

FILE

AC 90-48A

DATE 7/24/79

ADVISORY CIRCULAR



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Subject: PILOTS' ROLE IN COLLISION AVOIDANCE

1. PURPOSE. This advisory circular is issued to alert all pilots to the midair collision and near midair collision hazard and to emphasize those basic problem areas of concern, as related to the human causal factors, where improvements in pilot education, operating practices, procedures, and techniques are needed to reduce midair conflicts.

2. CANCELLATION. AC 90-48, Pilots' Role in Collision Avoidance, dated 3/20/70 is canceled.

3. BACKGROUND.

a. During 1978, 34 midair collisions (MAC) occurred in the United States resulting in 190 fatalities. Of the 190 fatalities, 144 resulted from the collision between an airliner and a light plane and included fatal injuries to seven persons on the ground. Most of the midair collisions occurred in good weather during the hours of daylight. During the same period, there were 495 near midair collisions (NMAC); a 29 percent increase over 1977.

b. The FAA has introduced significant programs designed to reduce the potential for midair and near midair collisions. This advisory circular is directed to pilots operating in the National Airspace System and emphasizes the need for all pilots to recognize the human factors associated with midair conflicts.

4. ACTION. The following areas warrant special attention and continuing action on the part of all pilots to avoid the possibility of their becoming involved in midair conflicts:

a. "See and Avoid" Concept.

(1) The flight rules prescribed in Part 91 of the Federal Aviation Regulations (FAR) set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained by each person operating an

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aircraft, when weather conditions permit, regardless of whether the operation is conducted under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).

(2) Pilots should always keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of aircraft being flown. Remember that most MAC accidents and reported NMIC incidents occurred during good VFR weather conditions and during the hours of daylight.

b. Visual Scanning.

(1) Pilots should look out in all directions and periodically scan the entire visual field. Remember that the performance capabilities of many aircraft, in both speed and rates of climb/descent, result in high closure rates limiting the time available for detection, decision, and evasive action.

(2) The probability of spotting a potential collision threat increases with the time spent looking outside, but certain techniques may be used to increase the effectiveness of the scan time. The human eyes tend to focus somewhere, even in a featureless sky. In order to be most effective, the pilot should shift glances and refocus at intervals. Most pilots do this in the process of scanning the instrument panel, but it is also important to focus outside to set up the visual system for effective target acquisition.

(3) Effective scanning is accomplished with a series of short, regularly-spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed 10 degrees, and each area should be observed for at least 1 second to enable detection. Although horizontal back-and-forth eye movements seem preferred by most pilots, each pilot should develop a scanning pattern that is most comfortable and then adhere to it to assure optimum scanning.

(4) Peripheral vision can be most useful in spotting collision threats from other aircraft. Each time a scan is stopped and the eyes are refocused, the peripheral vision takes on more importance because it is through this element that movement is detected. Apparent movement is almost always the first perception of a collision threat and probably the most important, because it is the discovery of a threat that triggers the events leading to proper evasive action. Visual search at night depends almost entirely on peripheral vision. In order to perceive a very dim light in a certain direction, the pilot should not look directly in this direction but scan the area adjacent to it. Short stops of a few seconds will help to detect the light.

(5) Lack of brightness and color contrast in daytime and conflicting ground lights at night increase the difficulty of detecting other aircraft.

(6) Pilots are reminded of the requirement to move one's head in order to search around the physical obstructions, such as door and window posts. The doorpost can cover a considerable amount of sky, but a small head movement may uncover an area which could be concealing a threat.

c. Clearing Procedures.

(1) Pilots should:

(i) Prior to taxiing onto a runway or landing area for takeoff, scan the approach areas for possible landing traffic by maneuvering the aircraft to provide a clear view of such areas. It is important that this be accomplished even though a taxi or takeoff clearance has been received.

(ii) During climbs and descents in flight conditions which permit visual detection of other traffic, execute gentle banks left and right at a frequency which permits continuous visual scanning of the airspace about them.

(iii) When operating under VFR during climb or descent, fly to the right side of the radial forming the airway in order to avoid IFR and VFR cruising traffic operating along the centerline of the airway radial.

(iv) Execute appropriate clearing procedures before all turns, abnormal maneuvers, or acrobatics.

d. Airspace, Flight Rules, and Operational Environment.

(1) Pilots should be aware of the type of airspace in which they intend to operate in order to comply with the flight rules applicable to that airspace. Aeronautical information concerning the National Airspace System is disseminated by three methods: aeronautical charts (primary); the Airman's Information Manual (AIM); and the National Notice to Airman System. The general operating and flight rules governing the operation of aircraft within the United States are contained in Part 91 of the FAR.

(2) Pilots should:

(i) Use currently effective aeronautical charts for the route or area in which they intend to operate.

(ii) Note and understand the aeronautical legend and chart symbols related to airspace information depicted on aeronautical charts.

(iii) Develop a working knowledge of the various airspace segments, including the vertical and horizontal boundaries.

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(iv) Develop a working knowledge of the specific flight rules (FAR 91) governing operation of aircraft within the various airspace segments.

(v) Use the AIM. The Basic Flight Information and ATC Procedures describes the airspace segments and the basic pilot responsibilities for operating in such airspace.

(vi) Contact the nearest FAA Flight Service Station for any pertinent NOTAM's pertaining to their area of operation.

(3) Pilots should also be familiar with, and exercise caution in, those operational environments where they may expect to find a high volume of traffic or special types of aircraft operation. These environments include airport traffic patterns, particularly at airports without a control tower; airport traffic areas (below 3,000 feet above the surface within five statute miles of an airport with an operating control tower); terminal control areas; control zones, including any extensions; Federal airways; vicinity of VOR's; restricted areas; warning areas; alert areas; intensive student jet training areas; military low-level high-speed training routes; instrument approach areas; and areas of high density jet arrival/departure routings, especially in the vicinity of major terminals and military bases.

e. Use of Communications Equipment and Air Traffic Advisory Services.

