

3 Feb, 2021

Mr. Ali Bahrami
Associate Administrator for Aviation Safety
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Ali,

The Performance-based Operations Aviation Rulemaking Committee (PARC) Steering Group is pleased to submit the following recommendation for your consideration. The PARC Navigation Work Group (NAV WG) recently completed a review and analysis of issues that have arisen when a VORTAC and VOR/DME is decommissioned, and a stand-alone DME facility remains at the same geographic location. Some inconsistencies in the process have led to confusion for flight crews and in some instances extends to communication confusion between flight crews and ATC.

The Nav WG did a tremendous job providing background, highlighting issues, and providing the necessary information to the PARC Steering Group. The PARC SG supports the attached recommendation.

I would be remiss to not mention the consistently impressive work the Nav WG accomplishes to standardize design criteria, improve efficiencies, and drive the NAS to a more robust and accessible performance-based operations. My hat is off to the entire WG.

The PARC appreciates your continued support of our activities.

Sincerely,



Mark Bradley
Chairman, PARC

Cc: Mark Steinbicker
Chris Hope
Mike Cramer

Recommended changes for use of DME Fixes in RNAV procedures.

PARC Navigation Working Group

January 2021

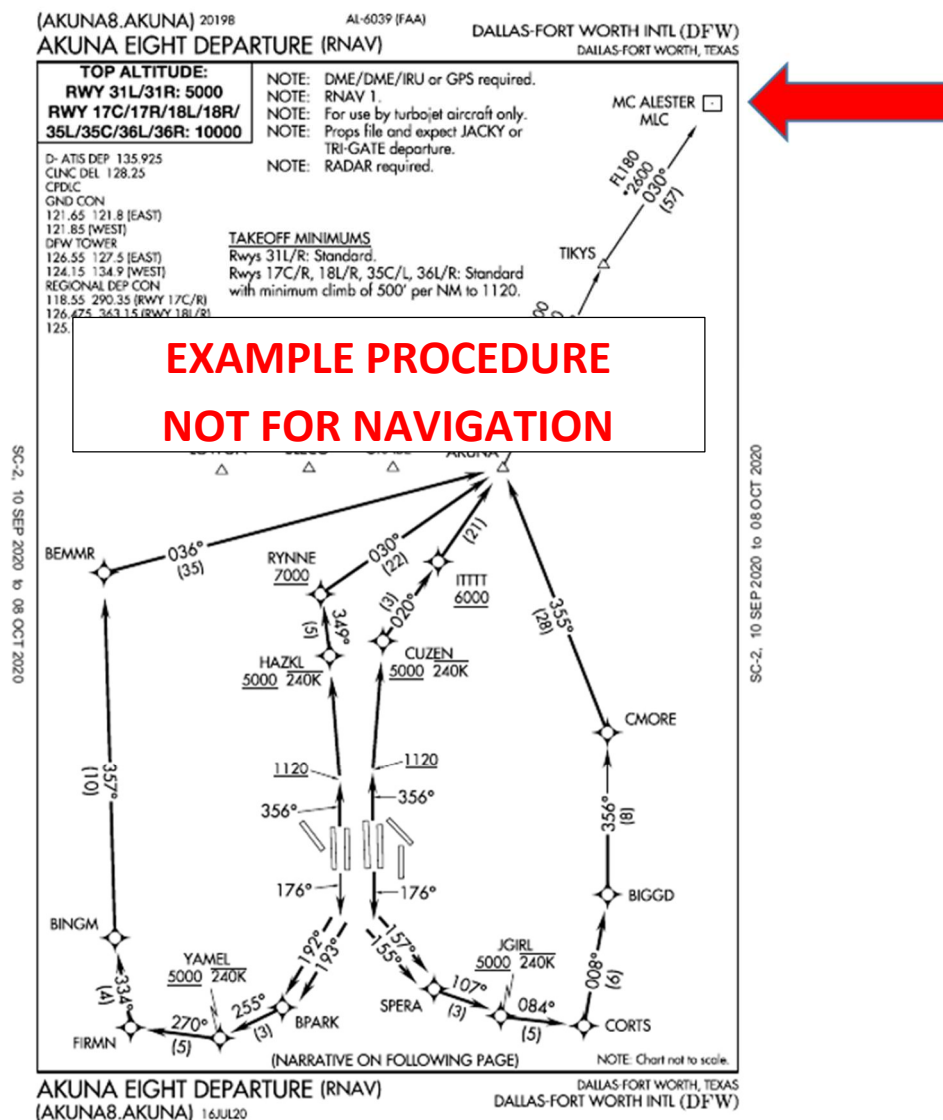
BACKGROUND: As an element of the FAA's VOR MON program, the FAA continues to decommission many VORs across the NAS. Meanwhile, in an effort to retain and expand the NAS DME infrastructure in support of the NextGen DME Program, the FAA also operates select DME facilities as stand-alone DMEs in the same geographic locations as the decommissioned VORTACs and VOR/DMEs. The FAA expects these stand-alone DME facilities to support a robust DME infrastructure aiding existing and future PBN operations (e.g. RNAV en route ops). Some of the decommissioned VORTAC or VOR/DME stations and others scheduled for future decommissioning served as fixes on many RNAV procedures (SIDS/STARS) and RNAV routes. To minimize costs and delays in amending these RNAV procedures and routes when decommissioning a VOR, the FAA converted these VORTAC or VOR/DME fixes to "DME-only" fixes by referencing the fixes to the remaining, stand-alone DME facilities. The new stand-alone DME facilities also retain the 3-letter NAVAID identifier from the original VORTAC or VOR/DME facility. At a glance, this seems practical since a stand-alone DME station cannot support conventional navigation under IFR, but an aircraft's RNP system can use the stand-alone DME facility's location as a waypoint or fix (e.g. use the facility's latitude and longitude to define the fix definition).

