THOSE CRITICAL Ms

Charts vary on how they depict minimum enroute and other critical altitudes. Fortunately, the numbers are important only in a few circumstances.

By Harry Kraemer

As instrument pilots, we have our choice of charts published by Jeppesen or by NOS. We can argue about the advantages of each but the fact is, either system does the job. From time to time, you may have to fly with either or even both, en routes from one system and plates from another.

Can you switch back and forth with ease? There's no reason you can't but some terms and nomenclature may be confusing and are worth a review.

Generally, the two systems use the same terms and definitions for the basics such as MEAs, MOCAs, MRAs and the like.

However Jepp products have a few terms unique to their charts and there are minor variations in typographical convention.

Critical Ms

- ❑ MEA guarantees obstacle clearance and (usually) navigation and communication coverage.
- ❑ MOCA gurantees obstacle clearance and navigation with 22 nautical miles of VORs.
- ❑ 91.177 requires flight at MEA or MOCA but when in radar contact, you can fly below MEA if above ATC's local minimum instrument altitudes.
- ❑ Jeppesen's MORA and NOS's OROCA are essentially the same. To apply either for off route navigation, you must be in radar contact.
- ❑ Sectional MEFs provide no usable IFR obstacle clearance.

MEAs

First, let's review the basic minimum altitudes. The MEA or minimum en route altitude is the lowest published altitude between radio fixes that meets obstacle clearance requirements. That's 2000 feet in mountainous areas and 1000 feet elsewhere.

Unless an MEA gap is posted, the MEA guarantees navigation signal reception and, with a few exceptions here and there, adequate communications at the MEA.

Both chart systems depict MEAs, of course, but the symbology is different. On Jeppesen charts, the MEA appears below the airway label box, on NOS charts it's above the box. MEAs can increase along the route, especially in the mountainous west. For obstruction clearance, you normally begin your climb when reaching the fix where the MEA changes.

MCAs

But if a higher gradient is necessary to clear the terrain, you'll find an MCA or minimum crossing altitude.

A MCA normally applies to one direction on the airway. In the following example (MCA 9800 E), the MCA is 9800 feet when eastbound. You must cross the MCA at the altitude shown on the chart. NOS uses an "X" enclosed in a flag to alert to a MCA. Jepps usually show the MCA next to the associated intersection, with the airway number, altitude and direction.

On occasion, to help reduce chart clutter, a number enclosed in a circle is often used to indicate an MCA. In this case, Jeppesen depicts a box located near the fix with additional information. In practical terms, unless you're flying at the MEA, MCAs aren't often an operational factor because ATC tends to assign higher altitudes.

MOCA

Next up is the MOCA or minimum obstruction clearance altitude. The MOCA is the lowest published altitude between radio fixes that meets obstacle clearance requirements for the entire route. However, the MOCA only assures acceptable radio navigation signal coverage within 22 nautical miles of the VORs defining the route.

The difference between the MEA and MOCA is that the MEA guarantees navigation signal coverage throughout the entire segment and the MOCA does not. As shown in the illustration at right, Jepp charts show this altitude followed by the letter "T" for terrain. NOS charts show the MOCA with a leading asterisk: *4000.

Legalities

Quick legalities: FAR 91.177 requires that you fly at least at the MEA when operating IFR, except you're allowed to fly down to the MOCA when within 22 nautical miles of the VOR concerned "based on the pilot's reasonable estimate of that distance."

There's one glaring exception to this rule: In some parts of the country, you'll see extraordinarily high MEAs where it's obvious that terrain isn't a factor. Usually, the MEA is jacked up to meet nav reception requirements.

However, if ATC radar coverage is available—it usually is—you can fly well below the MEA because you're above the local Center's or approach control's minimum instrument altitude.

If you've ever been assigned an altitude below a very high published

MEA, this exception explains it.

MAA

On occasion, the FAA has to establish a MAA or maximum authorized altitude. The MAA is the highest altitude you can legally fly on a route. MAAs are usually established when two VORs with the same frequency are within range of each other. Lowering the MAA reduces the chances of confusing interference.

Of all the altitudes posted on charts, this one is probably the most obscure. There are only a handful of MAAs in the U.S.

