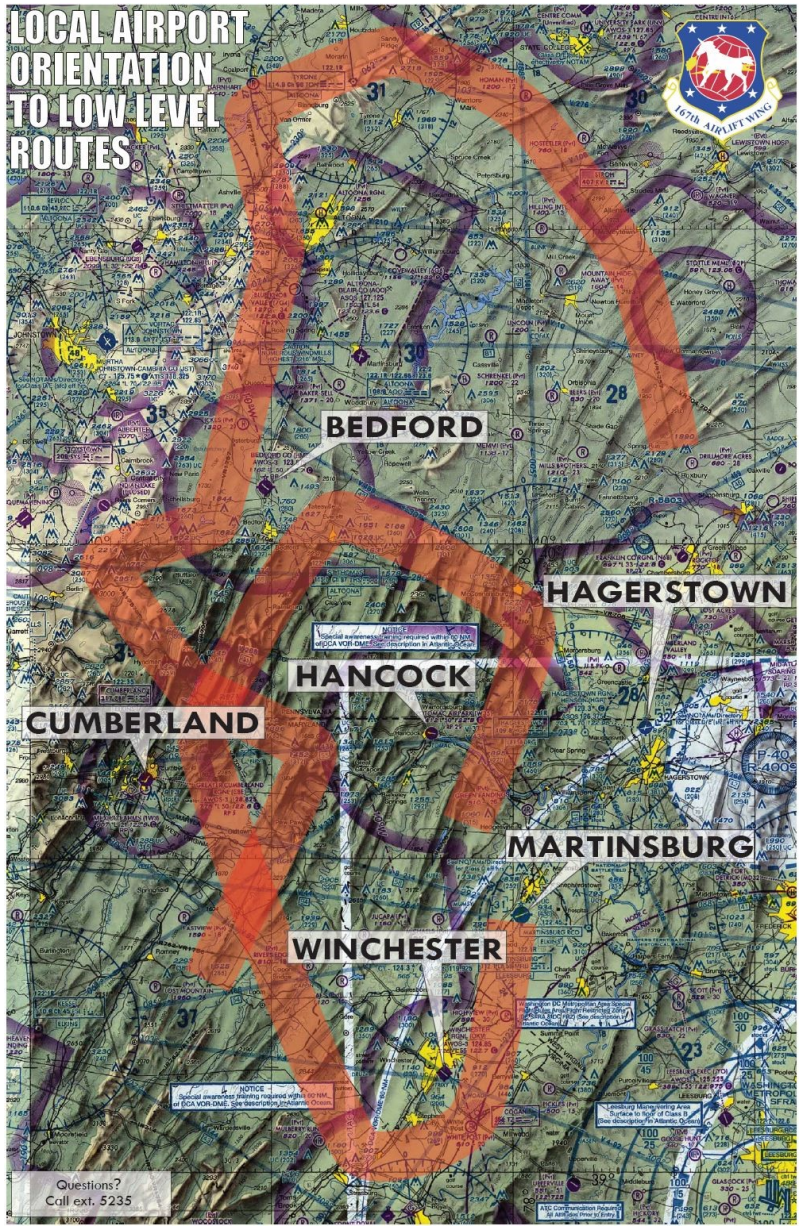


- Always be vigilant of low-flying, fast-moving military aircraft in the red-shaded areas.
- Occasionally, we fly random low level routes all over the state of WV.
- Speeds: Up to 350 knots, Altitudes: 300-2500 AGL
- At night, Aircraft lighting may vary due to the use of Night Vision Goggles.
- Wake turbulence hazards exist in trail.
- 1-800-WX-Brief will provide active routes and may have upcoming schedules.
- Further Questions? Call 167th Flight Safety @ 304-616-5235

167th Airlift Wing
Eastern WV Regional Airport
Shepherd Field (KMRB)
Martinsburg, WV

MID-AIR COLLISION AVOIDANCE (MACA)

167th AW Flight Safety Office
Eastern EV Regional Airport
Shepherd Field
Martinsburg, WV 25405
Phone: 304-616-5235

