



Midair Collisions Analyzed

The most dangerous places for colliding in flight with another airplane continue to be in the general area of airports, and the base leg and final approach segments of the traffic pattern are still the most critical, according to separate but related studies by the National Transportation Safety Board (NTSB) and the FAA on 1968 midair collisions and near-collisions.

Though midair collisions are historically few in number, the possibility of running into another aircraft in flight remains one of the most deep-seated concerns of practically every pilot, from the 15,000-hour-plus airline captain to the student making his first solo flight around the pattern.

Underscoring this basic concern is the fact that the most frequently heard advice in piloting circles, especially in general aviation, is "Keep your head on a swivel!" The advice is not without reason. The two new studies provided pilots with the most recent Government information on where and when their "swiveling" tactics are the most critical.

The NTSB's study, "Midair Collisions in U.S. Civil Aviation, 1968," analyzed 38 actual mishaps last year, 24 of which resulted in 71 fatalities. The fatalities were all general aviation pilots and their passengers. A general aviation plane was involved in each of the 38 accidents, and all but four occurred between two general aviation aircraft.

FAA's study, "Near Midair Collision Report of 1968," provided a comprehensive and informative analysis of 1,128 incidents last year which were classed "hazardous." The 1,128 were part of a total of 2,230 "near-miss" reports voluntarily submitted to the FAA last year by pilots. Nearly 30% of the 1,128 "hazardous" near-collisions were considered "critical" incidents. In this category, 128 cases happened during the en route portion of flight and 189 occurred in the airport area.

Similarities between findings in the two reports showed that all 38 of the actual midair collisions, as well as the largest percentage of the "critical" near-collisions, took place in VFR or better weather conditions (minimum ceiling 1,000 feet, visibility three miles). Most indicated a need for increased vigilance outside the cockpit and improvements in piloting techniques for some pilots.

"In comparing the 1968 midair collision accidents and critical near-midair collision incidents, the similarity [accidents-incidents] in terminal areas was

significant," the FAA study said. "For example, the lack of radio communication with the control tower by one of the aircraft when operating below 2,000 feet a.g.l. [above ground level] within five miles of the airport continually re-occurred."

Of possible special significance was the fact that a total of 10 flight instructors were involved in the actual midair collisions, and 31 of the "critical" near-collisions involved cases where both planes were on IFR and under "positive control" of the air traffic control system. The FAA report made a special point of noting the possibility that many pilots flying IFR may be assuming a false sense of security when flying IFR and are unaware of the deficiencies and limitations of the nation's radar control system.

"Twenty-four of the 38 midair collisions," reported the NTSB, "occurred over or in the vicinity of an airport. Twenty of these occurred while approaching to land. Two occurred during the takeoff phase and two occurred when one of the aircraft was descending to the airport . . . the number of midair collisions increased on final approach, getting worse at position of flare-out."

AOPA officials last year were less than active in supporting the "near-miss" reporting program, citing difficulties in establishing adequate guidelines for what is, and what is not, a "near-miss." They also expressed reservations about the final use of the study and indicated it conceivably might be used by some FAA policymakers to place further restrictions and expenses on general aviation operations. Many of the actual "near-miss" reports submitted by individual pilots were open to differing interpretations, Association officials also contended.

As stated in the FAA's 1½-inch-thick document on near midair collisions, "It

is recognized that in busy airspace, such as in control zones, aircraft often do pass in close proximity to each other where a 'near-miss' situation does not actually exist. Also, one pilot might believe he had a 'near-miss' whereas the other pilot was at all times fully aware of the presence of the other aircraft and was acting accordingly.

"Situations of the type indicated above do occur," continued the report, "and the uncertainty which they create, with respect to 'near-miss' designations, must be given due weight in the assessment of a hazardous situation. In general, therefore, it appears reasonable to assume that where aircraft come within very close proximity of each other without each being aware of the other's intent or destination, there is a potential danger to flight safety and a valid near midair collision situation exists.

"The severity of danger of a collision in flight was determined, and each occurrence was classified as 'hazardous' (critical or potential) or 'no hazard,' based on the following guidelines:

"Critical—A situation where collision avoidance was due to chance rather than an act on the part of the pilot.

"Potential—An incident which might have resulted in a collision if no action had been taken by either pilot.

