

March 3, 2015

Ms. Margaret Gilligan  
Associate Administrator for Aviation Safety  
Federal Aviation Administration  
800 Independence Avenue  
Washington, DC 20591

Dear Peggy:

At the request of members of the Performance-based Operations Aviation Rulemaking Committee (PARC), the PARC Navigation Working Group (Nav WG) reviewed procedures at Nashville that embedded an open segment (a vector leg) within an RNAV departure, where fixed legs were used both before and after the vector. These procedures had been operating well, but fell into a conflicting area within criteria. After a review of FMSs and their abilities, the Nav WG derived a solid set of criteria for the design of these "Open SIDS" which has been forwarded to your office from the PARC in August 2014. The PARC then asked that the Nav WG develop guidance for the use of the Open SIDS concept.

The attached recommendation addresses circumstances under which the Open SID should be used, and circumstances under which it should not be used in airspace design. This may be used as guidance to airspace and procedure designers wanting to apply the Open SID design concepts.

PARC has retained a history of meetings and backup substantiation of conclusions on the PARC website. The PARC respectfully requests the FAA provide the PARC with a formal response.

Sincerely,

A handwritten signature in black ink, appearing to be 'Mark Bradley', with a horizontal line extending to the right.

Mark Bradley  
Chairman, PARC

Cc: R. Dunham  
M. Steinbicker  
B. DeCleene  
M. Cramer

**PBN Departure Procedures**  
**“Open SID” Implementation & Utilization Guidelines**

**Open SIDs**

**Definition:** A PBN departure starting and ending with a defined path but containing a manual termination leg within the procedure, e.g., VA-DF-FM-IF-TF-TF.

*Note: The definition specifically calls out a manual termination (as opposed to simply a Heading to Altitude or other such leg) because the essence of these procedures is that they will require a pilot manual termination once ATC vectoring is complete.*

While a DP with a contiguous (unbroken) lateral path offers many benefits there are locations and situations where a *non-contiguous* DP offers benefits that cannot be provided by a DP using a contiguous path.

There are a several reasons that an “Open SID” i.e. one with a non-contiguous PBN path RNAV may provide benefit. However, there are also situations where this type of design may not be appropriate. In the four sections of this paper, the following is provided:

- 1) Guidance for implementation,
- 2) Guidance on the conditions under which the concept is most appropriate, and
- 3) Guidance for conditions under which the concept should not be applied,
- 4) An appendix with an example that was implemented in Nashville before being pulled because of being disallowed under current rules.

**Implementation**

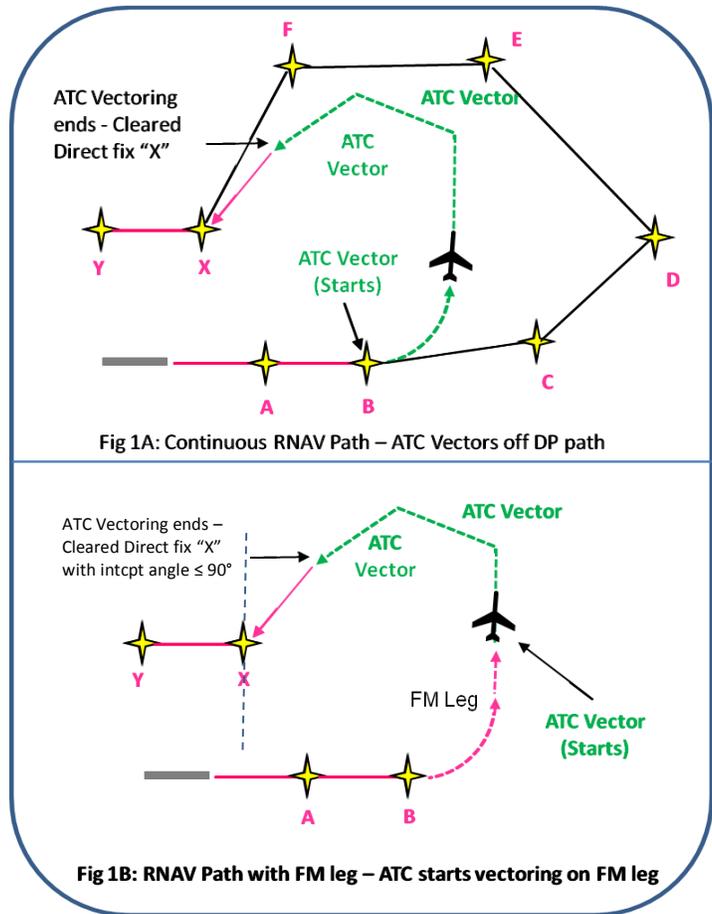
“Open SIDs” will require that the procedure and airspace designers have the training and guidance to use this option *only when and where needed* (see following sections).

