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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-83-35 through -43

The National Transportation Safety Board has completed its followup investigation of the nation's Air Traffic Control (ATC) system. 1/ The investigation, which was initiated on September 20, 1982, examined the operation of the ATC system from August 3, 1981, to December 31, 1982. The investigation included the survey of 51 ATC facilities, during which about 350 controllers and other ATC facility staff and managers were interviewed. The Board's investigators observed the operation of the ATC system from within the facilities, while riding in the cockpits of commercial airliners, and while flying general aviation aircraft within the system. Questionnaires regarding the ATC system and stress and fatigue were sent to randomly selected controllers who worked at the facilities surveyed. Additionally, questionnaires were sent to scheduled airline users of the ATC system and were distributed to pilots of nonscheduled aircraft soliciting their views on the efficiency and safety of the ATC system. The Board's investigators also visited 20 Flight Service Stations (FSS) where the managers and specialists were interviewed.

The purpose of the followup investigation was to evaluate the Federal Aviation Administration's (FAA) effectiveness in resolving the safety issues which arose because of the controllers' strike and the FAA's progress in the subsequent system rebuilding efforts. The Safety Board has based its assessment of the safety of the ATC system, in part, on its monitoring of the system in the course of the Board's ongoing fulfillment of its accident investigation responsibilities during the period since the strike.

In general, the Safety Board found during the followup investigation that, based strictly on the absence since the strike of a significant number of accidents attibuted to ATC factors, the ATC system has been operated safely. However, the Board identified several specific safety areas of concern which indicate that the margin of safety is less than the Safety Board believes to be desirable. Early in the followup investigation, the Board identified a number of shortcomings in ATC facility administration and in the management of controller on-the-job training. On December 20, 1982, the Board directed four recommendations to the FAA that specifically addressed those training concerns. 2/ In the course of completing the investigation, the Board became concerned

1/ For additional information, read "Followup Study of the United States Air Traffic Control System" (NTSB/SIR-83/1).
2/ For additional information, read safety recommendation letter, dated December 20, 1982, to the FAA Administrator (Recommendations A-82-146 through -149).

about the following broad subject areas: the reporting and investigation of controller and pilot errors and deviations which are system safety indicators; controller workload, stress, and fatigue; facility management practices, including traffic volume and flow control; and FSS program management and provision of services to certain system users.

The matter of most concern is that our investigative findings show that there has been incomplete reporting of operational errors and deviations, pilot deviations, and near midair collisions. The Safety Board considers these "system safety indicators" to be the best means by which to assess the safety of the ATC system, rather than the undesirable after-the-fact indicators -- accidents. The Board is aware that the FAA uses these indicators as its means of assessing controller proficiency and performance. However, the Board found during its followup investigation that there are many reportable occurrences which go unreported for a number of reasons. The failure to report errors also occurred before the controllers' strike. Consequently, the use of system safety indicator statistics to evaluate the overall ATC system safety, or an individual facility or controller's performance or proficiency, is and will be of no real value until consistent reporting is a fact. Without a standard and complete reporting base, comparisons and valid conclusions cannot be drawn, and quality control improvements in the system cannot be made. More importantly, the performance of the newly trained and certified controller workforce cannot be accurately measured.

The Safety Board confirmed the nonreporting of system safety indicators by several means, including statements by controllers that a considerable percentage of errors go unreported. The most significant evidence involved analyses of radar facility conflict alert data and computer-stored aircraft track data and voice tapes. The Board's investigators found several instances of less-than-standard separation of aircraft by these means, yet found no record of reports or investigations of the incidents. This deficiency was also evident during the investigation of the Air Florida, Inc., Boeing 737 accident at Washington, D.C., on January 13, 1982. In its report of that accident, 3/ the Safety Board expressed its concern that, although the controller's handling of traffic in that case was clearly contrary to established FAA procedures, no operational error was recorded. As a result of its concern, the Safety Board issued Safety Recommendation A-82-86 on August 11, 1982, that requested the FAA to "Evaluate the criteria and current practices of Air Traffic Control facilities regarding the declaration and reporting of operational errors to ensure that all errors are reported and are investigated." On November 15, 1982, the Administrator of the FAA responded that, "We believe our criteria delineating what constitutes an operational error are clear and concise. Our employees know that when they are aware an operational error has occurred, they are required to report the incident immediately. To emphasize the importance of this, on April 6, 1982, I issued a directive emphasizing the reporting of errors."

