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## **MID-AIR COLLISION AVOIDANCE**



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# INTRODUCTION

Midair Collision Avoidance (MACA) is a subject that is gaining heightened awareness among both civilian and military aviation communities. With increasing numbers of aircraft taking flight and many airports approaching gridlock, knowledge of air traffic and airfield operating procedures becomes more vital for pilots and aircrews. This pamphlet contains information on locally based aircraft operations, traffic patterns, arrival, and departure routes at Dover Air Force Base. The goal of the 436th Airlift Wing Flight Safety Office (436 AW/SEF) is to provide sufficient information to pilots and aircrew to enable recognition of potential midair collision hazards and help everyone enjoy a safe flying environment.

“See and avoid” is the proverb by which all aircrews must adhere regardless of operating IFR or VFR. In the local Dover airspace, large military aircraft tend to be relatively easy to see while smaller civilian aircraft tend to cause more difficulty in accurate visual acquisition. Nonetheless, it is everyone’s responsibility to visually scan for traffic at all times. Therefore, all aircraft transiting the Dover airspace are highly encouraged to use all available aircraft lighting, transponder, and Air Traffic Control (ATC) advisory services to the maximum extent possible.

The 436 AW/SEF is the Office of Primary Responsibility (OPR) for the development, publishing, and maintenance of the Dover AFB Midair Collision Avoidance (MACA) pamphlet. If you have any questions concerning information contained within this pamphlet, contact the 436 AW/SEF at (302) 677-2048 or Air Traffic Control at (302) 677-3262.



## DOVER AFB

Dover Air Force Base is part of Air Mobility Command, a worldwide network of bases whose primary mission is transporting people and equipment. Our base is located 60 miles east of the Baltimore/Washington area, and 60 miles south of Philadelphia.

The base is home to the 436th Airlift Wing (AW) and the 512th Airlift Wing (Reserves). Together, the wings operate the jumbo strategic airlift C-5 Galaxy and the dynamic airlift C-17 Globemaster III aircraft.

There are over 50 civilian airfields within a 60 mile radius of Dover AFB. Since Dover is the largest military aerial port on the East Coast, local air traffic is often congested. The types of aircraft transiting the Delmarva airspace range from home-built ultra lights to huge jumbo-jets to supersonic fighter aircraft.

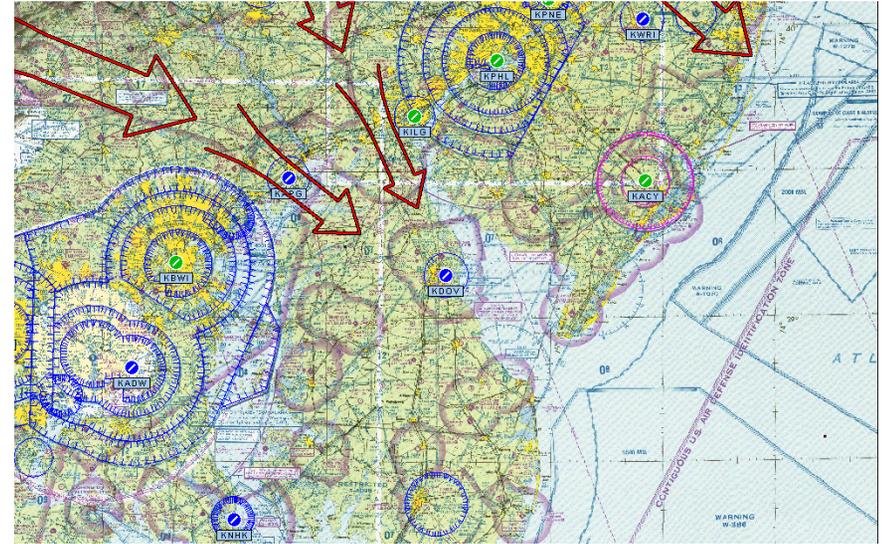
**BOTTOM LINE...**The potential for a mid-air collision is extremely high!