"For both critical and potential," the report stated, "closest proximity of less than 500 feet would normally pertain except in situations involving a high rate of closure (400 knots plus)." All near-miss reports which did not fit the critical or potential guidelines were classified as "no hazard" incidents.

In an obvious attempt to further refine its analysis and weed out questionable near-collision incidents, the FAA study team said it compared the major similar facts on the bulk of its "hazardous" cases with major facts on the actual 1968 midair collisions. "Since the

Midair mishaps and near-misses last year serve as a reminder to all pilots of the need to constantly stay vigilant in the cockpit and practice 'see and avoid' tactics. Thirty-eight midair collisions occurred in calendar 1968

by LEW TOWNSEND/AOPA 376636

major characteristics of the 'hazardous' group were similar to those of midair collisions, this was considered the 'hard core' near midair collision group for subsequent technical and statistical analysis."

Taking a look first at the detailed findings in the NTSB report, pilots were told, "It takes two to collide, but only one need be careless. Statistics in 1968 show all are vulnerable, from the pilot with 15,000 hours to the pilot on his first solo."

"Instructor pilots seem more vulnerable than the average pilot," NTSB observed. "Fifty percent of the collisions around the airport involved flight instructors. Perhaps it is because they spend more time in the traffic pattern

and have additional activities and related distractions in teaching and monitoring their students' actions."

Supporting its statements that midair collisions are not confined to low-time pilots, NTSB reported that 25 of the 38 midair crackups involved pilots with more than 1,000 hours. "However, 32 of the collisions involved pilots with less than 100 hours in type as opposed to seven [pilots] who had 1,000 hours or more in type. From the statistics on total pilot-time, an inference can be drawn that while all pilots are equally vulnerable to collisions, experienced pilots were involved in significantly high numbers."

"A more significant inference," NTSB continued, "is that pilots with less time

in type are more vulnerable to collisions because of their greater attention to cockpit details and to flying the plane."

Prior to stating its conclusions and listing specific recommendations for the FAA, airplane manufacturers, airport operators and pilots, the NTSB report briefly summarized facts on the 14 mid-air collisions last year which occurred away from an airport area:

"Three involved agricultural aircraft, one during a ferry flight and two [during] on-the-job aerial spraying."

"One occurred where one of the aircraft was engaged in instructional training."

"One occurred where both aircraft were engaged in instructional training."

"One occurred where one of the aircraft was engaged in instrument flying training."

"One occurred between aircraft being flown in formation beyond pilot abilities, with one pilot under the influence of alcohol."

"One occurred between aircraft on pleasure flights and both pilots under the influence of alcohol."

"One occurred between aircraft of the same organization while herding horses."

"One occurred between aircraft of the same organization while spotting fish."

"One occurred between two gliders while soaring in the same thermal."

"One, involving a military aircraft, occurred in the vicinity of a military training area."

"One occurred in Alaska where the silhouette of a crossing aircraft blended with the snow-covered background."

Though reporting that adverse weather was not "a significant factor" in any of the 38 midair crashes, NTSB said that haze and/or smoke "were likely to have been in the area in six instances; precipitation, showery in nature, was probably in the general area in 11 cases."

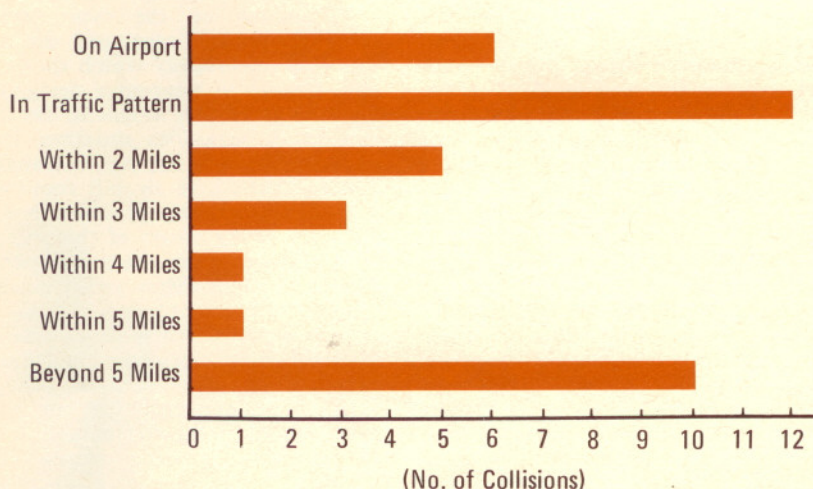
"All 38, however," emphasized the Safety Board, "occurred during daylight hours under VFR conditions. It was found in eight cases where, during descent, one aircraft overtook another, low and at slow closure rates, that inherent aircraft design restrictions to vision reduced the pilot's ability to see the other aircraft. The pilot's lack of compensation for this in his maneuvers was a significant factor in nearly all the midair collisions."

