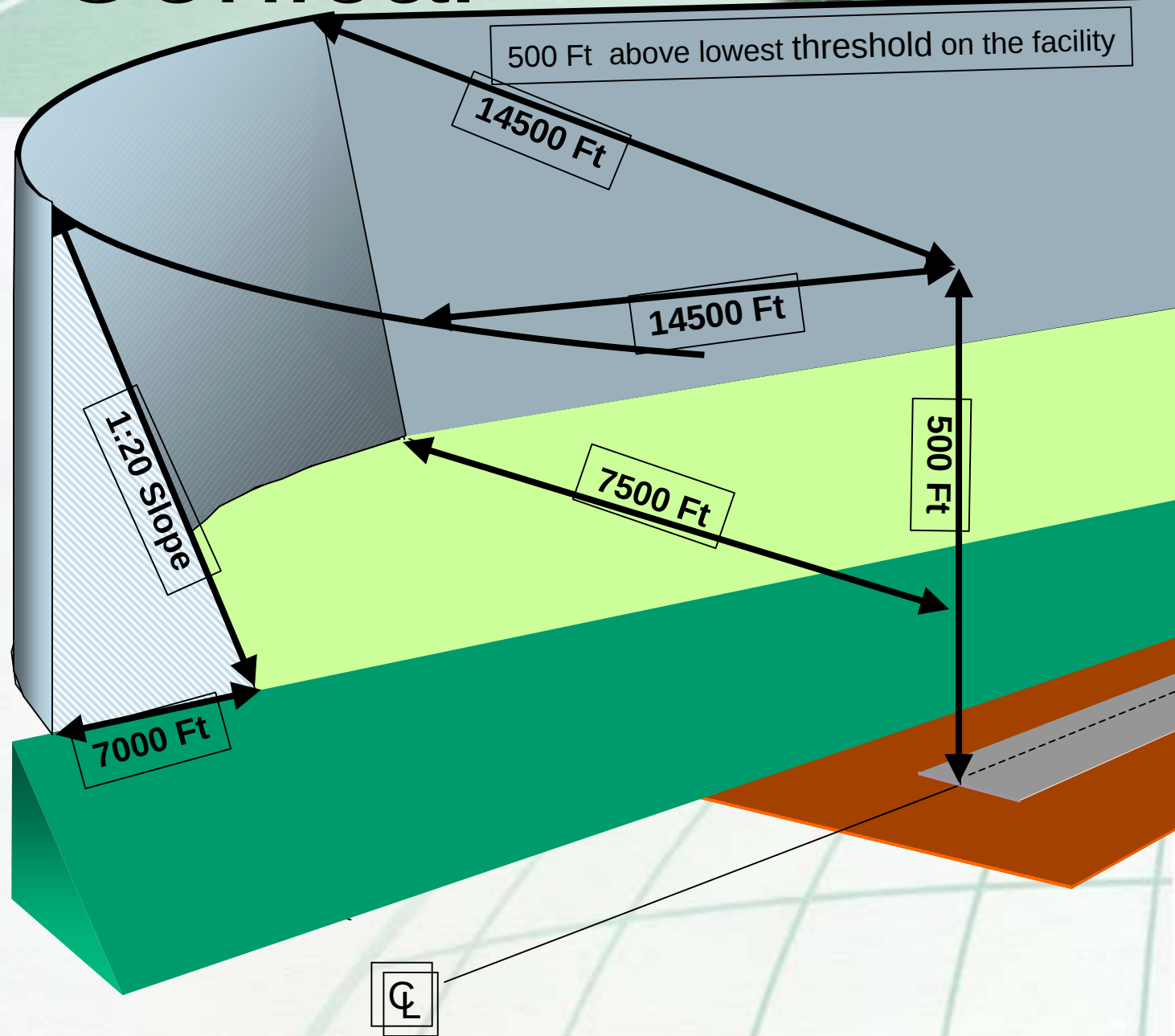
Transitional

150 Ft
1050 Ft
1 : 7 Slope

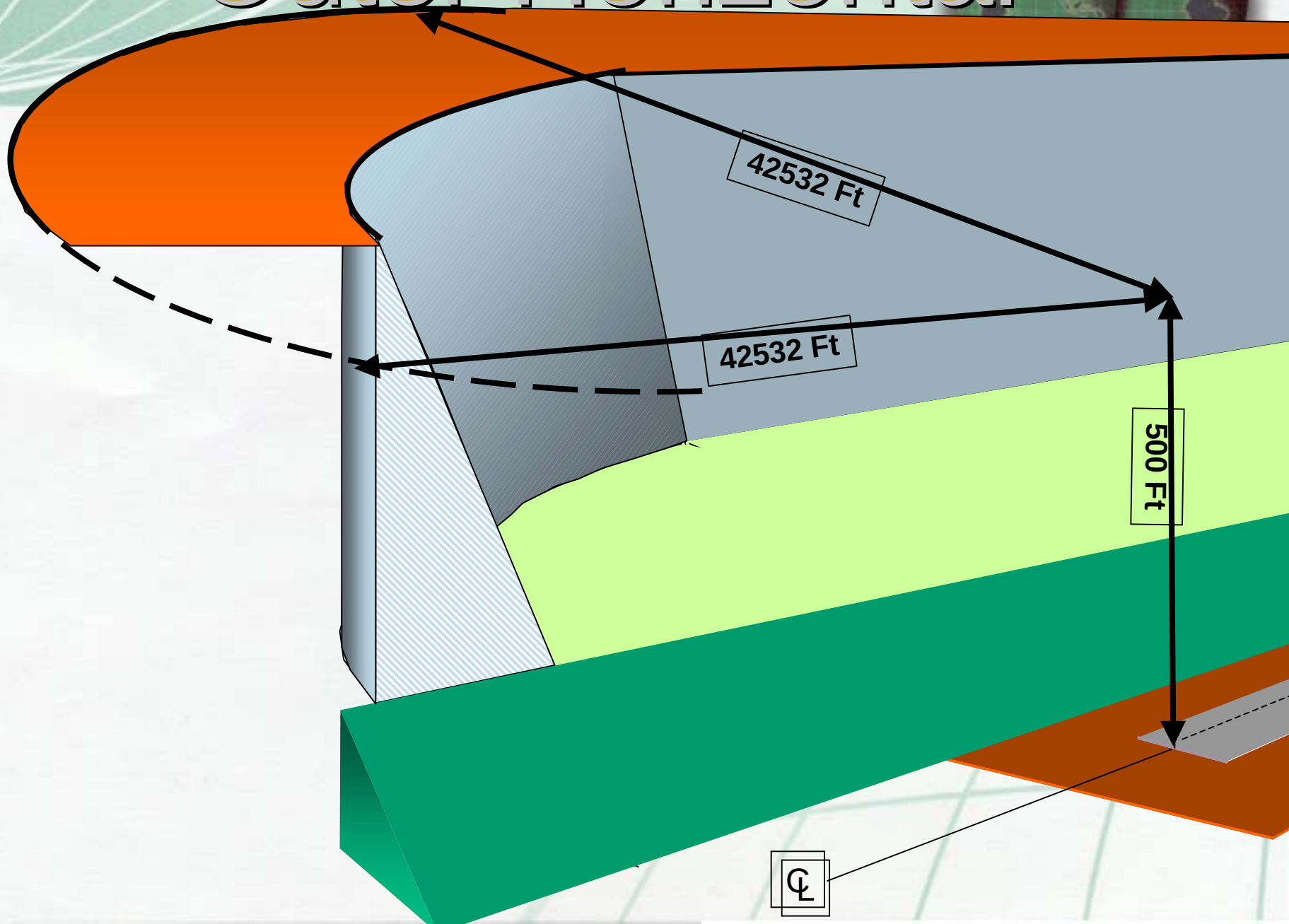
Inner Horizontal



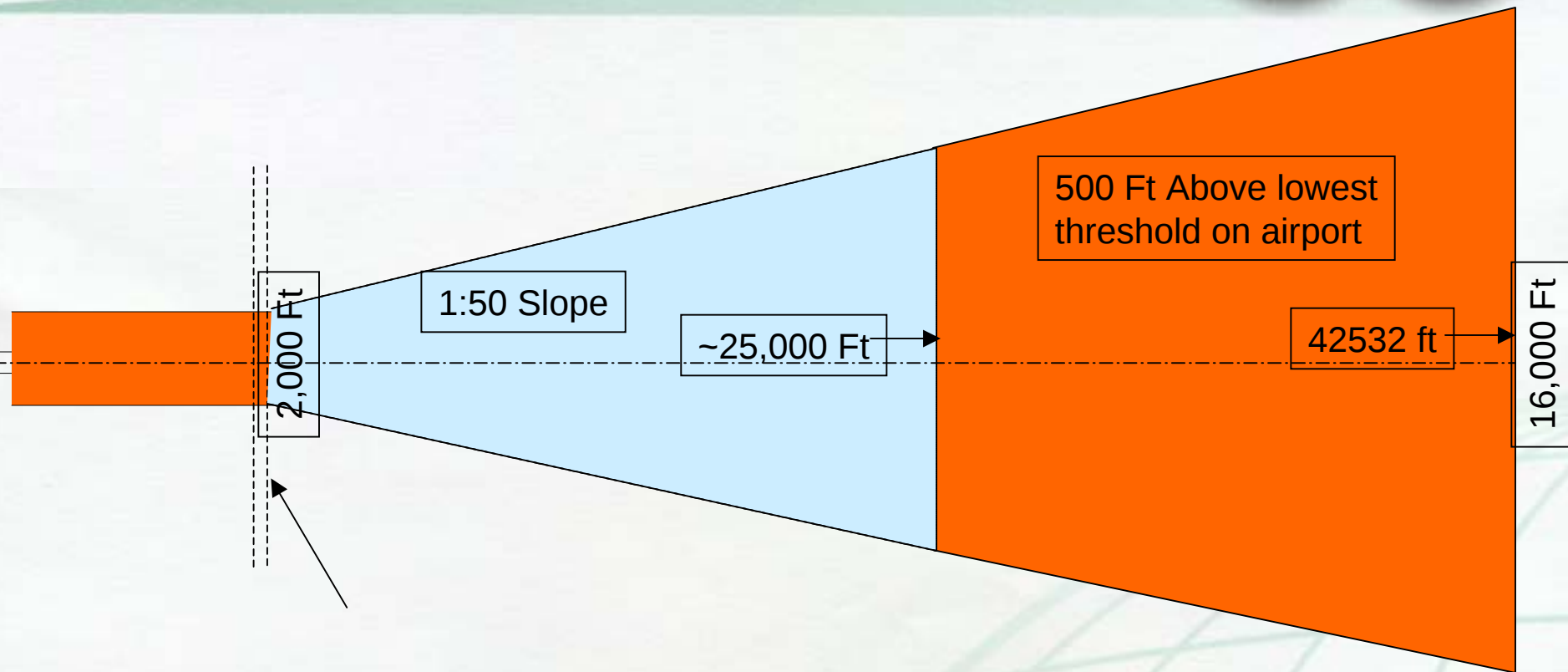
Conical



Outer Horizontal



