18 February, 2022

Mr. Rico Carty
Acting Executive Director, Flight Standards Service
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, DC 20591

Dear Rico,

The Performance-based Operations Aviation Rulemaking Committee (PARC) Steering Group is pleased to submit the following recommendations from the PARC Navigation Working Group for your consideration:

1) ILS/GLS/LPV Hot Temperature Intermediate Segment
2) Level Segment Deceleration Distance
3) Charted Temperature Usage

As always, the PARC appreciates Mike Cramer's leadership in bringing needed changes to Nav criteria. I think you'll find these three recommendations bring some needed changes that will improve pilot understanding of temperature limitations and reduce the need for waivers on procedures being produced in the National Airspace System.

The PARC looks forward to the FAA's review of these reports and any feedback on the items contained within.

Sincerely,

Ronald Renk
Industry Co-Chair, PARC

Cc: Chris Hope
Mike Cramer
Angela Williams

ILS/GLS/LPV Hot Temp Intermediate Segment

Issue

The PARC NAV Working Group worked on criteria to allow RNP to xLS which ushered in the ability to connect the downwind of an xLS approach to the final approach segment (FAS). When the work was completed the 8260.58A got an update with the following language added to Appendix C PBN Transition to ILS/GLS/LPV Final:

1. **Purpose.** When establishing an **RF intermediate** segment that transitions to an ILS/GLS/LPV final, the design must account for high temperature conditions that may cause higher than indicated true altitudes during the glide slope capture.

The reason this language was required was as a result of the shorter FAS segment on this new type of transition to final that did not allow the pilot time to recognize they could be above the glideslope on a hot temperature day. The NAV Working Group wanted to protect the pilot and ensure glideslope capture in all conditions.

This language was later updated to remove the "RF intermediate" verbiage and was replaced with the following language in update 8260.58B:

1. **Purpose.** When establishing an intermediate segment that transitions to an ILS/GLS/LPV final, the design must account for high temperature conditions that may cause higher than indicated true altitudes during the glide slope capture.

While this language was agreed upon by the PARC, when it started to be applied to ILS/GLS/LPV approaches, we quickly learned it had unintended consequences. New approaches and existing approaches would be designed/redesigned with a shallow intermediate segment that lower the altitudes on straight in ILS/GLS/LPV approaches that have worked for many years.

This change ultimately had a severe negative effect on communities that underly ILS/GLS/LPV approaches. The noise levels from the aircraft increased compared to the previous approaches. When this effect was brought to the PARC NAV Working Group's attention, it was clear action needed to be taken.

Recommendation

When the group reviewed the course of events leading to this change and looked at the mitigations in place when approaching an ILS/GLS/LPV approach from a more traditional transitions that served these approaches, a solution became clear. The PARC NAV Working Group suggests the following language replace the current text:

1. Purpose. When designing an offset intermediate segment to intercept an ILS/GLS/LPV final approach segment (FAS) with a turn that intercepts the extended final approach course within 2 NM of the desired glideslope/glidepath capture point, the procedure design must account for high temperature conditions that may cause higher-than-indicated true altitudes during the capture of the aircraft's vertical guidance and transition into the final approach guidance mode. When this type of turn is present, the procedure design must comply with the criteria in this appendix and offer a shallow descent gradient in the offset intermediate segment. This descent gradient must ensure the aircraft has the opportunity to capture the FAS vertical guidance from a position below the glideslope/glidepath.

   Note: Many aircraft flight guidance systems have control laws that require the aircraft be below the geometric glideslope or glidepath in order to "capture" the vertical guidance and progress into the final approach mode (i.e. the ILS, GLS or LPV final approach modes).

We believe this update will cover the original intent of the PARC's work to protect pilots coming from downwind to a short FAS but will also allow existing approaches in the NAS to continue without the need to be updated with lower altitudes that will adversely affect the communities at the airports these approaches serve.

Recommend Change to Public Standard Terminal Arrival Procedure design criteria supporting a reduction in deceleration distance for speed reductions where descents are not permitted

PARC Navigation Working Group

September 08, 2021

Background.