ISSUE: *If an RNAV procedure or route uses a VORTAC or VOR/DME as part of the procedure or route definition (e.g. an RNAV waypoint or fix in the path definition) and the FAA schedules the VOR for decommissioning while retaining the DME facility as a stand-alone DME, the FAA currently expects the remaining stand-alone DME to continue to serve as a RNAV waypoint or fix. This new use of a stand-alone DME in this manner combined with nonstandard charting and flight deck displays is confusing flight crews and ATC controllers. In some instances, this confusion causes the flight crew to refuse a new or revised ATC clearance to use the stand-alone DME as an RNAV fix during "direct- to" operations.*

DISCUSSION: As the FAA continues to decommission VOR facilities, many more stand-alone DME facilities populate the NAS. However, as more RNAV procedures employ the stand-alone DME facilities as fixes, there is growing confusion with flight crews on how to effectively identify and operationally use a stand-alone DME facility as a RNAV fix. In part, nonstandard and unfamiliar charting and flight deck displays of a stand-alone DME facility and its use as an RNAV fix cause flight crew confusion; and, in some instances, the confusion extends to the communications between the flight crews and ATC.

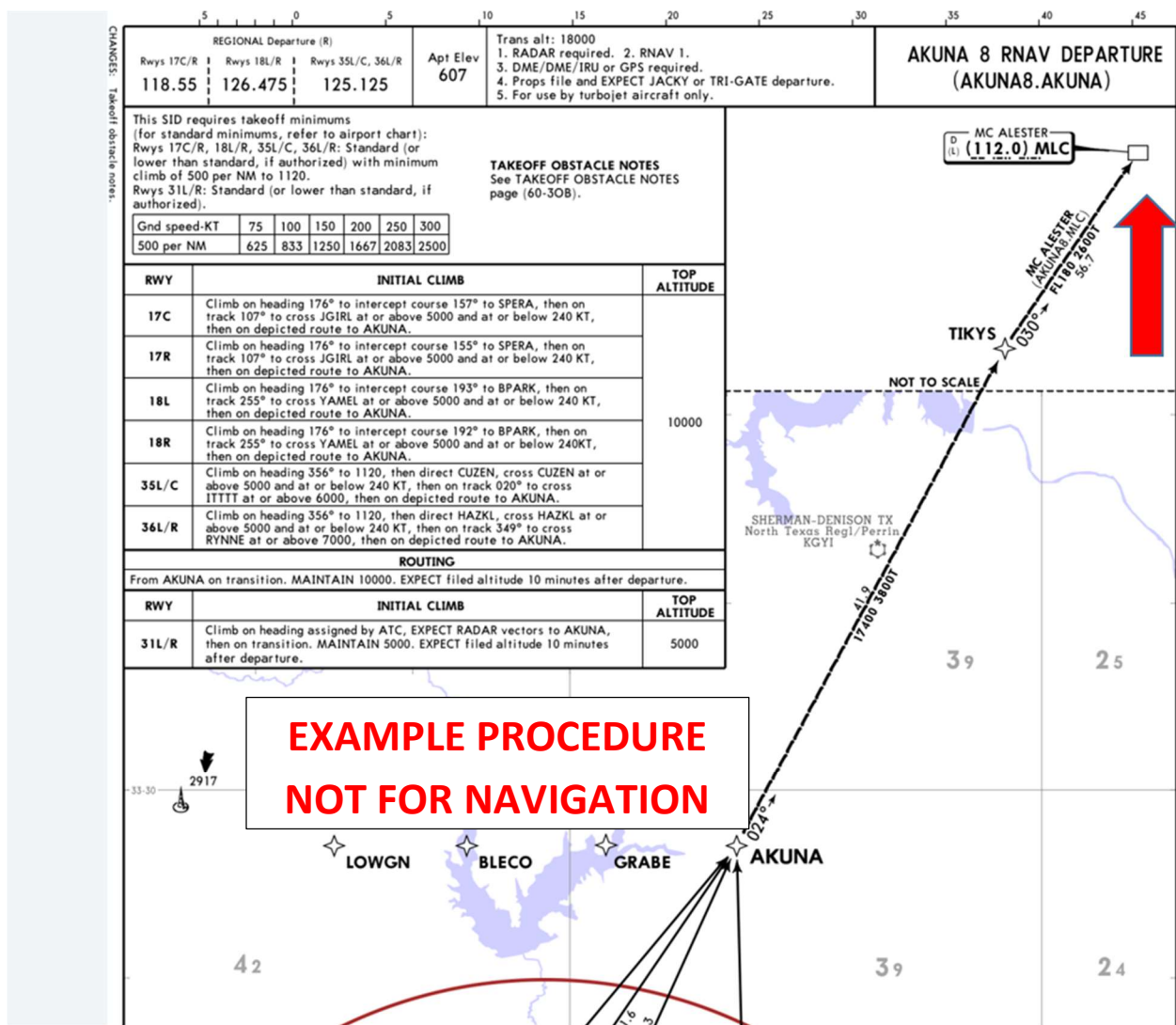
The following charting examples depict the inconsistency flight crews see on a day-to-day basis. The first chart is a sample NACO chart for the AKUNA.8 RNAV departure procedure (i.e. SID) from KDFW (see below). At the time this chart was current, the FAA had decommissioned the McAlester VORTAC (MLC), yet retained the remaining DME facility as a stand-alone DME. On the chart, the square box ("□") indicates