**C-172 after midair with C-150**

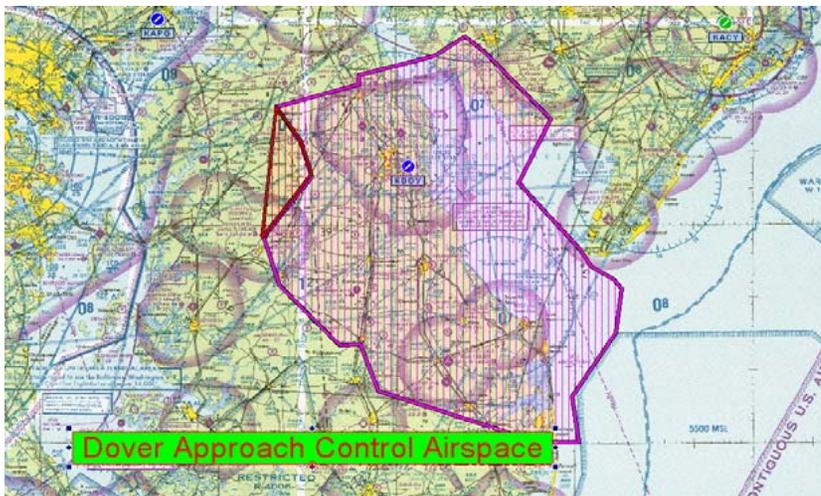
## DOVER AIRSPACE

The airspace surrounding Philadelphia, Baltimore, and Washington DC is some of the busiest in the country. Dover's proximity to these areas brings a high volume of traffic through the Delmarva Peninsula and increases the chances of a mid-air collision.



## RADAR APPROACH AIRSPACE

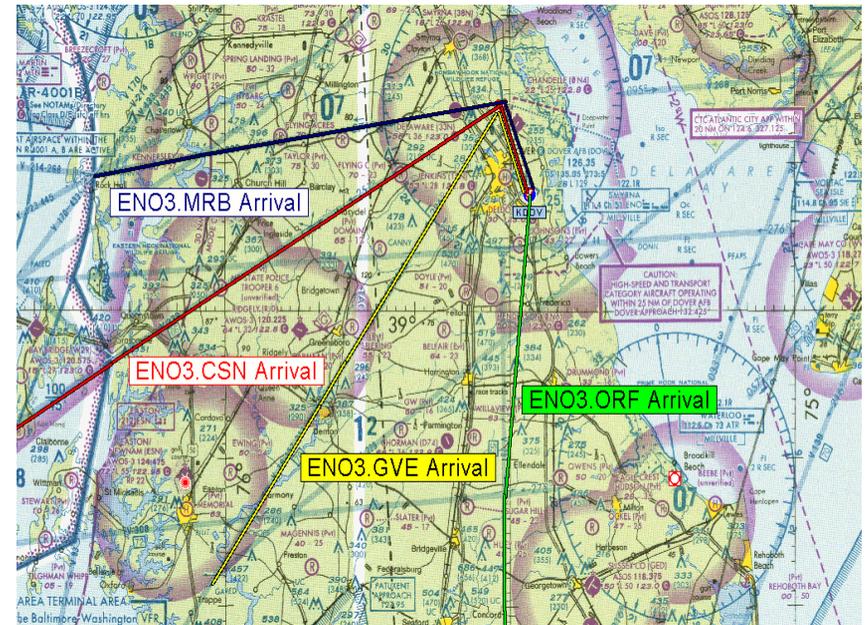
Dover AFB provides radar control services to aircraft transiting the area shown on the following page for altitudes 7,000 ft and below. Above 8,000 ft, the airspace is controlled by Washington Center. The most congested area in our airspace is north of the base. Most VFR traffic passes north of Dover and south of Philadelphia. Arriving traffic landing runway 19 intercept the localizer at 1,700 feet MSL. Traffic departing runway 01 and runway 32 initially climbs to 3,000 feet MSL. Be cautious for arriving and departing traffic!



