

Procedure turn simplicity

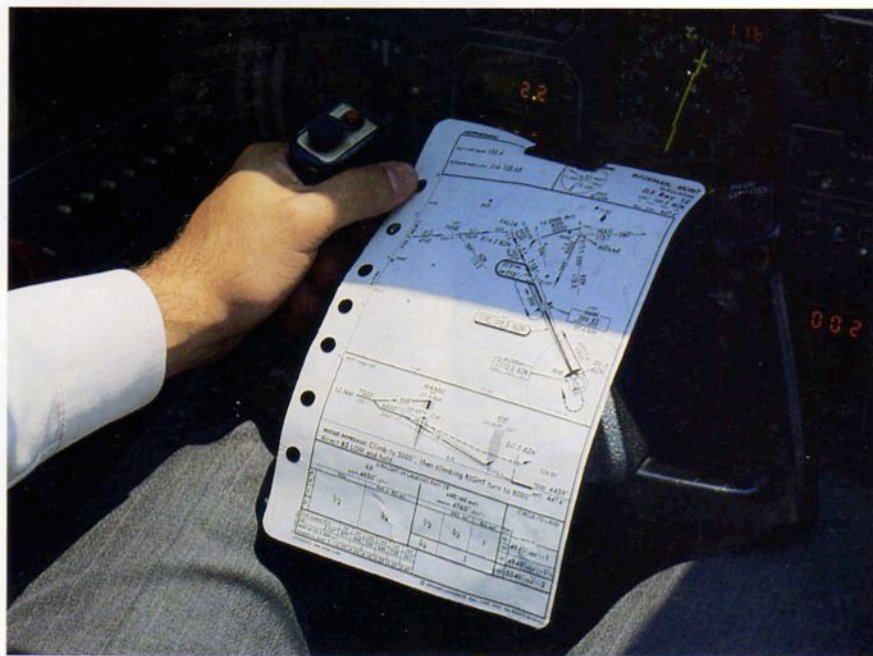
Objective of the PT: to arrive at your final approach fix at the correct published altitude in proper configuration.

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ATP. Airbus A310, Boeing 727,
Learjet series

FOR some professional pilots, the good ol' procedure turn is an excellent example of the ancient (and lost?) art of instrument flying. Many of us have come to survive, if not thrive, in ATC's environment of positive control. Unless you frequent certain uncontrolled airports (and of course, there's the arena of flight training), you may be hard-pressed to remember your last real-world procedure turn. It's no wonder some of us make such work of it.

As noted in the Airman's Information Manual (AIM), a procedure turn is specified when it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. It is a required maneuver except when the symbol NoPT is shown, when radar vectoring is provided, when a holding pattern is published in lieu of the procedure turn, when conducting a timed approach or when the turn is not authorized.

On US Government National Ocean Survey (NOS) charts, a barbed arrow



Pilot Dave Meyer reviews a Jeppesen Bozeman MT (BZN) approach chart before descending.

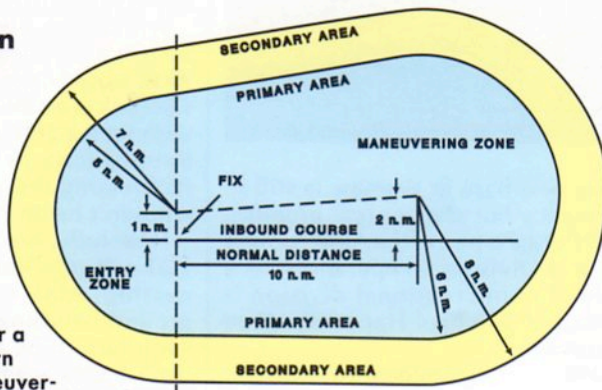
indicates the direction or side of the outbound course on which the procedure turn is made. Headings are provided for the course reversal using the 45-degree-type procedure turn.

You may be more familiar with Jeppesen's schematic portrayal of the procedure turn. It, too, depicts the 45/180-degree turnaround but it's done in such a way that it may be misleading to some. If you are unfamiliar with the TERPs design criteria for the procedure turn, you may be among those who use Jeppesen's depiction as a procedural flight tract. Please know there are easier and equally safe options available.

According to the AIM, the point at which the turn may be commenced and the type and rate of return is left to the discretion of the pilot. In other words, you have options. Racetrack patterns, 45-degree procedure turns, teardrop procedure turns and 80/260 degree course reversals are examples of perfectly acceptable ways of making the turn.

The design profile for a typical procedure turn is your maneuvering airspace. Thus, procedure turn altitudes and final approach fix altitudes are simply clearance altitudes based on obstructions within this designed area. The turn-

Procedure turn maneuvering airspace



The design profile for a typical procedure turn shows the total maneuvering airspace. In the primary area the normal distance is 10 nm and the minimum obstacle clearance is 1000 ft. In the secondary area, 500 ft of clearance is provided at the inner edge but this tapers uniformly to zero at the outer edge.

