

# JEPP'S BRIEFING



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Let's ponder for a moment an interesting question about minimums and obstacles. If you were flying a helicopter on a VOR approach, could you descend vertically down to the MDA at the FAF and be safe all the way to the MAP? The answer? Only if you receive a clearance from the "Bureau of Mines." In other words, the MDA *does not* provide obstacle clearance from the FAF to the MAP on a non-precision approach.

The question was meant to be mind stimulating - and because sometimes it may be difficult to stay above the minimum altitudes, it is good to understand some of the protection that is built into instrument approach procedures by the people who design them.

Now for a little explanation of the answer. In the FAA's TERPs criteria, paragraph 289 says "Existing obstacles located in the final approach area within 1 mile past the point where a fix can first be received may be eliminated from consideration by application of a descent gradient of 1 foot vertically for every 7 feet horizontally. This 7:1 descent gradient shall begin at the point where the fix can first be received at a height determined by subtracting the final approach required obstacle clearance (ROC) from the minimum altitude required at the fix."

A good example of this can be found on the VOR or GPS-A approach into Corona, California. The approach is from the Paradise VOR that sits on top of a hill. The VOR elevation is 1,495 feet. After passing the VOR, the descent can be down to the circling MDA

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at 1,480 feet. Although the VOR is only 15 feet above the MDA, the MDA on other approaches could possibly be as much as 504 feet below an obstacle right at the FAF if the FAF was a VOR.

### Stepdown Fixes

Occasionally a fix is located on the final approach segment between the FAF and the MAP. This fix is not a final approach fix, but it is called a stepdown fix and is used on non-precision approaches. When this fix can be identified during the approach, you normally get lower minimums after passing the stepdown fix.

The stepdown fix is used primarily for two reasons. First, there are many cases in which there is a high obstacle in the final approach segment that would cause very high landing minimums. In this case, the FAA will designate a stepdown which is placed beyond the controlling obstruction in the final approach segment. After you have identified and passed the fix, you can descend to the MDA for the airport.

The second reason is when the final approach segment is excessively long, the TERPs criteria requires the MDA to be raised. When the final approach segment exceeds six miles, the MDA is increased at a rate of five feet for each one-tenth of a mile over six miles. When a stepdown fix is incorporated in the final approach segment, the basic obstacle clearance is applied between the stepdown fix and the MAP.

Sometimes, a constant descent rate cannot be made from the FAF down to the runway since a stepdown fix altitude might be higher than the constant descent angle from the FAF to the runway. In these cases the descent rate *after* the stepdown fix will not exceed 400 feet per nautical mile, or 3.77°, and still have straight-in landing minimums.

### Intermediate Segment

The intermediate segment is located just outside the final approach segment and is designed primarily to get the airplane set for the final descent into the airport. It is the segment in which aircraft configuration, speed, and positioning adjustments are made for entry to the final approach segment. The intermediate segment begins at the intermediate fix (IF) and ends at the final approach fix.

The intermediate segment is designed to be aligned with the final approach segment; however, this may not always be practical because of terrain or

other obstacles. When the final and intermediate courses are not identical, the intermediate segment will be at an angle not greater than 30° to the final approach course.

Because the intermediate segment is used to prepare the aircraft speed and configuration for entry into the final approach segment, the gradient normally is as flat as possible. The optimum descent gradient in the intermediate segment normally does not exceed 150 feet per mile. The maximum permissible gradient is 318 feet per mile, except for a localizer approach published in conjunction with an ILS procedure. In this case, a higher descent gradient equal to the commissioned glideslope angle (provided it does not exceed 3°) may be used.

The optimum length of the intermediate segment is 10 nautical miles; however, the minimum length is five miles and the maximum length is 15 miles. A minimum of 500 feet of obstacle clearance is provided in the primary area of the intermediate segment. The width of the intermediate segment varies according to the width of the final approach segment at the final approach fix.

### Initial Approach Segment

The initial approach segment is located just outside the intermediate segment. It is designed to transition incoming traffic from the enroute structure to the intermediate segment. However, when the intermediate fix is part of the enroute structure, an initial approach segment might not be designated. In this case the approach begins at the intermediate fix.

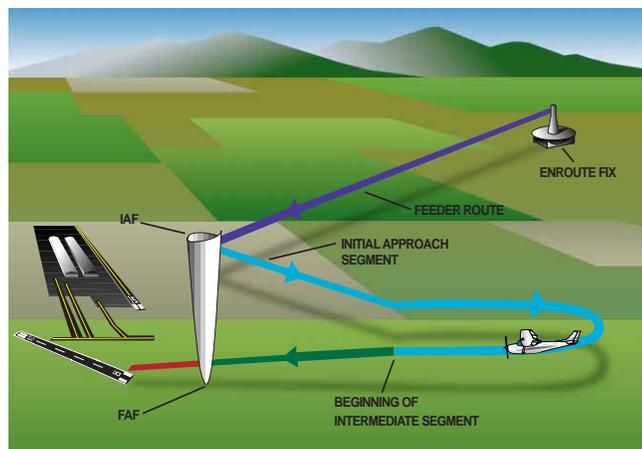
The initial approach segment can be flown using many methods. The following list contains some of these:

- DME arc • VOR radial • NDB course
- Heading (dead reckoning) • Radar vectors
- Procedure turns • Holding patterns
- Combinations of the above

In most cases, the beginning of the initial approach segment is identified with the letters "IAF." This IAF is the fix referred to in FAR 91.185 as "a fix from which the approach begins" for the point where the descent to the airport can be initiated. The IAF is also a fix that is required for GPS receivers which are certified to fly approach procedures. In GPS receivers all approaches are retrieved from the databases beginning at the IAF.

