

## Minimum Area Altitudes - Ground Lesson

### Attention

I am not on an airway...do I need to worry about hitting a building, tower, or mountain?

### Objective

To know how high we need to fly so we do not have to worry about hitting things.

### Schedule

Ground instruction – 10 minutes

### Reference Material

[https://www.faa.gov/air\\_traffic/flight\\_info/aeronav/digital\\_products/aero\\_guide/media/Chart\\_Users\\_Guide\\_12thEd.pdf](https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/media/Chart_Users_Guide_12thEd.pdf)

[http://www.uscg.mil/auxiliary/missions/auxair/ifr\\_intro.pdf](http://www.uscg.mil/auxiliary/missions/auxair/ifr_intro.pdf)

[https://www.ivao.aero/training/documentation/books/SPP\\_APC\\_Minimum\\_flight\\_altitude.pdf](https://www.ivao.aero/training/documentation/books/SPP_APC_Minimum_flight_altitude.pdf)

### Material

#### MEF

The Maximum Elevation Figure (MEF) represents the highest elevation within a quadrant, including terrain and other vertical obstacles (towers, trees, etc.). A quadrant on Sectionals is the area bounded by ticked lines dividing each 30 minutes of latitude and each 30 minutes of longitude. MEF figures are rounded up to the nearest 100' value and the last two digits of the number are not shown. MEFs over land and open water areas are used in areas containing manmade obstacles such as oil rigs.

Pilots should be aware that while the MEF is based on the best information available to the Specialist, the figures are not verified by field surveys. Also, users should consult the Aeronautical Chart Bulletin in the A/FD or AeroNav Products website to ensure that your chart has the latest MEF data available.

Unlike the Minimum safe altitude used for IFR flight, the MEF does not include any margin for aircraft clearance above the terrain nor for altimeter error.

**12<sup>5</sup>**  
*In this example the  
MEF represents  
12,500'.*

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### §91.119 — Minimum safe altitudes: General.

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

- (a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
- (b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
- (c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

### MORA

Minimum off route altitudes (MORA). The pilot should be aware of the existence of two variations in this category: the MORA and the GRID MORA. The minimum off route altitude named MORA is an altitude which provides 2,000 feet of terrain clearance in mountainous areas and 1,000 feet in non-mountainous regions; at the same time it provides a reference point of clearance of 10 nm from the route centerline.

The GRID MORA provides terrain and man-made structure clearance within the section outlined by latitude and longitude lines. The Grid MORA value clears all terrain and man-made structures by 1000ft in areas where the highest elevations are 5000ft MSL or lower and by 2000ft in areas where the highest elevations are 5001ft MSL or higher.

The Grid MORA is a good value to determinate obstacle clearance whenever the pilot has to, or would like to divert from the airway, e.g. during an emergency descent or when flying direct to a point away from an airway.

### OROCA

The Off Route Obstruction Clearance Altitude (OROCA) is represented in thousands and hundreds of feet above mean sea level. The OROCA represents the highest possible elevation including both terrain and other vertical obstructions (towers, trees, etc.) bounded by the ticked lines of latitude and longitude. In this example the OROCA represents 12,500 feet.

OROCA is computed just as the Maximum Elevation Figure (MEF) found on Visual charts except that it provides an additional vertical buffer of 1,000 feet in designated non-mountainous areas and a 2,000 foot vertical buffer in designated mountainous areas within the United States. For areas in Mexico and the Caribbean, located outside the U.S. ADIZ, the OROCA provides obstruction clearance with a 3,000 foot vertical buffer. Unlike a MEF, when determining an OROCA the area 4 NM around each quadrant is analyzed for obstructions. OROCA does not provide for NAVAID signal coverage, communication coverage and would not be consistent with altitudes assigned by Air Traffic Control. OROCA can be found over all land masses and open water areas containing man-made obstructions (such as oil rigs). OROCA are shown in every 30 x 30 minute quadrant on Area Charts, every one degree by one.