

AERONAUTICAL CHARTING FORUM
Instrument Procedures Group
October 27, 2009
HISTORY RECORD

FAA Control # 09-02-288

Subject: LNAV/VNAV Minimums vs. Circle to Land Minimums

Background/Discussion: Until a relatively recent change in TERPs, circle-to-land minimums (CMDAs) could not be lower than straight-in minimums (MDAs) on any given SIAP. However, circle-to-land minimums could be different for an airport on different SIAPs, based on the principle that straight-in minimums could not be lower than circle-to-land minimums. Pilots understand this long-standing principle.

However, lower circle-to-land minimums are currently published on some RNAV IAPs that combine LPV, LNAV/VNAV, and LNAV procedures provided the circle-to-land minimums are not lower than the LNAV NPA minimums. (See the attached KMDT RNAV 13, where the CMDA is 392 feet lower than the LNAV/VNAV DA). Pilots equipped for LNAV/VNAV, but not for LPV, are rightfully confused about how to fly to circle-to-land minimums on a SIAP like the KMDT RNAV 13. This is an undesirable and unnecessary procedural complication.

Recommendations: Whenever the LNAV/VNAV DA is higher than the LNAV MDA, publish the LNAV/VNAV procedure as a separate SIAP, with circling minimums not less than the straight-in minimums. (In the example SIAP's case, the CMDA on the LNAV/VNAV IAP would be 1,580 and on the LPV and LNAV IAPs 1,180.)

Comments: This recommendation affects FAA Orders 8260.3B, *TERPS*, and 8260.19D, *Flight Procedures and Airspace*, and various related FAA directives.

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Date: October 2, 2009

HARRISBURG, PENNSYLVANIA

AL-188 (FAA)

WAAS CH 86313 W13A	APP CRS 128°	Rwy Idg TDZE Apt Elev	8070 308 310
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RNAV (GPS) RWY 13

HARRISBURG INTL (MDT)

⚠ Circling NA south of Rwy 13-31. For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5F) or above 48°C (118°F). DME/DME RNP-0.3 NA. Inoperative table does not apply to LNAV/VNAV all Cats.



MISSED APPROACH: Climb to 3500 direct NERVY and via track 039° to CURNA and hold, continue climb-in-hold to 3500.

