ICAO Electronic Terrain and Obstacle Data

Amendments 33 & 36

Amendment 33
to ICAO Annex 15, Chapter 10

Published

July 2004, ICAO Annex 15(Aeronautical Information Services) added a new Chapter 10 introducing Standard and Recommended Practices (SARPS) for the provision of electronic Terrain and Obstacle Data (eTOD)

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Amendment 33
to ICAO Annex 15, Chapter 10

Technical Requirements
"Standards"

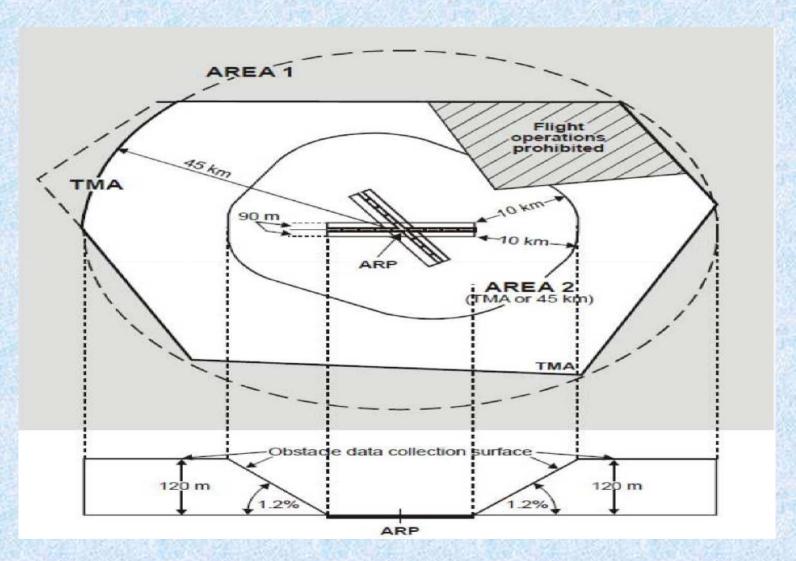# Area 1 Obstacles & Terrain Entire Territory of a State

- Post Spacing (terrain) – 3 arc seconds (approx
- 90 meters)
- Vertical Accuracy – 30 meters
- Vertical Resolution – 1 meter
- Horizontal Accuracy – 50 meters
- Confidence Level – 90%
- Data Classification-routine
- Integrity Level – 1x10 to the -3
- Maintenance Period – as required

Area 2 Obstacles & Terrain Terminal Control Area

- Post Spacing (terrain) – 1 arc second (approx 30
- meters)
- Vertical Accuracy – 3 meters
- Vertical Resolution – 0.1 meter
- Horizontal Accuracy – 5 meters
- Confidence Level – 90%
- Data Classification-essential
- Integrity Level – 1x10 to the -5
- Maintenance Period – as required

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Areas 1 & 2 Terrain

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.
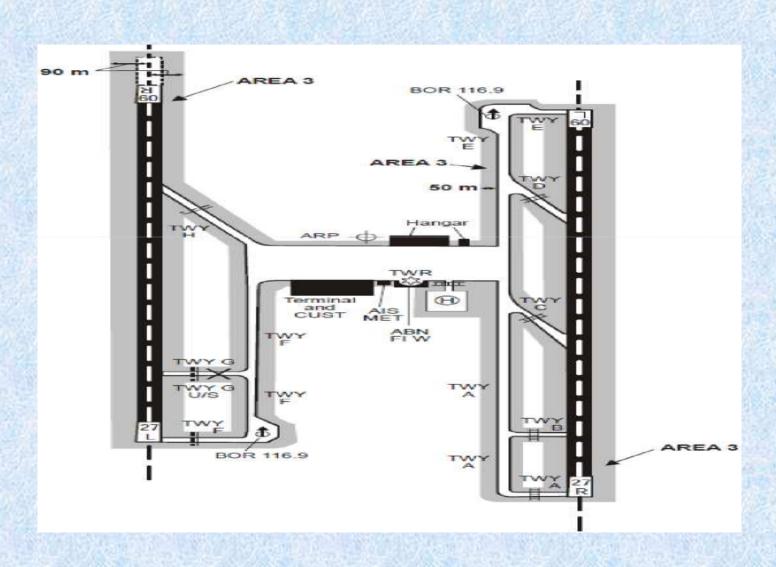
Area 3 Aerodrome/Heliport Area

