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The Minimum Operational Network (MON) and the Future of VORs (Maj A. Alwin MNWG)
Much is being written about the fate of the 896 VORs (VHF Omnidirectional Range) that have populated the continental US since the mid-last century. Since the introduction of satellite navigation, VORs have become obsolete and are destined for the chopping block. If you've been nodding your head in agreement so far, you're in for a surprise.

In the field of aviation, the inherent limitations of VOR navigation are well known. With the introduction of RNAV, the ability to fly direct is a huge advantage, not to mention the ability to do so without signal loss. As more efficient performance-based navigation expands throughout the system, the need for maintaining the current network of VORs is diminishing. As a result, by 2030 the number of VOR stations in the contiguous U. S. will be reduced to 580. Current MON airports are identified on IFR low altitude charts and chart supplements. Relying solely on MON VORs aircraft equipped with VOR navigation only will likely result in a tortuous path from Point A to B. Most GA operations including CAP rarely use VORs to navigate.

The purpose of the VOR MON is to provide a backup navigation system in case of loss of GPS service. Users will be able to navigate through the signal loss area to a MON airport using VOR navigation and execute an ILS, VOR or Localizer approach. MON airport approaches will not require DME or ADF equipment to complete an approach. The VOR MON network assures that at least one airport will be within 100 Nautical Miles (NM). In addition, the MON VORs are being upgraded to increase service volumes to 70 nm from 5,000 feet to 14,000 feet. As a result of this increase in capability, the number of VORs required in the network can be reduced without impacting navigational integrity. The VOR MON network is not intended to be an efficient or useable navigation network for VOR- only aircraft (i.e., aircraft not equipped with GPS or Wide Area Augmentation System (WAAS) avionics). Not all airports will have instrument approaches that will be usable by VOR-only aircraft. In the MON, all VORs will be retained in Alaska, the Western U.S. Mountainous Area (WUSMA), and U.S. Islands and territories.

Changing over to MON VORs will also mean revising communications infrastructure, instrument procedure and chart revisions, VOR airways, etc. Aside from what has already been done, the FAA considers this a work in process and continually seeks input from those of us who use the system and other stakeholders. In the meantime, CAP Operations officers and pilots outside the WUSMA should familiarize themselves with the MON in their respective Wings. According to the FAA, the status of various VORs is evolving for some time to come. GPS outages will have an effect on our ability to navigate during airborne missions; therefore, we should be prepared for such an event.

It is not unusual to see NOTAMs for GPS outages on any given day although they tend to be geographically limited. CAP must be able to complete its mission with or without GPS. In the event of a national emergency, it's possible that the US Air Force will shut down the entire GPS system. We need to be ready to use MON and any other navigational aids to complete our mission.

Landing with another airplane occupying the same runway! (Maj D. Oppenheim LAWG)
Welcome to what will be the first of several articles throughout the year dealing with legal topics that CAP members (pilots and non-pilots alike) will hopefully find interesting, informative, and thought provoking. So go ahead, place 4 or more stripes on your shirt's epaulets and let's go metaphorically sit in the left seat.

The topic du-jour concerns the legality of landing on a runway where another aircraft is still occupying a portion of that same strip. I know what many of you are thinking; "He's lost his mind all over again." Under FAR 91.111(a) "No person may operate an aircraft so close to another aircraft as to create a collision hazard." I suppose my fellow attorneys could generate a lot of billable hours ascertaining the definition of "close to", but for now we will have to accept that, paraphrasing Justice Potter Stewart's Supreme Court opinion in "Jacobellis v. State of Ohio", the FAA "will know it when they see it.". CAPR 70-1 provides some guidance in that area as to taxi operations, which can be found in section 9.11.6.3 which states CAP Pilots, and presumably the aircraft that they're in control of, "must remain 75 feet behind light, single engine aircraft, 200 feet behind light multi-engine, or light jet aircraft and 500 feet behind helicopters, heavy multi-engine or heavy Jet Aircraft." The CAP regulations, however, are silent as to the scenario postulated in the first sentence of this paragraph. So, what does the PIC do when another airplane is still on the runway? The answer is: "It depends".