the stand-alone DME facility and replaced the previously charted VORTAC symbol. While the square box ("□") is the international standard symbol for charting a stand-alone DME facility, there is little flight crew familiarity with the symbol. Likewise, the stand-alone DME retains the decommissioned VORTAC's 3-letter ID misleading

some flight crews to believe the VORTAC is still active and available. In other words, some flight crews believe the “□” symbology on the chart is erroneous, and the original NAVAID is still in service.



In the next example, the Jeppesen chart below also uses the square symbol (“□”) to indicate the change in “MLC” from a VORTAC to a stand-alone DME facility and represents the DME facility as an RNAV fix. However, this chart retains the original VORTAC facility’s VHF frequency, its Morse Code ID and even the previous facility’s service class. Again, this charting technique causes some flight crews to think the “□” symbol is simply a charting mistake, and they have been led to believe the VORTAC is still in service.

See the Jeppesen chart example below on the next page.



Yet, the charting of stand-alone DME facilities as part of RNAV procedures and routes is just one aspect of this problem. Currently, the aircraft and avionics OEMs do not use standardized symbology to display a stand-alone DME facility on the flight deck as either a NAVAID or as an RNAV fix. A recent update to RTCA DO-257B, the MOPS for *Depiction of Navigation Information on Electronic Maps*, standardizes future flight deck displays' depictions of stand-alone DME facilities (using the square box, "□") in new aircraft and avionics applications, but widespread implementation of the new standard is years, if not decades away.