When using this concept, the designer must assure that aircraft will be at or above the minimum vectoring altitude by the start of the FM/VM leg and throughout the ATC vector maneuver. It is assumed that the ATC direct clearance to the fix where the RNAV route resumes will be at an intercept angle not to exceed 90 degrees relative to the next leg. These conditions rescind/ replace the Pilot Navigation Area (PNA) evaluation and associated DME/DME assessment.

Figure 1A depicts a continuous PBN DP. Figure 1B depicts an “Open SID”.

It is beyond the scope of this paper to assess all situations where an “Open SID” may be preferable to a continuous defined path procedure. However, there are circumstances where an “Open SID” shall not be used. These are when:

1. Radar surveillance is not available
2. 4-D trajectory management is required (i.e. future NextGen implementations)



**General Rationale for “Open SID” employment**

Generally an “Open SID” should be used only when each of the following three conditions apply:

1. The initial departure leg(s) must define a specific ground track/path **and**
2. The intermediate departure leg(s) are anticipated to require frequent tactical vectoring **and**
3. The final departure leg(s) must define a specific ground track/path

A partial list of examples of each of the above conditions are captured in Table 1 to further clarify when an “Open SID” concept may be employed. In using the table, the items in the three columns may be combined in any fashion as long as one condition from each column is in effect; when that is the case, the concept may be employed.

*NOTE: For example, the concept could be employed if conditions 1.1 & 2.1, & 3.1 apply (first full row of the table). It could also be employed if conditions 1.1 & 2.2 & 3.3 apply. Any combination is acceptable as long as all three conditions are met.*

*NOTE: If items from fewer than three of the vertical columns are required then an “Open SID” design should not be considered.*