SALT LAKE Center 132.4

BOZEMAN Radio (LAA) CTAF 123.65

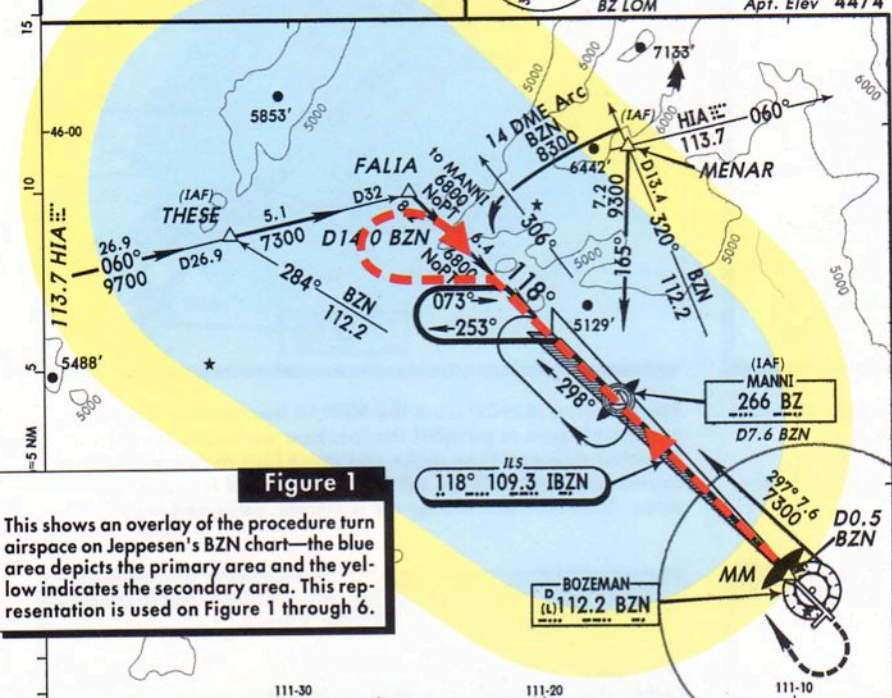
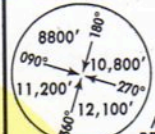
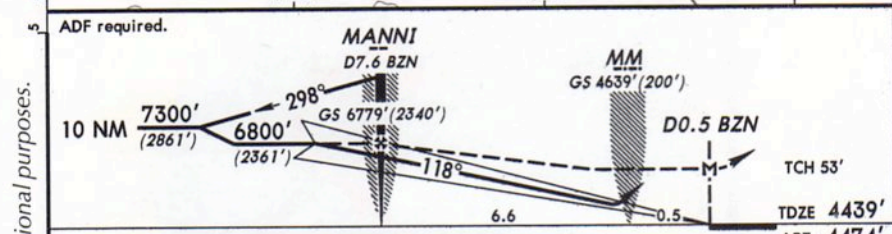


Figure 1

This shows an overlay of the procedure turn airspace on Jeppesen's BZN chart—the blue area depicts the primary area and the yellow indicates the secondary area. This representation is used on Figure 1 through 6.



MISSED APPROACH: Climb to 5000', then climbing RIGHT turn to 8000' direct BZ LOM and hold.

STRAIGHT-IN LANDING RWY 12					CIRCLE-TO-LAND	
ILS			LOC (GS out)			
DA(H) 4650' (211')			MDA(H) 4760' (321')			
FULL			RAIL out			Max Kts
RAIL or ALS out			ALS out			MDA(H)
A						90
B						120
C	1/2	3/4	1/2	3/4	1	140
D			3/4		1	165
						5040'

Gnd speed-Kts	70	90	100	120	140	160
GS 3.00°	377	484	538	646	753	861
MAP at D0.5 BZN pr						
MANNI to MAP 7.1	6:05	4:44	4:16	3:33	3:03	2:40

CHANGES: See other side. © JEPPesen SANDERSON, INC., 1985, 1993. ALL RIGHTS RESERVED.

You're approaching MANNI from the southeast. You may cross MANNI, proceed outbound on the localizer, fly the 45° displacement angle and turn right to intercept the localizer inbound as illustrated in Figure 1 (above). A typical scenario would be to fly outbound on the localizer for a minute or so and then 45 seconds on the 253° heading before making the 180° turnaround to intercept the localizer inbound. But you don't have to do all that work.

You may cross MANNI, extend as you fly outbound on the localizer and then make one turn (on the depicted side) to intercept the localizer inbound (Figure 2 right). This is best described as a modified 80°/260° turn. You may find it easier to compensate for wind drift and better judge your distance from MANNI using this method.

around portion of the procedure turn must be executed within the distance specified in the profile view of the published instrument approach procedure (IAP).

