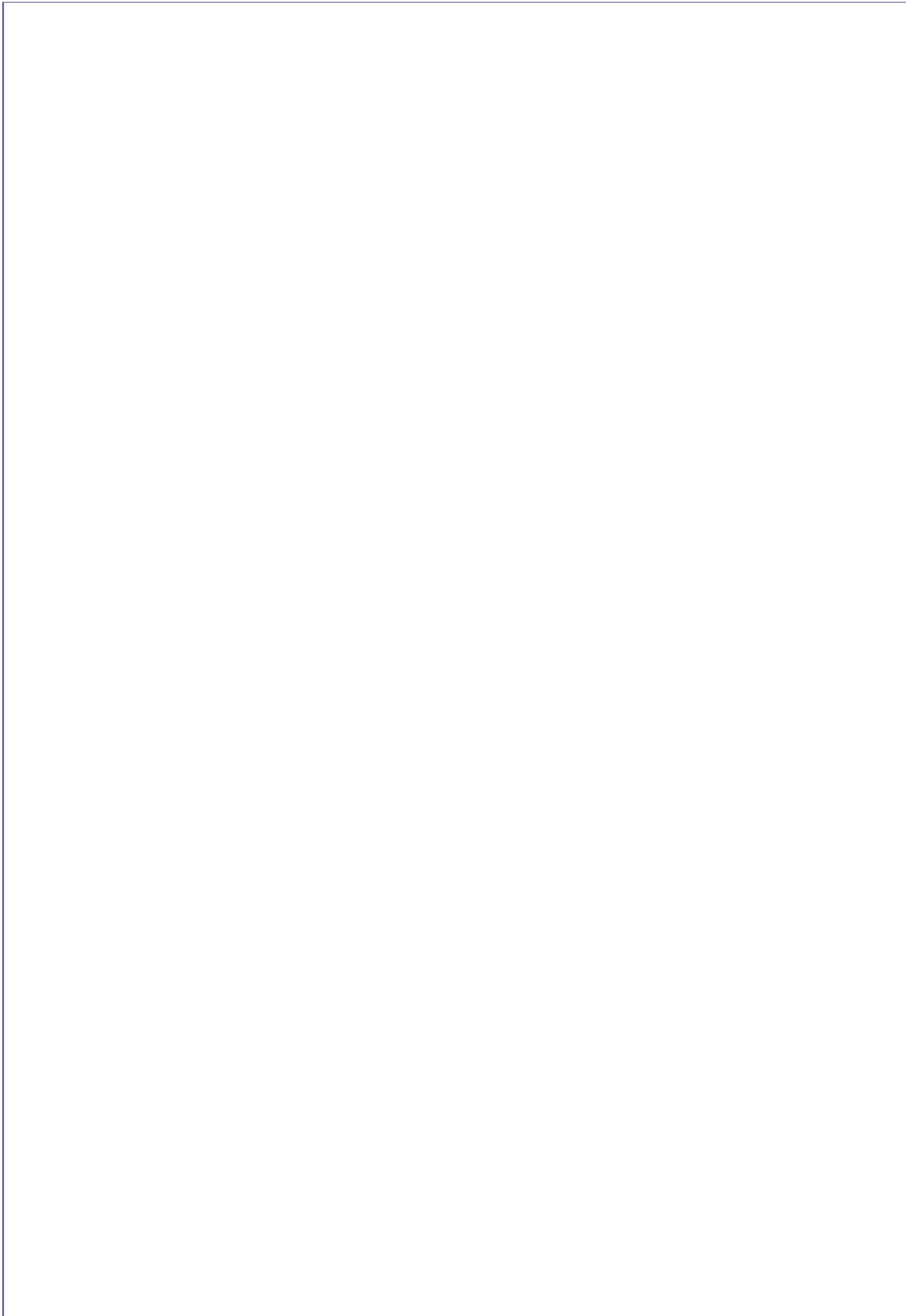


Lesson 1: *The VOR Approach*[Fly This Lesson Now](#)

—by Rod Machado

The VOR Approach

Figure 1-1 shows the VOR approach chart for Santa Monica, California.



Look at the thick black line located in the plan view (position E) running from right to left down toward the airport. This is the instrument approach course that takes you to the airport (position F). Located on the airport is the VOR station (position G) that provides the navigation signal for the approach. Here's how you'd fly this approach.