Most of the accidents happened around areas having considerable general aviation activity, and "the most likely time and place for collisions to occur would be on bright, clear Sunday afternoons in August at uncontrolled airports." The Safety Board added, however, that "the air traffic control system was a factor in approximately 20% of the collisions."

Summarizing part of its conclusions, the Safety Board said, "It was noted that two of every three collisions occurred at an airport, that the pattern of collisions started during the descent to the airport, that it gradually increased while entering the landing pattern, and that the most critical period is the final turn-in right up to the airport threshold

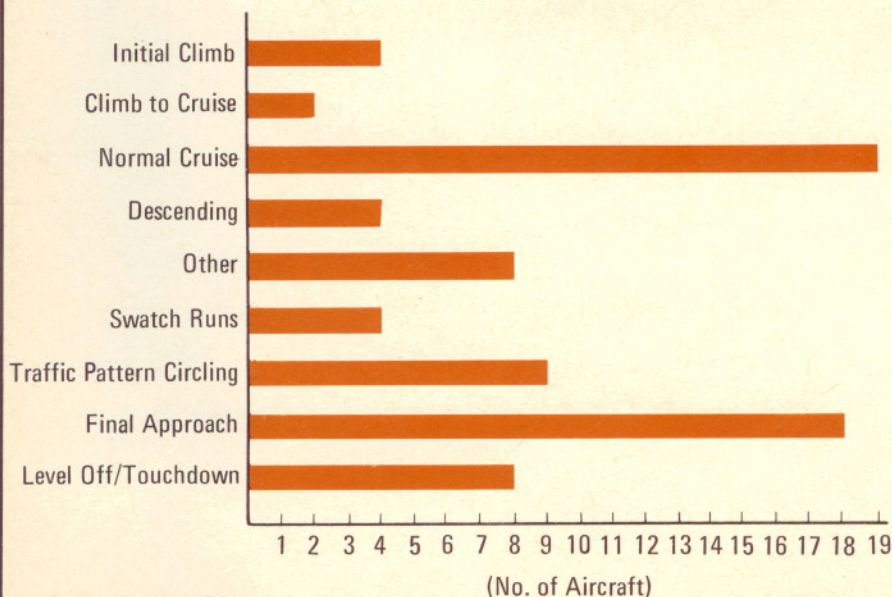
1968 MIDAIR COLLISIONS

(PROXIMITY TO AIRPORT)



FLIGHT PHASES OF MIDAIR ACCIDENTS

(38 Mishaps, 76 Aircraft)



Source: NTSB

and flare-out. It is during this critical period that four of every five collisions at or near airports occurred."

Requesting AOPA and other aviation organizations to publicize its findings, "as well as promote, wherever appropriate, the principles of collision avoidance awareness on the part of pilots," the NTSB asked owners and operators of airports, and local and state officials, "to assure that VFR approach and departure traffic pattern procedures are established at every airport. Further, that such procedures be clearly identified and made known to pilots."

In its recommendations, the NTSB included several which were either conceived or strongly supported by AOPA. A similar situation existed with regard to some of the recommendations presented by the FAA's study group on near-collisions.

NTSB asked the FAA to "designate climb and descent corridors for high-performance aircraft at high-density airports," plus "support the expeditious development of low-cost Collision Avoidance Systems (CAS) for all civil aircraft." The concept of special climb and descent corridors for jets and other high-performance aircraft using busy airports is an active project of AOPA [July PILOT, page 29]. The Association also is a strong supporter of increased research and development to attain a low-cost Proximity Warning Indicator (PWI), considered the stepping-stone toward development of the more sophisticated CAS.

Showing support for still another AOPA proposal, first made in 1956, the NTSB added, "The Safety Board further recommends that the manufacturers of general aviation aircraft direct their attention to the need for increased visual conspicuity of small, as well as large, airplanes." AOPA also has long contended that increased cockpit visibility was essential to airliners as well as small planes.