INTRODUCTION

The 167th Airlift Wing is part of Air Mobility Command, a worldwide network of bases whose primary mission is transporting people and equipment. Our base is located at Eastern WV Regional Airport (EWVRA), Shepherd Field (KMRB), which is 55 miles northwest of the Washington DC metropolitan area, and 36 miles northwest of Washington Dulles IAP. The base is home to the 167th Airlift Wing (AW), West Virginia Air National Guard. The 167th AW operates 8 C-17 Globemaster III aircraft. There are many public and private airfields within a 40-mile radius of EWVRA including two restricted areas, i.e. P-40 and the DC SFRA. Due to the proximity of three major international airports (IAD, BWI, and DCA), local air traffic is often congested. The types of aircraft transiting the area range from home-built ultra lights to huge Jumbo-jets to supersonic fighter aircraft.

BOTTOM LINE…The potential for a mid-air collision is extremely high!

POTOMAC APPROACH CONTROL AIRSPACE
MARTINSBURG CLASS "D" AIRSPACE

EWVRA is surrounded by Class D airspace. Every aircraft should contact Martinsburg Tower (124.3) before entering the airspace. Since we all share the same sky, it is our duty to know about your flying operations and stay out of your way while letting you know about our activities. **The best way to avoid a mid-air collision is to stay alert, communicate your intentions to ATC (Potomac and/or Tower), request flight following, and operate your transponder in Mode C to maximum extent possible.** Help us know where you are and where you are going. We monitor the same frequencies you do and we will be looking and listening for you! If you intend on traversing the Class D airspace, establish and maintain two-way radio contact with Martinsburg Tower (124.3) prior to entering Martinsburg Class D airspace.

Pilots should be especially alert for heavy C-17 jet traffic when flying within 15 nautical miles of EWVRA since operations are conducted 24 hours a day, 7 days a week, every day of the year. Visual traffic patterns are flown to both ends of the runway including various VFR opposite direction approaches. Extensive NVG (night vision goggle) training is also being conducted. IFR radar pattern altitude is usually 3,000— 4,000 feet MSL, while our VFR traffic pattern is flown at 2,100 feet MSL. However, we occasionally fly non-standard VFR tactical approaches to the airfield from altitudes 1100 feet MSL to 9,500 feet MSL and from any angle of approach to the field. Planned NVG operations are always published in the NOTAMS for KMRB at least 24 hours prior.

When flying training sorties and real world missions, our crews use special call signs. Expect to hear call signs beginning with "DECOY" (for local area flying) or "REACH" (for missions). The majority of our local area flying involves maneuvering to the west and southwest with traffic patterns flown on the north side of the field for a right base to runway 26. As stated earlier, we incorporate tactical maneuvers into our training so the maneuvering areas and patterns will vary.

SUMMARY

Mid Air Collision Avoidance (MACA) is the responsibility of everyone who flies an aircraft. Advances in technology have reduced the likelihood of mid-air collisions, but "the system" is not foolproof. Situational awareness and knowing who and where potential mid-air collisions are likely to occur is a huge step in flying safely and mishap free.

IMPORTANT TELEPHONE NUMBERS

167th Airlift Wing
Flight Safety Office 304-616-5235
Public Affairs 304-616-5240/5251
http://www.167aw.ang.af.mil

FAA Baltimore Flight Standards District Office
Main Switchboard (410) 787-0040

FAA Washington Flight Standards District Office
Main Switchboard (703) 230-7664

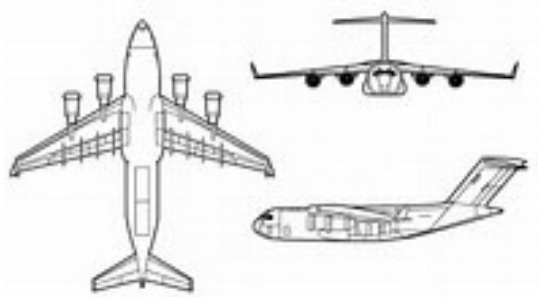
FAA Safety Team (FAASTeam) https://www.faasafety.gov

Flight Service 1-800-WX-BRIEF https://www.1800wxbrief.com

***** The SEEANDAVOID website is currently down and will be remain down for the near future. The National Guard Bureau is working with DOD on how best to bring the program back online. *****

This pamphlet was designed to spark interest in the subjects of mid-air collision avoidance, wake turbulence, and to familiarize you with the operations at Eastern WV Regional Airport, Shepherd Field, KMRB. If you have questions concerning these topics, please call us at 304-616-5235.