Let's assume your airplane is located at DARTS intersection (position H). This intersection shows the beginning of the VOR approach course. All instrument approach courses are identified by thick black lines in the plan view section. Notice that the VOR approach course consists of the 212-degree VOR course to the Santa Monica VOR. Your job is to get on that thick black line and fly the depicted course to the airport. And while you're tracking this course, you're also descending to the lowest altitudes, as shown in the approach chart's profile section (position C).

So how do you get onto this approach course in the first place? ATC will either give you radar vectors (headings) to intercept the thick black line, or you can fly a VOR course that leads you to it (more on this later).

Flying the Santa Monica VOR Approach

To fly the 212-degree course to the VOR, tune your navigation receiver to 110.8 MHz (Santa Monica's VOR frequency, position I), and then set your OBS to 212 degrees. Heading 212 degrees will align you with the approach course. From here, you begin tracking the 212-degree course to the airport.

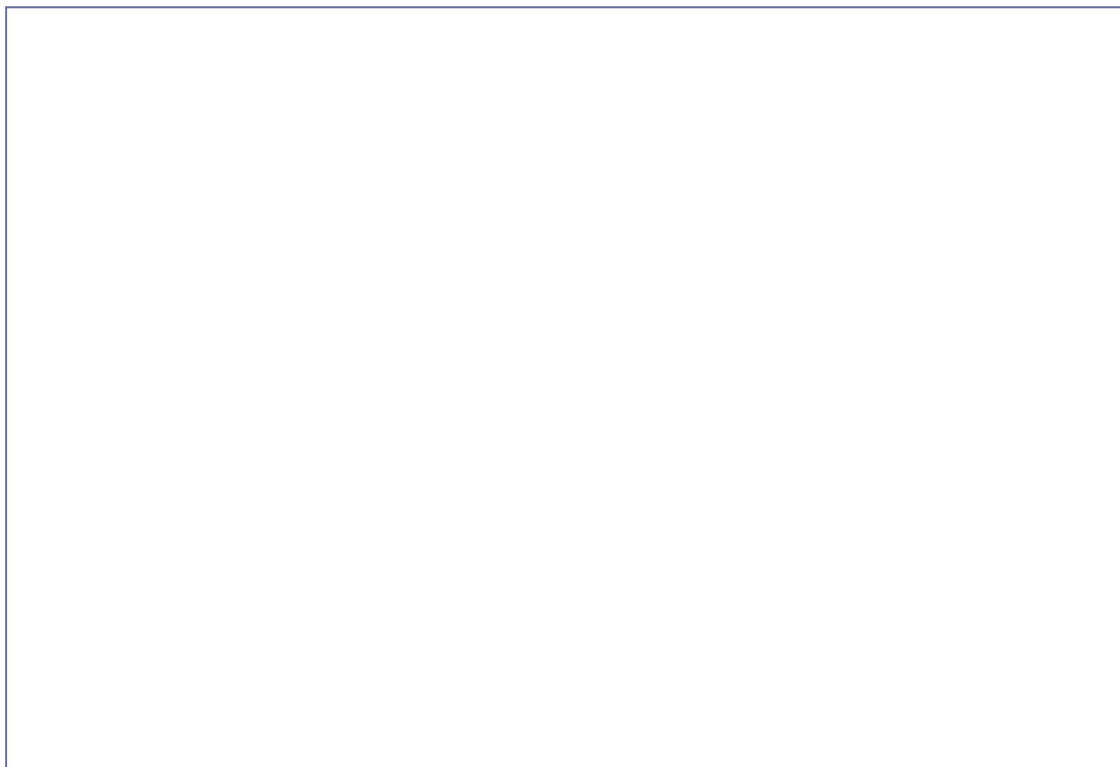
The profile section shows that once you're past DARTS intersection, you can descend to an altitude of 2,600 feet (position J). Many airplanes have Distance Measuring Equipment (DME). If yours does, you can obtain a DME reading from the Santa Monica VOR. As you approach the VOR, the DME counter shows your distance from the VOR decreasing. When the DME shows 6.7 miles, you're at BEVEY intersection (position K). Now you can descend to 1,120 feet. What's the reason for making descents in steps? You're kept above the higher obstacles located along the approach course. As you get closer to the airport, the obstacles usually aren't as tall. (Apparently, other pilots have already knocked the bigger ones down.) Therefore, you're progressively lowered on the approach course as you approach the runway.

