

Tricky Mountain IAPs

Traps await the unwary pilot who hasn't first flown procedures like these two in VMC.

By Wally Roberts

A READER RECENTLY WROTE TO us about the dilemmas facing an instrument pilot at a mountain airport such as Friedman Memorial Airport (KSUN), which serves the Sun Valley, ID resort area. This article will take a close look at the safety and legal implications of the two seemingly very different IAPs for this airport.

Figure 1 (on right) is the NDB/DME-A approach, which has existed for several years, and which has been the subject of some long-term notam activity that took the approach out of service. The approach is in service today because problems with the performance of the NDB facility were resolved. More recently, a stand-alone non-precision GPS IAP was added (Figure 2 page 11), with straight-in minimums for Runway 31. This article will make numerous references to these two approach charts.

Lay of the land

Friedman Airport is located in an unusual topographical setting for a mountain airport with IFR procedures. Most popular Western mountain resort airports, such as Jackson Hole, Eagle, Telluride, and Aspen, are located deep within a mountain range with mountains in all directions. Friedman is different, however, in that the terrain to the southeast through southwest is a flat plain until within about five miles south of the airport. The plan view in Figure 2 shows this topography quite well.

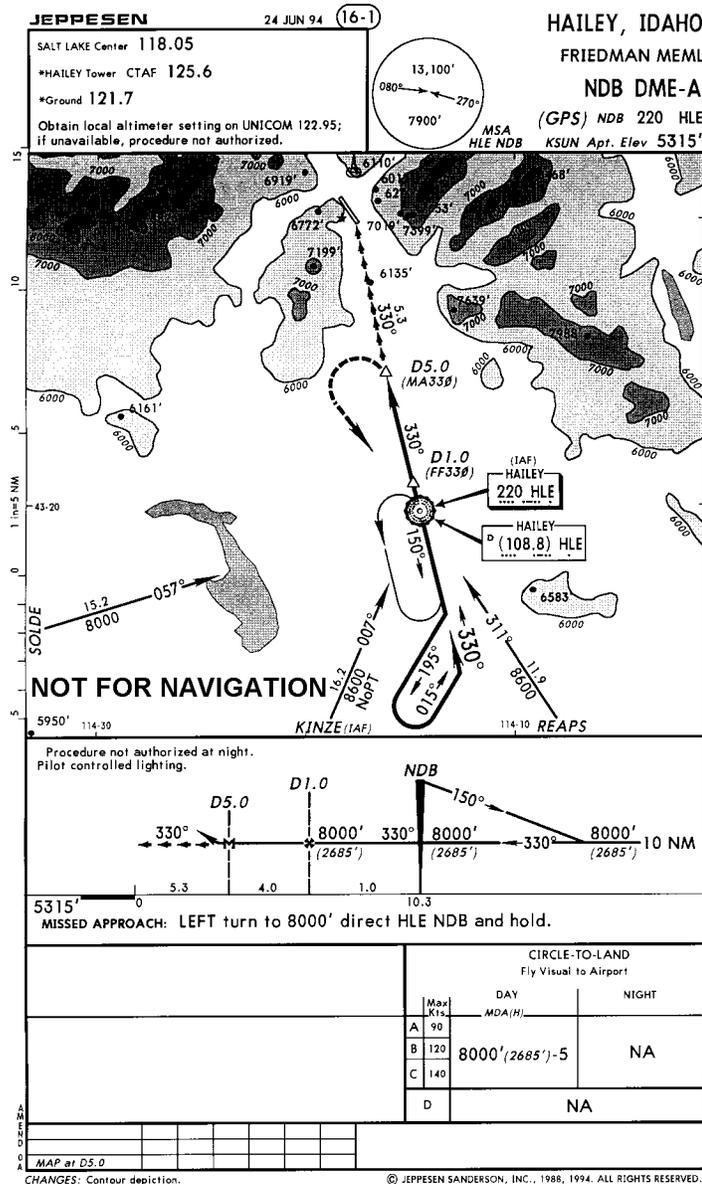
Once within 5 miles of the airport from the southerly approach paths, the terrain starts to close in on both sides of final, until the airport itself which is surrounded on three sides by massive terrain features. What a place to build an airport! Had this airport been located 10 miles to the south, it could have had a "200 and a half" ILS. (Durango, CO [KDRO] is a good example of how to correctly locate an airport in a simi-

lar mountain area.)