Like the NTSB, the FAA's study group recommended increased vigilance by pilots for other traffic, a continuing plea of AOPA, plus urged renewed attention to development of low-cost PWIs and CASSs. The FAA report also endorsed AOPA proposals for airplane manufacturers and the FAA to jointly work toward improved cockpit visibility in all future aircraft and an extension of the 250-knot speed limit below 10,000 feet to include military jet operations.

"Several of AOPA's recommendations for improved safety have been adopted in the past," reported AOPA Vice President Victor J. Kayne, Policy and Technical Planning, "and it is gratifying that others are receiving new impetus at this time. Looking at the other side of the coin, however, there are some recommendations in both reports with which we don't agree and probably will oppose, but at least the lists of recommendations are not all adverse to the interests of our members."

"More than 50% of the total hazardous near midair collisions (1,128) occurred within terminal areas with an operating control tower," the FAA study

group reported. It estimated that for every voluntary report submitted, another four incidents went unreported. FAA accounted for the large number of reports coming from tower-equipped fields by expressing a belief that the pilots were aware that many persons probably observed the near-mishaps and if they did not report it, someone else would. The situation would be just the reverse at small nontower airports, the agency implied.

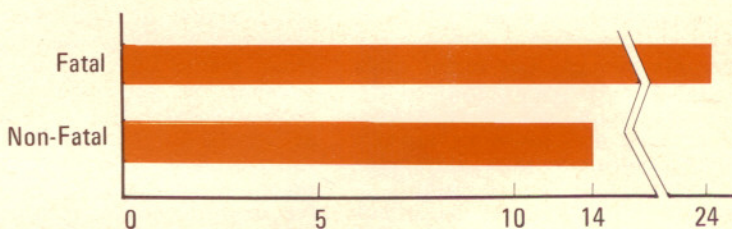
"Seventy percent, or 434 near midair collisions [NMACs], occurred within 10 nautical miles of the airport and at or below 3,500 feet above ground level [a.g.l.]," the FAA report said. "This is the most susceptible airspace for NMACs to occur. Here, aircraft on an approach

to the airport, not necessarily an instrument approach while descending, encountered an unknown VFR aircraft between the airport and his position on the approach. The same was true of an aircraft in climb configuration departing from an airport."

Turning to nontower airports, those facilities used predominantly by general aviation, the FAA report said that "98 hazardous NMACs occurred within five miles of airports without a tower. The susceptible segment of this terminal airspace was the traffic pattern. Eighty-six percent of the NMACs occurred in the traffic patterns.

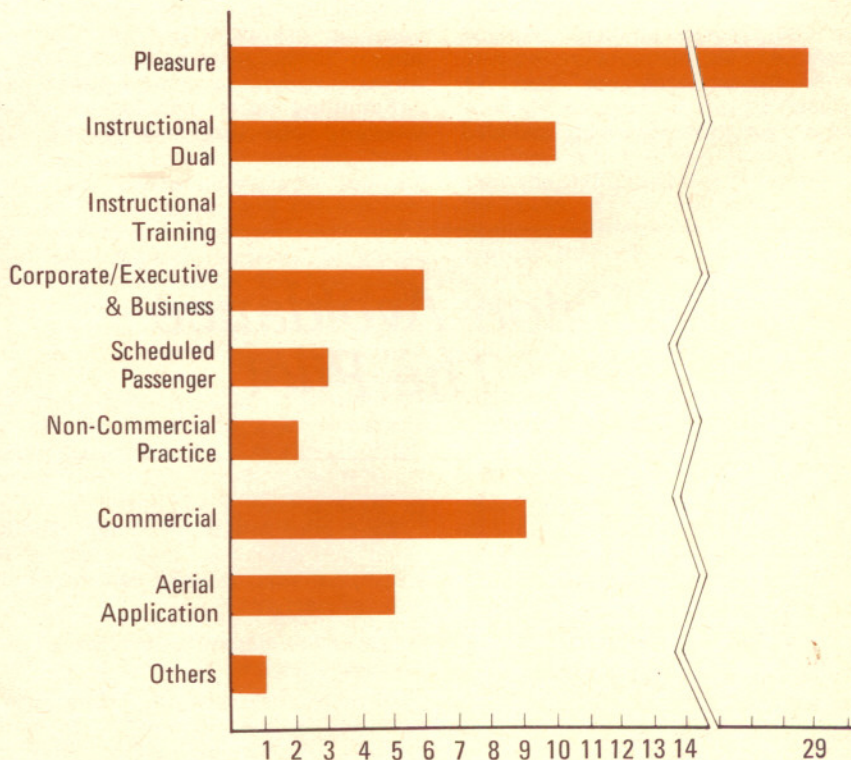
"The most frequent cause of the NMAC was one aircraft cutting the other out of the traffic pattern. Random