*Table 1 Conditions Allowing Application of Open SID*

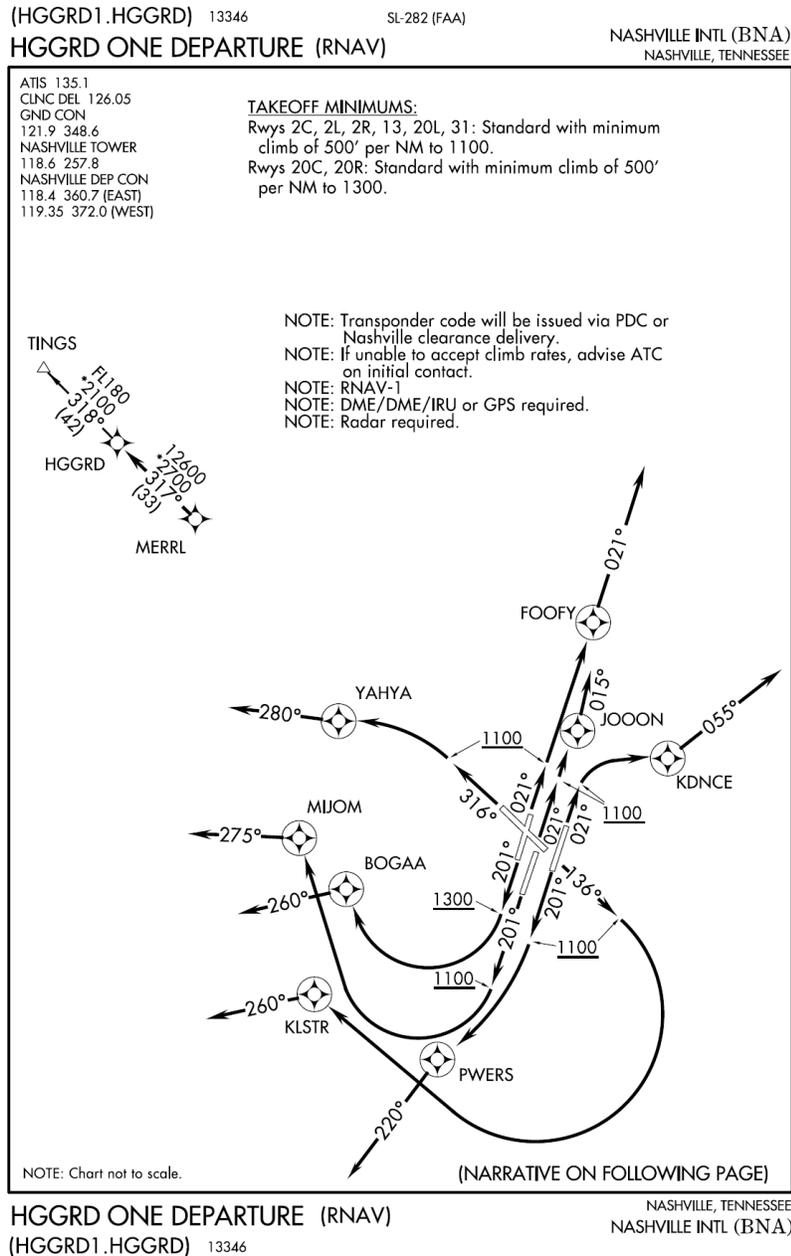
	<b>Condition 1</b>	<b>Condition 2</b>	<b>Condition 3</b>
1	Terrain or obstacles near the initial climb out path	Requires dispersion of ground tracks to distribute noise footprint	Join a PBN route (where containment is assumed at the entry point)
2	Noise sensitive areas near the initial climb out path	Frequently requires anticipated tactical intervention to separate departing traffic e.g. from hub/satellite airfields	To define a path around high terrain
3	Prohibited or restricted areas near the initial climb out path	Requires attaining a minimum altitude enables a large angle turn to be accomplished (to reduce DP departure track miles)	To define a path around prohibited or restricted airspace

**General Rationale Preventing “Open SID” employment**

In addition to the conditions where the concept definitely shall not be employed (non-radar, 4D required, as noted in the implementation section above), there are situations where the concept, in a more general sense, should not be employed. The following list, provides a partial list of examples of these situations:

1. Where terrain or other factors constrain the available path through most or all of the procedure,
2. When vectoring is not anticipated to be the norm,
3. When a series of altitude and speed constraints are required on the DP at waypoints after the VM/FM leg. (The FMS cannot provide accurate calculations for the climb profile unless there is a defined lateral path),
4. When vectoring is anticipated but will not significantly affect the flight track distance or result in a large number of bypassed fixes on the procedure.

## Appendix – Example Departure Design



In this example, every runway has a departure path that ends in a VM (heading to manual termination). The SID then continues for all runways from the fix MERRL with TF to HGGRD and then TINGS. Operationally, ATC was able to pick aircraft off the departure path direct to MERRL at any time it was convenient, however, if they could not prior to one of the VM origins (YAHYA, FOOFY, BOGAA, etc.) the path was still defined in the RNAV system as a VM, so any aircraft not intervened with prior to those waypoints would all follow the same path until cleared direct to MERRL.