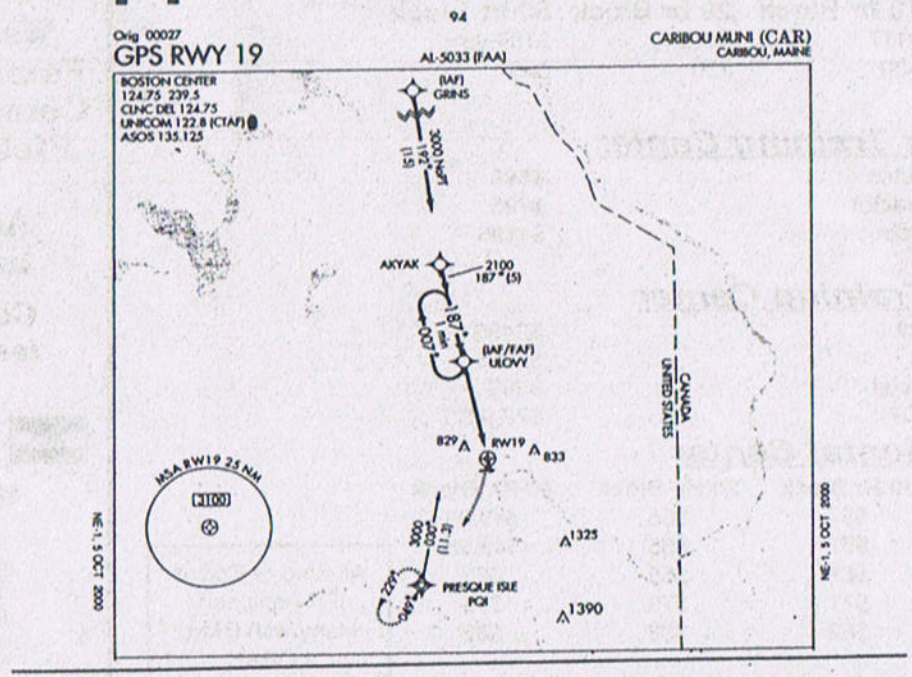
Instrument Approach with a Procedure Turn

By Harry Kraemer

A procedure turn can be found on almost any type of approach. The procedure turn is defined in the Pilot/Controller Glossary as: "The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course." The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are left to the discretion of the pilot.

Some procedure turns are specified by procedural track and must be flown exactly as depicted. The distance is normally 10 nm (or as published on the approach plate); however, it can be as little as five miles or increased to as much as 15 miles. This is known as the procedure turn limit. Timing can be used to keep the aircraft within the 10-nm circle. The procedure turn is a required maneuver (if published), except when you are on a segment that has the symbol NoPT, when being radar vectored, when a holding pattern is published, when conducting a timed approach, or when a procedure turn is not authorized.

As stated earlier, the direction of turn is specified in the procedure. The point at which the turn may be commenced and the type of turn are left to the discretion of the pilot. The 45-degree/180-degree procedure turn is the most common. This consists of a track outbound from the fix (normally this is timed). You will want to go out far enough so that you have plenty of time inbound to get established on course and descend to your MDA. You also will have your inbound or outbound course set on your OBS, and you will be making corrections for wind to stay on course.



Times will vary depending on aircraft speed or wind direction (the time is usually about two minutes). If you have a strong head wind outbound, you may want to go out a little longer than if you had no wind or a tail wind. With a tail wind outbound, you will shorten the time. A 45-degree turn away from the outbound track (after the proper timing is up) is started (this leg will be timed). Your time outbound on the procedure turn also will vary depending on wind direction and velocity. A barb will indicate the direction or on which side of the outbound course this 45-degree turn will be made. You may need to establish wind correction on this leg.

A 180-degree turn is made to intercept the inbound course after the completion of the 45-degree leg. This turn normally is made away from the fix (which gives you more time to get established on the inbound leg). Intercepting the final approach course inbound is where you would report "procedure turn inbound." This point on the procedure is referred to as the Final Approach Point (FAP).

The FAP can serve as the FAF (on a nonprecision approach) and identifies the beginning of the final approach segment. As you intercept the final approach course inbound, you should be sure that your landing checklist is complete as you begin your descent. Don't hesitate getting the descent established, if fly-

Continued On Page 90

Procedure Turn

Continued From Page 88

ing a non-precision approach.