C-17A GLOBEMASTER III, KMRB, MARTINSBURG, WV



Height: 55 feet

Length: 174 feet

Wingspan: 170 feet

Max Takeoff Weight: 585K Lbs

Low level routes: 300-1500 AGL, 180-350 knots

Pattern & VFR Speeds: 160-250 knots

Final Approach Speed: 120-140 knots

VFR TACTICAL TRAINING: Departures and Arrivals

National security largely depends on the ability of our military forces to safely deliver troops and equipment in a combat environment. One method we use while penetrating unfriendly airspace involves low-level flying. Occasionally, you may see one of our huge C-17 aircraft flying extremely low at high speed, either departing or approaching EWVRA from any direction. High-speed combined with low altitude make see-and-avoid much more difficult. Outside vigilance is key!

LOW LEVEL MILITARY TRAINING ROUTES

Numerous low level military training routes are located throughout the U.S. The Tri-State area is no exception. Aircraft not only from the 167th Airlift Wing but also from other military units will be operating at altitudes down to approximately 300 feet AGL and sometimes at speeds much greater than 250 knots. Many of these routes are depicted on the VFR sectionals as light grey lines labeled VRxxx or IRxxx. Slow Routes (SRxxx) are not on sectionals but most local FSS stations can to tell if the any routes in your planned flying area are active.

TRANSPONDERS

Private pilots can help Air Traffic Control (ATC) by installing a transponder in their aircraft. The difference between a non-transponder equipped aircraft and one with a transponder is substantial. Transponders make the radar signature "size" of a Piper Cub the same as a jumbo jet. If you have a transponder (preferably with "MODE C" altitude encoding), USE IT! Many pilots turn the transponder off when leaving terminal areas to "save" its useful life. There are two dangers in this practice. One danger is you become less visible on the controller's radarscope, and the other is the possibility of forgetting to turn it back on at your destination. A final thought…your operative altitude-encoding transponder can help our Traffic Alert and Collision Avoidance System (TCAS) equipped C-17 aircrews see and avoid you. Extend everyone's "useful life" and leave it on!

MID-AIR COLLISION STATISTICS

Almost 50 percent of mid-air collisions result in at least one death. Naturally, mid-air collision avoidance (MACA) is an important aviation safety topic. With the sky becoming more and more congested, the threat of a mid-air collision is increasing. According to the NTSB, the most probable cause of mid-air collision is the "pilot in command failed to see and avoid other aircraft". Aircraft speeds today challenge our ability to "see and avoid".

Here are a few facts about mid-air collisions:

1. Mid-air collisions generally occur during daylight hours:

- 56% of the accidents occurred in the afternoon.
- 32% of the accidents occurred in the morning.
- 12% of the accidents occurred at night, dusk, or dawn.
-

2. Most mid-air collisions occur under good visibility.

3. Flight fatigue (fatigue resulting directly from flight related operations) was not a major factor in mid-air collisions:

- The average flight time prior to the collision is 45 minutes. This time varies from takeoff to over 7 hours.
- 60% of the pilots on the mishap flight had been airborne 30 minutes or less.
- Only 6% had been flying longer than 2 hours.

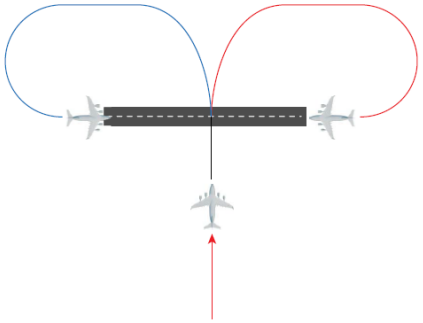
BLIND SPOT

We all have a "blind spot." Potential for a midair collision lies within this blind spot. At one mile this area could be 800 feet by 500 feet, and at 5 miles, this area could be almost a mile wide. One way you can compensate for the blind spot is to move your head around while doing your scanning and look more than once in a given direction. Here is a demonstration on locating your blind spot. With your right eye closed, look at the cross on the right. Move the paper back and forth about a foot away from your eye; the circle on the left will disappear. When that happens, the circle is in your blind spot.

