



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Log 2037

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In reply refer to: A-88-24 through -27

Honorable T. Allan McArtor
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On January 20, 1987, about 1228, central standard time, a U.S. Army Beech U-21A airplane, Army 18061, and a Sachs Electric Company Piper PA-31-350, N60SE, collided at 7,000 feet msl over the Lake City Army Ammunition Plant, Independence, Missouri, about 5 miles east of the eastern boundary of the Kansas City Terminal Control Area. The U-21 was level at 7,000 feet and en route to Fort Leavenworth, Kansas, in accordance with instrument flight rules (IFR). The PA-31 was climbing eastbound to an unknown cruise altitude, having departed the Kansas City Downtown Airport in accordance with visual flight rules (VFR), en route to St. Louis, Missouri. The airplanes collided nearly head-on in daylight and visual meteorological conditions. Although both airplanes were equipped with operating mode-C transponders, the radar controllers in communication with the U-21 did not observe and were not alerted to the conflict. Therefore, traffic advisories were not provided. As a result of the accident, two pilots and one passenger aboard the U-21 and the pilot and two passengers aboard the PA-31 were fatally injured. Both airplanes were destroyed. 1/

The National Transportation Safety Board is concerned that many VFR pilots of transponder-equipped (with or without mode C) aircraft have the mistaken impression that the air traffic control (ATC) system routinely monitors or tracks their flights and provides traffic advisories regarding their flights to IFR and participating VFR flights. This accident and others recently investigated by the Safety Board convincingly illustrate that VFR flights are not tracked routinely unless the pilot requests and the ATC system provides flight-following services. VFR pilots cannot be assured that simply operating an airplane equipped with a mode-C transponder on VFR flights provides any guarantee of separation from VFR or IFR airplanes.

A retrack of the Kansas City Terminal Radar Approach Control (TRACON) Automated Radar Terminal System (ARTS) III data demonstrated graphically how this accident might have been prevented. By manually tagging up the limited data block of the PA-31 (during the retrack), a full data block was generated and computer tracking of the PA-31 was initiated automatically. This activated the conflict alert subprogram of the ARTS III equipment. The conflict alert subprogram compared the progress of the flight track and altitude information of the PA-31 with that of all other tracked targets. Then about 40 seconds before the collision, an aural alarm was activated, the data block

1/ For more detailed information, read Aircraft Accident Report--"Midair Collision, U.S. Army Beech U-21A, Army 18061, and Sachs Electric Company Piper PA-31-350, N60SE, Independence, Missouri, January 20, 1987" (NTSB/AAR-88/01).

information of the conflicting targets began to flash on the controller's radarscope, and a conflict alert message identifying the airplanes in conflict was displayed in the preview area of the radarscope. The Safety Board believes that if this type of distinct and unambiguous information had been presented to alert the controllers before the accident, the controller's attention would have been immediately focused on the conflicting airplanes, and the controller would have had ample opportunity to issue a traffic advisory or a safety alert to the U-21 pilots.

Interviews of the Kansas City TRACON staff and review of their policies and traffic, indicated that ATC services typically would have been provided to the PA-31 pilot under the circumstances of the accident flight had those services been requested. During heavy controller workload conditions and at facilities that are normally very busy, VFR pilots may find that their requests for flight-following or other ATC services are frequently not fulfilled. Recognizing that the workload of many facilities is already high at times and would be increased to the extent that some VFR pilots may not always be able to obtain air traffic services, the Safety Board believes that VFR pilots should nonetheless attempt to obtain those services, when they are available, as a means of reducing the potential for involvement in midair collisions. In this case, the Safety Board concludes that the accident probably would have been prevented if the PA-31 pilot had availed himself of flight-following services (or filed an IFR flight plan).

Advisory Circular (AC) 90-48C urges VFR pilots to take advantage of air traffic advisory services as a means of assisting them in seeing and avoiding other aircraft, but not substituting for the pilots' own visual scanning. The AC was issued before the conflict alert feature was in widespread use in the U.S. ATC system. Although the Safety Board concurs with the emphasis that the AC places on pilots scanning effectively to avoid midair collisions, the Safety Board believes that AC 90-48C should be updated to alert pilots to the significant additional safety benefits accruing from conflict alert when flight-following services are provided to VFR pilots.

The Safety Board noted with interest that the workload at the Kansas City TRACON East Radar position was considered light by the involved controllers at the time of the accident. Although the position relief briefing provided an untimely increase in controller workload and a possible distraction immediately before the accident, the traffic was so light that it may have lulled both controllers into a reduced state of vigilance. A reduced state of vigilance would explain why they failed to detect the presence and conflict presented on their radarscope by the limited data block representing the PA-31 airplane.

The Safety Board is concerned that the position relief briefing occurred at the critical time when the radar targets of the PA-31 and the U-21 were converging on the radarscope, yet the convergence of the targets was not noticed by either controller. Even though these controllers were not overloaded by their operational environment, the combination of controller complacency associated with light workload and the operational requirement of a relief briefing may have caused the controllers to narrow their perception and attention to that single task in lieu of their other ATC duties. This rearrangement of controller priorities probably occurred unintentionally.