With 11 airplanes in Louisiana Wing based at towered and non-towered airports alike, all with runways of varying length, it is possible, and legal, that you may land the CAP plane while another plane has not yet "exited" or departed the strip on which you intend to greet terra firma. We'll break this down by reviewing procedures at towered fields and then taking a gander at non-towered airports. Baton Rouge (KBTR) will be the towered airport in our example.

KBTR has three runways: 4L-22R @ 7500 feet, 13-31 at 7005 feet and 4R-22L at 3799 feet. In our example, our mighty bug-smasher has been cleared by the tower to land on RWY 13 and as we're barreling down final at breathtaking 65 knots, the Beech Bonanza that landed in front of us is still little more than half-way down the runway. With sweat soaked palms and a furrowed brow, our right hand is spring loaded to put all 180 horses into full after-burner and initiate a go-around. With a gnawing sense of discomfort, you query the tower controller, who is responding in a monotone voice acquired from years of listening to Gregorian Chants, advises "cleared to land." How can that be? There's another airplane slightly more than halfway down the runway! The legal answer lies in the FAA's Air Traffic Control Procedures Manual, when, between sunrise and sunset, and provided certain minimum distances from the landing threshold exist, the tower MAY issue a landing clearance while another aircraft is still on the runway.

For better or worse, landing aircraft are distributed into three categories, appropriately labeled Category I, II and III. For Category I aircraft, which are small single engine propeller driven aircraft weighing 12,500 lbs. or less, AND ALL helicopters, AND Category II aircraft, which are small twin engine propeller drive aircraft weighing 12,500 lbs or less AND Category III, which are all other aircraft, 3000 feet of separation from the landing threshold is all that is required for a Category I aircraft, ergo our CAP C172/182/206, to land behind another airplane which may be still on the runway. The landing threshold is identified by the threshold line markers at arrival end of a runway. (See photo). If a Category II aircraft is landing BEHIND a Category 1 or another Category II airplane, then 4500 feet separation is required. The Tower Controller must determine the separation distance prior to issuing the landing clearance and it's probably a good thing our Cessnas don't come with rear view mirrors anymore. The primary reason for issuing such a landing clearance is to increase the arriving and departing traffic flow.

Remember however, first and foremost, you are still the PIC and if you are uncomfortable landing on a controlled runway behind another airplane that hasn't exited, despite being cleared to land, initiate a go-around, and advise the tower. No points are deducted from any scorecard, no paperwork is initiated or required, and the tower controller will re-sequence you for another shot at the asphalt. That might involve a 5-mile downwind, but you will eventually get the runway all to yourself.

Moving over to the other side of the equation of "non-towered" facilities should cause our intrepid aviators to foment a slightly different thought process. Using Louisiana Regional (KREG) as an example, the AFD reflects a single runway, 5003 feet in length. In theory, it is legal to land on a runway at a non-towered facility prior to the airplane in front of you exiting or departing the runway, but is it wise and/or safe? Are any of us that good at judging if an aircraft is 3,000 feet past the runway threshold marker or only 2,850 feet? Does distance really matter? There will be no tower controller for guidance or to help you judge distance, so the wise choice is to land or takeoff only when the runway environment is fully clear. Remember to make sure you are on the correct CTAF for the facility in question and announce your intentions in accordance with Airman's Information Manual (AIM), paragraph 4-1-9 and Advisory Circular (AC) 90-66B.