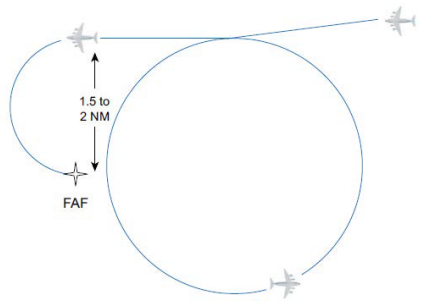
TYPICAL 167AW C-17 VFR REQUESTS

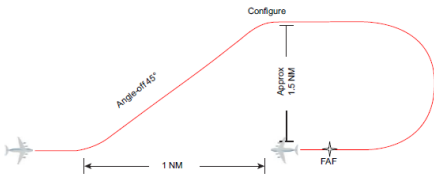
"TOWER, DECOY XX request (high/low) (beam/teardrop/90-270/overhead/spiral down) approach for (runway), (left/right) base from (altitude)"

BEAM

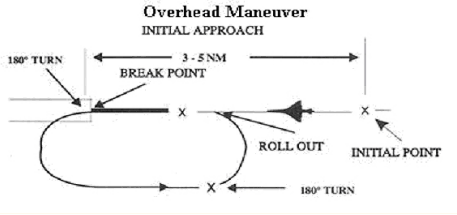


SPIRAL DOWN

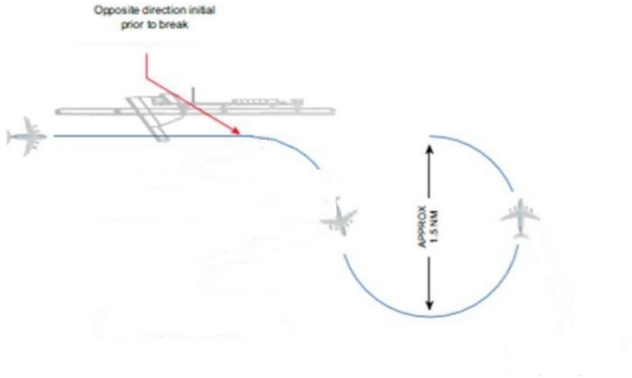




TEARDROP



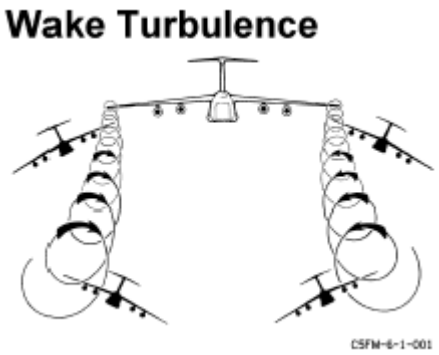
OVERHEAD



90-270

WAKE TURBULENCE – Airborne

According to http://media.nasaexplores.com/lessons, "… in late 1969, (the) Dryden Flight Research Center pilots began investigating wake vortices by flying an instrumented F-104 fighter behind a B-52 bomber and C-5 transport. The C-5's vortices were so strong that on one flight, they caused the F-104 to roll inverted and lose 3,000-4,000 feet of altitude, even though the fighter was flying 10 miles behind the larger airplane." Assume the C-17 has the same effects as the C-5.