The normal procedure turn distance is 10 nm. This may be reduced to a minimum of 5 nm for Category A and rotary-wing aircraft or increased to as much as 15 nm to accommodate certain very high-performance aircraft. Timing may be used as an aid in remaining within that specified distance but it's not a necessary element of the procedure turn. RNAV, DME and/or radar identification are often more precise aids in helping you execute the turn within legal boundaries.

The AIM provides some additional guidance, in that a maximum speed of 250 kias should be observed, but the overall objective of the procedure turn remains the same: arrive at the FAF on the procedure turn course at the FAF altitude in the proper aircraft configuration to successfully complete the final approach portion of the instrument approach procedure.

The design of a procedure turn provides a minimum of 1000 ft of obstacle clearance in the primary area. However, in the 2-nm-wide secondary area, the 500 ft of clearance provided at the inner edge tapers uniformly to zero at the outer edge. Commonly, the inbound and outbound courses of the procedure turn are simply reciprocals.

Using the "to scale" overlap of the TERPs procedure turn airspace on Jeppesen's plan view of the Bozeman ILS Rwy 12 IAP, visualize your options for executing the procedure turn based on the various entry positions. Remember, you are not locked into a timing factor. You are not required to fly the 45-degree displacement loop as the Jeppesen depiction of the procedure turn may have led you to believe.

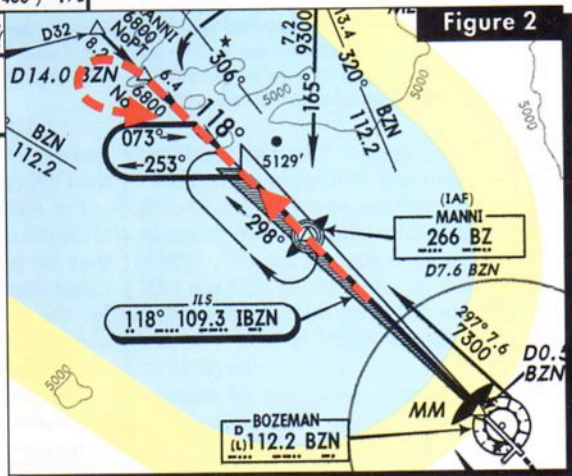
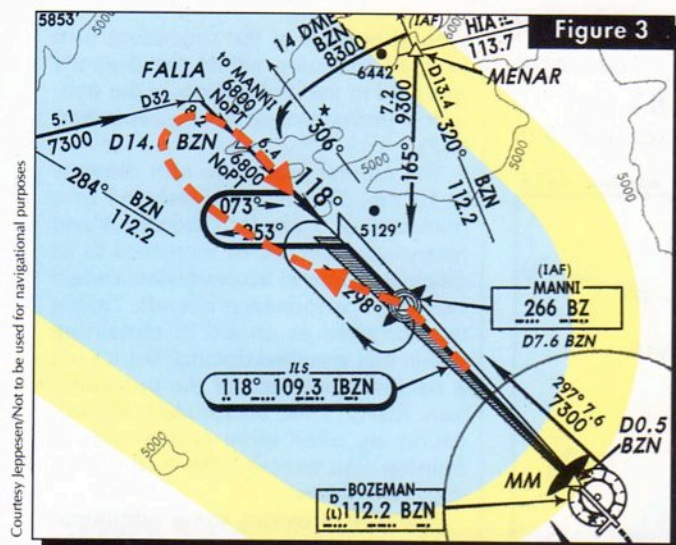
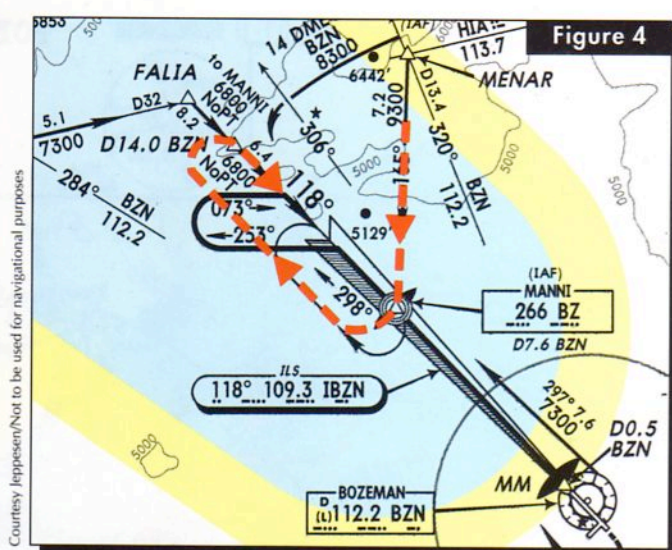


