

removed. Some VOR equipment decodes the identifier and displays it to the pilot for verification to charts, while other equipment simply displays the expected identifier from a database to aid in verification to the audio tones. You should be familiar with your equipment and use it appropriately. If your equipment automatically decodes the identifier, it is not necessary to listen to the audio identification.

**d.** Voice identification has been added to numerous VORs. The transmission consists of a voice announcement, “AIRVILLE VOR” alternating with the usual Morse Code identification.

**e.** The effectiveness of the VOR depends upon proper use and adjustment of both ground and airborne equipment.

**1. Accuracy.** The accuracy of course alignment of the VOR is excellent, being generally plus or minus 1 degree.

**2. Roughness.** On some VORs, minor course roughness may be observed, evidenced by course needle or brief flag alarm activity (some receivers are more susceptible to these irregularities than others). At a few stations, usually in mountainous terrain, the pilot may occasionally observe a brief course needle oscillation, similar to the indication of “approaching station.” Pilots flying over unfamiliar routes are cautioned to be on the alert for these vagaries, and in particular, to use the “to/from” indicator to determine positive station passage.

**(a)** Certain propeller revolutions per minute (RPM) settings or helicopter rotor speeds can cause the VOR Course Deviation Indicator to fluctuate as much as plus or minus six degrees. Slight changes to the RPM setting will normally smooth out this roughness. Pilots are urged to check for this modulation phenomenon prior to reporting a VOR station or aircraft equipment for unsatisfactory operation.

**f. The VOR Minimum Operational Network (MON).** As flight procedures and route structure based on VORs are gradually being replaced with Performance-Based Navigation (PBN) procedures, the FAA is removing selected VORs from service. PBN procedures are primarily enabled by GPS and its augmentation systems, collectively referred to as Global Navigation Satellite System (GNSS). Aircraft that carry DME/DME equipment can also use RNAV which provides a backup to continue flying PBN

during a GNSS disruption. For those aircraft that do not carry DME/DME, the FAA is retaining a limited network of VORs, called the VOR MON, to provide a basic conventional navigation service for operators to use if GNSS becomes unavailable. During a GNSS disruption, the MON will enable aircraft to navigate through the affected area or to a safe landing at a MON airport without reliance on GNSS. Navigation using the MON will not be as efficient as the new PBN route structure, but use of the MON will provide nearly continuous VOR signal coverage at 5,000 feet AGL across the NAS, outside of the Western U.S. Mountainous Area (WUSMA).

**NOTE—**

*There is no plan to change the NAVAID and route structure in the WUSMA.*

The VOR MON has been retained principally for IFR aircraft that are not equipped with DME/DME avionics. However, VFR aircraft may use the MON as desired. Aircraft equipped with DME/DME navigation systems would, in most cases, use DME/DME to continue flight using RNAV to their destination. However, these aircraft may, of course, use the MON.

**1. Distance to a MON airport.** Within the contiguous United States (CONUS), the VOR MON is designed to ensure that an airport that has an instrument approach that is not dependent on GPS, ADF, DME or radar within 100 NM of any location. These airports are referred to as “MON airports” and will have an ILS approach or a VOR approach if an ILS is not available. VORs to support these approaches will be retained in the VOR MON. MON airports are charted on low-altitude en route charts and are contained in the Chart Supplement U.S. and other appropriate publications.

**NOTE—**

*Any suitable airport can be used to land in the event of a VOR outage. For example, an airport with a DME-required ILS approach may be available and could be used by aircraft that are equipped with DME. The intent of the MON airport is to provide an approach that can be used by aircraft without ADF or DME when radar may not be available.*

**2. Navigating to an airport.** The VOR MON will retain sufficient VORs and increase VOR service volume to ensure that pilots will have nearly continuous signal reception of a VOR when flying at 5,000 feet AGL. A key concept of the MON is to ensure that an aircraft will always be within 100 NM

of an airport with an instrument approach that is not dependent on GPS. (See paragraph 1-1-8.) If the pilot encounters a GPS outage, the pilot will be able to proceed via VOR-to-VOR navigation at 5,000 feet AGL through the GPS outage area or to a safe landing at a MON airport or another suitable airport, as appropriate. Nearly all VORs inside of the WUSMA and outside the CONUS are being retained. In these areas, pilots use the existing (Victor and Jet) route structure and VORs to proceed through a GPS outage or to a landing.