Off Route Altitudes

The MORA or minimum off-route altitude is a term unique to Jeppesen products but a version of it is also found on NOS en route charts. Also called the grid MORA, it provides a minimum of 1000 feet of obstruction clearance within the grid where the value appears. Obviously, that's a good thing to know for off-airways, direct navigation.

NOS's version of the same thing is called an OROCA or off-route obstacle clearance altitude. It provides the same clearance as Jeppsen's MORA; 1000 feet. While we're talking about grid or quadrant elevations, those found on sectionals are called MEFs or maximum elevation figures.

They provide no IFR obstacle clearance—just a couple of hundred feet of fudge factor. So if you're using them for off airways nav, add at least 1000 feet to your IFR altitude.

Normally, off-airways grid altitudes aren't critical in everyday IFR operations. If you're operating off airways, you have to be in radar contact and that assumes you're above ATC's minimum instrument altitude.

Then again, maybe not. Just know what the figure represents and make sure you'll at be least 1000 feet above it if off airways.

MRAs

MRAs (minimum reception altitudes) are established where a minimum altitude is required to have adequate reception of the navigation signals forming an intersection or fix. When operating below an MRA, you might not be able to identify the fix or intersection. But remember, an MRA doesn't ensure terrain clearance, just nav receptions. NOS alerts you to an MRA by showing a flag with the letter R inside. Jeppesen and NOS both note a MRA as follows: *MRA 10000.*

MIAs, Too

Two final Ms worth mentioning are the minimum vectoring altitude—which applies to approach controls—and the minimum instrument altitude, which applies to centers. Neither of these are published although both do the same thing: Provide at least 1000 feet of obstacle clearance.

If you're curious about what the local MVA/MIA is, it's reasonable to ask the controller. This will instantly clarify any confusion over what you've been assigned an altitude 1000 feet lower than the MEA or the OROCA.

Someday in the not-too-distant future, we may have such a thing as an MIA/MVA. Until then, if you need to know an MIA/MVA, ask.

Flying IMC is not the time to try and figure out what something means, or worse yet, guess. Most of the time, these minimum altitudes won't come up as an operational issue. Then again, on your very next flight, you may have to duck down below the MEA to escape icing. Knowing how to pick the MOCA off the chart is a critical survival skill.

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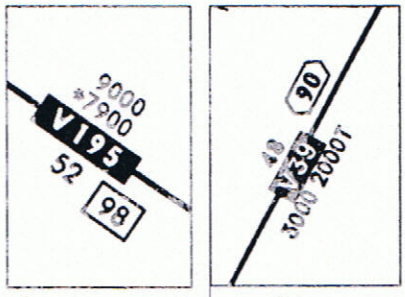
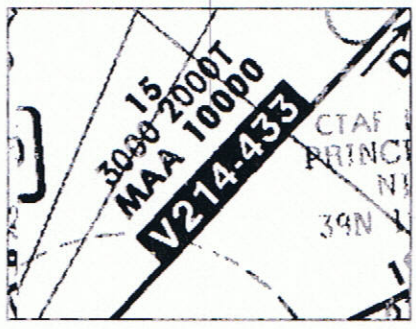
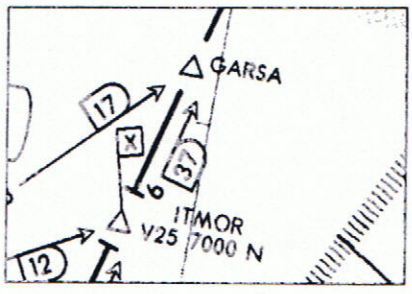


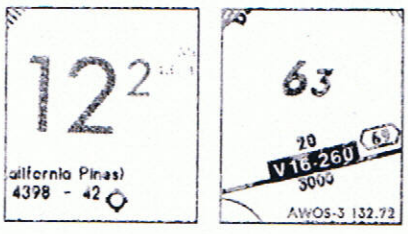
The two Ms that really matter: NOS, left, gives MEA and NMOCA below, with asterisk. Jeppesen depicts MOCA with "T."



MAAs are relatively rare and are published when two VORs on the same frequency may interfere.



MCAs on NOS charts are shown as a flagged X, with airway direction (north) given after the altitude.



Off-route altitudes are called OROCAs on NOS charts (left) and MORAs on Jeppesen charts, right. Both provide 1000 feet of IFR obstacle clearance.