**ARINC 424 NDB**

**Draft 3 of Supplement 24**

**Discussion Paper**

**Location: Atlanta, Georgia**

**April 15-17, 2023**

Hold To AN INtercept (HI) Path Terminator

**V.0**

Joshua Fenwick, Garmin – AVDB Team



|  |
| --- |
| **SUMMARY** |
| Kick-off discussion paper to outline the potential new HI path & termination leg type.  Garmin is proposing a new “HI” path terminator for legs designed as a holding pattern but the inbound leg is meant to intercept the next leg before the hold’s fix. |

1. **INTRODUCTION/ BACKGROUND**

There have been many discussion items over the past few decades about the termination point of holding patterns. During these discussions, it was determined that many existing FMS systems will treat the termination point of an HF leg as the fix which follows the Attachment 5 description of an HF leg as a “single circuit terminating at the fix”.

A diagram of a line with text

Description automatically generated

Figure 1: Attachment 5 – HA/HF/HM Legs

The problem is that there are many racetrack course reversals which start at a fix beyond the FAF where the expectation is that it terminates as an intercept of the final approach prior to the FAF. For example, the LFQT NDB Z RWY 22 has two racetracks start at 3 NM beyond the FAF with the expectation that the hold terminates in the intercept of the final approach prior to the FAF.

**A screenshot of a tablet

Description automatically generated**

Figure 2: LFQT NDB Z RWY 22

Here is a sample of the current NavDB coding we are receiving for this procedure which does not have the racetracks coded. The reason is that the HF path & termination leg type can’t be used in this case.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **APP**  **ID** | **SEQ**  **NR** | **FIX**  **ID** | **P/T** | **RECD**  **NAV** | **Waypoint**  **Description** | | | | **RHO** | **MAG**  **CRS** | **DIST** | **ALT** | **VERT**  **ANG** | |
| N22-Z | 010 | IN22 | IF | MRV | E |  |  | I | 0045 |  |  | 02500 |  |
| N22-Z | 020 | FN22 | CF | MRV | E |  |  | F | 0030 | 2160 | 0015 | 02500 |  |
| N22-Z | 021 | MRV | CF | MRV | N |  | S |  | 0000 | 2160 | 0030 | 01410 | -349 |
| N22-Z | 030 | MN22 | CF | LEQ | E | Y |  | M | 0031 | 2160 | 0031 | 00246 | -349 |
| N22-Z | 040 | MN22 | FA |  |  |  | M |  |  | 2160 |  | 02900 |  |
| N22-Z | 050 | MRB | DF |  | N | E |  | H |  |  |  |  |  |

Figure 3: LFQT NDB Z RWY 22 Current Coding

Here is an additional example from Martin Zillig at the EHEH ILS X OR LOC RWY 03 where the racetrack starts at the EHOJI fix which is beyond the MAP, and it appears the expectation is to intercept the final approach between the FAF and MAP.

A black and white map of an airport

Description automatically generated

Figure 4: EHEH ILS X OR LOC X RWY 03

1. **DISCUSSION and/or ACTION**

See below for a very high-level set of proposed changes to the ARINC 424 Attachment 5 to add a new hold to intercept (HI) leg. There will need to be a deep dive into the full Attachment 5 to find all the places where changes need to be made. For now, I am just showing a rough draft of the changes to Table 1.2, Table 1.3, Table 1.4 and Table 1.5.

1. **Legacy ARINC 424 changes as depicted (Track Changes is Helpful)**
   1. Update Attachment 5, Table 1.2: Add new “HI” Path & Termination

|  |  |  |
| --- | --- | --- |
| **Procedure** | **Beginning Leg** | **Ending Leg** |
| SID Runway Transition | CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, VA, VD, VI, VM, VR | AF, CF, DF, FM, HA, HF, HM, IF2, RF, TF, VM |
| SID Common Route | CA1, CD1, CF1, CI1, CR1, DF1, FA, FC, FD, FM, HF6, IF, VA1, VI1, VM1, VR1 | AF, CF, DF, FM, HA, HF, HM, IF2, RF, TF, VM |
| SID Enroute Transition | FA, FC, FD, HF, IF | AF, CF, DF, HA, HF, HM, RF, TF |
| STAR Enroute Transition | FC, FD, HF, IF | AF, CF, DF, HF, HM, RF, TF |
| STAR Common Route | FC, FD, FM, HM, IF | AF, CF, DF, FM, HF, HM, IF2, RF, TF, VM |
| STAR Runway Transition | FC, FD, FM, HF, IF | AF, CF, DF, FM, HF, HM, IF4, RF, TF, VM |
| Approach Transition | FC, FD, FM, HF, HI, IF, PI | AF, CF, CI3, HF, HI, HM, PI, RF, TF, VI3 |
| Final Approach Coding | IF | AF, CF, RF, TF |
| Missed Approach | AF, CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, HA, HM, RF, TF, VA, VD, VI, VM, VR | AF, CA, CF, DF, FM, HM, RF, TF, VA, VM |

* 1. Update Attachment 5, Table 1.3: Add new “HI” Path & Termination

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | AF | CA | CD2 | CF1 | CI | CR | DF | FA2 | FC | FD | FM3 | HA | HF | HI | HM | IF | PI | RF | TF | VA2 | VD | VI | VM3 | VR |
| HI |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
|  | HI |
| AF |  |
| CA |  |
| CD |  |
| CF |  |
| CI |  |
| CR |  |
| DF |  |
| FA |  |
| FC |  |
| FD |  |
| FM |  |
| HA |  |
| HF |  |
| HM |  |
| IF |  |
| PI |  |
| RF |  |
| TF |  |
| VA |  |
| VD |  |
| VI |  |
| VM |  |
| VR |  |

* 1. Update Attachment 5, Table 1.4: Add new “HI” Path & Termination

|  |  |  |
| --- | --- | --- |
| **Leg Code** | **Example Path** | **Description** |
| HI |  | Figure 22: Holding in lieu of a procedure turn to an Intercept (HI). Defines a holding pattern in lieu of a procedure turn course reversal to intercept the subsequent leg at an unspecified position. |

* 1. Update Attachment 5, Table 1.5: Add new “HI” Path & Termination

TBD

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PT | W/P  ID | OVR  FLY | HLD | TD | TDV | RMD  NAV | THETA | RHO | OB  CRS | TM/  DST | ALT  ONE | ALT  TWO | SPD  LMT | VRT  ANG | ARC  RAD | ARC CTR | COMMENTS |
| HI |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. **XML ARINC 424 changes as depicted (Track Changes is Helpful)**

* Jira Ticket: TBD
* Git Feature Branch: TBD
* Summary of changes: TBD