



PLTS™ for ArcGIS®—Aeronautical Solution: Implementing eTOD in the AIS Data Model

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PLTS for ArcGIS—Aeronautical Solution: Implementing eTOD in the AIS Data Model

An ESRI White Paper

Contents	Page
Overview of eTOD	1
Terrain and Obstacle Coverage Areas	1
The Challenge	1
eTOD Feature Classes in the AIS Data Model	2
eTOD Workflow	2
What's New in PLTS for ArcGIS—Aeronautical Solution 9.3 Service Pack 1	4
Notes	4

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Overview of eTOD

According to the International Civil Aviation Organization's (ICAO) new requirement (Amendment 33) in Annex 15, all ICAO participating states are to ensure the availability of terrain and obstacle data in electronic format between November 20, 2008, and November 18, 2010. This data shall be defined by four coverage areas around any airport, collected according to specific numerical requirements for each area, and stored in a geodatabase with ICAO-defined attributes for the obstacle and terrain feature classes. Obstacle features can be represented as points, lines, or polygons, and terrain data can be added as a raster dataset. Reliable and precise obstacle and terrain data for in-flight and ground-based applications can provide significant safety benefits for international civil aviation. To facilitate compliance, ESRI has added Electronic Terrain and Obstacle Database (eTOD) capabilities to Production Line Tool Set (PLTS™) for ArcGIS®—Aeronautical Solution.

Terrain and Obstacle Coverage Areas

The coverage areas for collecting and recording sets of electronic terrain and obstacle data in the database are defined as follows:

- Area 1—Entire territory of the state
- Area 2—Terminal control area per Aeronautical Information Publication (AIP) or not exceeding a 45 km radius from the airport (ARP) (whichever is smaller) (For aerodromes without a legally defined terminal control area, a 45 km radius applies.)
- Area 3—At instrument flight rules (IFR) aerodromes/heliports, from runway edge to 90 m from runway centerline and 50 m from edges for all other movement areas
- Area 4—120 m wide and 900 m long area at precision approach category II and III runways

The Challenge

Identifying the coverage areas and storing the data with the specified requirements have posed major challenges to the aviation community. ICAO member states are struggling to find a solution for managing this large collection of inherently spatial data in the most reliable and cost-efficient way. Aeronautical Solution meets these challenges by extending the Aeronautical Information System (AIS) data model to include eTOD feature classes and integrating a simple workflow to create the coverage areas.

eTOD Feature Classes in the AIS Data Model

The new AIS data model schema can now accommodate data to meet the eTOD requirements in Amendment 33. To accomplish this, the model has been upgraded to include four new feature classes—*PointObstacle*, *LineObstacle*, *PolygonalObstacle*, and *ObstacleArea*—with three new many-to-many relationship classes—*PointObstacleArea*,

LineObstacleArea, and *PolygonalObstacleArea*. The relationship classes are created to show the association between each obstacle feature (in *PointObstacle*, *LineObstacle*, and *PolygonalObstacle*) contained within a particular obstacle coverage area (in *ObstacleArea*). All feature classes have been modeled according to the feature catalog in ICAO Doc 9881. The data exchange standard maintained is Aeronautical Information Exchange Model (AIXM) 4.5. The schema upgrade will work on any ESRI-supported geodatabase including personal/file, workgroup, and enterprise. Thus, the upgraded AIS model provides a storage bin once the terrain and obstacle data has been collected for each coverage area.

eTOD Workflow

A major part of the current challenge faced by the aviation industry is defining and visualizing the coverage areas for terrain and obstacle data collection. Aeronautical Solution makes this a seamless process by introducing a [Task Assistant](#) workflow called *eTOD Tasks.xml* in Aeronautical Solution 9.3 service pack 1 (SP1). The entire workflow consists of step-by-step instructions utilizing [Feature Builder](#) and core ArcGIS Desktop ArcMap™ editing functionality to accomplish the following broad tasks:

- eTOD Obstacle Area Creation—Construct each coverage area (included as subtasks) according to the specifications in ICAO Doc 9881 and store each area in the *ObstacleArea* feature class.
- Populating Relationship Classes—Create the relationship between each obstacle feature and its related coverage areas to populate *PointObstacleArea*, *LineObstacleArea*, and *PolygonalObstacleArea*.

The following figures provide examples of Area 1 (ICAO member state—Spain), Area 2, Area 3, and Area 4 (for a sample airport—Salinas Muni, California), created using the Task Assistant workflow inside the ArcMap application of ArcGIS Desktop.

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Figure 1
Obstacle Coverage Area 1