(1) One of the major factors contributing to the likelihood of NMAC incidents has been the mix of known arriving and departing aircraft with unknown traffic in terminal areas with operating control towers. The known aircraft were in radio contact with some function of the tower (local, approach, or departure control) and the other aircraft were not in two-way radio contact and unknown to the tower at the time of the NMAC. This precluded the tower from issuing traffic advisory information to either aircraft.

(2) Although pilots should adhere to the necessary communications requirements when operating VFR, they are also urged to take advantage of the air traffic advisory services available to VFR aircraft.

(3) Pilots should:

(i) Use the AIM.

(A) The basic AIM contains a section dealing with services available to pilots, including information on VFR advisory services, radar traffic information services for VFR pilots, and recommended traffic advisory practices at nontower airports.

(B) The airport/facility directory contains a list of all major airports showing the services available to pilots and the applicable communication frequencies.

(ii) Develop a working knowledge of those facilities providing traffic advisory services and the area in which they give these services.

(iii) Initiate radio contact with the appropriate terminal radar or nonradar facility when operating within the perimeters of the advertised service areas or within 15 miles of the facility when no service area is specified.

(iv) When it is not practical to initiate radio contact for traffic information, at least monitor the appropriate facility communication frequency, particularly when operating in or through arrival/departure routes and instrument approach areas.

(v) Remember that many factors, such as limitations of the radar, volume of traffic, controller workload, and other traffic unknown to the controller, may prevent the controller from providing traffic advisory information service on possible conflicting traffic.

f. Airport Traffic Patterns.

(1) During 1978, a significant number of midair collisions, as well as near midair collisions, occurred in the traffic pattern.

(2) Pilots should:

(i) When operating at tower-controlled airports, maintain two-way radio contact with the tower within the airport traffic area. Make every effort to see and properly avoid any aircraft pointed out by the tower or any other aircraft which may be in the area and unknown to the tower.

(ii) When entering a known traffic pattern at a nontower airport, keep a sharp lookout for other aircraft in the pattern. Enter the pattern in level flight and allow plenty of spacing to avoid overtaking or cutting any aircraft out of the pattern.

(iii) When approaching an unfamiliar airport fly over or circle the airport at least 500 feet above traffic pattern altitude (usually at 2,000 feet or more above the surface) to observe the airport layout, any local traffic in the area, and the wind and traffic direction indicators. Never descend into the traffic pattern from above.

(iv) Be particularly alert before turning to the base leg, final approach course, and during the final approach to landing. At nontower airports, avoid entering the traffic pattern on the base leg or from a straight-in approach to the landing runway.

(v) Compensate for blind spots due to aircraft design and flight attitude by moving the head and maneuvering the aircraft.

g. Flying in Pairs or in Formation.

(1) During 1978, several midair collisions occurred which involved two aircraft on the same mission with each pilot aware of the other's presence.

(2) Pilots who are required by the nature of their operations to fly in pairs or in formation are cautioned to:

(i) Recognize the high statistical probability of their involvement in midair collisions.

(ii) Make sure that adequate preflight preparations are made and the procedures to be followed are understood by all pilots intending to participate in the mission.

(iii) Always keep the other aircraft in sight despite possible distraction and preoccupation with other mission requirements.

(iv) Avoid attempting formation flight without having obtained instruction and attained the skill necessary for conducting such operations.

h. Flight Instructors and Pilot Examiners.

(1) The role played by flight instructors in preparing pilot applicants for any certificate or rating to conduct flight operations in today's increasing air traffic environment with maximum attention to collision avoidance cannot be overemphasized.

(2) Flight instructors should set an example in carefully observing all regulations and recognized safety practices since their students will consciously or unconsciously imitate the flying habits of their instructors.

(3) Flight instructors should:

(i) Guard against preoccupation during flight instruction to the exclusion of maintaining a constant vigilance for other traffic.

(ii) Flight instructors and persons acting as safety pilots should be particularly alert during the conduct of simulated instrument flight where there is a tendency to "look inside."

(iii) Place special training emphasis on those basic problem areas of concern mentioned in this advisory circular where improvements in pilot education, operating practices, procedures, and techniques are needed to reduce midair conflicts.

(iv) Notify the control tower operator at airports where a tower is manned regarding student first solo flights.

(v) Explain the availability of and encourage the use of expanded radar services for arriving and departing aircraft at terminal airports where this service is available, as well as radar traffic advisory services for transiting terminal areas or between en route points.

(vi) Understand and explain the limitations of radar that frequently may limit or prevent the issuance of radar advisories by air traffic controllers (refer to AIM).

(4) Pilot examiners should:

(i) During any flight test, direct attention to the applicant's vigilance for other air traffic and adequate clearance of the area before performing any flight maneuver.

(ii) Direct attention to the applicant's knowledge of the airspace, available FAA air traffic services and facilities, essential rules, good operating practices, procedures, and techniques that are necessary to achieve high standards of air safety.

1. Scan Training. The Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation has developed an excellent educational program designed to inform pilots on effective visual scan techniques. All pilots are encouraged to attend FAA/industry sponsored safety meetings which feature this program. The program, called "Take Two and See," is available on loan through the AOPA Air Safety Foundation, 7315 Wisconsin Avenue, Washington, D.C. 20014, or interested persons may contact the Accident Prevention Specialist at any FAA General Aviation District Office or Flight Standards District Office for further information.


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