As a caveat, please note that in my capacity as Wing Legal Officer, I represent CAP, not its individual members and that by merely perusing this article or having it stuffed in your "flight bag" does not make me your personal lawyer, nothing herein creates an attorney-client relationship or privilege, this article is for informational purposes only and should not be construed as, or constitutes, legal advice. Also, if the CAPR (CAP Regulations) and the FAR's (Federal Aviation Regulations) are referenced, then the more "restrictive" of the two is to be followed. Finally, as PIC, under FAR 91.3(a), "the pilot in command is directly responsible for, and is the final authority, as to the operation of that aircraft." Keep in mind that "just because an action is legal does not mean it's safe." If anyone has any questions, comments, concerns, or suggestions for future topics, please email me at doppenheim@cap.gov. That said, let's go out and fly!

Watchful eye (Maj M. Banner FLWG)

On 12 November 2022, two World War II – era aircraft, a Boeing B – 17 Flying Fortress and a Bell P – 63 King Cobra, collided while in formation flight during an airshow at Dallas Executive Airport in Dallas, Texas. Upon impacting the left side of the B – 17 at a high rate of speed, the P – 63 disintegrated immediately while slicing off the rear section of the B – 17s fuselage (Figs. 1 A and B).

Fig. 1 A

Fig. 1 B

This tragic mid-air collision (MAC) resulted in six fatalities as well as the irreplaceable loss of precious historical aircraft. Why did this MAC occur? In general, pilot distractions and ineffective visual scanning for other aircraft are contributing factors of MACs. Distractions, due to excessive head-down and looking inside and talking with crewmembers / passengers during critical portions of flight for example, take away from visually scanning for other traffic, predisposing to a MAC. (See FAA Advisory Circular 90 – 48E, Pilots' Role in Collision Avoidance for an excellent review of MAC prevention.)

Because a large majority of MACs and reported near mid-air collisions (NMAC) occur in the vicinity of airports, especially non-towered airports, along low-level training routes and in military operational areas (MOA) supports the notion that pilots should not rely on the "big sky theory" for MAC prevention. Considered as "high risk", MACs can be mitigated by applying risk management (RM) controls (best/safest course of action) such as the so-called "see and avoid" regulation FAR 91.113, i.e., ". . . under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft". This federal law requires pilots to scan the surrounding airspace for aircraft during all phases of flight, particularly while flying in the traffic pattern.

Visual scanning

Pilots should have their eyes outside the cockpit visually scanning for aircraft approximately 75% of the time and 25% of the time spent on visual tasks inside the cockpit (FAA FAR / AIM). Detecting aircraft deemed as potential collision threats at safe distances increases the time and options a pilot must evade those aircraft. For effective scanning, a series of short, regularly spaced eye movements should be performed; each eye movement should not exceed 10° and held for 1 to 2 seconds. For example, one method is to move the eyes in 10° segments from the left wingtip to the right wingtip over a 180° arc and then reverse the process back to the left wingtip (Fig 2). Also, scanning at least 10° up and 10° down from the horizon is recommended.

