



# National Transportation Safety Board

Washington, D. C. 20594

## Safety Recommendation

2063

Date: June 7, 1988

In reply refer to: A-88-46

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

On January 15, 1987, about 12:52 p.m., SkyWest flight 1834, a Swearingen SA-226TC (METRO II), and a Mooney M20 collided in flight over Kearns, Utah, in visual meteorological conditions. The two pilots and six passengers aboard the METRO II and the two pilots aboard the Mooney were killed in the accident which occurred within the Salt Lake City (SLC) airport radar service area (ARSA).

Because the targets of both accident airplanes were found to have been displayed on the Final controller's radarscope, the National Transportation Safety Board evaluated the procedures at the SLC Terminal Radar Approach Control (TRACON) and the actions of the Final controller to determine why no traffic advisories regarding the Mooney's target were issued to the METRO II flightcrew.

The Final controller had first priority responsibility for separation of flight 1834 from other instrument flight rules traffic and to provide additional services, including traffic advisories for other traffic. He was fulfilling part of that responsibility during the sequence of events leading up to the accident by continually giving radar vectors to flight 1834 to separate it from two Boeing-737's approaching SLC International Airport. However, both of those airplanes were ARSA participants and were displaying full data block (FDB) radar returns with altitude information as recorded on the Automated Radar Terminal System (ARTS IIIA). The Mooney was not mode-C equipped and was not an "associated" tracked target, so it was not displaying a limited data block or an FDB. That is, all beacon targets are "tracked" within the ARTS IIIA system; however, only those targets which are designated as "associated" are displayed as tracked targets. Tracking data, such as data blocks, are suppressed for nonassociated tracks, such as for the Mooney, and these radar targets appear to the radar controller as "untracked" target reports, along with primary and secondary targets.

The Final controller stated that pilots were having difficulty seeing other aircraft, but they were not having difficulty seeing the airport. He said that controllers at SLC are accustomed to observing non-mode-C targets operating in and near the traffic

1/ For more detailed information, read Aircraft Accident Report--"SkyWest Airlines Swearingen METRO II and Mooney M20, Midair Collision, Kearns, Utah, January 15, 1987" (NTSB/AAR-88/03).

4581B

pattern at SLC Municipal 2 Airport (SLC 2) presumably below the ARSA. The SLC TRACON controllers have an understandable expectation that such targets are not within the ARSA airspace if they are not in radio contact. They stated that they routinely observe visual flight rules (VFR) targets on the radar as aircraft depart SLC 2 in a climb, and they observe these targets routinely disappear during descent to landing. In this case, the Mooney target was very near the position of the "normal" SLC 2 traffic pattern. At the same time, the Final controller was busy resolving potential conflicts with the aircraft landing at SLC International Airport. Compounding the situation was the fact that the radar symbol (triangle) depicting the Mooney was obscured by a data tag for part of the time available for the controller to notice the symbol and to provide traffic advisories.

The Safety Board believes that the overlapping of the Mooney's target by the data block from the Boeing-737 may have contributed to the Final controller's failure to note the Mooney's target and his subsequent failure to provide a traffic advisory to the METRO II. When the Mooney's target became unobscured (about 48 seconds before the collision), it was nearly directly over SLC 2. At that time, a non-mode-C target in the vicinity of SLC 2 would not have been of concern to the Final controller. Moreover, the absence of the Mooney's target before that time could have been perceived as an aircraft that had descended for a landing at SLC 2--a routine occurrence.

In fact, the Final controller stated that he recalled seeing a non-mode-C target 3 to 4 miles south of SLC 2 moving toward SLC 2 while he was handling the METRO II, but he had no more than normal cause to monitor it. He said he did not see any VFR targets in the vicinity of the METRO II before the collision, and he had no reason to believe that the target he had noted earlier was the airplane later involved in the accident. However, during the several seconds after the Mooney's target passed to the north of SLC 2, the Final controller was busy providing traffic advisories to the METRO II as part of his duties. Since the Mooney was not in radio contact with him, if he did notice the Mooney target in the seconds before the collision, he may have subconsciously dismissed it as being in the traffic pattern at SLC 2 and below the ARSA as it was supposed to be. The fact that the Mooney's target was obscured during the same time that normal traffic at SLC 2 disappears from the radarscope may have reinforced this situation.

As part of the investigation of this accident, the Safety Board examined the Federal Aviation Administration's (FAA) training programs for terminal radar controllers. Investigators visited the FAA Air Traffic Control (ATC) Academy in Oklahoma City, Oklahoma, April 6 through 9, 1987, and the SLC TRACON on April 10, 1987, to review the training curricula and to interview management and training personnel.

At the time of the midair collision in Kearns, the National Air Traffic Screen, Placement, and Training Program (NATSPT) was being used to screen candidates in the entrance phase of controller training. On the average, approximately 60 percent of the students successfully complete this first screen. The Radar Training Facility (RTF) courses (en route and terminal) were also operating as screening devices; however, between 89 and 99 percent of the students successfully completed these screens.

Managers and staff from the RTF and from the Human Resources Research Branch (of the Civil Aeromedical Institute) expressed the opinion that there was no longer a need to use the RTF courses to screen controllers since the NATSPT had proved to be an effective tool in selecting the students with the best aptitude for becoming controllers. Furthermore, as long as the RTF courses were designated as screens, the course material could not easily be modified to reflect air traffic environmental changes.