In May 2014, the PARC VNAV Action Team forwarded a report, "Design Considerations for Optimal Profile Descent Procedures", to the PARC SG for approval in recommending new design considerations in construction of Optimal Profile Descent (OPD) procedures associated with RNAV Standard Terminal Arrival Procedures (STAR). This document was approved and ultimately forwarded to the AVS-1 for use in amending the procedure design standards for STAR(s). Subsequent use of this document by AFS 400 and AJV saw many of the report's design considerations become design standards in the FAA Order 8260.3.

As airspace managers and procedure designers began using the new orders and tools incorporating several of the OPD design recommendations, implementation of new STARs revealed that some the new criteria were very restrictive. In some cases when designing new STARs, the draft procedures did not "fit" the available airspace. One such case where certain criteria appear too restrictive is the deceleration distance speed reductions required during a level leg segment.

During the development of the new STAR criteria for the deceleration distance a speed reduction requires in a level segment, FAA Flight Procedures and Airspace Group (FPAG) determined some aircraft may need additional distance due to delays in the aircraft reaching a stabilized deceleration rate. This conclusion resulted in the current standards in FAA Order 8260.3E, para 2-2-10.A, which requires a minimum distance of 4 NM when a STAR requires a speed reduction of 40 KTS or less in a level flight segment.

Despite the current criteria, an IDLE thrust, stabilized deceleration rate of 10 KTS/NM has been a proven means to determine an effective deceleration distance for level flight. In fact, simulations conducted by the former FAA Flight Procedures Standards Branch determined a 40 KT speed reduction in a level segment can be accomplished in slightly more than 4 NM. Their simulations also confirmed that an aircraft's autoflight system (e.g., the autothrottle) can enable these speed reductions despite a minor delay in reaching a stabilized deceleration rate. However, the STAR procedure design criteria require a minimum of 4 NM for even a minor speed reduction, such as 10 KTS. Yet, many aircraft regularly demonstrate the ability to complete a 10 KT speed reduction in less than 2 NM.

Given what the actual aircraft demonstrate vs. the conservative STAR design criteria, STAR designs can impose an excess deceleration distance for small speed reductions. This excess distance may make a desired path for a STAR unavailable in tight airspace. Several Metroplex procedure design teams ran into this issue when finalizing new STAR designs; and, as result, acceptance by the FAA Procedure Review Board (PRB) required numerous waivers to finalize the procedures for publication. This continuing issue then prompted many airspace procedure design teams to request PARC Nav

WG members bring this to the WG to see if any changes could be made to this criterion to better support airspace constraints and negate the need for future waivers.

Ultimately, one member of the PARC Nav WG asked this group to support a new task to review the existing criterion and recommend changes to better support current and future airspace procedure design projects. The Nav WG members can draw on their experience with aircraft performance capabilities, previous airspace design projects and operational experience to offer a recommended change to FAA Order 8260.3E, para 2-2-10.A.

Discussion.

The PARC Nav WG began their effort by discussing the history of how the FAA developed this criterion. This led to follow-on discussions on current aircraft capabilities, which can support new deceleration criterion. This effort also focused on flight operations and procedural altitudes below 15,000 FT MSL. As the WG brainstormed the issue, the efforts led to consensus and ultimately a recommendation for amending FAA Order 8260.3E, para 2-2-10.A.

Issue and Recommendation.

Issue: *Provide a recommended change to FAA Order 8260.3E, para 2-2-10.A, providing deceleration distances that better align with current aircraft performance capabilities and reduces the track distance required to support small speed reductions in level flight (less than 40 KTS).*
Discussion: The WG determined the current, fixed distance of 4 NM for speed reductions of 40 KTS or less in level segments was too restrictive in STAR procedure design. In one case, a procedure design required a 3-mile segment (due to airspace constraints) and a speed reduction less than 40kts. Yet, the order's requirement for a minimum leg length of 4 NM resulted in the procedure failing review and required a waiver for a procedure design aircraft could safely fly. To avoid this design constraint, the WG came to consensus on the use of "30 KTS or less" as a guide to speed reductions that requires a minimum deceleration distance of "3 NM".