There is no standard length for the initial approach segment, but it rarely exceeds 50 miles. The standard width for the primary area is four miles on each side of the initial approach course. When any portion of the initial approach is more than 50 miles from the navigation facility, the width and obstruction criteria for the enroute airways apply to the portion more than 50 miles from the navaid.

The initial approach segment altitude provides a minimum of 1,000 feet obstruction clearance within four miles each side of the



course centerline. The obstruction clearance outside the four-mile range is minimal, which means—*stay on course*.

The turn from the initial approach segment to the intermediate segment cannot exceed 120°. When the angle exceeds 90°, a lead-in radial is provided which gives at least two miles of lead for determining when to turn inbound on the intermediate course.

When a DME arc is used for an initial approach segment, the minimum radius of the arc is seven miles. When the last portion of the DME arc exceeds a 90° angle to the intermediate segment, lead-in radials which are at least two miles before the intermediate segment are included in the approach procedure.

Whenever a procedure turn is depicted as part of an approach procedure, a procedure turn forms an initial approach segment. This is also true for tear drop course reversals and holding patterns, or race track patterns that are used to align the airplane with the final approach course just prior to the FAF.

The procedure turn forms an initial approach segment until the inbound course is intercepted. Look at the illustration and note that after intercepting the inbound course you are on the intermediate segment. For this reason, you can descend to the final approach fix crossing altitude after completion of the procedure turn. Remember that the initial approach segment obstruction clearance altitude is 1,000 feet, whereas the intermediate segment obstruction clearance is 500 feet.

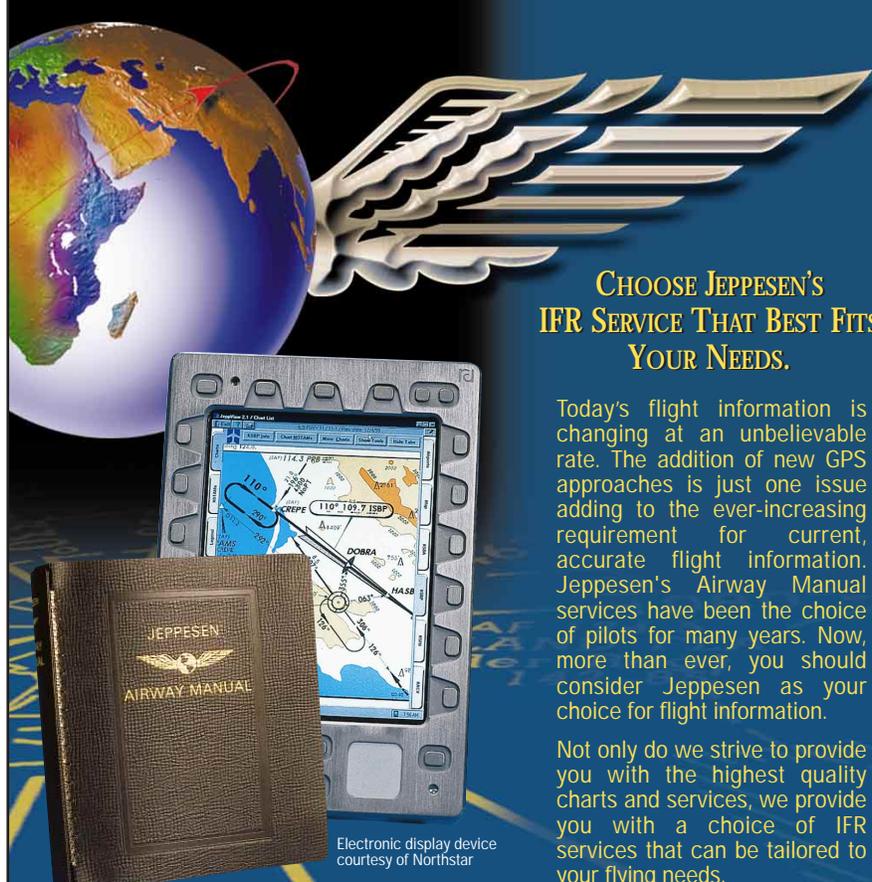
Some approach procedures are based on VORs or NDBs located on the airport. On these types of approach procedures, after completing the procedure turn and established on the inbound course, you have intercepted the *final approach segment* for the descent to the MDA. With this type of approach, the intermediate segment and final approach fix are eliminated.

## Feeder Route

On some approaches, the initial approach fix is not part of the enroute structure. For these approaches, it is necessary to designate a transition course between the enroute fix and the approach structure. This transition course is called a "feeder route." A route from the VOR to the outer marker is a feeder route, and it is not defined as an approach segment if a procedure turn is executed after passing the outer marker. The obstruction clearance criteria for enroute airways are applied to feeder routes.

If a landing cannot be made, a missed approach procedure must be flown. The missed approach segment begins at the missed approach point (MAP) and ends at an enroute fix, or upon returning to the final approach fix (initial approach fix in this case). The missed approach segment can consist of straight courses or turns and is performed any time visual contact with the runway environment hasn't been made by the time

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## Segments on Approach Charts

All the knowledge in the world won't help until we start making applications to the real world. In the next article, we will refer to an approach chart to determine the various segments and feeder routes.



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