

# Minimum IFR Altitudes



Cleared For  
the Option!

Quick Ground Lesson



# Altitudes

Indicated altitude = The altitude that the pilot is able to read at the altimeter.

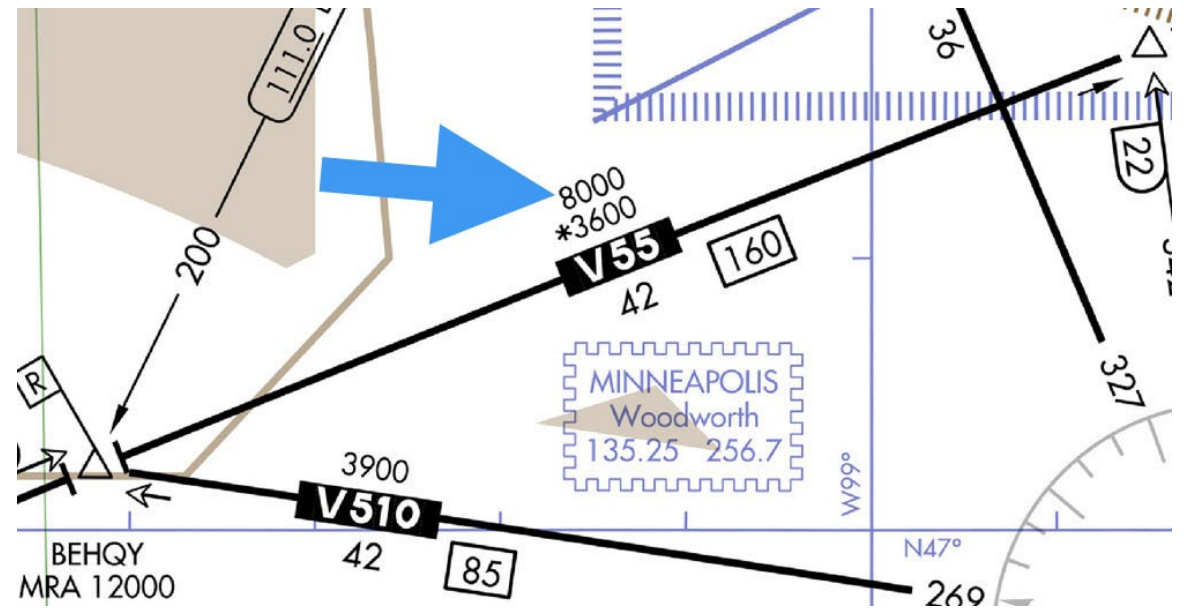
True altitude = The expressed altitude in terms above the sea level.

Height = The altitude in terms of distance above a certain point.

# Minimum En Route Altitude (MEA)

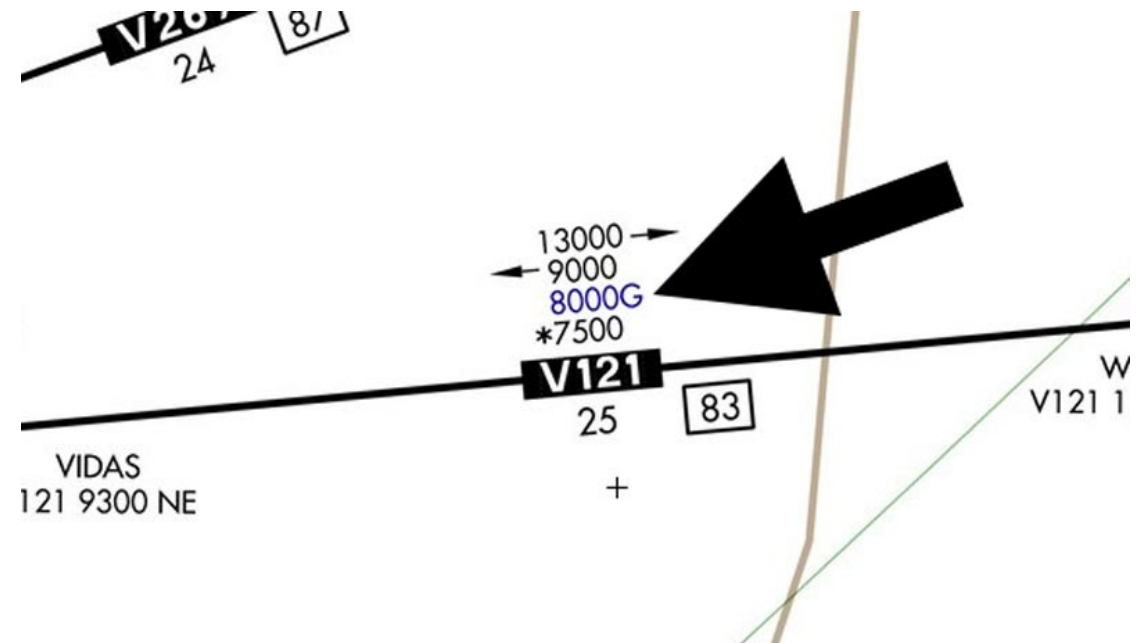
The MEA is the lowest published altitude between radio fixes that ensures navigation signal coverage and meets obstacle clearance requirements between those fixes.