App/Dep Surfaces





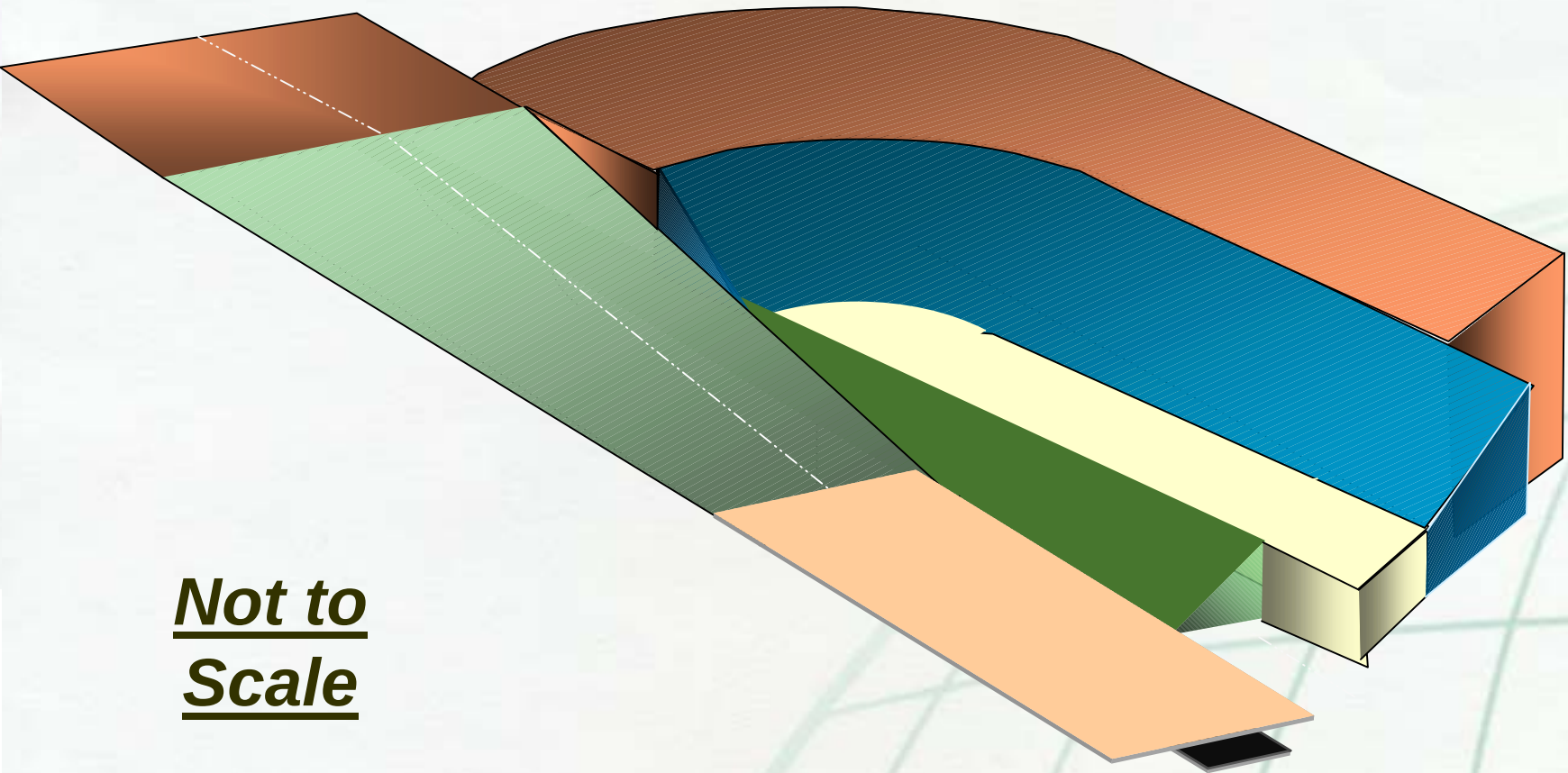
~42,532 Ft

The “flat” approach departure surface

Collection Model 3-D



Obstruction Identification Surface (OIS)



Not to
Scale

Data Ownership

Two globes showing the Americas, positioned to the right of the title.

- Respect sovereignty of country
- Data returned to host country
- Will not release data to others
- Encouraged to share data with ICAO

Output



- Five year maintenance Cycle
- Formatted to meet Military requirements
 - Vector, ArcInfo, Shape, ?
- Geographic information system

Summary



- Move from Land-based Navigation
- Accurate Geo-referenced Information
- Global Positioning System