Finally, when the DME reads 2.4 miles, you're at CULVE intersection (position L). Since no lower altitudes are shown in the profile view, you need to go to the minima section—the section of the approach chart that identifies the lowest altitude to which you are allowed to descend on this instrument approach—(shown in position D) for the final and lowest altitude to which you can descend. The minima section shows 660 feet as the minimum descent altitude (MDA). To go any lower, you must have the airport in sight. You must have at least the one-mile visibility shown in the minima section next to the 660 feet to go any lower.

If you don't have the airport in sight by the time you fly over the VOR, you're required to execute a missed approach. Therefore, if the VOR flag flips from **TO** to **FROM** and you don't have the airport in sight, you must fly the missed approach procedure (position M). This procedure takes you to a safe altitude from which you can plan your next approach.

A Variation of the VOR Approach

There are several variations to the VOR instrument approach procedure. Once you master these, you'll have no problem interpreting any approach chart. For instance, Figure 1-2 is the VOR approach to Long Beach, California.



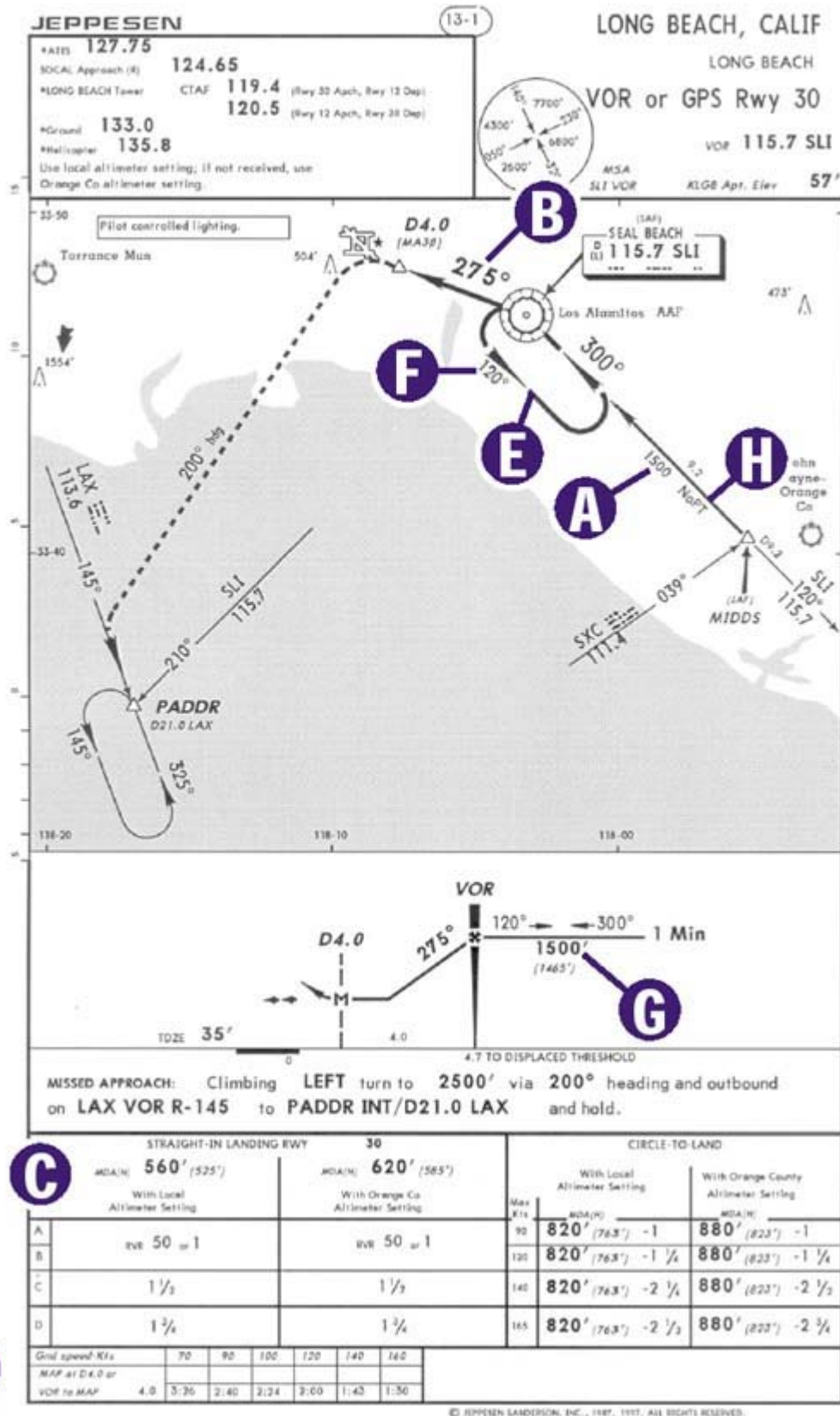


Figure 1-2

(You'll notice that there is a slight difference in chart format between Figure 1-1 and 2. Within the next couple of years, all approach charts will eventually change to the format shown in Figure 1-2). The approach consists of two main segments. The first segment is the 300-degree course to the SLI VOR (tune the VOR to 115.7 MHz, and set the OBS to 300 degrees). The minimum altitude along this route is 1,500 feet, as shown by position A.

