

# Threading The Needle Properly

*It's important to know when you can descend in the hold, and when to complete the procedure.*

**By Wally Roberts**

A DESIGNATED EXAMINER (DE) RECENTLY failed an applicant for an instrument rating while flying the VOR Runway 11 approach to Prescott, AZ. The pilot-applicant had a common misunderstanding about the holding patterns depicted on approach charts.

The pilot flew the full approach correctly, with procedure turn, to minimums. The DE announced "no visual references," so the pilot missed the approach, and ended up holding at DRK in the published missed approach holding pattern (see chart next page). The applicant made several turns in the hold at 9,000 feet. The DE (simulating ATC) then advised that the

weather had improved slightly and said, "Cleared for the VOR Runway 11 ap-

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proach." This occurred about the time that the applicant had completed acircuit of the

holding pattern. Instead of maintaining 9,000 feet and positioning himself on the outbound course for the procedure turn, the pilot simply continued in the holding pattern while descending to 6,500 feet, outbound in the hold.

That was the end of the checkride, and could have been the end of the world for this pilot had obstacles existed to the limits of protected airspace. Although Jepp's holding pattern icon is rather small, many real-world holds eat up a lot more airspace in actual circuits. In fact, with the altitudes required in the Prescott procedure, the holding pattern protected airspace is almost as large as the procedure turn protected area, although of somewhat different

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mensions.

The illustration (below right) shows the approach plan and profile view, with the addition of the TERPs-protected airspace required for the procedure turn (8,500 feet, minimum), intermediate segment (6,500 feet minimum) and final approach segment (FAF to runway threshold). The big oval area protects for the procedure turn entries and maneuvers, and has 1,000 feet of required obstacle clearance (ROC) in its primary area, and from 500 feet, tapering to zero in its shaded secondary area.

The funnel area shown from 10 miles out on the 305 radial to the VOR is the intermediate segment (6,500 feet, minimum). The intermediate's ROC is as little as 45 feet in the primary area and tapers from primary ROC to zero in the secondary. So, as you can see, the pilot descended to 6,500 feet in airspace that could have had obstacles as high as 7,500 feet (procedure turn's ROC base).

The procedure turn maneuvering area is generous because of all the entry and maneuvering possibilities. However, the intermediate area is based on the assumptions of a centered VOR CDI and straight-ahead, level or descending flight. You can see from this illustration why it's important to adhere to the course reversal's minimum altitude until solidly established on the intermediate course inbound.

Only when a holding pattern is shown in bold type does it serve as the course-reversal segment. In a situation such as Prescott, where a holding pattern would be placed at the FAF to serve as a course-reversal instead of a procedure turn, the maximum altitude difference permitted by TERPs between the minimum holding altitude and the intermediate (inbound on-course) altitude is 300 feet, in order to maintain a reasonable descent gradient with a one-minute holding pattern.

On the other hand, procedure turns can have an altitude difference of as much as 2,000 feet between the procedure turn minimum altitude and the intermediate segment's minimum altitude. This descent cannot be made until maneuvering is completed, and the aircraft is on-course and inbound.