### 3. Using the VOR MON.

(a) In the case of a planned GPS outage (for example, one that is in a published NOTAM), pilots may plan to fly through the outage using the MON as appropriate and as cleared by ATC. Similarly, aircraft not equipped with GPS may plan to fly and land using the MON, as appropriate and as cleared by ATC.

#### **NOTE-**

*In many cases, flying using the MON may involve a more circuitous route than flying GPS-enabled RNAV.*

(b) In the case of an unscheduled GPS outage, pilots and ATC will need to coordinate the best outcome for all aircraft. It is possible that a GPS outage could be disruptive, causing high workload and demand for ATC service. Generally, the VOR MON concept will enable pilots to navigate through the GPS outage or land at a MON airport or at another airport that may have an appropriate approach or may be in visual conditions.

(1) The VOR MON is a reversionary service provided by the FAA for use by aircraft that are unable to continue RNAV during a GPS disruption. The FAA has not mandated that preflight or inflight planning include provisions for GPS- or WAAS-equipped aircraft to carry sufficient fuel to proceed to a MON airport in case of an unforeseen GPS outage. Specifically, flying to a MON airport as a filed alternate will not be explicitly required. Of course, consideration for the possibility of a GPS outage is prudent during flight planning as is maintaining proficiency with VOR navigation.

(2) Also, in case of a GPS outage, pilots may coordinate with ATC and elect to continue through the outage or land. The VOR MON is designed to ensure that an aircraft is within 100 NM of an airport, but pilots may decide to proceed to any appropriate airport where a landing can be made.

WAAS users flying under Part 91 are not required to carry VOR avionics. These users do not have the ability or requirement to use the VOR MON. Prudent flight planning, by these WAAS-only aircraft, should consider the possibility of a GPS outage.

#### **NOTE-**

*The FAA recognizes that non-GPS-based approaches will be reduced when VORs are eliminated, and that most airports with an instrument approach may only have GPS- or WAAS-based approaches. Pilots flying GPS- or WAAS-equipped aircraft that also have VOR/ILS avionics should be diligent to maintain proficiency in VOR and ILS approaches in the event of a GPS outage.*

### 1-1-4. VOR Receiver Check

a. The FAA VOR test facility (VOT) transmits a test signal which provides users a convenient means to determine the operational status and accuracy of a VOR receiver while on the ground where a VOT is located. The airborne use of VOT is permitted; however, its use is strictly limited to those areas/altitudes specifically authorized in the Chart Supplement U.S. or appropriate supplement.

b. To use the VOT service, tune in the VOT frequency on your VOR receiver. With the Course Deviation Indicator (CDI) centered, the omni-bearing selector should read 0 degrees with the to/from indication showing "from" or the omni-bearing selector should read 180 degrees with the to/from indication showing "to." Should the VOR receiver operate an RMI (Radio Magnetic Indicator), it will indicate 180 degrees on any omni-bearing selector (OBS) setting. Two means of identification are used. One is a series of dots and the other is a continuous tone. Information concerning an individual test signal can be obtained from the local FSS.

c. Periodic VOR receiver calibration is most important. If a receiver's Automatic Gain Control or modulation circuit deteriorates, it is possible for it to display acceptable accuracy and sensitivity close into the VOR or VOT and display out-of-tolerance readings when located at greater distances where weaker signal areas exist. The likelihood of this deterioration varies between receivers, and is generally considered a function of time. The best assurance of having an accurate receiver is periodic calibration. Yearly intervals are recommended at which time an authorized repair facility should recalibrate the receiver to the manufacturer's specifications.