Communications coverage, however, is not guaranteed.



# RNAV Minimum En Route Altitude

RNAV MEAs are depicted on some IFR en route low altitude charts, allowing both RNAV and non-RNAV pilots to use the same chart for instrument navigation.



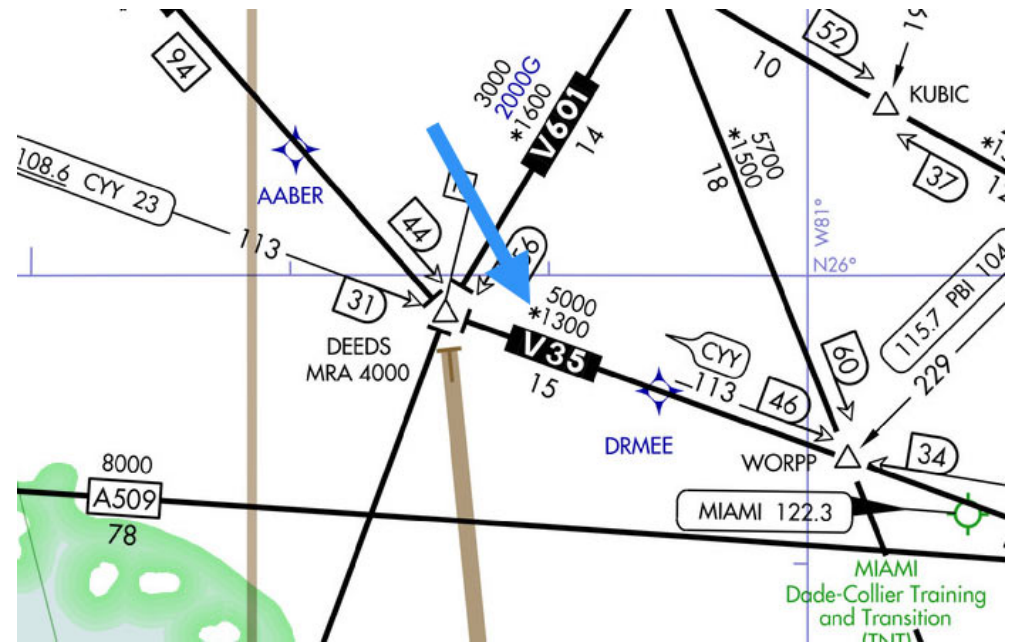
# Minimum Obstruction Clearance Altitude (MOCA)

The MOCA is the lowest published altitude in effect between fixes on VOR airways, off-airway routes, or route segments that meets obstacle clearance requirements for the entire route segment.

MOCA will assure:

Minimum vertical separation of 1000ft (300m) from the ground or landmarks.

22NM VOR reception range.