**Dover Approach Control Airspace.**

## DEPARTURES/ARRIVALS AND APPROACHES

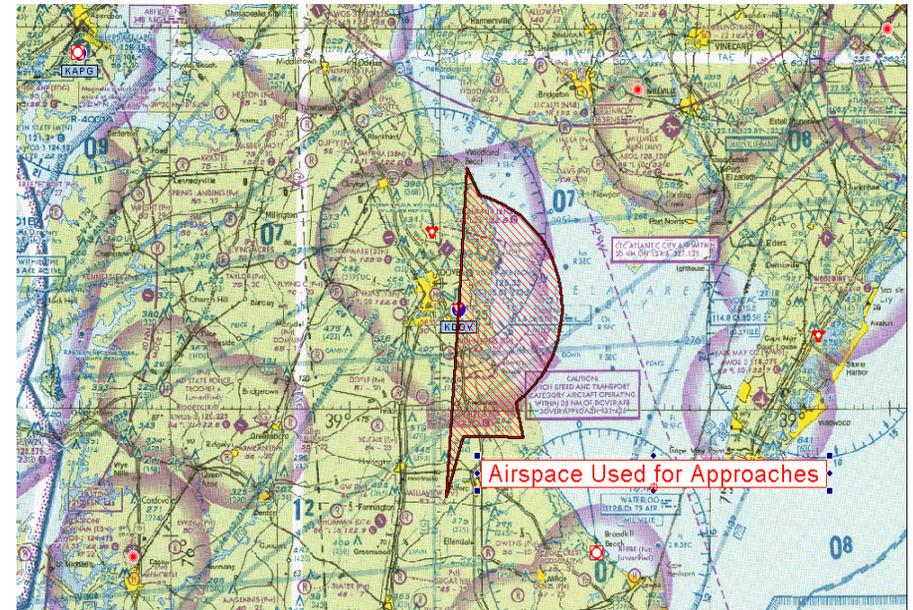
Depicted on the following pages are the various routes that IFR aircraft use to get in and out of Dover AFB. Pilots use these during both IMC and VMC weather conditions. Numerous near mid-air collisions have taken place in this type of airspace and it requires considerable attention when transiting it. **Airspeeds will range up to 250 knots.**



**Smyrna 3 Arrival from the south and west (ENO3).**

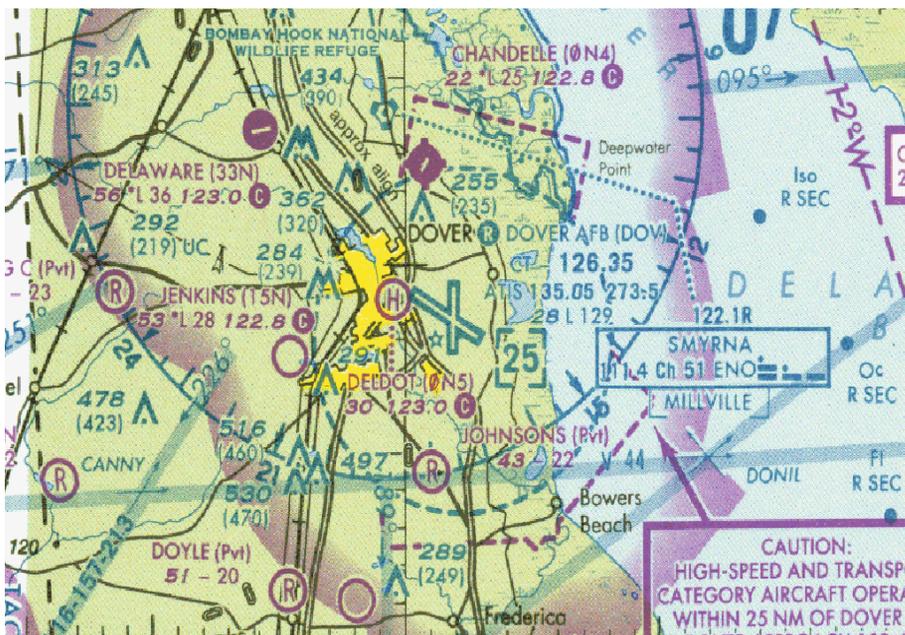


**Sea Isle 5 departure to the east (SIE5).**



**Airspace typically used for instrument approaches.**

# DOVER CLASS D AIRSPACE



The base itself is surrounded by Class D airspace. Every aircraft should contact Dover Approach (132.425) 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 and communicate your intentions to Dover Approach Control (132.425) and request flight following. Help us know where you are and where you're going. We monitor the same frequencies you do and we'll be looking and listening for you. If you intend on traversing the Class D airspace, establish and maintain two-way radio contact with Dover Approach (132.425) prior to entering the airspace.