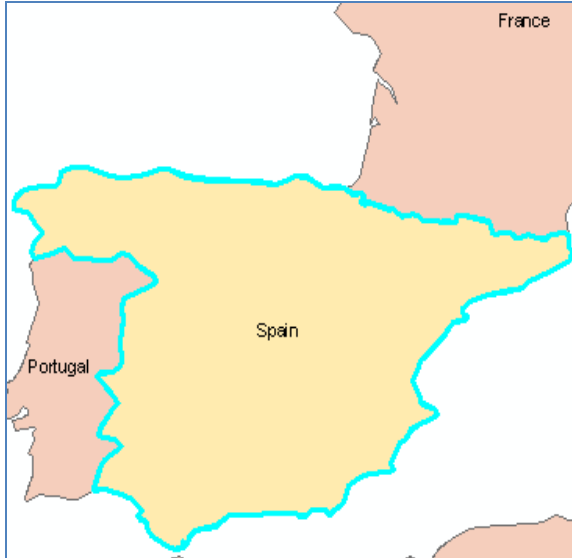


Figure 2
Obstacle Coverage Area 2

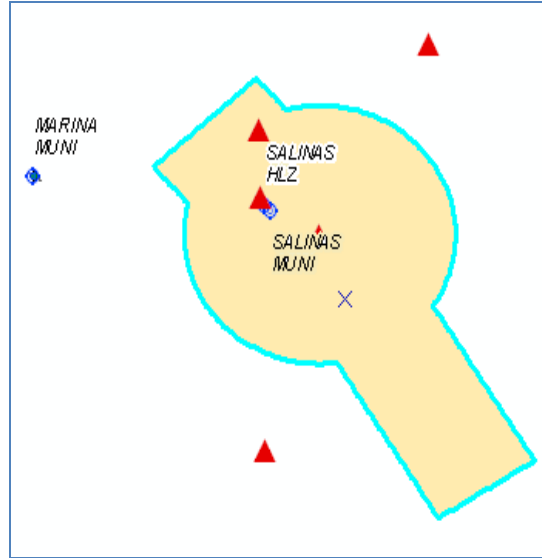


Figure 3
Obstacle Coverage Area 3

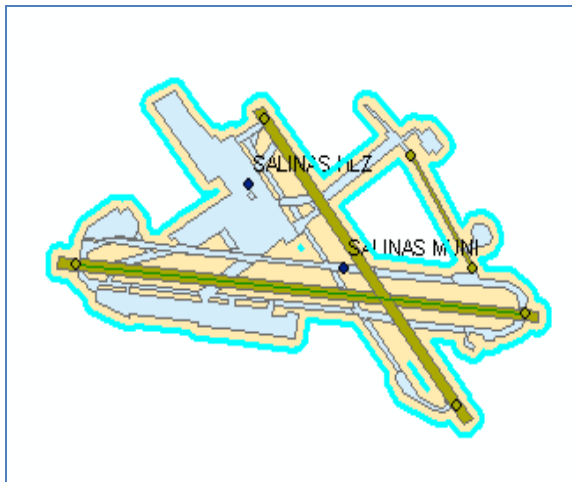
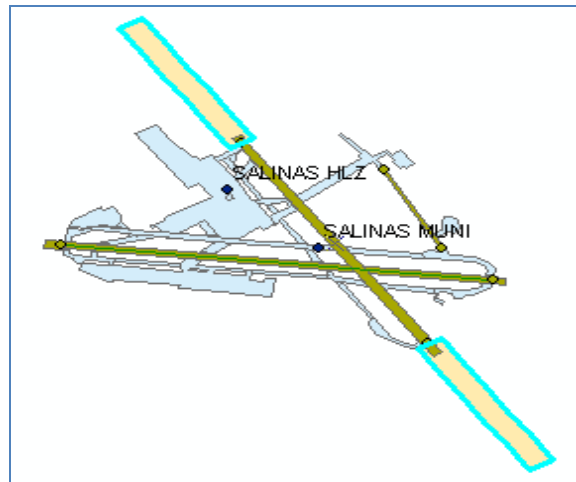


Figure 4
Obstacle Coverage Area 4



**What's New in
PLTS for ArcGIS—
Aeronautical
Solution 9.3
Service Pack 1**

One of the key features in Aeronautical Solution 9.3 SP1) is support for eTOD implementation in the AIS data model. It bundles the AIS model extension and the Task Assistant workflow for eTOD in a simple and integrated form. The AIS data model provides a storage bin for the terrain and obstacle data that meets the ICAO requirements. The extensibility of the model makes it easy to add a terrain raster dataset for users interested in storing terrain in the database after collecting it from their own sources. ICAO Doc 9881 specifies the required attributes in the terrain feature class. Definitions of the new eTOD feature classes added to the AIS data model schema can be found in the data dictionary in PLTS Help along with an SP1 read-me document as guidance for the new functionalities in the model. The step-by-step instructions in the workflow are focused on the non-geographic information system (GIS) user, providing a simple and efficient method to create and visualize the required obstacle coverage areas. The additional feature in the workflow includes steps to populate the relationship classes that can be utilized for further spatial analysis with the data.

For more information, visit www.esri.com/arcgisaero.

Notes

- ICAO's Amendment 33 integrated a new Chapter 10—Electronic Terrain and Obstacle Data, a new Appendix 8—Terrain and Obstacle Data Requirements, and a number of revisions to Appendix 1—Contents of Aeronautical Information Publication (AIP) and Appendix 7—Aeronautical Data Quality Requirements. Additionally, ICAO has also released Doc 9881—Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information that summarizes all the requirements for eTOD.
- The upgraded AIS model does not include any cartographic copies of the new feature classes, which are required for charting purposes. However, they can be created from the master feature classes.



About ESRI

For four decades, ESRI has been helping people make better decisions through management and analysis of geographic information. Our culturally diverse staff work with our business partners and hundreds of thousands of people who use GIS to make a difference in our world.

A full-service GIS company, ESRI offers support for implementing GIS technology from the desktop to enterprise-wide servers, online services, and mobile devices. GIS solutions are flexible and customizable to meet the needs of all our users.

Our Focus

At ESRI, we focus on promoting the value of GIS and its applications throughout the world and pay close attention to our users' needs. Our software development and services respond to our customers with products that are easy to use, flexible, and integrated. Our technology is multidisciplinary, productive, and valuable to our users.

We have a strong commitment to educating our customers through ESRI's various training programs. ESRI is a socially conscious business and invests heavily in issues regarding education, conservation, sustainable development, and humanitarian affairs.

Contact ESRI

1-800-GIS-XPRT (1-800-447-9778)

Phone: 909-793-2853

Fax: 909-793-5953

info@esri.com

www.esri.com

Offices worldwide

www.esri.com/locations



ESRI
380 New York Street
Redlands, California
92373-8100 USA