Once the **TO/FROM** flag flips and reads **FROM**, you need to turn and track outbound on the 275-degree course that leads you to the airport (position B). Since the profile doesn't show any minimum altitudes for this section of the procedure, look at the minima section of the chart (position C). You're allowed to descend to 560 feet on this approach. Where's the missed approach point? It's based either on time (start your watch at the VOR and count down the time for a given ground speed) or a DME reading from the VOR. Both of the missed approach points are shown by position D.

The Racetrack Course Reversal

One last note on this approach chart: Notice the racetrack pattern shown in the profile view (position E). This is one of two means of course reversal (also known as a procedure turn). If you're heading to the VOR from the north, it's too sharp a turn to cross the VOR and fly the 275-degree course toward the airport. Therefore, you should cross the VOR and reverse course. Flying a heading of 120 degrees (position F) allows you to go opposite the inbound course. From here, you'll turn to intercept the 300-degree course to the VOR, and fly the 275-degree course toward the airport once you've crossed the station.

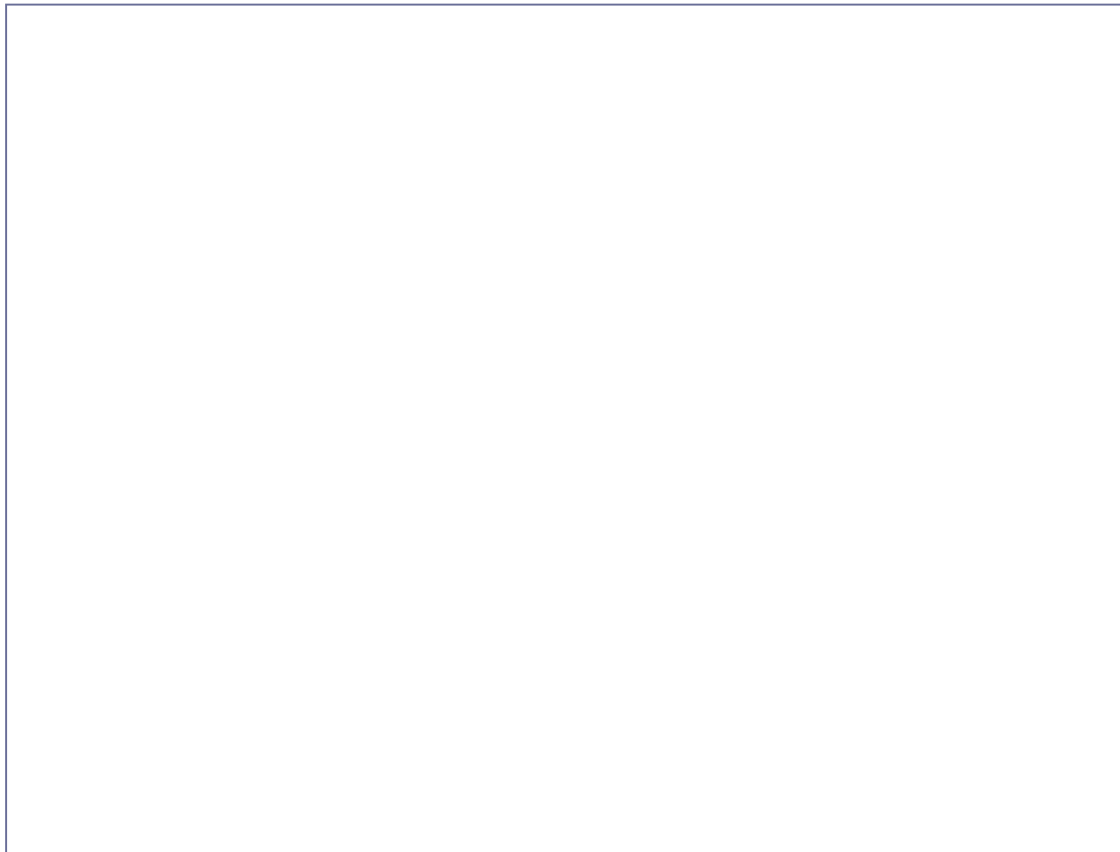
Simply stated, your objective is to try and stay within the boundaries of the racetrack as you reverse course. Outside these boundaries, you're not given protection for terrain. Of course, in a simulator, this is no big deal. You may conk a few simulated mountain goats on the head, but so what? Since we're practicing to develop real flying skills, however, let's pretend this is real. What's the minimum altitude to fly the racetrack course reversal? This is shown in the profile view as 1,500 feet (position G).