Within the last 12 months the Safety Board has investigated five midair collisions in which the air traffic controller workload was judged light or moderate, yet the controllers did not perceive a collision threat and did not issue traffic advisories or safety alerts before any of the collisions. The apparent pattern suggests that periods of low air traffic controller workload may result in periods of reduced vigilance on the part of the controllers and produce a greater hazard to traffic separation than had been previously recognized. In the Safety Board's runway incursion special

investigation, 2/ it was found that heavy traffic and reduced visibility were infrequently involved. On the contrary, traffic was reported as light or moderate at the time of most of the incursions where controller actions were involved. In some of the controller-induced runway incursions, the controllers were working as few as two airplanes. The Federal Aviation Administration (FAA) Civil Aeromedical Institute, in a study of ATC operational error incidents occurring from 1965 to 1980, noted that 40 to 50 percent of the errors occurred under moderate controller workloads. Over the period evaluated, there was a reported trend toward increased numbers of incidents occurring during light traffic. 3/

The Safety Board believes that it is more likely that the Kansas City TRACON East Radar controllers were distracted from monitoring traffic in the moments before the collision because of their position relief briefing and associated duties than that they were inattentive and not vigilant as a consequence of their otherwise light workload. Nonetheless, the Safety Board is concerned with the apparent increase of ATC operational errors, runway incursions, and midair collisions which have occurred during periods of low air traffic controller workload. The Safety Board believes that controllers have a tendency to relax their vigilance in the low workload environment making them susceptible to operational errors and omissions. The Safety Board believes that corrective action is needed to preclude reduced controller vigilance during periods of low controller workload.

ARTS tracking systems superimpose computer-generated alphanumeric symbology over the primary and secondary radar target information on controller radarscopes. Tracking of radar targets and distinguishing IFR from VFR targets is much easier using the ARTS information than the primary and secondary radar information that is also displayed. Because full data blocks (FDB) provide more alphanumeric symbology (and information) than limited data blocks (LDB), and because radar controllers control traffic that is almost always identified by FDBs, there is reason to believe that LDBs might sometimes be overlooked by controllers, particularly when controller workload is high or when controller vigilance is reduced. Controller dependence on ARTS III FDB target symbology could cause controllers to attach diminished importance to primary, secondary radar, and LDB target information even when transponder mode-C information is provided. The Safety Board believes that the LDB symbology associated with the radar target of N60SE was sufficiently prominent on the controllers' radarscope that the controllers should have seen it. However, reliance on ARTS FDB radar symbology may have been responsible for their failure to see the target symbology associated with the PA-31.

If this type of oversight is occurring elsewhere in the ATC system, controllers are denying themselves radar target information that would potentially reduce the continuing threat of midair collisions between IFR and VFR aircraft. The Safety Board believes that the FAA should examine the underlying ATC factors in midair collisions and near-midair collisions to determine the extent to which controllers have become dependent on ARTS FDB symbology and the training or remedial measures needed to alleviate the problem.

The Safety Board also believes that the FAA should direct additional effort toward the development of low-cost proximity warning and conflict detection systems for general aviation aircraft to assist pilots in the detection and avoidance of potential

2/ Special Investigation Report--"Runway Incursions at Controlled Airports in the United States" (NTSB/SIR-86/01).

3/ Schroeder, D.J., "The loss of prescribed separation between aircraft: How does it occur?" Transcripts, 1983 Conference of the Society of Automotive Engineers, 4426-4434.

collision threats. On June 7, 1972, in conjunction with the publication of a special investigation of midair collisions, ^{4/} the Safety Board issued a number of safety recommendations to the FAA including A-72-157 that addressed this issue. On October 2, 1972, the FAA responded to the Safety Board with assurances that efforts were in progress to develop collision avoidance systems and proximity warning instruments that are cost feasible to the general aviation community. Based on these assurances, the Safety Board classified the recommendation "Closed--Acceptable Action." However, it appears that the general aviation community has benefited very little during the past 15 years from the FAA's efforts in the development of collision avoidance systems. Therefore, the Safety Board believes that the FAA should place additional emphasis on the development of these systems for general aviation aircraft.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Update Advisory Circular 90-48C and emphasize in operational bulletins, the Airman's Information Manual, pilot training programs, and accident prevention programs the advantages of using air traffic control flight-following services on visual flight rules flights as a further means of reducing the midair collision hazard. (Class II, Priority Action) (A-88-24)

Incorporate formal training on the dangers of the low workload environment at all levels of air traffic controller training. (Class II, Priority Action) (A-88-25)

Establish an ad hoc task force, including controller and human performance expertise, to evaluate the extent to which radar air traffic controllers are dependent on full data block radar symbology to carry out their duties and to make appropriate improvements in initial and recurrent radar training to rectify such deficiencies. (Class II, Priority Action) (A-88-26)

Expedite the development, certification, and production of various low-cost proximity warning and conflict detection systems for use aboard general aviation aircraft. (Class II, Priority Action) (A-88-27)

Also as a result of its investigation, the Safety Board issued Safety Recommendation A-88-28 to the National Business Aircraft Association and the Aircraft Owners and Pilots Association.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, NALL, and KOLSTAD, Members, concurred in these recommendations.

By: 
Jim Burnett
Chairman

^{4/} Special Investigation Report--"Midair Collisions in U.S. Civil Aviation, 1969-1970" (NTSB-AAS-72-6).