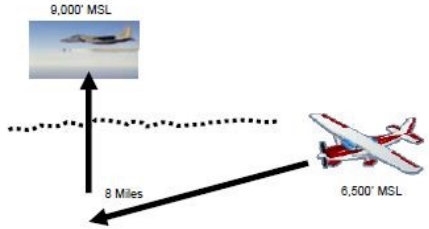


COLLISION AVOIDANCE TIPS

1. Clear constantly for other aircraft, both visually and over the radios.
2. Know where high-density traffic areas are.
3. Obtain an IFR clearance or participate in radar flight following whenever possible and continue to practice "see and avoid" at all times.
4. Use landing lights at lower altitudes, especially when near airports.
5. Announce your intentions on UNICOM and use standard traffic pattern procedures at uncontrolled airfields…. Be predictable!
6. Always use your Mode C transponder if equipped.
7. Use the appropriate hemispherical altitudes and don't let your altitude "wander".
8. Fly as high as possible.
9. Keep your windscreen clean. A bug on the windscreen can obstruct your view of other airborne aircraft coming your way.
10. Don't get complacent during instruction! Instructors make mistakes too. Many mid-air collisions occur during periods of instruction or supervision.
11. When flying at night, avoid white light in the cockpit. White light disrupts your night vision, even when used momentarily.
12. Beware of wake turbulence.
13. Understand the limitations of your eyes and use proper visual scanning techniques. If an aircraft appears to have no relative motion but is increasing in size, you are on a collision course.
14. Practice appropriate clearing procedures before and during all climbs, descents, and turns.
15. Avoid complacency. SEE AND BE SEEN!

FINDING THE TRAFFIC

Let's say you are flying neat KMRB at 6,500' MSL and Tower gives you the following traffic call: "N1234AB, you have military traffic at your 2 o'clock, 8 miles 9,000 feet". The easiest way to find it is to first look at the 2 o'clock position, then focus your eyes to something on the ground at the approximate distance (8 miles in this case), then move your eyes up to the altitude (slightly above the horizon in this case). Works like a charm! Tower may also tell you the traffic is "maneuvering" which means the position is changing rapidly. Keep asking for position reports if initially unable to acquire the traffic.



SCANNING TECHNIQUES

EMPTY FIELD MYOPIA

When flying in clear, cloudless skies, like we mostly have here in the high desert regions of California, your eyes will focus on the instrument panel or the propeller, only 3'-6' in front of you. That means you will have to refocus your eyes to find traffic. Add that to the reaction time described on page 21 and now it will take you even longer to move out of danger.

DISTRACTIONS

That cool new GPS you have may be nice, the conversation with your friends may be engaging, the cool stuff on the ground may grab your interest, but all that may be diverting attention away from the traffic outside your airplane. Being a pilot means prioritizing. Keep most of your attention outside, especially when flying in a MOA.

BUGS

Clean that windshield. A traffic conflict will look like a bug when about 1 mile or more away from you. By the time a fast moving (fighter) traffic conflict is larger than the bugs on your windshield, it's already too late.

STANDARD SCANNING TECHNIQUE

Moving your eyes around the sky produces nothing but a blur for your brain to decipher. In order to see correctly, you must steady your eyes and focus on something other than the blue sky (Empty Field Myopia). Select about a 15 degree portion of the sky, focus your eyes on the ground at about 5 miles away, then move up and scan a few inches above and below the horizon. Move to the next 15 degree segment. Repeat often. This will keep your attention outside, and you can do this while talking to your friends. If you teach this to your passengers, they'll help out, and think you are cool...well, maybe not cool.

WHAT AFFECTS YOUR ABILITY TO SPOT TRAFFIC

1. **Image Size**: The bigger the jet, the easier it is to find.
2. **Luminance and Contrast**: Darkness, sunlight flare, haze and fog will affect contrast and reduce visibility.
3. **Darkness Adaptation**: It takes 30 minutes to adapt to darkness.
4. **Motion**: An object must move to interest the eye and the brain. A stationary object in the windshield is on a collision course.
5. **Exposure Time**: The more time to see, the better the odds of finding the traffic. Keep your attention outside in high traffic areas.

PILOT REACTION TIME

HUMAN LIMITATIONS

Although you may think that you can react quickly to a traffic conflict, the truth is that most of us take about 4 seconds to recognize another aircraft as a threat to our flight path. Then, it takes another 2-3 seconds to actually move the flight controls and get the aircraft to do something. If you are flying a small GA aircraft, it may take another 10 seconds just to climb or descend 50 feet. That means it will take about 16 seconds from spotting a threat to moving your aircraft only 50 feet off altitude to avoid a midair. In those 16 seconds, a military jet can travel a long way at 250-350 KIAS.

