Headquarters Air Combat Command

A Better Way to Evaluate Aerial Obstructions

Integrating GeoBase Data into Air Force Terminal Instrument Procedure Reviews

Brian Dye
Matthew Moore
ACC IGI&S “GeoBase”

This Briefing is: UNCLASSIFIED
Overview

Terminal Instrument Procedure Reviews (TERPS) – Develop procedures to land aircraft SAFELY!

- TERPS Responsibilities
- TERPS History
- Obstruction Evaluation Process
- Master Obstacle Chart
- Future Integration (Automation & LiDAR)
TERPS Responsibilities

A3AO (TERPS) Responsibilities include:

• Evaluating aerial obstructions
• Compile obstruction data and maintain Master Obstacle Chart (MOC) for each installation
• Design and Maintain Precision Terminal Approach/Departure Procedures for Aircraft
TERPS Manual Process

• Relied on E/C Series Hardcopy Maps from Base Civil Engineer to identify on base obstructions
• Used aeronautic charts to identify potential obstructions off base
• Would manually draw, and then enter data into AFTERPS software
TERPS History

TERPS Manual Process

- Paper sources were no longer “current” and not updated
- Unable to verify if all features were included (lightning rods, antennas, trees, etc.) without onsite visit
- US instrument procedures different than non-precision procedures used outside US.
- Non precision procedures involved in 1996 crash of Ron Brown
**Obstruction Evaluation Process**

- New software Global Procedure Designer (GPD)
- Precision Procedures
- Take hours to run instrument approach
- Difficult to “quickly” identify potential obstructions
- Used combination of GPD and internet map sites to identify potentially impact on procedures
- Impact identification takes 15 minutes instead hours or overnight
**Improved Obstruction Evaluation Process**

- In 2007, ACC IGI&S “GeoBase” and TERPs streamlined process to improve safety and further reduce manual identification efforts
- Incorporated multiple data sources onto ACC IGI&S viewer on AF portal
  - Imagery for each base & surrounding area
  - Add NGA DVOF data
  - Existing TERPS obstructions
  - TERPS Procedures for each runway
  - Airfield obstructions maintained by A7ZP
  - DMS coordinates
Improved Obstruction Evaluation Process

IGI&S “GeoBase” Support for GPD Desktop Software

- Installation data available for on-demand download by TERPS office via Air Force portal
- Common Installation Picture (CIP), updated weekly
- Most recent aerial photography in Geo Tiff format
- Other data available by permission of data stewards
Improved Obstruction Evaluation Process

Web Environment and GDP Support Improve Mission safety by:

- Combining authoritative sources in a single location
- DVOF data is updated monthly
- New DVOF additions are identified for TERPS office
- Incorrect obstruction locations can be identified, and authoritative source notified
Improved Obstruction Evaluation Process

• Web Environment and GDP Reduce Manpower Hours Identifying Potential Obstructions


  Days & Weeks → 15 Minutes & Longer → 5 Minutes or less

• Practical example at Dyess AFB

  TERPS received applications for 500 windmills

  GPD & Public Map Web Site → AF Portal & IGI&S GPD Support

  125 Manpower Hours to identify potential impacts → 42 Manpower Hours or less to identify potential impacts
**Master Obstacle Chart (MOC)**

- **Manual Master Obstacle Chart (MOC) Creation**
  - Map identifying the highest feature on each part of base
  - Used CE Maps as starting point
  - "Wagon Wheel" originally used to aid manual identification process
  - Splays radiate 10 miles from center of runway
  - TERPS identify highest feature in each cell
Master Obstacle Chart

- Manual Master Obstacle Chart (MOC) Creation Issues
  - Requires over a month to complete a new MOC for each installation
  - Can not use CE maps older than two years
  - Must make trips to base to verify that features have not been missed
  - Little or no information about features outside base fence
  - Limited information on vertical heights and accuracy
  - Costly in manpower hours to maintain

A better way forward was needed to improve safety and manpower usage…
**Improved Master Obstacle Chart (MOC) Generation**

Combining Authoritative Sources onto Air Force Portal

- MOC grid and data available on ACC NORTHCOM viewer:
  - Includes TERPS obstructions
  - High resolution imagery of base
  - High resolution imagery off base
  - Ability to “zoom in” and verify objects
  - Contours and terrain data available
  - CE data updated on weekly basis
- Must account for “maximum height” of aircraft on taxiways, trucks on perimeter roads, trees, etc.
- Data accuracy available via metadata
Anticipated Master Obstacle Chart (MOC) Generation

- LiDAR – Light Detection and Ranging
- Accuracy – 1 to 2 points per square meter or higher yielding an RMSE no greater than 6 inches.
- First Return – Structures & Tree Canopy
- Last Return Data – Detailed Ground Elevation Model
- Features typically missed by LiDAR collection are utility poles, antennas, etc. These features are already collected as part of AF policy.
Anticipated Master Obstacle Chart (MOC) Generation

- Utilize in MOC Generation
  - Locate Highest Points

- Evaluate Airfield Imaginary Surfaces
  - Identify Obstructions
Anticipated Master Obstacle Chart (MOC) Generation

• Automated MOC Generation and Evaluation Potential to Reduce Manpower Hours

- Manual MOC Creation Process: 160 Hours
- MOC Creation with IGI&S Support: 40 to 60 Hours
- MOC Automation (Anticipated): 8 to 10 hours
Way Forward

- Web Viewer & GPD Support
  - Add DVOF & other data to web viewer to support CENTAF & AFSOUTH operations
  - Downloadable data for over 2,000 airfields and forward operating locations in both AOR’s is available for pre-planning
  - Develop automated script to e-mail TERPS office a list of new obstructions after each DVOF update
  - Track time and manpower savings to quantify effectiveness
Way Forward

• Automated MOC Generation
  • Develop control document and memorandum of understanding between TERPS office and data stewards to populate and maintain necessary data to support automated MOC generation
  • Modify existing MOC generation application to further automate process to reduce workload on base level staff
  • Identify procedures to replicate data to ACC command database and monthly review for TERPS
  • Track time and manpower savings to quantify effectiveness
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