Different final approach courses

In Figure 1, the NDB MAP is 5.3 nm from the threshold of Runway 31. Note in Figure 2 that the GPS MAP is

at the threshold of Runway 31. Although these procedures are supposed to be free of humor, the name of the MAP waypoint for the GPS IAP is worthy of note; not to denigrate the significance of the FAWP's name!



REPRODUCED WITH PERMISSION © JEPPESEN SANDERSON, INC., 1996. ALL RIGHTS RESERVED.

Figure 1. The MAP for this procedure is 5.3 nm from the runway threshold. Standard missed approach protection is lost not only when descending well below this high MDA, but as the aircraft proceeds well beyond the MAP in the "fly visual to airport" portion of the final approach segment.

Different visibility minimums

The required minimum visibility in the NDB IAP to descend below MDA or continue toward the airport beyond the MAP is five miles. In the GPS IAP, the required visibility is only 1-1/4 for Category A, 1-1/2 for B, and 3 miles for C. There are some real traps here, which I will discuss later. For non-commercial operations, although reported weather isn't a requirement for the IAPs, the actual weather conditions must be at least the specified values.

This is where the not-for-hire honor system is really tearing at the safety margins when the reported weather is below minimums. In my view, a pilot has no business flying these IAPs at this airport without having good "local conditions" knowledge. Unlike the regulations for commercial operators, however, the "airport qualifications" requirement for not-for-hire is strictly up to individual pilot prudence. I recommend using this airport under IFR *only* if a day/VFR arrival and departure have first been made when the area is free of clouds topping the mountains, and the pilot has a good recollection of the local airport layout and area topography.

Different MAPs

The almost-certain reason a MAP is located prior to a runway/airport is because terrain in the missed approach segment would result in an unacceptable increase in minimums. By moving the MAP away from the airport, the procedures designer can often design a missed approach segment far less encumbered by terrain. What this means to the pilot is standard missed approach protection is lost not only when descending well below a high MDA, but as the aircraft proceeds well beyond the MAP in the "fly visual to airport" portion of the final approach segment.

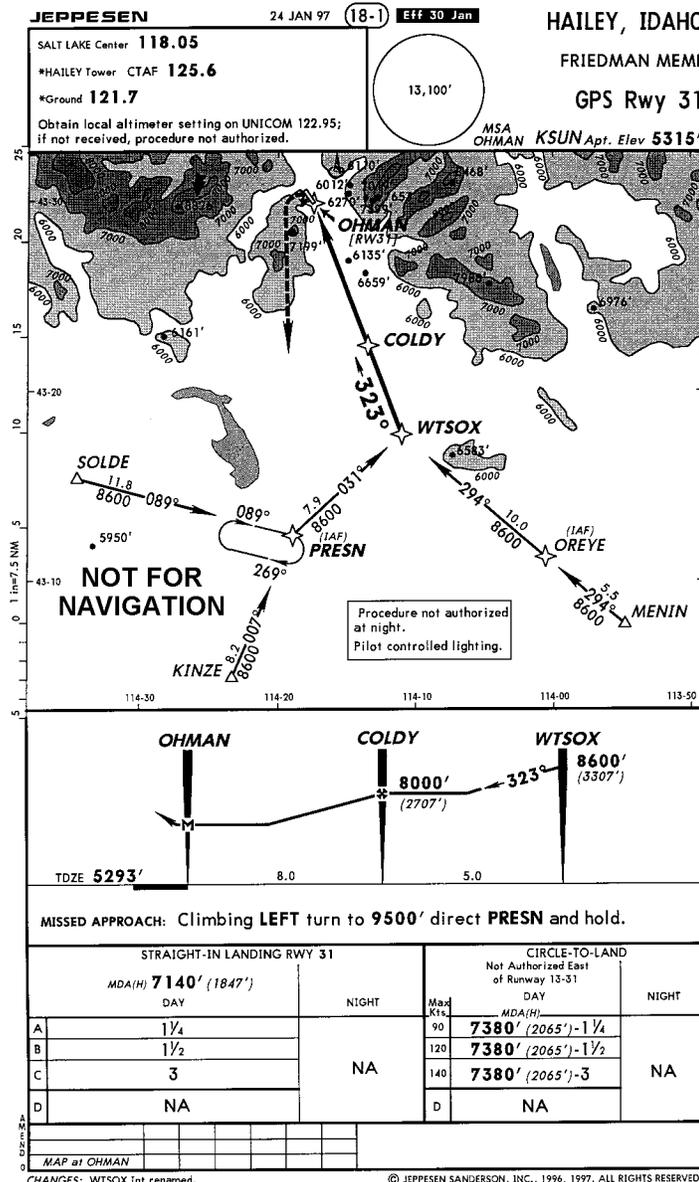
TERPs requires that standard final approach segment required obstacle clearance (ROC) be extended to the runway/airport where the MAP is located prior to threshold (straight-in minimums) or first part of airport (circling-only minimums). So, why the early