# § 91.177 Minimum altitudes for IFR operations.

(a) Operation of aircraft at minimum altitudes. Except when necessary for takeoff or landing, or unless otherwise authorized by the FAA, no person may operate an aircraft under IFR below—

(1) The applicable minimum altitudes prescribed in parts 95 and 97 of this chapter. However, if both a MEA and a MOCA are prescribed for a particular route or route segment, a person may operate an aircraft **below the MEA down to, but not below, the MOCA**, provided the applicable navigation signals are available. **For aircraft using VOR for navigation**, this applies only when the aircraft is within **22 nautical miles of that VOR** (based on the reasonable estimate by the pilot operating the aircraft of that distance); or

(2) If no applicable minimum altitude is prescribed in parts 95 and 97 of this chapter, then—

(i) In the case of operations over an area designated as a mountainous area in part 95 of this chapter, an altitude of 2,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown; or

(ii) In any other case, an altitude of 1,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown.

# § 91.177 Minimum altitudes for IFR operations.

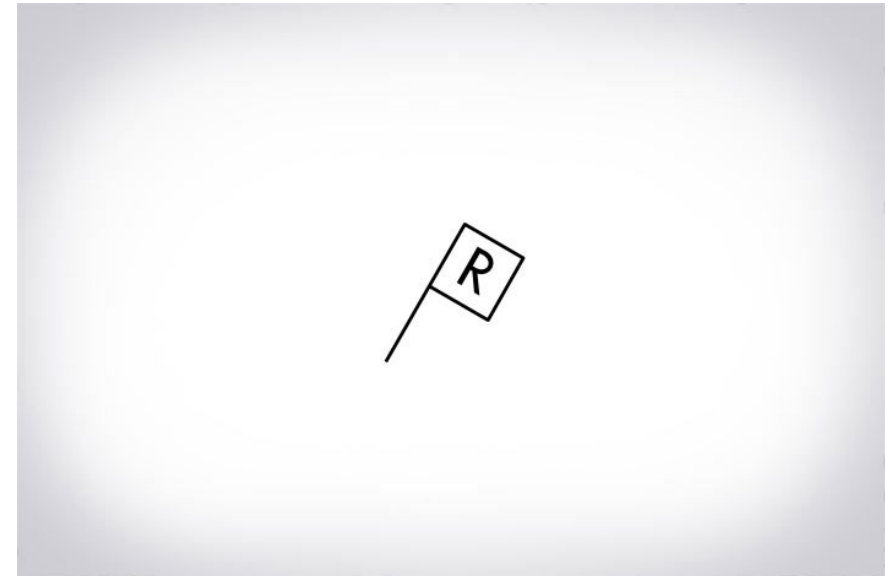
(b) Climb. Climb to a higher minimum IFR altitude shall begin immediately after passing the point beyond which that minimum altitude applies, except that when ground obstructions intervene, the point beyond which that higher minimum altitude applies shall be crossed at or above the applicable MCA.



# Minimum Reception Altitude (MRA)

The Minimum Reception Altitude (MRA) is the lowest altitude on an airway segment where an aircraft can be assured of receiving signals from navigation aids like VOR or NDB.

When the MRA at the fix is higher than the MEA, an MRA is established for the fix and is the lowest altitude at which an intersection can be determined.