Safety Board investigators observed that in the terminal laboratory simulation problems (29 problems given over 12 days) none of the problems included actual depictions of primary or secondary targets, and none included VFR targets without mode-C altitude encoding which penetrated terminal airspace (ARSA or terminal control areas (TCAs)). All VFR targets were mode C and did not penetrate the ARSAs or TCAs until given approval by the trainee.

The chief of the Radar Training Section advised the Safety Board that the RTF personnel were not aware of the circumstances of recent midair collisions. He stated that he had not received any direction to change existing programs as a result of the recent accidents. He also informed the Safety Board that a training proposal for the terminal course had been forwarded to FAA headquarters on August 12, 1986, which discussed modifying the program to eliminate the screening process of the RTF portion of training.

On October 5, 1987, the FAA decided to change the status of the RTF courses from a screening format to a training format. This change was effective February 16, 1988, for the terminal course, and February 26, 1988, for the en route course. As soon as the hardware and software improvements are available, the courses will be modified to include minimum safe altitude warning conflict alert, and mode-C intruders in the laboratory problems. The equipment modernization phase is already in the procurement phase. The software improvements are expected to be completed by June 1990. Until these modifications are completed, ARSA/TCA intruders will not be included in the RTF simulation problems.

The radar training course used at the SLC TRACON was derived from the FAA Terminal Instructional Program Guide which provides guidance for establishing facility training programs. The SLC TRACON uses an electronic target generator (ETG) to provide realistic training for radar controllers. At the time of the Kearns accident, the ETG had 39 scenarios in varying degrees of complexity; however, VFR mode-C intruders were not incorporated into any ETG scenarios. The SLC TRACON management stated that the need to provide such training "had not been identified before the accident." After the Safety Board's visit on April 10, 1987, ARSA intruders were included in ETG scenarios.

Facility records revealed that the Final controller had received briefings on the implementation of the ARSA and procedures for ARSAs during February, March, April, July, August, and October 1986. A special briefing was provided during May 1986, before the ARSA became effective. During April 1986, the Final controller had received a briefing on safety alerts that had been mandated by the Northwest Mountain Region of the FAA.

Regarding the Final controller, the Safety Board concluded that his training and experience were more than sufficient to prepare him to perform his tasks properly. He had been a full performance level controller since 1983 and had worked with the SLC ARSA since its implementation in May 1986. Therefore, although he probably had not received formal training with regard to ARSA intruders in the past during his initial (RTF) training at the ATC Academy and during ETG training at the facility, his on-the-job experience was sufficient to have made him aware of the potential for such intruders. Consequently, the lack of formal training for ARSA intruders is not considered a factor in this accident, although it is a deficiency in the radar controller training program that should be corrected.

Despite the fact that the ATC Academy RTF was considered a screen versus true training, the Safety Board is concerned that radar training in the RTF scenarios did not include ARSA (or TCA) intruders. Similarly, the lack of "real world" training in the facility ETG training also concerns the Safety Board. The Safety Board believes that initial radar controller training, including screening programs, should include scenarios involving aircraft that violate "expected" controlled airspace standards so that controllers will be prepared for such contingencies.

The implementation of automated redundancies to assist controllers in their duties is several years from total implementation. In the meantime, the Safety Board believes that initial radar training, on-the-job training, and recurrent training should include "real world" scenarios to properly prepare controllers. The Safety Board believes that the FAA's failure to require "real world" training for radar controllers regarding ARSA (and TCA) intruders indicates a deficiency in the ATC system that should have been identified and corrected before this accident. The fact that the SLC 2 traffic pattern was so close to the final approach path to SLC and the possibility that pilots would violate the ARSA should have been identified, and procedures and training should have been provided to cope with this problem. This system deficiency suggests a lack of a proactive quality assurance program within the FAA air traffic service.

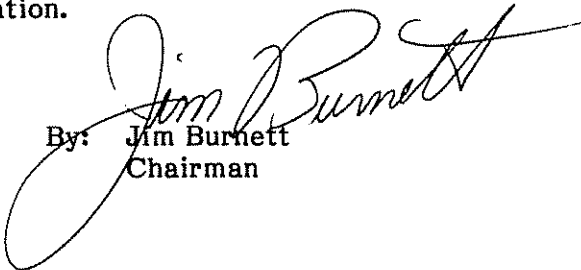
The apparent widespread number of TCA and ARSA intruders identified in the recent past and the number of near-midair collision reports should have prompted a systematic analysis by the FAA to develop accident prevention measures. For example, National Aeronautics and Space Administration Aviation Safety Reporting System reports for SLC during the months before the accident revealed several occurrences of pilots reporting VFR intruders in the SLC ARSA during vectors to land at SLC. In some of those instances, the location and circumstances were virtually identical to the location and circumstances of this accident.

The Safety Board believes that a thorough review of this matter by the FAA before the accident should have identified the potential for air traffic controllers to overlook untracked non-mode-C aircraft in the area north of SLC 2. If the FAA had conducted such a review, the need for special training or procedures would have been apparent. In fact, a specific requirement that operations out of SLC 2 be mode-C-equipped could have been derived. Consequently, the Safety Board concludes that the lack of an aggressive quality assurance effort by the FAA was an element that indirectly set the stage for this accident.

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

Review and revise as necessary the Air Traffic Control Academy and facility terminal radar training programs to include "real world" aspects, such as visual flight rules intruders, into the radar training facility and the electronic target generator scenarios. (Class II, Priority Action) (A-88-46)

BURNETT, Chairman, KOLSTAD, Vice Chairman, and LAUBER and NALL, Members, concurred in this recommendation.

By:   
Jim Burnett  
Chairman