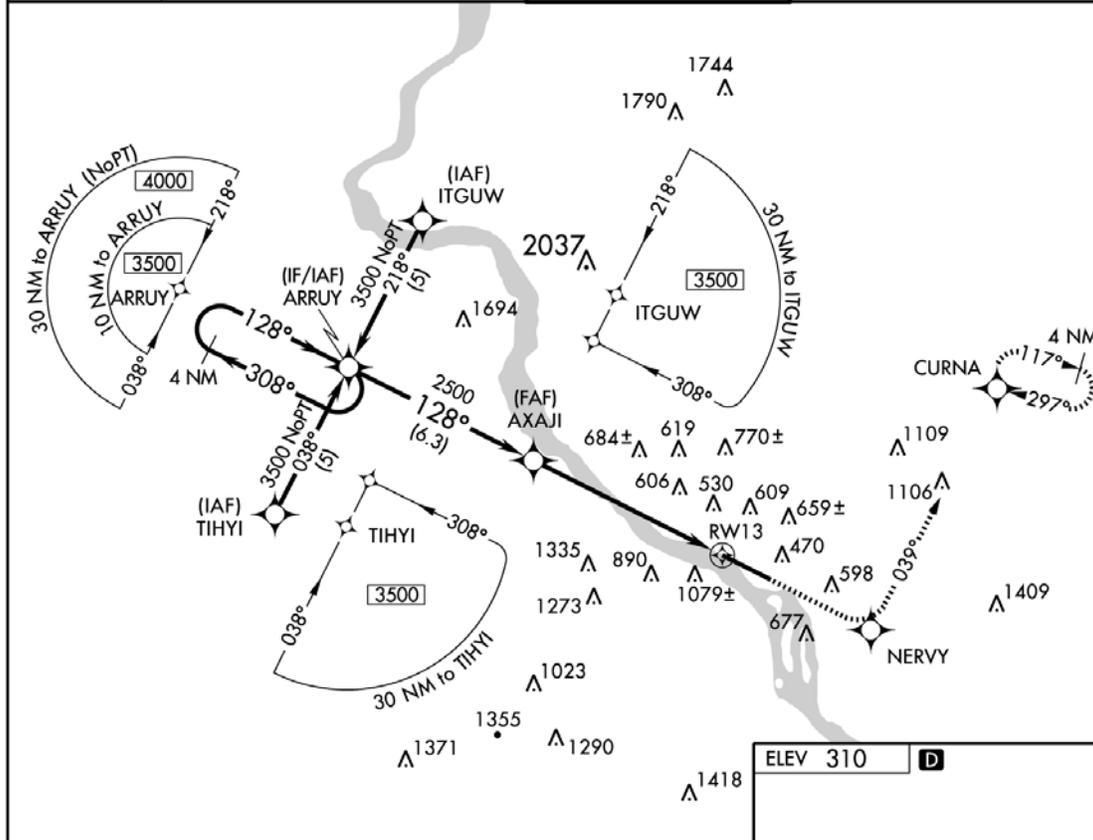
ATIS
118.8

HARRISBURG APP CON
124.1 273.525

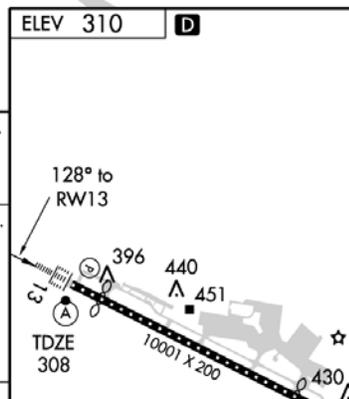
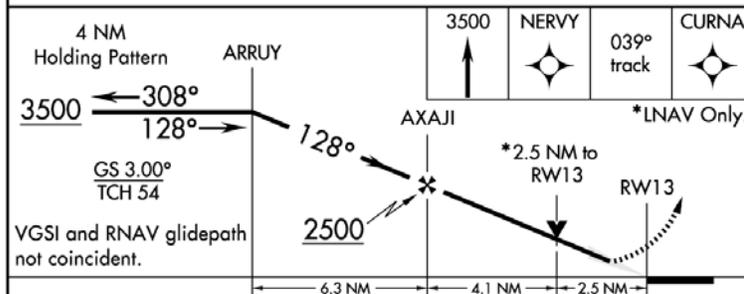
HARRISBURG INTL TOWER
124.8 269.35

GND CON
121.7 348.6

NE-4, 24 SEP 2009 to 22 OCT 2009



NE-4, 24 SEP 2009 to 22 OCT 2009



CATEGORY	A	B	C	D
LPV DA		558/24	250 (300-½)	
LNAV/VNAV DA		1572-5	1264 (1300-5)	
LNAV MDA	1180/24 872 (900-½)	1180/40 872 (900-¾)	1180-2 872 (900-2)	1180-2¼ 872 (900-2¼)
CIRCLING	1180-1 870 (900-1)	1180-1¼ 870 (900-1¼)	1180-2½ 870 (900-2½)	1180-2¾ 870 (900-2¾)

TDZ/CL Rwy 13
REIL Rwy 31
HIRL Rwy 13-31

HARRISBURG, PENNSYLVANIA
Amdt 1 09183

40°12'N - 76°46'W

RNAV (GPS) RWY 13

Initial Discussion - MEETING 09-02: New issue presented by Rich Boll, NBAA. Rich stated that traditionally TERPS does not allow circling minimums lower than straight-in minimums. However, many new RNAV approaches with LPV, LNAV/VNAV, and VNAV straight-in lines of minima published do have a circling minimum descent altitude (CMDA) lower than the LNAV/VNAV decision altitude (DA). This can cause confusion for pilots equipped for LNAV/VNAV but not LPV. Tom Schneider, AFS-420, stated that this has been an item of discussion between the AFS-420 staff and the National Aeronautical Navigation Services (NANS). One option is to publish separate charts. Brad Rush, NANS, stated that this is an old issue. When LNAV/VNAV minimums were first added to LNAV approaches, minimums were being raised. Many users, AOPA in particular, were concerned that minimums were being raised and LNAV minimums deleted. It was decided to publish both lines of minima to provide greater flexibility for all users. Tom Schneider, AFS-420, explained that TERPS criteria specified that "...the CMDA must not be above the FAF altitude or below the straight-in MDA of the highest nonprecision approach (NPA) line of minima published on the same chart..."(See 8260.3, Volume 1, paragraph 3.2.1b). LNAV/VNAV is considered APV; therefore, the LNAV MDA is the default when establishing the CMDA. Rich noted that lots of industry cannot fly LPV; however, they can fly the approach to the LNAV minima using baro-VNAV for vertical guidance. Therefore, he questions the need to publish LNAV/VNAV minima when these minima are significantly higher than the LNAV minima. NBAA supports retaining LNAV/VNAV minima when these minima are at or near the LNAV minima. Lev Prichart also suggested that perhaps we should get rid of LNAV/VNAV. Brad responded that establishing LNAV/VNAV procedures at Part 139 airports was a CAST initiative and he doubted whether NBAA and AOPA would support losing the option. The issue was raised that perhaps LNAV/VNAV minimums should be eliminated when the DA(H) is calculated to be higher than LNAV MDA. Ted Thompson, Jeppesen, stated that he is not in favor of publishing separate Z,Y,X approaches as not all boxes can accommodate multiple procedures of the same type to the same runway. Tom recommended that Rich take the issue back to NBAA and determine whether there is a set value difference between the LNAV MDA and the LNAV/VNAV DA where LNAV/VNAV should not be published. Rich agreed to do so.