Below are examples of a B-787 flight deck's nonstandard presentation of a stand-alone DME facility as an RNAV fix and the same stand-alone DME facility as NAVAID. In the first image, the B-787 nav display (ND) depicts a stand-alone DME facility that is in use as a RNAV fix by displaying the fix using the traditional waypoint symbol (i.e. "◆"). This symbology is present when the stand-alone DME facility's location is part of a published RNAV procedure or when the flight crew enters and executes the stand-alone DME facility in the aircraft's RNP system's flight plan route or legs page by using the 3-letter NAVAID ID, in this example "MLC".

In contrast, if the B-787 flight crew selects the stand-alone DME on the FMC's "FIX" page, then the ND depicts the stand-alone DME through use of a VORTAC symbol. This symbol's appearance through use of the "FIX" page leads the flight crew to erroneously believe the VORTAC is still in service.

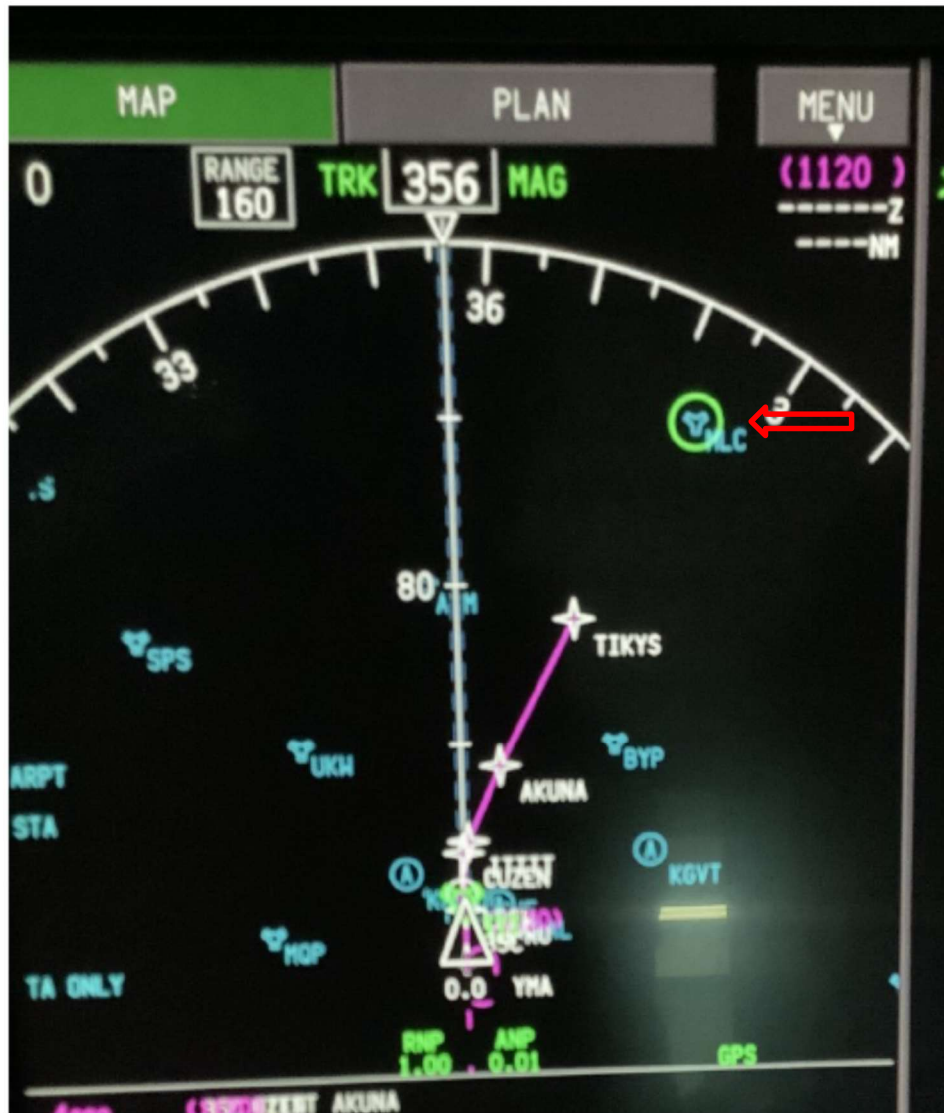
Meanwhile, if the stand-alone DME is in use as a RNAV fix in the FMC's flight plan route and the flight crew also selects the stand-alone DME on the FMC "FIX" page, then the ND superimposes a VOR/DME symbol and the waypoint symbol on top of one another. This makes the ND's representation of MLC difficult to discern, adding to further confusion.