Therefore, if I'm heading down to SLI VOR from the north, I'll turn and fly a heading of 120 degrees after crossing the station. This should keep me close to the racetrack boundaries. After one minute (the time shown next to the racetrack in the profile view, position G), I'll turn left to intercept and track the 300-degree course back to the VOR and complete the instrument approach. Of course, this also assumes that I've previously set my OBS to 300 degrees. With slight simplification, that's pretty much how it's done in the real world.

As an additional note, there are routes leading to the VOR (called feeder routes because they feed you onto the instrument approach procedure) that don't require a course reversal. Position H shows one feeder route starting at MIDDS intersection and listing the letters NoPT, which stands for no procedure turn. Along this route, you should fly the instrument approach without doing the course reversal. In other words, fly directly to the VOR and then to the airport.

The Barb-Type Course Reversal

The second type of course reversal is shown in Figure 1-3.



SIMCharts by Jeppesen

This aeronautical chart is intended for flight simulation use ONLY and will vary from actual navigational charts.

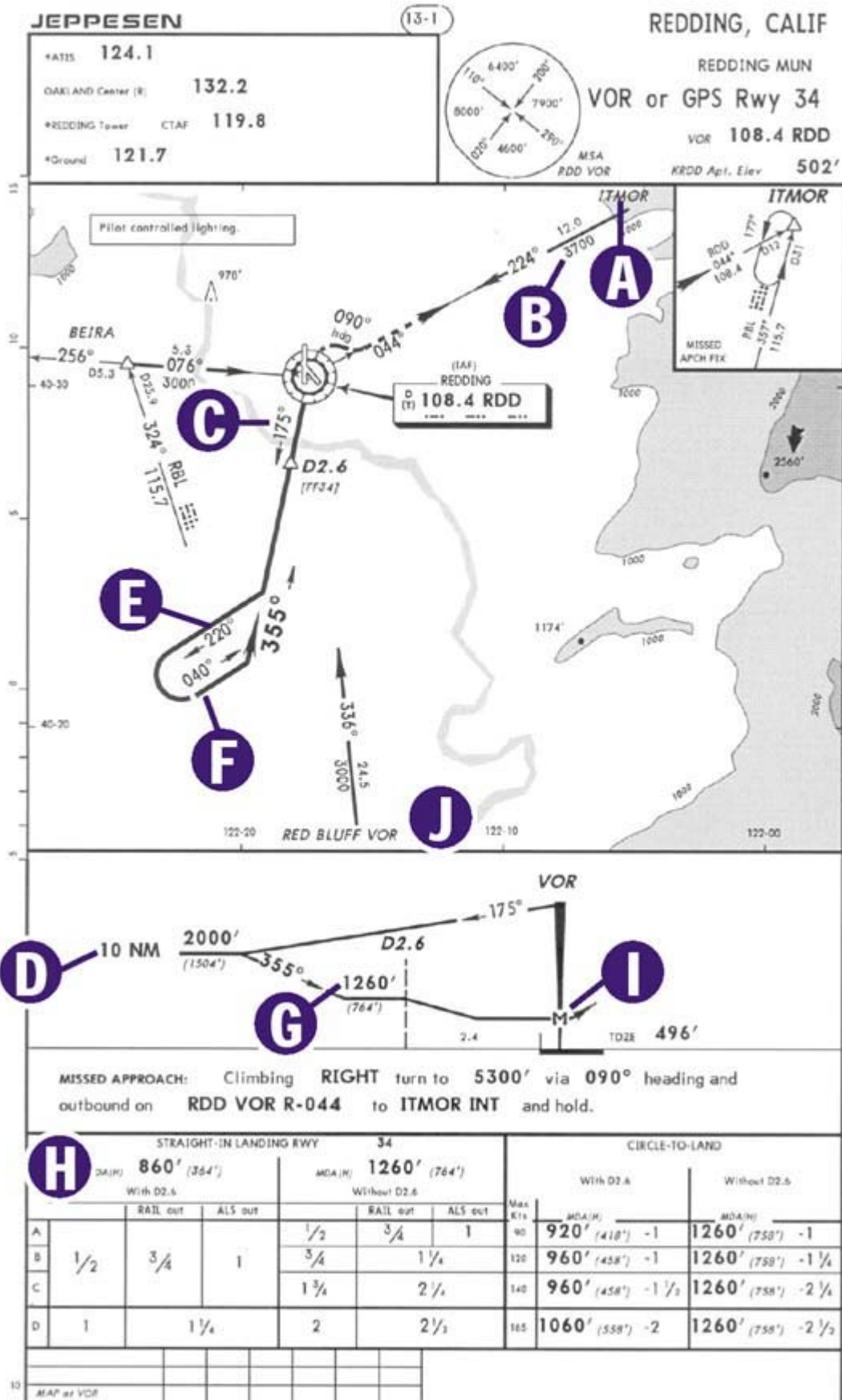


Figure 1-3

This is known as a barb-type course reversal (or procedure turn). Let's assume you're approaching from ITMOR intersection (position A). This route leading to the RDD VOR consists of flying the 224-degree course (tune the VOR to 108.4 MHz, and set the OBS to 224). The minimum altitude along this route is 3,700 feet (position B). Once you cross the VOR, turn and track outbound on the 175-degree course, as shown by position C (you must now set your OBS to 175). The objective here is to travel outbound, reverse your direction, and then track inbound and fly the instrument approach course.