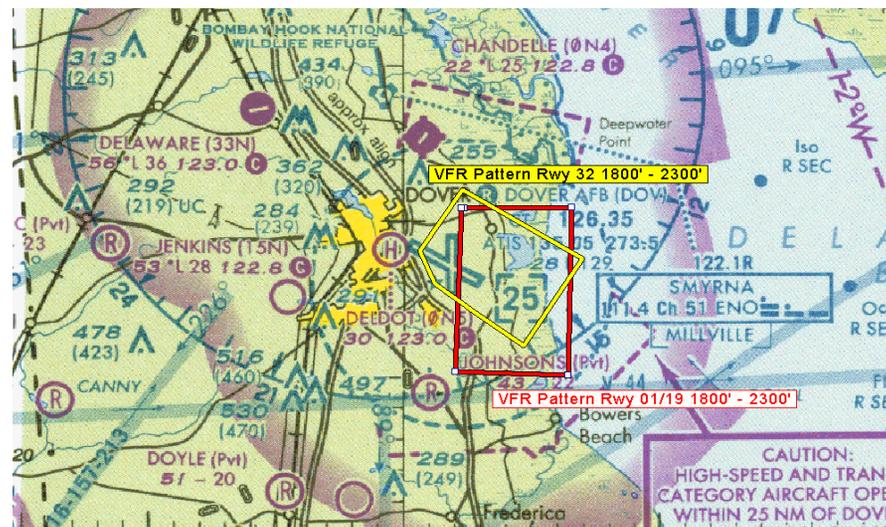
Pilots should be especially alert for heavy C-5 / C-17 jet traffic when flying within 15 nautical miles of Dover AFB since

extensive operations are conducted 24 hours a day, 7 days a week, every day of the year. Our normal traffic pattern is 3,000 feet MSL and below. However, we occasionally fly non-standard VFR approaches to the airfield from altitudes as high as 5,000 feet MSL.

Our traffic pattern is normally flown east of the airfield. IFR radar pattern altitude is usually 3,000 feet MSL, while our VFR traffic pattern is flown at 1,800 feet MSL.

In addition, C-17 formations of up to 4 aircraft with 1 minute separation may launch from Dover AFB. The elements will then rejoin and fly in one mile trail formation utilizing 500 feet altitude separation. It is very important to realize that if you see one military aircraft, look out for others in formation.

Our crews use special call signs. Training sorties use "BOLAR" or "HAGAR" for C-5s and "ROYAL" or "RIDER" for C-17s. Our mission crews use the "REACH" call-sign.



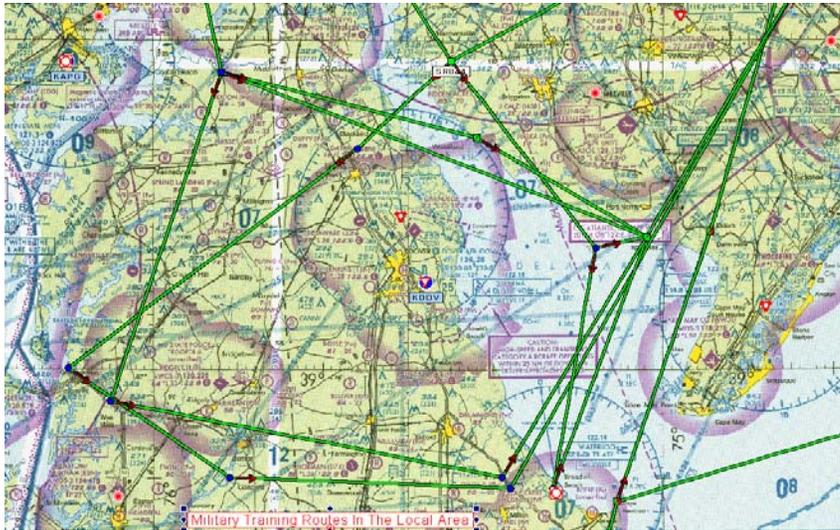
**Typical Dover VFR traffic patterns.**

VFR operations at and around Dover AFB are utilized during aircrew training maneuvers. Sometimes you will find us practicing high-speed, circling maneuvers at a variety of altitudes

within 10 miles of the base. We also train quite a bit at night with our lights out. If you plan to transit Dover's airspace while this kind of training is taking place, it would be best to over-fly at or above 5,000 feet.

## MILITARY TRAINING ROUTES (MTRs)

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. Being low-level proficient requires use of nationally-organized low-level Military Training Routes (MTRs). High-speed combined with low altitude make see-and-avoid much more difficult. Be vigilant when crossing a published MTR as any type of military aircraft could be on the route. Generally, the MTRs are established below 10,000 feet MSL for military operations at speeds in excess of 250 knots. Various aircraft use these routes from our large C-5 & C-17 to the small F-16 fighter jets. There are four operational MTRs within 50 miles of Dover AFB: SR-800, SR-844, SR-847, and VR-1709.