# Minimum Reception Altitude (MRA)

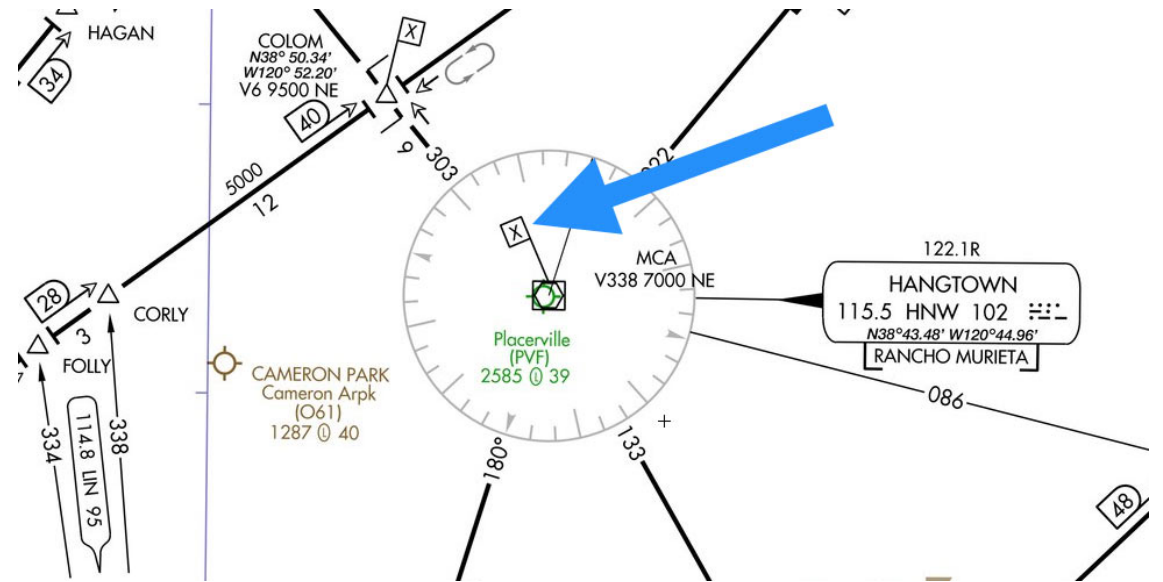
The MRA at intersection PRATZ is 3000 ft.



# Minimum Crossing Altitude (MCA)

An MCA is the lowest altitude at certain fixes at which the aircraft must cross when proceeding in the direction of a higher minimum en route IFR altitude.

The pilot should climb to the MCA before reaching the intersection; in that way the MCA will not be violated.





# Maximum Authorized Altitude (MAA)

An MAA is a published altitude representing the maximum usable altitude or flight level for an airspace structure or route segment.

It is the highest altitude on a Federal airway, jet route, RNAV low or high route, or other direct route for which an MEA is designated. Adequate reception of navigation signals is assured.

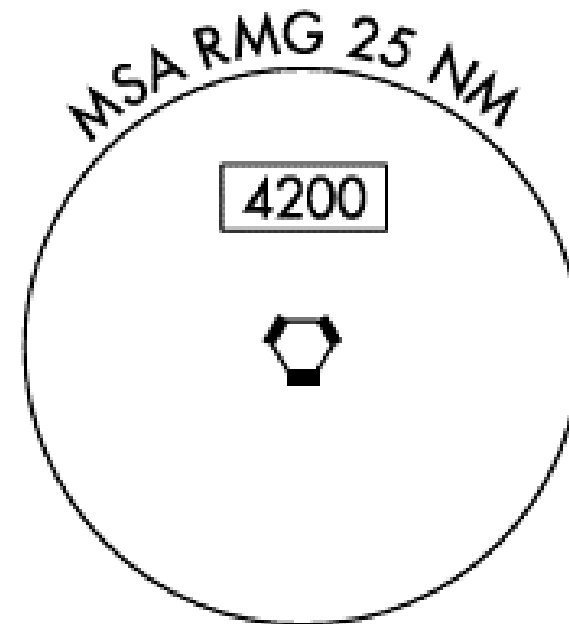


# Minimum Safe Altitude (MSA)

Altitudes depicted on approach charts which provide at least 1,000 feet of obstacle clearance within a 25-mile radius of the navigation facility, waypoint, or Airport Reference Point upon which the MSA is predicated.

MSAs are for emergency use only and do not necessarily assure acceptable navigational signal coverage.