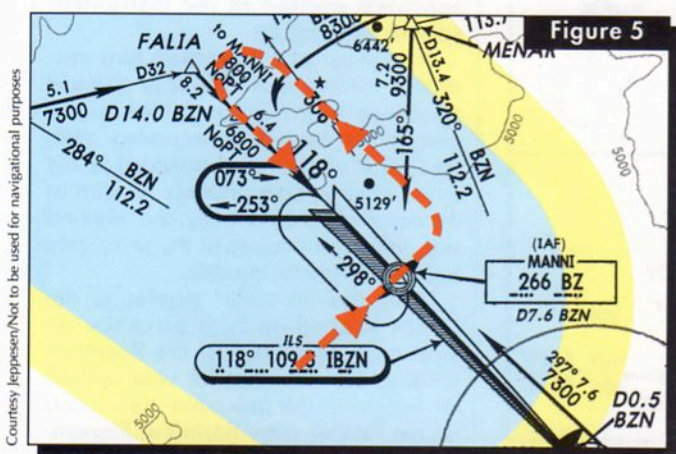
Figure 2



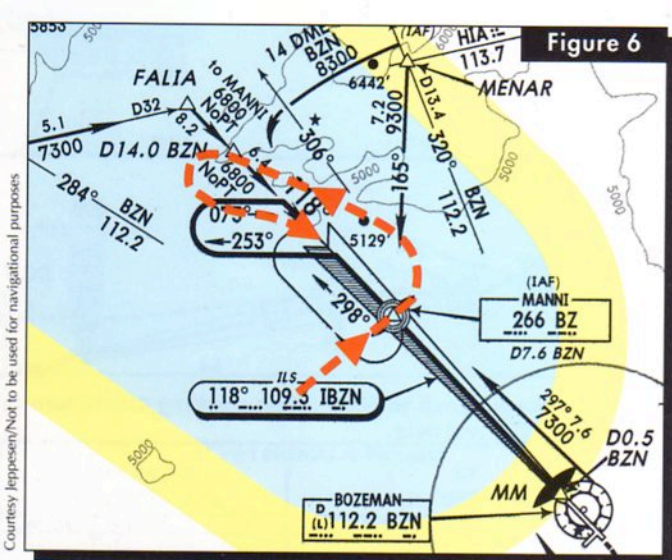
A third option is the teardrop entry (Figure 3). Simply turn to displace yourself from the procedure turn course in a teardrop pattern (approximately 30°) on the depicted or maneuvering side. The NDB bearing info will aid in establishing this offset relative to the localizer.



Approaching MANNI from the MENAR intersection (Figure 4), you simply turn to parallel the localizer outbound on the depicted side and then make one more turn to intercept the course inbound. Like the 80°/260° turns and teardrop patterns, this racetrack maneuver is simple, easy and legal.



Approaching MANNI from the southwest (Figure 5), your initial turn outbound will put you on the nonmaneuvering side of the instrument approach procedure. Referring to the procedure turn design overlay, you can easily see you don't have as much maneuvering airspace on the other side. The trick is to slow down prior to reaching MANNI so your initial turn outbound will not put you beyond the 4-nm primary boundary limit. The parallel procedure works quite well and it's perfectly legal as long as you're not flirting with unprotected airspace because of a larger turning radius.



For instrument maneuvering airspeeds in excess of 180 kts true, it's more prudent to turn toward the procedure turn course (to the west) using approximately a 20° intercept angle and then complete the procedure turn exercising the 80°/260° option (Figure 6). Remember, all other required maneuvering must be completed on the depicted side.

Words of wisdom about descending to the published minimum altitudes in the procedure turn: you may descend to the published procedure turn altitude (7300 ft) after departing the IAF. When the procedure turn altitude and the FAF altitude are different, do not descend to the FAF altitude (6800 ft) until you are established on the procedure turn course inbound. As a rule of thumb, "established" for the NDB or VOR is plus or minus five degrees (one dot on the CDI scale). For the localizer, it is

"on scale"—not biased to either side of the CDI case.

For those of you equipped with FMS technology, an IAP's procedure turn may be programmed into your sophisticated data base. If you select LNAV and let the computer fly the turn, you'll likely find yourself doing the 45-degree displacement loop. Depending on your entry position, you're liable to be involved in a good bit of inefficient maneuvering. Use "Heading Select" and avoid the flying circus flight path.

It's the much better plan.

The first time you execute a procedure turn using one of the easy-does-it options, you're bound to turn the head of your fellow crew member as well. It's a good idea to include the type of procedure turn you plan to make as an integral part of your briefing of the IAP. That way, the unenlightened aren't caught off guard. Too, your example will likely influence your fellow pilot to pursue a better awareness of procedure turn simplicity.