**Military Training Routes (MTRs) in the vicinity of Dover AFB.**

Route widths can vary along the MTR and extend several miles on either side of the charted MTR centerline depicted on sectional charts. Military aircraft conducting low level training can be anywhere within a MTR's structure. Seldom will aircraft be on the centerline or at a constant altitude when VFR conditions exist.

When requesting MTR information, give the FSS your position, route of flight, and destination in order to permit the FSS specialist to identify the MTRs along your intended flight path. When you are operating along or near an MTR, the only means of separation between you and military aircraft is **“SEE AND AVOID.”**

## ACTIONS TO REMEMBER

1. When planning a flight, especially below 1,500 feet AGL, carefully crosscheck available charts for the presence of MTRs and avoid them when possible. Only VR routes are depicted on sectional charts. SR and IR routes are not shown!
2. MTR corridors are not depicted on sectional charts; only the centerline of the route is shown. The actual corridor along the route is normally 5 NM on either side of the centerline.
3. When flying in close proximity to MTRs, contact the nearest Flight Service Station (FSS) for current flight activity along the route.
4. If you must operate near or through an MTR, do so above 1,500 feet AGL, and maintain a vigilant watch for aircraft.
5. When crossing an MTR, plan on crossing perpendicular to the route.
6. If you see a military aircraft, assume he does not see you.
7. Wake turbulence from heavy, high-speed aircraft is severe!

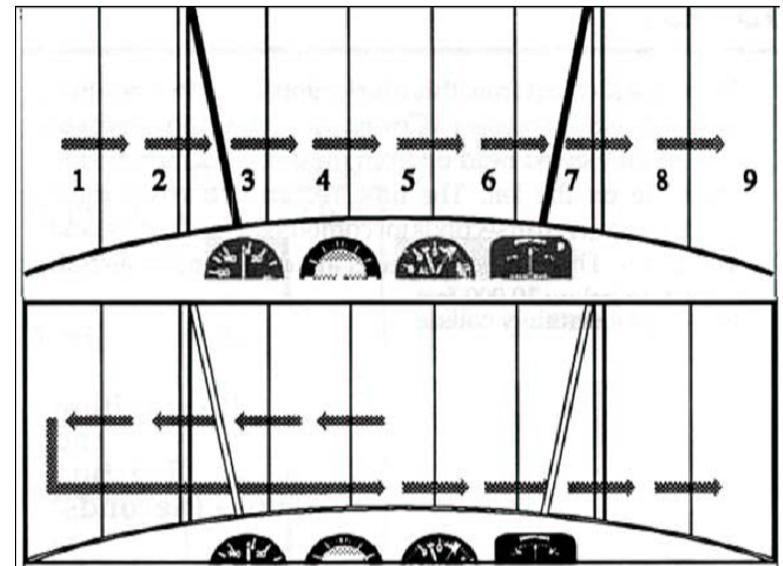


**C-5 at less than 1/2 mile.**

## COMMON MISCONCEPTIONS

Do you believe all air traffic in the radar-controlled airspace is shown on the controller's scope? It is not! This assumption can be fatal. Radar cannot protect you from unidentified aircraft. Most radar has "blind spots." Just because you are under radar contact does not mean the controller can keep you away from 100% of air traffic. ATC can only control participating aircraft.