Obstacles & Terrain

- Post Spacing (terrain) – 0.6 arc second (approx 20 meters)
- Vertical Accuracy – 0.5 meters
- Vertical Resolution – 0.01 meter
- Horizontal Accuracy – 0.5 meter
- Confidence Level – 90%
- Data Classification-essential
- Integrity Level – 1x10 to the -5
- Maintenance Period – as required

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Electronic terrain and obstacle data may be used in the following air navigation applications

- *Ground proximity warning system with forward looking terrain*
- *avoidance function and Minimum Safe Altitude Warning (MSAW)*
- *system;*
- *Determination of contingency procedures for use in the event of an*
- *emergency during a missed approach or take-off;*
- *Aircraft operating limitations analysis;*
- *Instrument procedure design (including circling procedure);*
- *Determination of en-route "drift-down" procedure and en-route*
- *emergency landing location;*
- *Advanced Surface Movement Guidance and Control System (A-*
- *SMGCS); and*
- *Aeronautical chart production and on-board databases.*
- *In addition, the data may also be used in flight simulator and*
- *synthetic vision systems, and may assist in the height restriction or*
- *removal of obstacles that pose a hazard to aviation.*

Area 3 Aerodrome/Heliport Area

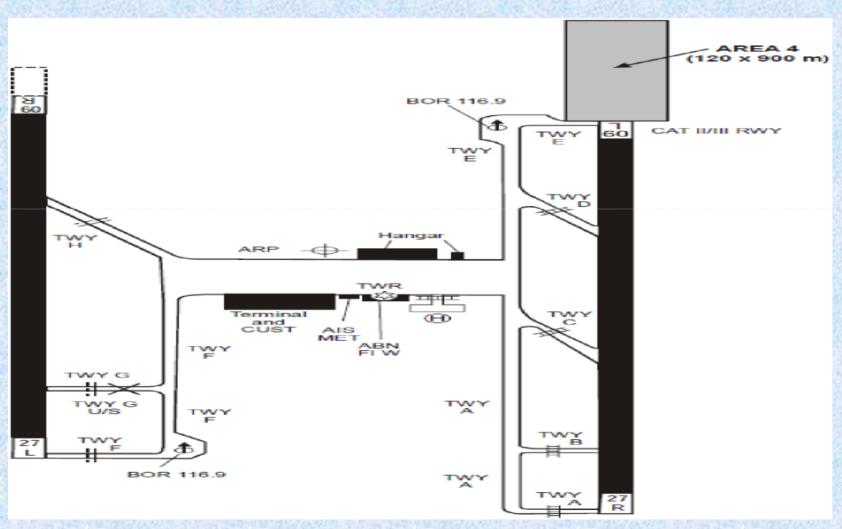# Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Area 4 Category II or III Operations Area Terrain Only

- **Post Spacing – 0.3 arc second (approx 9 meters)**
- **Vertical Accuracy – 1.0 meter**
- **Vertical Resolution – 0.1 meter**
- **Horizontal Accuracy – 2.5 meter**
- **Confidence Level – 90%**
- **Data Classification-essential**
- **Integrity Level – 1x10 to the -5**
- **Maintenance Period – as required**

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Area 4 Category II or III Operations Area

Electronic terrain and obstacle data may be used in the following air navigation applications

- *Ground proximity warning system with forward looking terrain*
- *avoidance function and Minimum Safe Altitude Warning (MSAW)*
- *system;*
- *Determination of contingency procedures for use in the event of an*
- *emergency during a missed approach or take-off;*
- *Aircraft operating limitations analysis;*
- *Instrument procedure design (including circling procedure);*
- *Determination of en-route "drift-down" procedure and en-route*
- *emergency landing location;*
- *Advanced Surface Movement Guidance and Control System (A-*
- *SMGCS); and*
- *Aeronautical chart production and on-board databases.*
- *In addition, the data may also be used in flight simulator and*
- *synthetic vision systems, and may assist in the height restriction or*
- *removal of obstacles that pose a hazard to aviation.*

