National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: July 14, 2000

In reply refer to: A-00-63 through -65

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

In this letter, the National Transportation Safety Board recommends that the Federal Aviation Administration (FAA) take action to address the following safety issues: inadequate air traffic controller proficiency in transitioning to and using backup mode operations, confusing computer messages displayed to controllers during transition to backup mode, and premature closure of reports filed by controllers to notify management of an unsatisfactory condition. The Safety Board identified these safety issues during its investigation of a December 6, 1998, air traffic control (ATC) operational error[1] at Boston Air Route Traffic Control Center (ARTCC). Although these safety issues did not directly contribute to the incident's occurrence, they warrant the FAA's attention. This letter summarizes the Safety Board's rationale for issuing these recommendations.

About 20 minutes before the operational error occurred, the Boston ARTCC experienced an unscheduled outage of its main processing system and computer display channel. Consequently, the facility switched to the Direct Access Radar Channel (DARC)[2] backup radar data processing system to provide ATC service. Depending on whether the main processing system is partially or wholly out of service, the DARC system operates in either DARC/HOST[3] or standalone[4] mode. Investigators determined that when the transition initially occurred, DARC was

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[1] An operational error is an ATC action that results in loss of required separation between aircraft. In this incident, the aircraft—a Delta Air Lines Boeing 767 and a Caledonian Airways Lockheed L-1011—were required to be separated by 2,000 feet vertically or 5 miles horizontally but passed within 400 feet vertically and 1.07 miles horizontally 10 miles south of East Hampton, New York.

[2] DARC is only used during an unscheduled outage or during required maintenance of the main processing system.

[3] In DARC/HOST mode, flight data processing functions are still available for use in conjunction with DARC radar data processing. In this configuration, controller alerting functions contained in the main processor, such as conflict alert and mode C intruder detection, remain operational, and manual controllers may continue to perform flight data functions at their keyboards.

[4] In DARC standalone mode, the disconnection of the interface between DARC and the main processor disables some keyboard functions and requires that some coordination between sectors be performed manually.

in DARC/HOST mode. Shortly thereafter, the system engineer intentionally disconnected the interface between DARC and the main processor, placing DARC in standalone mode. When this occurred, the main processor generated a message to sector computer readout devices and strip printers that read, "DARC DISABLED." According to airway facilities staff at Boston ARTCC, this message is intended to announce that the interface between the main processor and DARC has been disconnected. In postincident interviews, controllers reported that the message caused confusion about DARC operational status, leading them to request verification from their supervisor and airway facilities personnel that DARC was in fact operating.

Because DARC's capabilities are different in each mode, it is important that controllers understand which mode the system is operating in. In postincident interviews, some controllers reported that they were told only to "go to DARC" at the outset of the transition without being notified whether the system was operating in DARC/HOST or standalone mode. In addition, none of the controllers interviewed reported having any substantial recent experience using DARC to control live traffic. The operational supervisor on duty estimated that his last opportunity to control aircraft using DARC was about 8 years before the incident.

In a 1996 special investigation report on ongoing computer and related equipment outages at certain ARTCCs[5], the Safety Board noted a lack of controller understanding of DARC standalone operations and expressed concern about the FAA's provisions for DARC training and maintenance of controller proficiency in its use. In Safety Recommendation A-96-3, issued with the report, the Board asked the FAA to create a simulator-based program using the simulation capabilities of split-HOST operation during off-peak periods. The recommendation suggested that the training program include simulated transitions to and from DARC operating under both the DARC/HOST and standalone modes and that all controllers be required to complete the new program. Because the FAA reported technical difficulties with the recommended simulation approach, the Board classified Safety Recommendation A-96-3 "Closed—Reconsidered" in a June 6, 1997, response. The Board stressed, however, that although other forms of training have their place in ATC training programs, there is no substitute for simulator-based training.