The profile view shows 2,000 feet as the minimum altitude for the procedure turn, which should be completed within 10 nautical miles (nm) of the VOR (position D). As you're descending, you'll travel outbound and, while still within 10 miles, you can turn to a heading of 220 degrees (position E). Fly this heading for a minute or less, and then turn left to a heading of 040 degrees (position F) and intercept the approach course inbound. This means you must reset your OBS to track to the VOR (turn the OBS to 355 degrees). Once inbound, you may descend to 1,260 feet (position G). When your DME (from RDD VOR) reads 2.6 miles, you can descend to 860 feet, which is the altitude shown in the minima section (position J). The "M" shown in the profile section (position H) depicts the VOR as the missed approach point.

Notice the two feeder routes leading from ITMOR and RED BLUFF VOR to RDD VOR (positions A and I). Feeder routes are shown as slightly thinner than the instrument approach course, and they are always accompanied by minimum flyable altitudes. Neither of these routes lists the letters NoPT. Therefore, as you approach RDD VOR along any of these routes, you must fly the procedure turn as a means of reversing course before flying the instrument approach procedure.

From the RED BLUFF VOR (position I), track to the RDD VOR on the 336-degree course (set OBS to 336), and then make a left turn after crossing the VOR and track outbound on the 175-degree course from the VOR. Then, you repeat the same course reversal process listed above.

Did you get all that? I just took you through a quick course on VOR instrument approaches, something that usually takes instrument pilots months to understand. If you want to put an ice pack on your cranium, I'll understand. But believe it or not, there's only one more approach you need to look at in order to have a general idea about how most instrument approaches work. It's called the Instrument Landing System (ILS).

To get started with your instrument flying, click the **Fly This Lesson Now** link to practice what you just learned about VOR approaches.

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