ACTION: NBAA

MEETING 10-01: Rich Boll, NBAA, reported that he had not had a chance to work the issue to respond to the question whether there was a DA value above the LNAV MDA where LNAV/VNAV minimums should not be considered. Tom Schneider, AFS-420 briefed that on March 4th, AFS-400 held a Technical Review Board (TRB) where consensus was reached that circling from a procedure that only provided vertical guidance should not be authorized; e.g., ILS without LOC minimums, LNAV/VNAV without LNAV, etc. Larry Wiseman, AOV-330, asked whether this would require published military procedures that did allow circling from vertically guided procedures be annotated "Not for Civil Use". Tom responded not until the change was included in criteria. Rich asked whether it would be feasible to cease publishing LNAV/VNAV minimums on RNAV approaches if the computed LNAV/VNAV DA was 100' above the LNAV MDA. He added that pilots could still fly vertically guided LNAV approaches provided they did not go below the LNAV MDA. Mike Smet, NAVFIG, responded that if a value is to be considered, he recommended 60 feet since that is already the TERPS value required to add stepdown fix minimums. Brad Rush briefed that Order 8260.54A revised the dimensions of the LNAV/VNAV and LNAV final trapezoid to be more linear and more narrow. The Order also provides an option to adjust the LNAV/VNAV DA. These two improvements may help alleviate some of the problems. Brad also supports establishing a maximum difference between DA and MDA where LNAV/VNAV minimums would not be published. He supports the 60 foot value recommended by NAVFIG. Tom Schneider, AFS-420, stated that he would refer the issue to the AFS-420 RNAV criteria subject matter expert. **ACTION: AFS-420.**

Editor's Note: Post meeting, Rich Boll notified that NBAA supports the recommendation for a 60 ft maximum difference value where LNAV/VNAV minimums would not be published. Additionally, Tom Schneider advised that AFS-420 has begun coordinating a Notice to revise criteria and policy to prevent circling from a vertically guided procedure without an associated non-precision line of minima.

MEETING 10-02: Tom Schneider, AFS-420, briefed the following from T.J. Nichols, the AFS-420 TERPS conventional criteria specialist: "Guidance has been issued prohibiting the design of a circling procedure from a vertically guided procedure. Circling minima is authorized only where non-vertically guided minimums are published (a published VDA is not considered vertical guidance)." Tom added the following from Jack Corman, the AFS-420 TERPS RNAV criteria specialist: "The ACF proposed not publishing LNAV/VNAV minima if it were more than 60 feet above LNAV. This suggestion was initially rejected by AFS-420. Suppose there is a procedure with an LNAV HATh of 250, and an LNAV/VNAV HATh of 313. Vertically guided procedures insofar as possible is a goal of the CAST initiative, to wit: "Studies show that over 70 percent of FATAL accidents occur on non-vertically guided procedures. It is the recommendation that vertically guided procedures be offered where possible, and requirements for air carrier aircraft to fly vertically guided procedures when possible." In this case, it is not unreasonable to fly to a 313 HATh with vertical guidance vice a 250 HATh without it. However, after considering the RNAV (GPS) RWY 13 approach at Harrisburg Intl, PA, which has a 392' DA/MDA difference and a 4.5 mile visibility difference, it was agreed that some type tolerance should be developed whereby LNAV/VNAV minimums are not feasible. It was emphasized that Operations should play a role in the decision. Subsequent coordination with AFS-470 indicates they also support a value difference; however, do not necessarily agree that 60' is the correct value. Further coordination between AFS-420 and AFS-470 will ensue and a value decided upon prior to the next ACF. Vince Massimini, MITRE, provided information on WAAS performance capabilities. Mike McGinnis, AA/APA asked how it is possible that LNAV/VNAV minimums could be so much higher than LNAV only. Brad Rush, AJV-3B, provided a detailed explanation. **ACTION: AFS-420.**