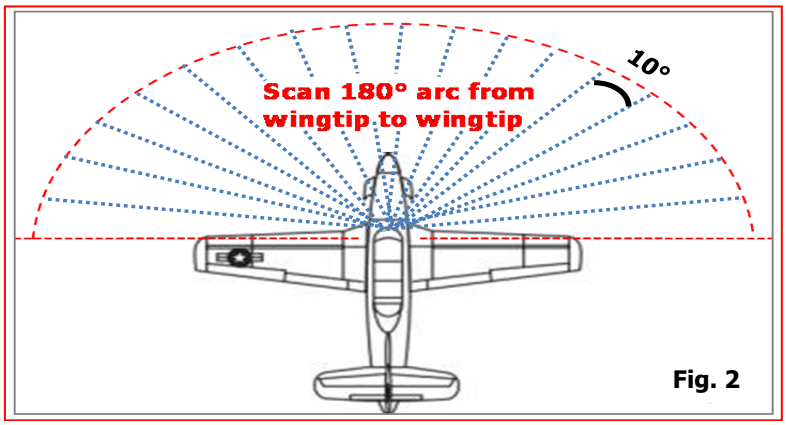

Fig. 2

Approach and Landing

It is estimated (AOPA) that 50% of all MACs occur in the traffic pattern, and, of these, most occur during final approach and landing. Pilots need to scan ahead, behind, above, and below while in the traffic pattern and make sure the final leg of the traffic pattern is clear before turning. This is particularly true at non-towered airports. Pilots also need to be aware of "blind spots", the result of airplane design that limits viewing, i.e., high-wing airplanes limit upward viewing, while low-wing airplanes limit downward viewing (Fig. 3). "Blind spots" have resulted in MACs where low wing airplanes have "landed" atop high wing airplanes (Fig. 4). Raising a wing to check for traffic before making a turn in a high-wing aircraft and making shallow S-turns when climbing and descending in any aircraft can help compensate for visual limitations imposed by aircraft design.

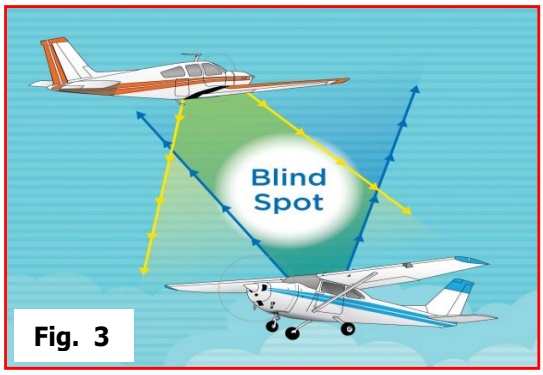

Fig. 3

Fig. 4

Scan for everything

Pilots need to be vigilant of all things occupying the airspace including birds, unmanned aircraft systems (UAS) or drones, powered parachute aircraft and skydivers. Figures 5 A and B depict a MAC accident (airplane and skydiver) that happened in 2014 at South Lakeland Airport (Lakeland, FL), a non-towered / uncontrolled grass strip at the edge of Lakeland Linder International Airport. A Cessna 170 was on short final coming in to land as a skydiver glided across the runway. The airplane was 75 feet above the ground when the pilot saw the skydiver. Although there was a collision, fortunately both the pilot and skydiver were not injured. The NTSB determined both the pilot and skydiver were at fault; the pilot for not visually scanning above for traffic (including skydivers) and the skydiver for being out of his drop zone and attempting to land on an active runway.

Fig. 5 A

Fig. 5 B

Traffic displays

What about electronic traffic display technology as a substitute for visually scanning for traffic? For example, in Figure 6 the inner and outer ring circumferences on the traffic display are at 5 and 10 NM respectively and nearby traffic considered as potential MAC threats are depicted in yellow. One target is approximately 1 NM and 100 feet above and climbing at the 12 o'clock position and a second target is 5 NM and descending from 500 feet above at the 5 o'clock position. The FAA does not consider using a cockpit traffic display as a substitute for visually scanning for traffic. Displayed traffic data should be considered as advisory information, not the primary and exclusive source of collision avoidance information. A traffic display, like an ADS-B traffic display example, is used to assist pilots acquire traffic by

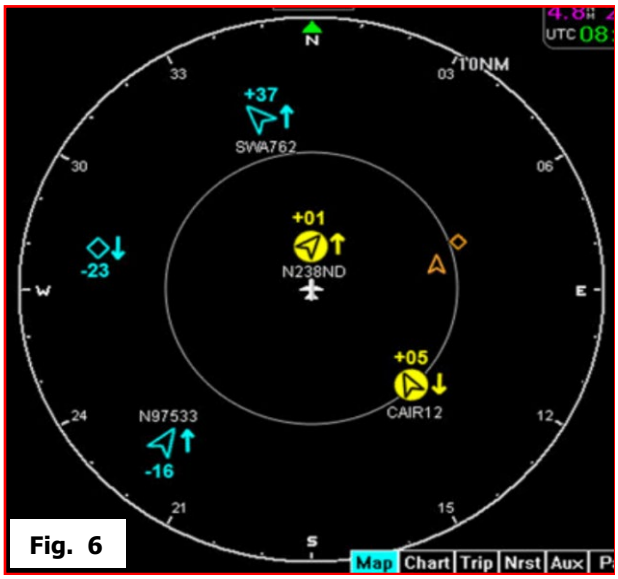

Fig. 6

providing situational awareness information (SA: knowing what is going on around you). When using a traffic display, verify the location of the traffic by visually scanning specific areas.