Recommendation: FAA should adopt the recommendation to amend the first and second sentences of FAA Order 8260.3E, para 2-2-10.A to read, "…***provide a minimum distance of at least 3 NM prior to a fix with a speed reduction of 30 KIAS or less. For deceleration greater than 30 KIAS, allow 1 NM between fixes with speed restrictions for every 10 knots of deceleration required.***"

Rationale: Use of a minimum fixed distance of 3 NM for speed reductions of 30 KTS or less allows airspace managers and procedure designers to better construct lateral paths in tightly confined airspace where a procedure may require small speed reductions. This update will avoid the need for waivers deceleration leg lengths of less than 4 NM in a level segment of a STAR. These waivers have routinely been granted by the PRB and to date have not resulted in any issues.

Summary: The PARC Nav WG recommends the SG adopt this criterion and forward the recommendation to the FAA for consideration and implementation. Adopting the criterion will better harmonize STAR design criteria with current aircraft performance utilizing current and future STAR procedure designs.

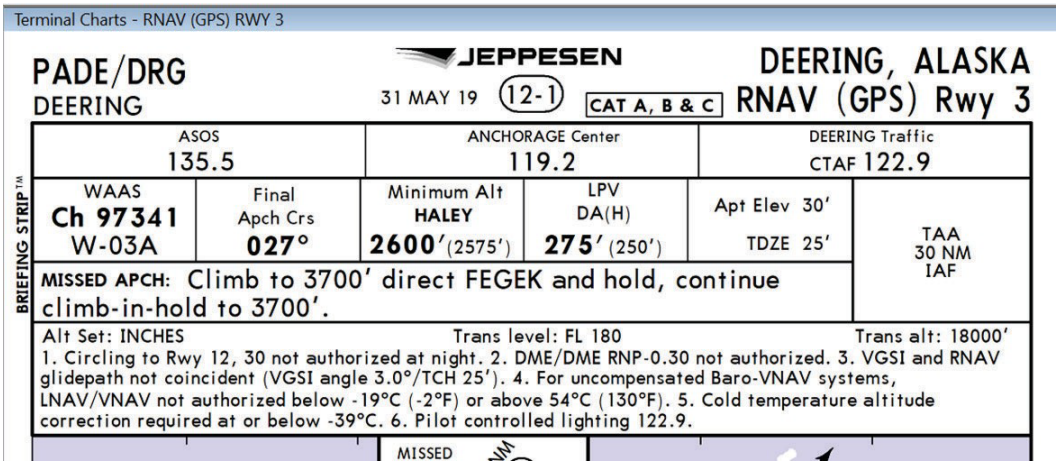
RECOMMENDED CLARIFICATION OF CHARTED TEMPERATURE LIMITS

Problem Statement

There are two types of temperature limits that can appear on RNAV procedures:

1. High/low temperature limits for baro-VNAV
2. Cold temperature airport (CTA) low temperature limit (Textual on Jeppesen, Snowflake ICON and temperature in Celsius on FAA produced charts.)

An example of a procedure with both limits on the chart is shown below:


Terminal Charts - RNAV (GPS) RWY 3

PADE/DRG
DEERING

JEPPESEN
31 MAY 19 (12-1)

CAT A, B & C

DEERING, ALASKA
RNAV (GPS) Rwy 3

ASOS	ANCHORAGE Center	DEERING Traffic
135.5	119.2	CTAF 122.9

BRIEFING STRIP™

WAAS	Final Apch Crs	Minimum Alt	LPV DA(H)	Apt Elev 30′	TAA
Ch 97341 W-03A	027°	HALEY 2600′(2575′)	275′(250′)	TDZE 25′	30 NM IAF

MISSED APCH: Climb to 3700′ direct FEGEK and hold, continue climb-in-hold to 3700′.

Alt Set: INCHES Trans level: FL 180 Trans alt: 18000′

1. Circling to Rwy 12, 30 not authorized at night. 2. DME/DME RNP-0.30 not authorized. 3. VGSI and RNAV glidepath not coincident (VGSI angle 3.0°/TCH 25′). 4. For uncompensated Baro-VNAV systems, LNAV/VNAV not authorized below -19°C (-2°F) or above 54°C (130°F). 5. Cold temperature altitude correction required at or below -39°C. 6. Pilot controlled lighting 122.9.