MAP in the NDB IAP? At first glance, it doesn't make sense, since the GPS IAP has standard missed approach protection at a lower MDA and at a MAP at the threshold of Runway 31.

My educated guess is the procedures designer at the time simply didn't have confidence in the ability of the pilot/system interface to consistently remain

within protected airspace under IMC as the aircraft proceeded farther away from the NDB facility and, thus, further into the box canyon.

Because of the reorganization a couple of years ago of the FAA's procedures design function from area flight inspection offices to Oklahoma City, *(continued on next page)*



REPRODUCED WITH PERMISSION © JEPPESEN SANDERSON, INC., 1996. ALL RIGHTS RESERVED.
 Figure 2. This GPS IAP has a built-in trap with the straight-in HAT of 1,847 feet. If the visibility is 1-1/4 miles, the Category A aircraft is faced with a descent angle in excess of 16 degrees if you don't see the runway until the specified visibility value! Circling has the same trap, because circling will almost always be a fairly minor realignment maneuver in the box canyon to line up with Runway 31.

Tricky Mountain...

(continued from page 11)

some of the corporate knowledge is lost to obscurity. Also, because of the tremendous workload faced by the national procedures office, existing procedures are often not reviewed when a new GPS IAP is designed for an airport. The significance of all this to you as a pilot is design inconsistencies between a given airport's IAPs cannot always be explained in certain terms of criteria or operational requirements.

Visibility criteria

Where the MAP is located prior to the runway/airport, TERPs requires the required visibility minimum either be sufficient to see the runway/airport at the MAP, or that the visibility be at least two miles, and the IAP be annotated "Fly visual to airport." Had the designer elected to require seeing Freidman Airport from the NDB MAP, the required visibility would have been 6-1/4 miles (5.3 miles converted to statute miles and rounded to next higher 1/4 increment). Apparently, the designer at the time believed two miles visibility was inadequate for flying-visual-to-airport up a box canyon. (Also, this section of TERPs was written well prior to the implementation of the current FAR 91.175 visual cue rules that came into effect in 1981.)

Because the MAP is located at the threshold in the GPS IAP, the determinant of the visibility minimums is the geometric requirements of TERPs, Table 6. The language in TERPs associated with Table 6 states, "The minimum standard visibility required for the pilot to establish visual reference in time to descend safely from the MDA and maneuver to the runway or airport varies with the aircraft category, the HAT/HAA, and the accuracy of the navigation system." (Emphasis added.)

Safe visibility geometry

The problem with TERPs, Table 6 is it was designed with flat-land airports in mind. It doesn't consider MDAs higher than 951 feet (HAT or HAA).