1968 FATAL AND NON-FATAL MIDAIR COLLISIONS

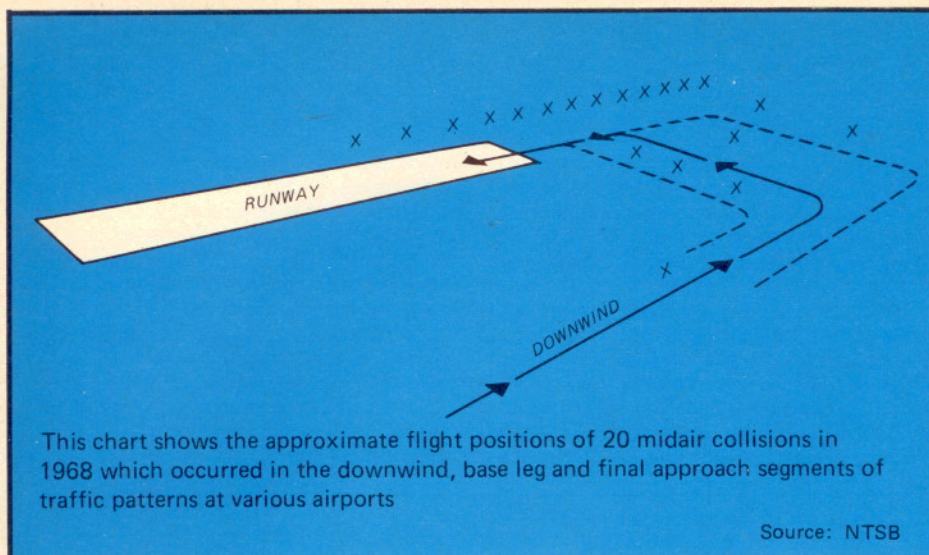


TYPE OF FLYING IN MIDAIR COLLISIONS

(38 Mishaps, 76 Aircraft)



Source: NTSB



entry into traffic patterns, entry while descending, entry on the base leg and straight-in approaches were the causes of one aircraft interfering with another in the traffic pattern. The major problem at nontower airports," claimed the study group, "is the lack of an orderly flow of arriving and departing aircraft caused by inadequate pilot knowledge of the direction and flow of traffic."

About 67% of the 409 hazardous near-collisions reported during en route segments of flights occurred below 10,000 feet m.s.l., and "nearly 40% of the total 409 occurred within 10 miles of a navaid. This was the most significant factor in the en route airspace."

In connection with its voluntary reporting program, the FAA asked pilots to submit their recommendations for reducing the problems of potential mid-air collisions. "Almost 80% of approximately 700 recommendations received were related to improving operating conditions in the terminal area," the FAA report said.

"These recommendations included

establishment of arrival and departure routes or corridors and positive control of all traffic in high density terminal areas and at military bases. Unrestricted radar traffic advisory service not dependent on controller workload was recommended for en route operation as at terminals. The need for terminal radar facilities at specific locations was mentioned as well as the requirement for control towers at other locations. Pilot recommendations also pertained to aircraft equipment and cockpit configuration.

"The largest number of pilot recommendations under any one category," stated the FAA report, "pertained to the need for educating pilots as to the airspace and operational environment in which they are flying or intend to fly. Pilots also recommend the need for establishing an orderly flow of traffic entering, operating in, and departing airport traffic patterns, particularly at airports without a control tower."

Summing up its conclusions on the near-miss reporting program, the FAA

study group said, "A hazardous midair collision incident is largely the result of (1) failure to observe good operating practices due to a lack of knowledge of the airspace environment, (2) a breakdown in the air traffic system, or (3) a combination of equipment and human factors which have worked to the detriment of the entire system.