MISSED

When both temperature limits appear on the same chart and they are different, it has led to pilot confusion in terms of applying temperature compensation. The reason for differences is because of the differing purpose for each limit, as follows:

1. High/low limits are computed to prevent the final segment flight path realized by the aircraft from becoming either too steep or too shallow when the airport temperature is above or below the standard day temperature (ISA).
2. The “cold temperature airport” (CTA) restriction tests each segment of a procedure to find the temperature below which the risk of the realized (true) path altitudes being below the obstacle clearance surface is greater than 1%.

One point of confusion arises because the CTA limit allows for manual temperature compensation to correct procedure altitudes, while in the AIM Paragraph 7-3-3a.1 and a.2 implies that manual compensation may not be used to correct outside of the baro-VNAV note temperature limit on RNAV (GPS) and RNAV (RNP) procedures. Since manual temperature correction is allowed for the CTA temperature, the Nav WG believes that manual temperature compensation should also be allowed outside the baro-VNAV limits to allow the procedure to be used outside those limits. The use of the term “uncompensated baro-VNAV systems” in applicable ACs apparently has been misinterpreted to mean “baro-VNAV systems without automatic temperature compensation” which was not the intent. Further confusion arises

when the CTA and baro-VNAV limits are different, what is the relationship? What temperature should be used for compensation?

For the preceding reasons, the Nav WG has agreed on the following two recommendation(s) to address each of these points of confusion separately. The first recommendation relates to the chart notes for the limits and aims to make it clear that either manual or automatic temperature compensation can be applied in all cases. Removing the term "uncompensated baro-VNAV systems" and rewording the note so that it simply states the procedure or minima will be N/A "unless temperature compensation is applied" should make it clear that either manual or automatic compensation is allowed. The second recommendation suggests an update to the guidance material in the AIM to clarify how and when temperature compensation should be applied when both limits appear on the same procedure.

Recommendation 1: Revise the AIM and other guidance material to clarify that manual temperature compensation of final approach segment altitudes for RNAV(RNP) and RNAV(GPS) procedures when the reported temperature is below (or above) the noted values is not precluded. Modify the charted limit notes (restated in the AIM) so that they will agree with the recommended revision to the chart notes (below).

The Nav WG has the following suggestions for modification of the chart notes:

1. RNAV(GPS) – "Baro-VNAV guidance to LNAV/VNAV minimums NA below _____°C or above ____°C unless temperature compensation is applied."
2. RNAV(RNP) – "Baro-VNAV guidance NA below _____°C or above ____°C unless temperature compensation is applied."
3. CTA note – "Cold temperature altitude correction required at or below ___°C."

These are only suggestions, there are likely other variations that will remove the implied restriction on using manual compensation, but the point is to make sure that the notes are not interpreted to imply that manual compensation is not allowed.

Recommendation 2: Clarify actions to be taken when high/low temperature chart notes occur on a procedure that also has a CTA temperature minimum. The following table shows the action to be taken based on the relationship between CTA minimum temperature (CTA), airport actual temperature (ACT) and the baro-VNAV LNAV/VNAV max/min temperatures. The Nav WG recommends that the following table be added to the appropriate guidance material for reference by flight crews.

TEMPERATURE RELATIONSHIP	ACTION
Airport Temp less than baro-VNAV LNAV/VNAV minimum temperature	Compensate baro-VNAV path when using LNAV/VNAV minima
Airport Temp greater than baro-VNAV LNAV/VNAV maximum temperature	Compensate baro-VNAV path when using LNAV/VNAV minima

RECOMMENDED CLARIFICATION OF CHARTED TEMPERATURE LIMITS

Airport Temp less than CTA Temperature	Compensate required segment altitudes

Addition of this table will also require that the guidance material be updated to include a table for corrections on “hot” (above ISA) days. The only guidance available currently is the “cold” day correction table in the AIM. This can be easily computed and included in relevant guidance for flight crews.

December 3, 2021