Amendment 33
To ICAO Annex 15, Chapter 10

Administrative

Requirements

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

- **Where?**

- **"All IFR Aerodromes"**

- **Terminal Airspace Aerodromes**

- **When?**

Electronic terrain and obstacle data may be used in the following air navigation applications

- Ground proximity warning system with forward looking terrain
- avoidance function and Minimum Safe Altitude Warning (MSAW)
- system;
- Determination of contingency procedures for use in the event of an
- emergency during a missed approach or take-off;
- Aircraft operating limitations analysis;
- Instrument procedure design (including circling procedure);
- Determination of en-route "drift-down" procedure and en-route
- emergency landing location;
- Advanced Surface Movement Guidance and Control System (A-
- SMGCS); and
- Aeronautical chart production and on-board databases.
- In addition, the data may also be used in flight simulator and
- synthetic vision systems, and may assist in the height restriction or
- removal of obstacles that pose a hazard to aviation.

Discussion

Since their introduction in 2004, the eTOD requirements sparked discussion world wide. Major themes include data collection and processing costs, liability issues, cross border harmonization, and cost recovery. There was also discussion as to are requirements even necessary? These issues discussed by the ICAO Air Navigation Commission and significant changes to the Standard and Recommended Practices (SARPs) have occurred reflected in publication of Annex 15, Amendment 36.

Amendment 36
To ICAO Annex 15, Chapter 10

Technical Changes

"Standards verse Recommendations"

Area 4 Change Obstacle data now required

- **Vertical Accuracy – 1.0 meter**
- **Vertical Resolution – 0.1 meter**
- **Horizontal Accuracy – 2.5 meter**
- **Confidence Level – 90%**
- **Data Classification-essential**
- **Integrity Level – 1x10 to the -5**
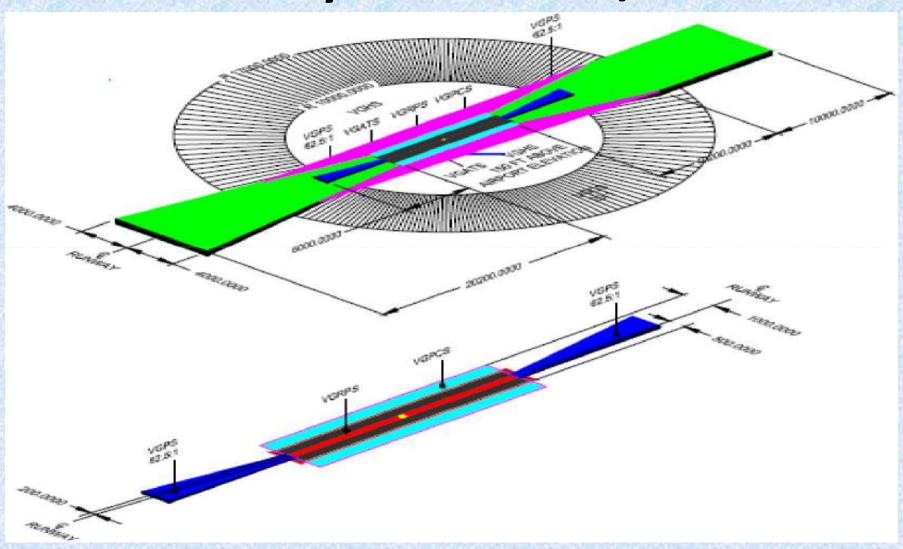- **Maintenance Period – as required**