AKA Minimum Sector Altitude also

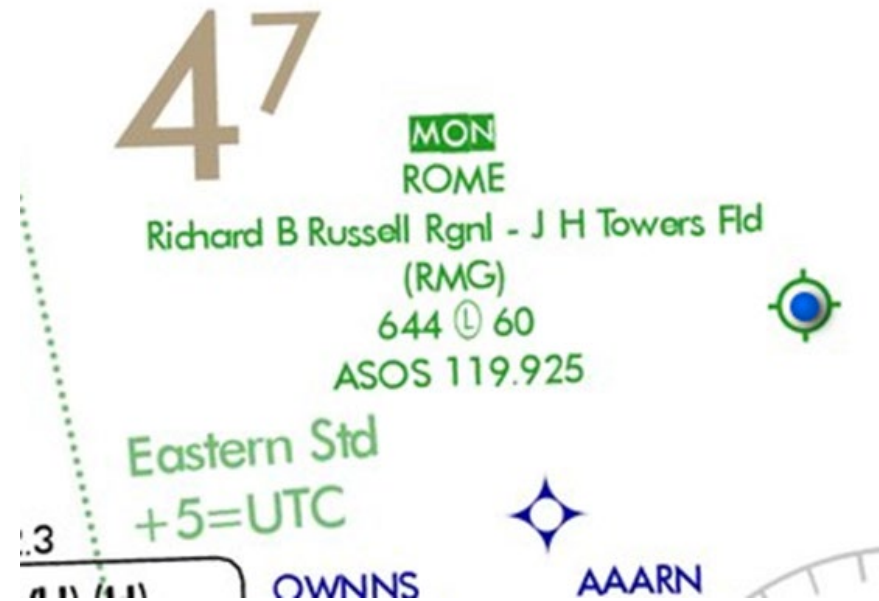


# MORA (IVAO Definition)

The minimum off route altitude (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.

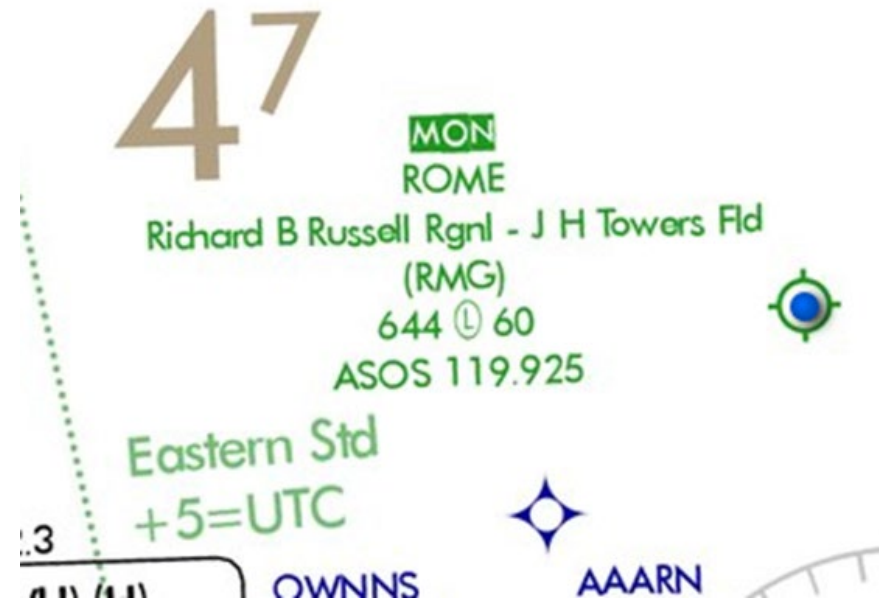


# MORA (IVAO Definition)

The Grid MORA value clears all terrain and man-made structures by 1000 ft in areas where the highest elevations are 5000 ft MSL or lower and by 2000 ft in areas where the highest elevations are 5001 ft 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.

The MORA around the Rome airport is 4700 ft.