On some approaches, you don't have much distance to get down to your MDA. You should know what power setting to use to give you the rate of descent you desire. The rate of descent will vary depending on the approach, aircraft type, and weather conditions; this is usually between 500 fpm and 1,500 fpm (I usually use 1,000 fpm in the Pilatus PC-12). I recommend that you have your first setting of flaps (approach flap setting) in before starting the procedure (for most airplanes, this is between 10 and 15 degrees).

The 80-degree/260-degree procedure turn also may be used. This procedure consists of an outbound track away from the fix, followed by a turn of 80 degrees away from the outbound course in the direction shown on the approach plate. This is followed almost immediately by a 260-degree turn in the opposite direction to intercept the inbound course.

Another type of procedure turn is known as the "Teardrop Turn." This consists of a specified outbound course for a specified distance or time, followed by a turn to intercept the inbound course. This type of procedure permits an aircraft to reverse direction and lose a considerable amount of altitude in a reasonably limited amount of airspace.

The VOR or GPS-A approach (figure 1), Frederick, Md., has a procedure turn with the fix on the field. I recommend that within 10 to 15 nm of the fix (IAF) at which you will start the approach, you have your aircraft slowed to approach flap speed. At this time, you may want to add approach flaps (I usually have approach flaps in at this time), depending on altitude, speed and type aircraft.

There may be times when ATC will keep you high (for traffic or other reasons) and clear you to the IAF at a much higher altitude than you would like to be. In this case, I would set my approach flaps before descending (to keep speed under control and also assist in losing altitude). After crossing the IAF, proceed outbound on the 040-degree radial of the Frederick VOR. I recommend using a 30-degree (30-degree maximum except in very adverse wind conditions) intercept angle to intercept the 040-degree radial outbound.

You should know what heading you are going to turn to before reaching the IAF (this will depend on what direction you are approaching the fix from). You may use timing on this outbound leg (one to two minutes should be enough for most small aircraft) to be sure that you remain within the 10-nm

Continued On Page 93

Procedure Turn

Continued From Page 90

ring. At 90 knots ground speed, two minutes will take you out three nm. You may need to adjust your timing according to the wind direction and speed.

If your aircraft is equipped with RNAV, GPS, or Loran, this also may be used to stay within the 10-nm ring. You want to go outbound far enough to give yourself the time and distance so that you don't feel rushed descending to the MDA inbound. After getting established on the 040 radial, you may descend to the altitude shown in the profile view (2,300 feet). Using DME or timing, start the procedure turn at a point that will allow it to be completed before exceeding the 10-nm limit on the plain view.

Timing on the procedure turn outbound should be about one minute (this may need to be adjusted for wind direction and speed). While outbound on the procedure turn, you should dial in the 220 radial and use this as a reference outbound for position awareness (the needle should show that the 220 radial is west of your position). Once you have intercepted the 220-degree radial inbound and after verifying that your landing checklist is complete, start your descent down to the MDA and level off until you reach the missed approach point (MAP), the VOR.

I recommend establishing a reference power setting, aircraft configuration (gear down), and rate of descent to use here (making adjustments from these). Example: 17 inches of manifold pressure, 2,400 rpm on the prop, gear down, flaps 15 degrees, and 1,000 fpm rate of descent. It is important to establish a good rate of descent (fpm depending on aircraft and weather), get down to your MDA, and start looking for the runway.

The rate of descent that you use may vary. If you are in IMC conditions and it is bumpy, you may want to use a rate somewhat less than if it were smooth. It is important to use a good rate (something you are comfortable with) that will get you down with time to get set up for the proper runway. The idea is to get down soon enough to give yourself plenty of time to see the runway and plan for your pattern entry (this may be a down-wind, base entry, or a straight in). However, I do not advise getting low too soon. Remember, the MDA is just that, a minimum! You may level off higher (pattern altitude) if you are in VFR conditions.

The NDB or GPS-B (figure 2), Winchester, Va., is an approach with the fix (primary NavAid) located off the field. You would proceed to Cogan (the IAF) and outbound on the 144-degree bearing from the station. After getting established on the 144-degree bearing, you may descend down to 3,600 feet as shown in the profile view. The procedure turn must be completed before 10-nm from Cogan (using timing, GPS, RNAV, or LORAN).

As you get established on the 324-degree bearing to the station, verify that your landing checklist is complete and start your descent. You have to level off at 2,900-feet until passing Cogan, and then you may continue down to the MDA. Notice that your MAP is timing from Cogan. With practice, you will be able to adjust your rate of descent so that you will cross the NDB (FAF) at 2,900-feet and continue your stabilized descent down to the MDA.

With the future going towards GPS, the procedure turn may soon be a thing of the past. Until then, we will follow the 45-degree turns on our plates.

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