Communication – proper phraseology

When Air Traffic Control (ATC – tower or flight center controller) queries a pilot about traffic in the immediate area and visual contact is established, the pilot should use proper phraseology by stating "Traffic in sight"; if traffic is unseen, state "Negative contact". The FAA discourages pilots from using incorrect and ambiguous phraseology such as "Tally-ho" when traffic is observed and "Ain't got-em" when traffic is unseen. (FAR / AIM, Pilot Controller Glossary)

MAC avoidance strategies

Proper altitude: Fly VFR cruising altitudes that correspond with the magnetic course above 3,000 ft AGL between 0° and 179°, fly altitudes of odd thousands plus 500 (e.g., 5,500 ft MSL); between 180° and 359°, fly even thousands plus 500 feet (e.g., 4,500 ft MSL).

VFR flight following: Request flight-following service from ATC to provide traffic advisories.

Avoid congested airspace: Avoid overflying approach fixes and navaids, like VOR sites for example, as that airspace can get congested. Determine if special use airspace, such as military operations areas (MOA), warning areas and alert areas are active along the intended route of flight

Turn on lights: External lights make the aircraft more visible. Turn on landing lights during final approach and departure and make your aircraft easier to spot if a traffic alert is given.

Sterile cockpit: To minimize distractions while scanning, no talking is permitted during critical phases of a flight, i.e., taxi, takeoff, climb, descent for landing and landing (CAPR 70 – 1).

Non-towered airports: Monitor CTAF and make position reports at 10 miles out, 5 miles out and entering traffic pattern. Include airport's name at the transmission's beginning and end.

Traffic patterns: Prior to entering a traffic pattern, scan all legs of the traffic pattern for aircraft and report each leg while listening and keeping a watchful eye out for other traffic.

Before takeoff: Prior to taxiing onto a runway, particularly at a non-towered airport, scan the approach and departure areas of the runway, as well as any intersecting runways.

Climbs and descents: Execute gentle banks to the left and right at intervals that permit visual scanning of the airspace during climbs and descents.

Clearing turns: Prior to practicing any flight maneuver, visually scan while flying clearing turns. 90° to 180° to the left and right, as well as scanning above and below.

Listening: Pilots should always listen on the CTAF or tower frequency 10 to 15 NM while inbound to an airport to help develop a mental picture of where traffic is located when entering and exiting the traffic pattern. This valuable SA information also helps a pilot understand directional movement of aircraft in the traffic pattern, runways in use for takeoff and landing and where to visually scan to mitigate a MAC.

Ground collision avoidance
It is also important to employ RM controls while taxiing to mitigate distractions that divert a pilot's attention from scanning outside of the airplane, risking collisions with aircraft, vehicles, structures, and people. Consider the following ground collision avoidance controls while taxiing:

- Do not perform checklist tasks.
- Do not program flight plans and radio frequencies.
- Do not engage in unnecessary conversations.
- Do not taxi at high speeds. Taxi at a cautious speed, i.e., slow enough so when the throttle is closed, the airplane can be stopped promptly (FAA, Airplane Flying Handbook). Additionally, CAPR 70 – 1 specifies when within 10 feet of an obstacle, pilots shall taxi at a pace not to exceed a slow walk until clear and when within 6 feet of an obstacle, pilots shall not taxi a CAP aircraft under its own power.

Pilots of both manned aircraft and unmanned aircraft systems all have the responsibility to be aware of MAC conflicts and avoid them. Bottom line for MAC mitigation – *look outside* for traffic and *peak inside* at the flight instrument.

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