Area 2 Obstacles Change

Divided into 4 sub areas

OLD   NEW
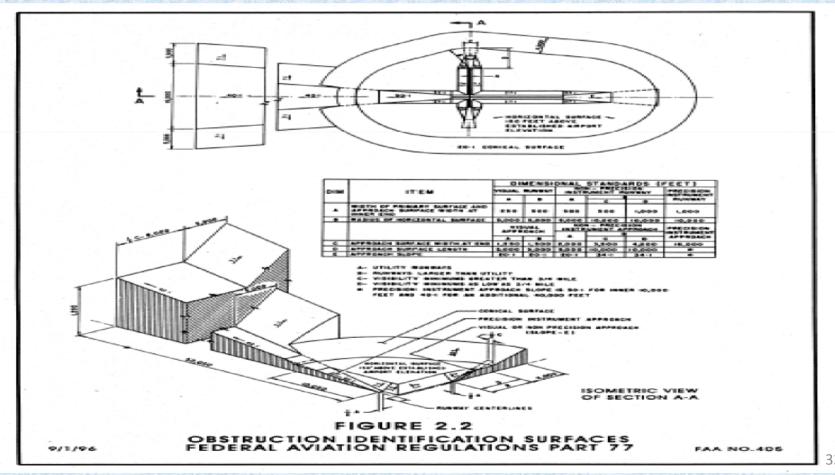
Area 2 Obstacles Change

- **Only Area 2a is a "Standard"**
- **Areas 2b, 2c, & 2d become "Recommendations"**
- **Penetrations of the take-off flight path area obstacle identifications (Annex 4, 3.8.2.1) and aerodrome obstacle limitation surfaces(Annex 14, Volume 1, Chapter 4)**
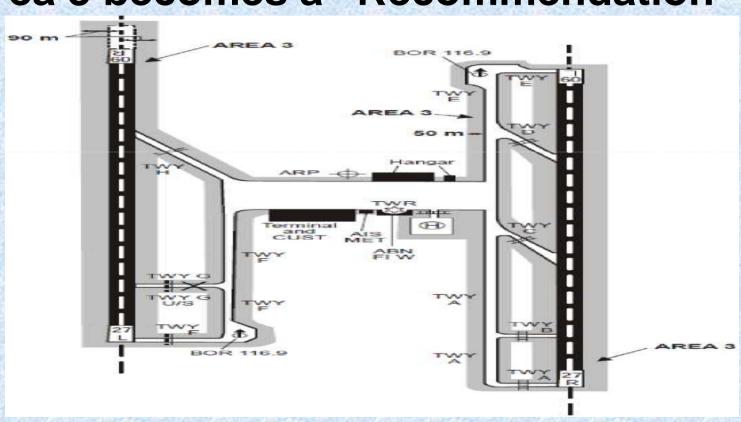
FAA Advisory Circular 150/5300-18B

FAA Advisory Circular 150/5300-18B
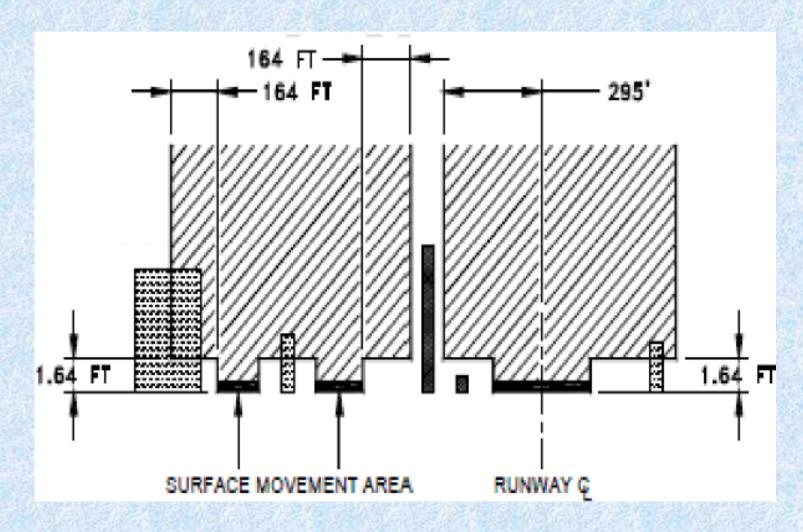
**Code of Federal Regulations (CFR)
Part 77**

FIGURE 2.2
OBSTRUCTION IDENTIFICATION SURFACES
FEDERAL AVIATION REGULATIONS PART 77

Area 3 Change

Area 3 becomes a "Recommendation"

FAA Advisory Circular 150/5300-18B

Amendment 36
To ICAO Annex 15, Chapter 10

Administrative

Requirement Changes

Where?

"Aerodromes regularly used by international civil aviation"

OLD (Amendment 33) IFR Terminal Airspace

NEW (Amendment 36) Customs Airspace

" Aerodromes regularly used by international civil aviation"

When?

November 18, 2010

Except Area 2a November 12, 2015

Thank You