The findings in the investigation of the December 1998 incident at Boston ARTCC have renewed the Safety Board's concerns about the FAA's training provisions for maintaining controller proficiency in the use of the DARC system. The Board learned during the investigation that the controllers involved in this incident had completed the annually required computer- and paper-based DARC refresher training. However, the Board continues to believe that this training is not comparable to simulated or actual DARC operations and is evidently inadequate to guarantee proficiency in use of the DARC system. Any situation in which controllers and supervisors may suddenly have to control aircraft using unfamiliar methods and procedures is undesirable. Therefore, the Safety Board believes that the FAA should evaluate and revise training standards for the use of the DARC system by all ATC personnel required to maintain operational currency on en route control positions. Such training should include significant periods of simulated or actual DARC operation.

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[5] National Transportation Safety Board. 1996. *Air Traffic Control Equipment Outages*. Special Investigation Report NTSB/SIR 96/01. Washington, DC.

During the investigation, Safety Board investigators were provided a copy of an Unsatisfactory Condition Report[6] (UCR) that was submitted to Boston ARTCC management on March 31, 1996. The UCR described controllers' confusion following the appearance of a "DARC DISABLED" message after a main processor outage on the same date as the submission. The management response to the UCR assessed the message as "erroneous information" and noted that a propensity for confusion exists because of its wording. The UCR was closed by the generation of a National Change Proposal (NCP), which asked that the "DARC DISABLED" message be changed to "DARC/HOST DISABLED AT XXXX." In an attempt to prevent further confusion while the NCP was being processed, Boston ARTCC management circulated a training bulletin to controllers that explained the meaning of the message. However, the December 6, 1998, incident suggests that this action did not sufficiently resolve the problem and that further action is required to modify the displayed message.

Safety Board investigators also learned that the NCP written in response to the March 1996 UCR was a near-duplicate of a May 31, 1995, NCP from the Salt Lake ARTCC. In response to a similar complaint, the Salt Lake ARTCC proposed changing the message to "DARC/NAS INTERFACE DISABLED AT XXXX." Because of the similar subject matter, the two NCPs were combined; however, the consolidated NCP was apparently never entered in the documentation control system, which tracks NCPs. Therefore, the requested software modification was never implemented. Boston ARTCC controller comments after the December 6, 1998, incident suggest that the need for the proposed software modification remains valid. Therefore, the Safety Board believes that the FAA should develop and implement an NCP to amend the wording of the "DARC DISABLED" message to clearly describe the operational status of the DARC interface with the main processor.

The Safety Board is also concerned that current FAA procedures permit UCRs to be closed before the reported problem is corrected. In the case of the March 1996 UCR, this practice—combined with mistakes in the logging and tracking process—resulted in the continued existence of an acknowledged software fault. Handling UCRs in this manner compromises the UCR program's effectiveness. If FAA management agrees that a reported problem needs to be corrected, a UCR should remain open until the corrective action is completed. Therefore, the Safety Board believes that the FAA should amend the procedures for responding to UCRs to ensure that reports of valid deficiencies remain open until completion of all corrective actions.

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

Evaluate and revise training standards for the use of the Direct Access Radar Channel (DARC) system by all air traffic control personnel required to maintain operational currency on en route control positions. Such training should include significant periods of simulated or actual DARC operation. (A-00-63)

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[6] A UCR is a report of a problem that, in the opinion of the submitter, represents a safety hazard or other serious matter in need of urgent correction. FAA procedures require that all UCRs be tracked and receive a timely and substantive response.

Develop and implement a National Change Proposal to amend the wording of the "DARC DISABLED" message to clearly describe the operational status of the Direct Access Radar Channel (DARC) interface with the main processor. (A-00-64)

Amend the procedures for responding to Unsatisfactory Condition Reports to ensure that reports of valid deficiencies remain open until completion of all corrective actions. (A-00-65)

Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in these safety recommendations.

By: Jim Hall
      Chairman