Table 6 is nonetheless somewhat rational for Categories C and D by stair-stepping visibility to three miles before the geometric assessment of the table truncates. With Categories A and B, however, the truncation occurs at 1-1/4 and 1-1/2 miles visibilities, respectively. In the case of the NDB IAP, all these concerns are greatly mitigated with the five-mile visibility requirement.

With the GPS IAP, however, there is a real trap built in with an 1,847-foot HAT for straight-in. If the actual visibility is 1-1/4 miles, the Category A aircraft is faced with a descent angle in excess of 16 degrees if the runway becomes visible at the specified visibility value! Circling at this location has the same trap, because circling will almost always be a fairly minor realignment maneuver in the box canyon to line up with Runway 31. Regardless of whether you elect straight-in or circling minimums, you're still flying up the same box canyon. (Circling to Runway 13 is highly discouraged by local airport policy and is pure folly in any case in view of the terrain on each side of the airport.)

Low-and-slow, look out above

If the visibility is fairly good, we can begin descent below MDA in total concert with the spirit and letter of all the FAR 91.175 visual cues and descent angle imperatives. Let's say we're at 400 feet on a one-mile final and a sweeping snow shower wipes out all visual cues. With either IAP, we're in serious difficulty at this point. Whether the MAP is

some four miles behind us or still ahead of us is a moot point. We're now well into the box canyon. The GPS IAP missed approach procedure takes us directly over top of 7,199-foot terrain along side of us. Our msl altitude, about 5,700 feet, is mightily below that terrain mass that tops out at 7,199 feet. This is no place to be, whether in a Cessna 182 or a high-powered Learjet!

The pilot who accepts the GPS IAP when the visibility is nudging towards the lower legal limits, is taking on either unrealistic approach path geometry, or (if actual visibility permits a rational descent angle) is facing a substantial risk of a collision with terrain if a missed approach becomes necessary well below MDA.

If there are no local weather conditions, such as snow showers, that pose a risk to a sudden loss of required visual reference, the safety risks are far less. Chances are with visibility reports of less than several miles, there's a good risk of a local condition such as snow, rain, fog, or smoke, that can pose a real safety risk hazard close-in to the airport.

Realistic minimums

In many countries, the aviation authorities would mandate a reported ceiling requirement on an airport like this. Prudent "personal minimums" would dictate a reported ceiling of not less than 2,100 feet for the GPS IAP, and 2,700 feet for the NDB procedure. With those ceiling requirements observed, you can afford to play around *somewhat* with

TAKE-OFF & IFR DEPARTURE PROCEDURE		FOR FILING AS ALTERNATE	
Rwy 13		Rwy 31	
1 & 2 Eng	2700-3	NA	A B C D
3 & 4 Eng	2700-3	NA	NA
IFR DEPARTURE PROCEDURE: Climbing right turn heading 150° to intercept the HLE NDB 160° bearing to HLE NDB. Aircraft departing HLE NDB bearings 030° clockwise 330° from HLE NDB climb on course.		All others continue climbing in HLE NDB holding pattern (hold southeast, left turns, 330° inbound) to cross HLE NDB at or above 8500'.	

CHANGES: See other side.

© JEPPESEN SANDERSON, INC., 1988, 1994. ALL RIGHTS RESERVED.

REPRODUCED WITH PERMISSION © JEPPESEN SANDERSON, INC., 1996. ALL RIGHTS RESERVED.

Figure 3. The IFR takeoff minimums and IFR departure procedure for KSUN. Note Runway 31 IFR departures aren't authorized under any circumstances. Also, Runway 13 has a mandatory (commercial operators) departure minimum of a 2,700-foot ceiling and 3 miles visibility. No climb-gradient alternative is provided.

reported visibilities at the lower authorized ranges, at least in the daytime.

I'm sure that some of the regulars who fly into this airport take advantage of the contact approach rules to seek relief from FAR 91.175 visual cues and descent requirements. However, I wouldn't even think "contact approach" at this airport unless I knew it like the back of my hand, and was operating at the airport on a frequent basis.