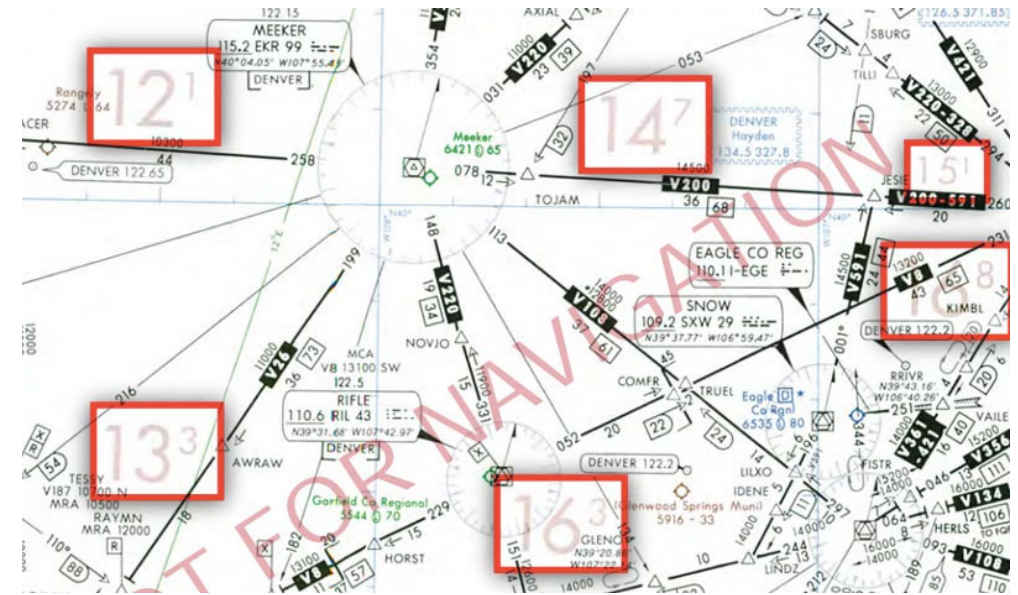




# Off-Route Obstruction Clearance Altitude (OROCA)

An off-route obstruction clearance altitude (OROCA) is an off-route altitude that provides obstruction clearance with a 1,000-foot buffer in non-mountainous terrain areas, and a 2,000-foot buffer in designated mountainous areas.

This altitude doesn't guarantee signal coverage from ground-based NAVAIDs, ATC radar, or communications coverage.



# Minimum Turning Altitude (MTA)

Minimum turning altitude (MTA) is a charted altitude providing vertical and lateral obstruction clearance based on turn criteria over certain fixes, NAVAIDs, waypoints, and on charted route segments. Check out Page 2-38 in Chapter 2 of the FAA's Instrument Procedures Handbook for more.

The turn area provides obstacle clearance for both turn anticipation (turning prior to the fix) and flyover protection (turning after crossing the fix). This does not violate the requirement to fly the centerline of the airway. Many factors enter into the construction and application of the turning area to provide pilots with adequate obstacle clearance protection. These may include aircraft speed, the amount of turn versus NAVAID distance, flight track, curve radii, MEAs, and MTA.



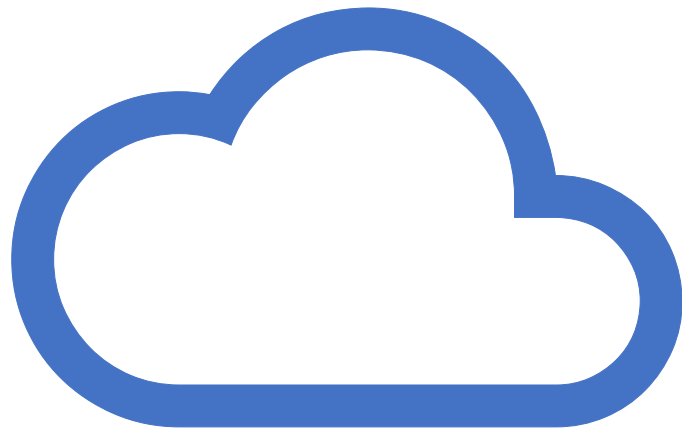
# Minimum Vectoring Altitudes (MVA)

MVAs are established for use by ATC when radar ATC is exercised.

The MVA provides 1,000 feet of clearance above the highest obstacle in non-mountainous areas and 2,000 feet above the highest obstacle in designated mountainous areas.

Because of the ability to isolate specific obstacles, some MVAs may be lower than MEAs, MOCAs, or other minimum altitudes depicted on charts for a given location.

While being radar vectored, IFR altitude assignments by ATC are normally at or above the MVA.



## VFR on Top

If you are in a situation where you have heavy cloud cover at say 2500 AGL but the clouds are only a couple hundred feet tall you can ask for VFR-on-top.

When you are above the clouds if you get this clearance you would use normal VFR cruising altitudes.

You would not have to ask every time you wanted to change altitude or heading.

You would need to check in with ATC when you need to pass back through the clouds.

You still have to make required reports. You can not to VFR-on-top in class A airspace.



Any questions I can answer or follow up later on?