HOW CLOSE IS TOO CLOSE?

Studies have shown that if two aircraft are closing at 600 KIAS, on a collision course (you at 100 KIAS and the jet fighter at 500 KIAS), there is no way to avoid a midair if they see each other at closer than 1.5 miles. This even assumes the jet fighter pulls 7 Gs to try to avoid the impact. Assuming both pilots see each other at 1.5 miles, and by the time they take the 6 seconds to move their aircraft, the impact will occur. No way out, none! High speed jets keep their landing and taxi light retracted to avoid drag, therefore they cannot turn them on in flight. BUT, you can turn yours on! At 10 miles, a jet pilot has plenty of time to move out of your way.

We do not see a lot of jet fighters at EWVRA but we do have a lot of heavy military traffic. Heavy aircraft utilize landing and taxi lighting below 10,000 feet MSL except for during NVG operations. During NVG operations all forward facing lights are infrared (IR) and only visible using night vision devices. C-17s do have an option of mixing forward IR lights and normal position and anti-collision lighting. So at night, a C-17 flying NVG operations will have normal lighting from the rear and side aspects; nose-to-nose, you will only see the red anti-collision lights flashing on the top and bottom of the fuselage. It is very difficult to judge separation based on just these anti-collision lights.

MANEUVERING

It's no secret that a small GA aircraft can't perform like a jet fighter or most heavy military aircraft. But every airplane has its strengths. When a heavy jet goes into a turn, it has a turn radius of about 1-2 nautical miles depending on speed, bank angle, and G-loading. However, most small GA aircraft can make the same turn in less than a 500 ft turn radius. That means you can out-turn our jets including fighters! How do you use this to your advantage? If you find you are on a collision course with a fast mover, big jet or small, you cannot out-climb or out-descend the higher performance jets, but you sure can turn tight and change your flight path quickly. Making a steep turn also exposes your entire wing, making you more visible. A tight turn may be your best option! Realize, if you turn to put a fast mover behind you, they will catch up quickly, and you'll lose sight too. Normally, turn to get the fast mover in front so they can cross your flight path as soon as possible. Just watch for wake turbulence after they have flown past.

WAKE TURBULENCE

"Every airplane generates wake turbulence in flight. Wingtip vortices are the most hazardous component of this wake. A wingtip vortex is a highly rotational mass of disturbed high-energy air created by an airfoil as it produces lift. (See figures below and next page.) The strength of the vortex is governed by the angle of attack and shape of the airplane wing. The strongest vortex occurs when the generating airplane is heavy, clean, and slow, (high angles of attack). If an airplane encounters wake turbulence, wingtip vortices can roll the airplane sharply, possibly exceeding the roll authority of the airplane. Avoid the area below and behind the generation airplane, especially at low altitude where even a momentary wake encounter can be hazardous. In all phases of flight, pilots should consider the wake turbulence generated by their airplane or preceding airplanes and plan or adjust their flight paths to minimize wake turbulence exposure to their own airplane or others. The amount of flight control input and the amount of time required to recover will depend on the severity of the wake turbulence encountered. In all cases, increasing power quickly but smoothly is always recommended. If engines become unstable due to the turbulent air, smooth throttle application is essential."

WAKE TURBULENCE – Takeoff and Landing

Wake turbulence is created when a wing is producing lift. It begins at rotation and ceases at touchdown. If landing on an adjacent runway where another aircraft has landed, keep in mind a crosswind might blow the wake turbulence toward you. When following an aircraft to touchdown, make note where the other aircraft landed. If continuing the approach, plan on touching down beyond the previous aircraft's landing point to avoid wake turbulence. Likewise, if taking off after another aircraft, delay takeoff unless you can liftoff at a point prior to the other aircraft, and can climb at a greater rate. Wake turbulence can linger for several minutes. **The best policy is to delay takeoff or landing until wake turbulence is no longer a factor.** Typically, the larger the size difference between aircraft, the more significant the wake turbulence hazard becomes.

Figure 16