MEETING 11-01: Tom Schneider, AFS-420, briefed that discussion is on-going between AFS-420 and 470 to determine whether not publishing LNAV/VNAV minimums when there is a large difference in DA and MDA is of value. There is also discussion of whether a maximum value should be established when there is a difference, and if so, what that value should be. To date, the issue is still under discussion to determine whether there is any benefit in eliminating LNAV/VNAV minimums in this situation. Lev Prichard, APA, asked if LNAV/VNAV minimums are taken away, will some operators lose the approach. JD Hood, Horizon Air stated that most pilots will use LNAV/VNAV to set up the approach and use vertical guidance to fly to the LNAV MDA. Brad Rush, AJV-3B, stated that under current policy, if the airport meets GQS standards, LNAV/VNAV minimums will be published. The issue will continue to be worked by AFS-42 and 470 through the US-IFPP. **ACTION: AFS-420 (US-IFPP) and AFS-470.**

Editor's Note: A telcon was held on May 3, 2011 with participation from the managers of AFS-470, AFS-420, AJW-913, and AJV-3B, as well as staff specialists from AFS-420. It was agreed that in order to continually support Commercial Aviation Safety Team (CAST) initiatives, LNAV/VNAV minimums will continue to be established wherever possible regardless of the difference in LNAV minimums. The associated circling MDA must be no lower than the lowest straight-in, non vertically guided (LNAV) **MDA**. A policy clarification memo has been prepared.

MEETING 11-02: Tom Schneider, AFS-420, briefed that per the secretary's post-meeting note in the minutes of the last meeting, AFS-400 issued a policy memorandum on August 10, 2011, clarifying that LNAV/VNAV minimums must always be published whenever the glidepath qualification surface (GQS) is clear. A copy of the memo was included in the meeting folder and is attached here. Tom recommended the issue be closed. Rich Boll, NBAA questioned that the memorandum appears to address the potential disconnect between Straight-In and Circling, but does not address the other related concern where LNAV/VNAV minimums (in accordance with applicable criteria) may be noticeably higher than LNAV-only. Bruce McGray, AFS-410, confirmed that it is confusing for pilots to see precision minimums that are excessively higher than the non-precision minimums. Rich referred to the Harrisburg, PA RNAV (GPS) RWY 13 approach that prompted the original issue paper. The LNAV/VNAV DA is 392 feet higher than the LNAV and circling MDAs. Additionally, the visibility requirement is 5 miles, much higher than the LNAV and circling visibility requirements. Rich suggested we may be giving pilots the message that it is safer to make a circling approach rather than a vertically guided straight-in approach. JD Hood, Horizon Air, interjected that it is not a safety discrepancy adding that there are other locations with the same situation. He emphasized that his airline does not want to lose LNAV/VNAV minimums and capability. Rich responded that using baro-VNAV under OpsSpec C-073 will provide the same vertical guidance benefit to the lower LNAV MDA. Rich added that an alternative to his recommendation would be to provide an explanation for this minima in the AIM and Instrument Procedures Handbook (IPH). Tom Schneider asked whether this would resolve the issue for NBAA. Bruce McGray, AFS-410, took the action item to develop and coordinate proposed wording for the AIM and IPH with the concerned parties (NBAA, APA, and Horizon Air). **ACTION: AFS-410.**

MEETING 12-01: Bruce McGray, AFS-410, reported there has been no activity on this issue since the last meeting. **ACTION: AFS-410.**