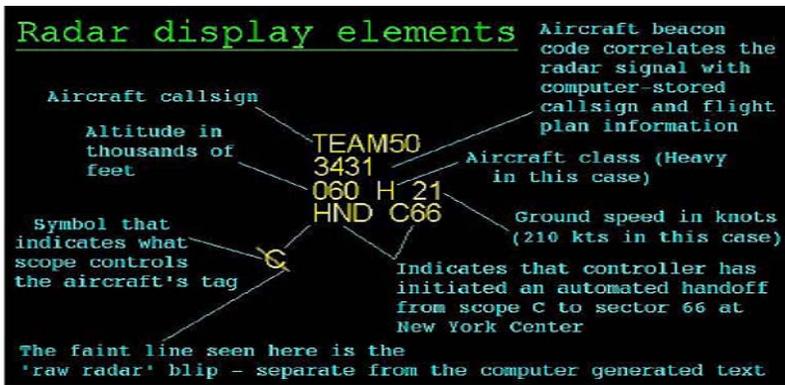
Many pilots believe any time they hear "Radar Contact" the controller has taken over all separation responsibilities. Never are pilots exempt from seeing and avoiding traffic conflicts. When under radar contact, the controller will share the responsibility with the pilot to resolve traffic conflicts. In the air, pilots are expected to pay attention to their surroundings. Anticipate what might happen by scanning the sky and listening to ATC frequencies. Know where traffic is and where you are. Most conflicts can be avoided by knowing where traffic is and where they are headed. Don't put all your trust in ATC when it comes to traffic avoidance! However, use radar services to the maximum extent possible. ATC is responsible to resolve traffic conflicts and can help you safely traverse controlled airspace. VFR pilots are highly encouraged to communicate with ATC and tell them their intentions.



**Common traffic scan patterns.**

## TRANSPONDERS

Private pilots can help 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 C-5 Galaxy. 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 radar scope, 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 Traffic Alert and Collision Avoidance System (TCAS) equipped C-5 and C-17 aircrews see and avoid you.



Depiction of aircraft information, provided by an aircraft's transponder, as displayed on the controller's screen.

## TCAS

As a GA pilot, you're probably wondering "what does TCAS have to do with me?" First of all, knowing the basics of TCAS will assist you when flying in congested areas shared by the larger aircraft and you'll realize *how important it is to have your transponder on*. Secondly, collision avoidance technology is finding its way to the GA market and is becoming more capable and affordable.



Example of a TCAS display.

Airliners and larger commuter aircraft with passenger seat capacity greater than 30 are now equipped with TCAS. In order for TCAS to provide alerts and advisories, the conflicting aircraft must have an operational transponder. A Resolution Advisory

(RA), which is the active vertical guidance provided by TCAS, requires the conflicting aircraft to have Mode C altitude reporting capability. **TCAS is blind to aircraft without a transponder or with their transponder turned off.**

## 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 collision:

1. Mid-air collisions generally occur during weekend daylight hours
  - 56% of the accidents occurred in the afternoon.
  - 32% of the accidents occurred in the morning.
  - 2% of the accidents occurred at night, dusk, or dawn.
2. Most mid-air collisions occur under good visibility.
3. The majority of the aircraft involved in collisions are not on any type of flight plan.
4. Nearly all accidents occur at or near uncontrolled airports and at altitudes below 1000 ft.
5. Flight fatigue (fatigue resulting directly from flight related operations) is not a major factor in most mid-air collisions.
  - The average flight time prior to the collision is 45 minutes. This time varies from takeoff to over seven hours.
  - 60% of the pilots on the mishap flight had been airborne thirty minutes or less.
  - Only 6% had been flying longer than two hours.
6. Pilots of all experience levels are involved in mid-air collisions, from the first solo ride to 20,000 hour veterans.

## COLLISION AVOIDANCE TIPS

1. Clear constantly for other aircraft, both visually and over the radios.
2. Know where high-density traffic areas are.
3. Always monitor the appropriate frequencies.
4. Obtain an IFR clearance or participate in radar flight following whenever possible and continue to practice “see and avoid” at all times.
5. Under IFR control, do not count on ATC to keep you away from other aircraft. There may be VFR aircraft operating in your environment that ATC is unaware of.
6. Use landing lights at lower altitudes, especially when near airports.
7. Announce your intentions on UNICOM and use standard traffic pattern procedures at uncontrolled airfields.... Be predictable!
8. If your aircraft is equipped with a transponder, turn it on and adjust it to reply on both Mode 3/A and C.
9. Use the appropriate hemispherical altitudes and don't let your altitude “wander.”
10. Fly as high as possible.
11. Keep your windscreen clean. A bug on the windscreen can obstruct other airborne aircraft coming your way.
12. Don't get complacent during instruction! Statistically, instructors are on board during 37 percent of flying accidents.
13. When flying at night, avoid white light in the cockpit. White light disrupts your night vision, even when used momentarily.
14. Beware of wake turbulence.
15. 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.
16. Practice appropriate clearing procedures before and during all climbs, descents, and turns.
17. Be aware of the type airspace in which you intend to operate and comply with applicable rules.
18. Avoid complacency. **SEE AND BE SEEN!**