Note: The following images show the differences between the presentations of a stand-alone DME on the B-787 ND. In the first image the stand-alone DME facility ("MLC") is in use as an active RNAV fix in the FMC flight plan. In contrast, the second image shows the display of the same stand-alone DME facility when the flight crew selects the DME facility using its 3-letter ID on the FMC "FIX" page.

B-787 NAV Display (ND) of the McAlester ("MLC") stand-alone DME as an RNAV fix (i.e. "✦"):



Map display of MLC (the stand-alone DME facility) after the B-787 flight crew selects the stand-alone DME “MLC” on the FMC’s “FIX” page by using the facility’s 3-letter ID:



Note: After selecting the FMC “FIX” page, the map displays MLC (the stand-alone DME) by using a VORTAC symbol.

As an example of other aircraft systems, Honeywell map displays in AIRBUS aircraft depict stand-alone DME facilities in use as an RNAV fix by using the standardized waypoint symbol (e.g. “✦”). In contrast, when the flight crew selects a stand-alone DME facility using the FMC’s “RADIO NAV” page, the aircraft’s map display depicts the stand-alone DME as a circle (e.g. “○”). Again, this is just another example of many nonstandard displays of stand-alone DME facilities.

While these examples do not provide an exhaustive look at how every aircraft their flight deck map displays depict stand-alone DMEs, there are sufficient disparate displays in service in Boeing and Airbus to show how the US implementation of stand-alone DME facilities as RNAV fixes causes confusion among flight crews today.

NOTE: *There is no practical need to chart a stand-alone DME facility. A flight crew cannot use a stand-alone DME in any practical manner like they can a VOR/DME or VORTAC. Yet, a stand-alone DME facility can serve as a reference NAVAID for an aircraft's RNAV system when the aircraft includes a DME receiver as a sensor supporting the aircraft's RNAV or RNP system. However, this use of any DME facility, be it a stand-alone DME facility or a DME facility that's part of a VOR/DME or VORTAC, occurs automatically within the RNAV or RNP system. There is no requirement or need to annunciate the DME facilities the RNAV or RNP system is using for position estimation to the flight crew.*

In contrast to the nonstandard depiction of stand-alone DME facilities on the flight deck, the charting, electronic display and operational use of RNAV waypoints is widely accepted, standardized and understood by the flying community. Aircraft OEMs generally offer map displays using the common waypoint symbol (i.e. “✦”) to depict an RNAV waypoint. Likewise, instrument chart providers consistently represent RNAV waypoints with this common symbol. Prior to the introduction of the stand-alone DME facility to the US NAS, the standardized use of the RNAV waypoint symbol (i.e. “✦”) on the flight crew's charts and the aircraft's electronic displays promoted efficiency, clarity and easy understanding during day-to-day PBN operations. There was no confusion between the depiction of an RNAV waypoint and the application of a VOR/DME or a VORTAC facility as an RNAV waypoint or fix as part of a route or procedure.

Recommendations: When decommissioning a VOR from an existing VOR/DME or VORTAC that is in use as an RNAV waypoint on a published PBN route or procedure, and the geographic location of the stand-alone DME facility remains a waypoint supporting the route or procedure; the FAA should define a new RNAV waypoint with a five character name at the same location as the DME facility. The RNAV waypoint should be used in lieu of the DME in defining the PBN route or procedure.

Criteria should be updated to specifically allow this name change as an abbreviated amendment to the existing RNAV procedure to minimize FAA workload and facilitate the change. (Suggested change to 8260.19 Section 4-5-7 c would be to add a line “Replacement of a ground-based navaid with an RNAV fix when Navaid is part of the route description and Navaid is decommissioned.”).

RATIONALE: Standardizing the charting and the display of the geographic location of a decommissioned VOR as an RNAV waypoint can completely avoid flight crew and ATC confusion. Meanwhile, the retention of the stand-alone DME facilities in the NAS as part of the US AIP and aeronautical data (e.g. the NAVAID catalog) can remain tacit from a charting perspective, while not compromising the RNAV and RNP systems use of all available DME facilities as a source for position estimation. This would ultimately retain the benefits of the ongoing use of the internationally standardized waypoint symbol (i.e. “✦”) on charting products and the aircraft flight decks, while also supporting the goals of the NextGen VOR and DME programs.