### Legal, but not good practice

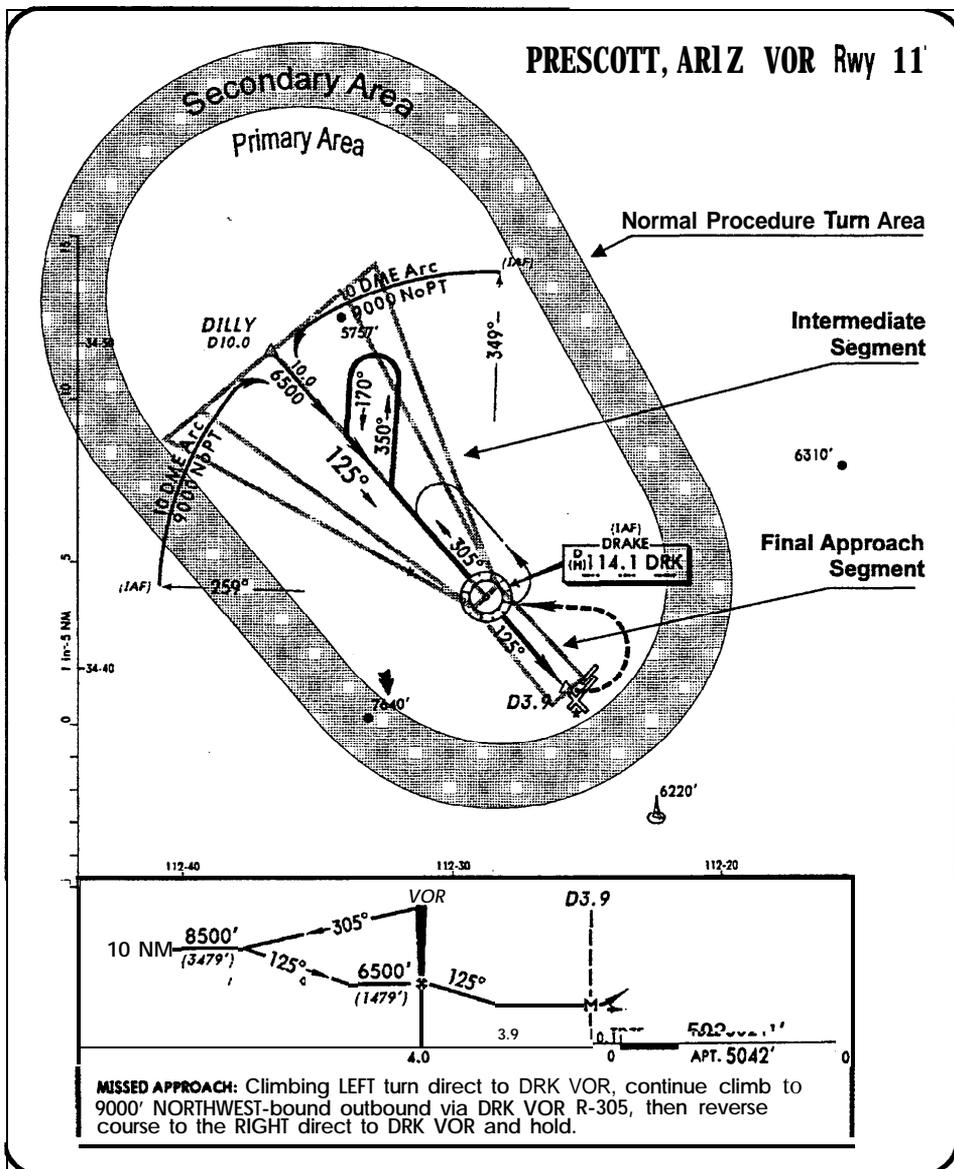
According to the AIM, in a procedure turn situation such as Prescott, once cleared for the approach, the pilot could have elected to extend the holding pattern to as far as 10 miles ("racetrack hold"), but not

descended lower than 8,500 feet, until inbound on the intermediate segment. Although this is legal, it isn't good practice for all situations. Instead, it's better to get on the published course outbound before starting the course reversal maneuver. This ensures more laterally-protected airspace during the course reversal. Without DME, it's easy enough to exceed the 1 O-mile limit if timing isn't started at the procedure turn fix. Don't confuse what I've said about the option to do a "racetrack hold" course reversal in normal 10-mile procedure turn airspace with a holding-pattern-in-lieu-of procedure turn (bold-type hold).

In summary, thin-type holding patterns are usually shown for missed approach

limit fixes on Jepp charts. On NOS charts, the missed approach holding pattern is shown as a dotted line. These holding patterns can be used to absorb ATC delays for traffic or weather. However, they aren't part of the approach procedure. Unless stated otherwise, all holding patterns shown on approach charts (missed approach/thin type or course-reversal/bold type) are one-minute patterns limited to a max speed of 200 knots for jets and 175 knots for props.

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*If you're in the holding pattern shown above, and are cleared for the approach, you can extend the holding pattern to within 10 miles. However you can't descend lower than 8,500 feet until inbound on the intermediate segment.*