MEETING 12-02: Bruce McGray, AFS-410, reported there has been no action to develop AIM language to help resolve the issue. The current FAA policy is to continue to publish both LNAV and LNAV/VNAV lines of minima regardless of difference in MDA/DA. The circling MDA will be based on (no lower than) the lowest non-vertically guided MDA. Tom Schneider noted that at meeting 11-02, it was the consensus to continue to publish both LNAV and LNAV/VNAV minimums whenever possible regardless of the difference. It was also agreed that improved AIM and IPH guidance would be developed to help explain why circling can sometimes be lower than the vertically guided MDA/DA. John Collins, GA Pilot agreed that a better explanation would help pilots understand a situation that is not common. Bruce accepted the IOU to work the AIM language in concert with NBAA, APA, John Collins, and Horizon Air. Gary McMullin, SWA, added that pilots flying an LNAV approach will still use vertical guidance (VNAV) to the MDA. Rick Dunham, AFS-420, advised that the guidance in the IPH has been expanded and the document is in the formal coordination process. AFS-420 will track this portion of the issue. **ACTION: AFS-410 and AFS-420.**

MEETING 13-01: Bruce McGray, AFS-410, reported that work has begun in concert with AFS-470 to develop AIM guidance using Harrisburg, PA as an example to explain why sometimes circling MDA may be lower than the straight in MDA/DA on approaches with both vertical guidance and non-vertically guided minimums. However, Bruce reported that not much progress has been made due to higher priority work. **Editor's Note:** *It should be noted that NBAA, APA, John Collins, and*

Horizon Air, offered at a previous meeting to assist AFS-410 in developing the AIM language. Tom Schneider, AFS-420, briefed the following update as received from Gil Baker, AFS-420 (ISI Contract Support) to Brian Strack, the AFS-420 OPR for the IPH: "Upon further investigation, it was discovered that revised language for the AIM and IPH has not been developed as was reported at the last meeting. However, this will be accomplished prior to the IPH entering the formal coordination process. An AIM change will be coordinated separately, hopefully for publication in Feb 2014." ACTION: AFS-410, AFS-470, and AFS-420.

MEETING 13-02: Bill Hammett, AFS-420 (ISI/Pragmatics Contract Support), briefed that the following draft language has been developed for the IPH; and, if accepted, may also be considered for the AIM:

On some RNAV (GPS) procedures, LNAV (only) and circle-to-land procedures might have lower minima than vertically guided straight-in procedures (LNAV/VNAV or LPV). A different sloping obstacle clearance surface (OCS) is applied to vertically guided procedures that may result in higher published LNAV/VNAV minima than that published for LNAV. Under TERPS criteria, the circling MDA may be no lower than the highest non-precision approach (NPA) line of minima published on the same chart.

Additionally, the missed approach point (MAP)-to-threshold distance is also factored into computing the minimum visibility value for each straight-in line of minima on the approach. The MAP for a non-vertically guided procedure is normally the threshold, but may be any specified point between the FAF and the landing threshold. The MAP for a vertically guided procedure is the point where the published glide path intercepts the DA. In those cases where there is a high NPA MDA, this point may be computed farther from the threshold, requiring a higher visibility. Thus, the LNAV and Circling MDAs and visibility minimums may be lower than the published LNAV/VNAV minimums.

Rich Boll, NBAA, stated that the text should include a copy of an IAP chart with the problem and a graphic to explain the variances in ROC application. John Collins, GA Pilot, agreed. Coby Johnson, AFS-410, asked how prevalent the problem is. Both Rich and John responded it is a common situation. Coby agreed that if it is, then AIM clarification should be provided. Rich added that pilots need to know what to do when flying LNAV/VNAV. When reaching the DA, does he/she initiate a missed approach or can the pilot revert to LNAV and continue to the LNAV MDA. Mike Webb, AFS-420, stated that the MOPS for SBAS state that the pilot should select a line of minima and fly it. Tom Schneider, AFS-420, requested that the ACF participants review the draft language and forward comments directly to Maj. Brian Strack, AFS-420, at brian.strack@faa.gov, Gil Baker at gilbert.ctr.baker@faa.gov and Bruce McGray, AFS-410, at bruce.mcgray@faa.gov. Taskings include: 1) AFS-410, in concert with AFS-470, to develop AIM language; and, 2) AFS-420 track IPH publication. ACTION: AFS-410, AFS-470, and AFS-420.

MEETING 14-01: Kel Christianson, AFS-470, discussed that pilots are confused when they review an approach plate and see an LNAV MDA & Circling MDA lower than the LNAV/VNAV DA. () A slide was presented which showed the guidance information that will be included in the AIM to help resolve this confusion. The slide was sent to NBAA, who reviewed and approved it. The new guidance will be included in the July AIM revision. Bob Lamond, NBAA, stated we can close this issue.

Status: Issue CLOSED