"Recognition of the other pilot's right to fly, communication of intentions to the proper ATC function, and knowledge of the airspace environment are also important operating practices which could reduce the number of near-miss conflicts as air traffic operations continue to multiply.

"Pilot responsibility for maintaining a vigilant lookout to 'see and avoid' other aircraft must be emphasized," the FAA report stated. "It is readily apparent, from the comments received, that pilots in VFR weather, operating under IFR flight rules, and pilots operating under VFR flight rules, are not exercising the maximum possible lookout vigilance for other aircraft.

"One important factor which evidently is contributing to this problem is that pilots are heavily dependent upon receiving traffic advisories when in radio contact with an air traffic control facility, particularly when under radar control or in contact for radar advisory service.

"Pilots need to fully understand," emphasized the study group, "that they cannot rely upon being advised of possible conflicting traffic for a number of reasons. These include the limitations of radar (inability to detect small and some large aircraft, including fighter types, particularly those without transponders in use); controller workload (involved in controlling IFR traffic with no time to issue advisories on uncontrolled traffic, which may or may not be observed by the controller); and the other traffic being unknown to the air traffic facility." □

Collision Avoidance And The Pilot

National Transportation Safety Board (NTSB) officials have put together a package of flight recommendations which are designed to aid pilots in reducing the potential dangers of midair collisions. The recommendations, which follow, were contained in the Safety Board's recent report, "Midair Collisions In U.S. Civil Aviation, 1968."

"See and Be Seen" Concept

Seeing is a full-time job for every pilot regardless of the type of aircraft being flown. A pilot must visually scan

in all directions, constantly.

Keep your windscreen and windows clean and also keep them clear of obstructions, such as solid sun visors and window curtains.

Inherent Visibility Obstructions in Aircraft Design

In many instances, the pilot's view is restricted by the inherent design of the aircraft. A window frame, fuselage structure, a wing, a wing strut, or a nacelle, create a blind spot. On some aircraft, the forward fuselage restricts

the view in front and below the aircraft. On low-wing aircraft, the pilot's view is restricted below the aircraft; and on high-wing, above the aircraft. Blind spots due to aircraft design are inevitable, but recognizable, and can be compensated for by the pilot.

Never let down, turn, or climb into a blind area. When letting down, turning, or climbing, it is advisable to make a slight left or right turn, or an "S" turn, or a rolling maneuver, whichever is appropriate and practical. Also, where applicable, look for converging shadows on the ground or on the cloud cover.

Radar Advisories

When there is less than three miles' visibility, file an IFR flight plan or stay out of controlled zones. If operating under marginal visibility flight conditions, take advantage of radar advisories. Contact the appropriate controller (radar), give your identification, position, altitude, heading, destination and

type of flight plan. When advised of traffic by the controller, respond in effect with "negative contact" or "have in sight" rather than an ambiguous "Roger."

Vigilance should not be relaxed even though radar traffic service is being provided.

Converging Traffic

When your aircraft is at a constant angle with another aircraft, or the image of the other aircraft on your windscreen is not moving, a collision is imminent. To estimate the altitude of an intruder aircraft, compare the relative position of the target to the horizon. When the target is at the horizon, it is at your altitude. If the target is lower than the horizon, it is at an altitude lower than yours. A target above the horizon should be higher than you.

Once you have spotted an aircraft, don't concentrate on it to the exclusion of other aircraft. Keep track of known traffic, but continue to look for others.

Visual Scanning

The proper technique for daylight visual scanning is for the pilot to systematically move his head and eyes over the entire area of visibility. Using this technique, any contrast or movement in the area of sight will be readily noted by the pilot.

Visual scanning at night requires a different technique. The pilot should depend almost entirely on his peripheral vision. He should, without staring for more than a few seconds at a time, look first in one area without moving his eyes and then to another area and so on. Any light in the area scanned will be noted.

An excellent aid, both in daylight and at night, to the pilot in visual scanning is the high-intensity flashing white light. If you pilot an aircraft equipped with such a light, for your own protection, it is suggested that the light be on at all times while the aircraft is in flight.

Designated Altitude

Always fly at the designated altitude, and remember, even thousands plus 500 feet altitudes westbound, and odd [thousands] plus 500 feet altitudes eastbound. Below 3,000 feet (a.g.l.), you're on your own. Update your altimeter setting as often as practicable.