Night approaches not authorized

There's no "TERPs" reason for these IAPs to be restricted from nighttime operations. The restriction is an old carry over of local policy to prohibit air carrier operations into this box canyon during darkness. Nonetheless, if the airport management wanted to permit non-commercial nighttime IAPs, the FAA would likely grant such a request. If that comes to pass, I would say only pilots with intimate local knowledge should attempt use of this airport at night, and then probably only when the part-time control tower is in operation.

Circling considerations

It's interesting to note the GPS IAP prohibits circling to the east, whereas the NDB procedure does not. A better

treatment would be to treat both procedures similarly: either authorize circling east of the runway with a sectorized higher MDA in the GPS IAP, or prohibit circling to the east in the NDB IAP. These types of design consideration require not only ROC evaluations, they require full inquiry into local operating requirements.

It's worth noting a circle to the west to land Runway 13 requires flying over terrain almost 1,600 feet higher than the airport. When it's really cold, altimeter errors could eat up the circling MDA ROC. Even if the tower would approve circling to Runway 13, it should only be done by those who have trained to proficiency in circling at this airport during good weather conditions.

NDB IAP terminal routes

The designer of the NDB IAP erred when designating the KINZE-HLE terminal route as "NoPT." As a result of our discussions with the FAA in preparation for this article, an FDC "T" notam has been issued which rescinds "NoPT" from that terminal route:

!FDC 7/1355 SUN FI/T FRIEDMAN MEMORIAL, HAILEY, ID.
NDB/DME OR GPS-A, ORIG...
REMOVE "NO PT" FROM

KINZE (IAF) R-007/16.2

NoPT routes requiring a course change must be followed by an intermediate segment of at least five miles in length. The course-reversal initial approach segment indeed does contain within its protected airspace an intermediate segment of adequate length. But, that intermediate-segment-within-the-procedure-turn is valid only for aircraft that actually fly the procedure turn.

Note the NDB procedure turn and MDA altitudes are the same. This speaks legions about the topography of the area.

Takeoff minimums provide clues

Figure 3 (page 12) depicts the IFR takeoff minimums and IFR departure procedure for the airport. Runway 31 IFR departures aren't authorized under any circumstances. Also, Runway 13 has a mandatory (commercial operators) departure minimum of a 2,700-foot ceiling and three miles visibility. No climb-gradient alternative is provided. There's a message in what the departure restrictions do and do not permit.

High MDAs and early MAPs

KSUN is a great case study. You'll particularly benefit from its lessons if
(continued on next page)

Subscribe to *IFR Refresher* today!

Yes, please enter my order for:

- 1 year of *IFR Refresher* for \$60 (U.S. and International).
- 2 years of *IFRR* for \$110 (U.S. and International).
- The back issues I've listed below, for just \$7.50 each, plus \$2.00 shipping and handling per total order. (For a listing of feature articles in each issue, see other side; cash or check only for back issue orders.)

\$ _____ Total for items selected above.
\$ _____ Shipping & handling (not applicable to subscriptions)
\$ _____ Total this order

Name _____

Address _____

City _____

State _____ Zip _____

Please bill my: MC/Visa _____ American Express _____

Card # _____ Exp. Date _____

Signature _____

Daytime Phone # (required for MC/V) _____

Mail to IFR Refresher, 75 Holly Hill Lane, Greenwich, CT 06836-2626

IFR Refresher Guarantee

If you are not completely satisfied with any item you order from us, you may cancel or return the item for a cheerful refund.

Tricky Mountain...

(continued from page 13)

you apply the concerns of this airport to any IAP that has either a high MDA or a MAP well prior to the airport. The high MDA situation is far more common than the early MAP situation. With

The high MDA situation is far more common than the early MAP situation.

high MDAs, think about the geometry of the visual final approach below MDA when the weather conditions are at, or near, minimums. Also, keep in mind the implications of a reported ceiling lower than the HAT/HAA of a high MDA.

Wally Roberts is a retired airline captain, former chairman of the ALPA TERPs Committee, and an active CFII in San Clemente, CA. Wally's web site: <http://www.terps.com>