High-Density Areas

When flying cross-country, avoid high-density areas unless landing. When approaching an airport, call the tower at least 15 miles out and give your aircraft type, "N" number, position, and your intention. If en route, keep 3,000 feet or higher over the airport or well clear, laterally, and call the tower when clear of the "local traffic" area. If landing, be precise in the pattern. Make your turn precisely into the final approach course and stay in line with the centerline of the runway, especially where there are parallel runways. Remember, 60% of midair collision accidents occur around airports. □

AOPA Statement On Indiana Collision

AOPA President J. B. Hartranft, Jr., in a statement issued Sept. 10, cautioned news media, Federal officials and the general public against jumping to conclusions or taking precipitate actions regarding the fatal midair collision near Indianapolis, Ind., which had occurred the previous day. Eighty-three persons died in the accident.

Hartranft announced that Roys Jones, director of AOPA's Air Traffic Control Department, had been sent to Indianapolis to work with the National Transportation Safety Board (NTSB) in sifting through the evidence to determine the cause and possible new cures for such tragedies.

The AOPA statement was issued to all news media, and first reports indicated that it was used quite widely. In addition to this statement, radio and TV appearances were made by various AOPA staff members, who also were interviewed by the press, explaining different aspects of the midair collision from the standpoint of general aviation.

The midair collision involved a *Cherokee 140* and an Allegheny DC-9 jetliner. The two aircraft converged and collided about 26 miles southeast of Indianapolis' Weir-Cook Municipal Airport.

"Enough facts are not yet known to try to pinpoint the probable cause of the accident," Hartranft said. "Everyone concerned should be extremely cautious about trying to prejudge causes of the accident until all the facts are in." Declining to second-guess what evidence the investigation would turn up, Hartranft said preliminary facts indicate that a special "climb and descent corridors" concept developed by AOPA would have reduced the possibility of the accident's occurring in the first place.

The concept basically involves establishing special "protected" corridors, or funnels, of airspace leading to and from every busy airport. "This airspace," said the AOPA president, "would only be used by approaching or departing high-speed traffic, such as the DC-9 jetliner involved in Tuesday's collision. It would be avoided almost as though it were contaminated airspace by aircraft pilots similar to the one in the propeller-driven plane which converged with the airliner."

Hartranft reported that formal recommendations for setting up such special corridors of airspace for high-speed aircraft were submitted to the FAA by the AOPA as early as March 1968. The basic recommendation has been resubmitted to the FAA and Congressional leaders a number of times since then, he added.

"It's certainly too late to undo the

circumstances which may have led to Tuesday's tragic affair," Hartranft continued.

Military aircraft currently use specially designated corridors of airspace for takeoffs and landings of high-speed aircraft at military fields. Under AOPA's proposal, the special corridors of airspace would be off-limits to slower-moving aircraft and would be used only by aircraft, such as jets, which are capable of maintaining a high rate of speed.

"There's substantial agreement among the private, corporate and airline pilots that this type of separation of high-speed and low-speed aircraft would immeasurably help reduce chances of anything like Tuesday's accident happening," Hartranft reported. "What's really frustrating," he said of the prospect of gaining FAA support, "is that this type of approach to the problem would not cost a nickel in new equipment, either that needed by pilots or that required by the FAA."

Hartranft also urged the nation's newsmen to guard against reporting major air accidents in a manner which appears to prejudge the cause of the accidents before investigations are completed. He said AOPA plans to submit its own findings on the accident and appropriate recommendations at the conclusion of the current investigation.

As reconstructed from the preliminary facts, the jetliner was on a northwesterly course and the lightplane was heading approximately due south. The headings of the two aircraft showed that the lightplane would have been on the right of the airliner prior to the accident. Federal Aviation Regulations require that where two aircraft are on a converging path, the aircraft on the right has the right of way, similar to rules which govern good safety practices on the highways and waterways.

The AOPA president emphasized the importance of obtaining all the facts surrounding the Indianapolis crash before attempting to isolate the probable causes of the accident. He noted the great harm done to air transportation in general, and private and business flying in particular, by publicized erroneous implications as to causes of two previous midair collisions involving private aircraft and airliners.

"In both cases, initial news reports implied that the private aircraft was at fault in the accidents, but it was later learned that was not correct. Unfortunately, the final reports of the accident investigations failed to receive anywhere near the same amount of publicity as that devoted to the mishaps immediately after they occurred." □