As a result of the FAA's response, the Safety Board classified Safety Recommendation A-82-86 as "Closed--Acceptable Action." However, the Board's followup investigation revealed that the FAA headquarters staff's perception of the operational error reporting program is not reflected in the actual situation existing in the ATC facilities. The Safety Board agrees with the FAA that the language of the operational error definitions and aircraft separation criteria is clear and precise; however, as evidenced by the FAA facility management and controller's testimony during the Air Florida accident investigation and by the Board's findings in the followup investigation, the application

3/ For additional information, read Aircraft Accident Report--"Air Florida, Inc., Boeing 737-222, N62AF, Collision with 14th Street Bridge, Near Washington National Airport, Washington, D.C." (NTSB-AAR-82-8).

of the intent of the rules and procedures is not precise or standardized. The evidence is sufficient enough and the hazards are significant enough to warrant immediate FAA action to require complete reporting and investigation of operational errors and other system safety indicators. The FAA's ATC management and controllers should recognize that complete reporting and investigation of errors is an extremely important means by which to measure the efficiency and safety of the ATC system and to improve the overall system, including training, procedures, and airspace and equipment design. The existing punitive approach to error analyses should be replaced with a prevention-oriented, positive approach, including possibly an immunity program to ensure complete reporting.

The present system for reporting of errors is essentially a voluntary "honor system" which relies mainly on controllers to report on themselves or on a fellow worker, and the report most likely will result in disciplinary action for the involved controller. The absence of direct first-line supervision, because supervisors are currently working traffic nearly full-time and are unable to monitor the controllers, fosters the nonreporting of errors. Further, the Board's investigators found no instance where the computer-stored data were evaluated for possible errors. That technique was used only in the instances where an error was reported and had to be verified for disciplinary action. The Board believes that this excellent tool for analyzing the safety of the ATC system should be refined and used routinely at facilities equipped to provide such analyses. Unfortunately, only 29 ARTS III/IIIA facilities (46 percent) are presently recording radar data because many of the data systems specialists are currently working active control positions and, therefore, are not available to set up the recording equipment. There is no apparent reason that a computer operator or other technician could not be assigned to set up the recording equipment in lieu of a data systems specialist. Therefore, the Board believes that the FAA should act immediately to staff the appropriate facilities so that continual computer recording capability is reinstituted.

The March 7, 1983, announcement by the FAA about its newly instituted quality assurance program to include computer programs to detect errors is a positive step, but it will be several months or years before it is implemented. In the meantime, direct supervision of controllers must be present to ensure enforcement of the existing procedures and directives for error reporting and investigation.

One of the existing excellent means by which system safety indicators are reported and analyzed is through the Aviation Safety Reporting System (ASRS) which is funded partially by the FAA and administered by the National Aeronautics and Space Administration (NASA). As a result of its initial ATC system investigation, the Safety Board recommended that the FAA periodically reemphasize use of the ASRS program by controllers. As a result of the FAA's reply, the Board classified the status of that Safety Recommendation, A-81-154, as "Closed--Acceptable Action." However, the findings of the followup investigation revealed that the ASRS forms are not readily available in many ATC facilities and that many controllers are not aware of or are not using the program. The FAA headquarters staff's perception that the ATC facilities are actually emphasizing the program is not correct. That is, the Administrator's efforts to reemphasize the ASRS program in ATC facilities did not lead to the desired goal. Although the FAA headquarters sent a notice to all ATC facilities in late October 1982 emphasizing the use of the ASRS program, that action alone apparently has not been sufficient. The FAA should seek confirmation that the intended results are achieved. The Safety Board supports the intent of the ASRS program, believes it is valuable, and urges the FAA to implement, in cooperation with the appropriate NASA officials, positive actions to encourage the use of the ASRS program to supplement the FAA's quality control and evaluation of the ATC system.

The second matter of concern to the Board is controller workload, fatigue, and stress. As a result of its initial investigation of the ATC system, the Safety Board recommended on October 14, 1981, that the FAA, "Establish and implement a program to detect the onset of, and to alleviate, controller fatigue and stress." The recommendation stemmed from the fact that controllers were working extended workdays and workweeks with reduced or no vacation time, and there were no programs in place to detect or monitor the possible adverse effects of stress and fatigue. On January 20, 1982, the FAA responded that it had taken several actions to minimize stress by reducing traffic volumes at selected facilities. The FAA also initiated a review to consider, for the long term, the need for, and method of, implementing a monitoring system which would identify controllers who might be suffering from the effects of fatigue or stress. As a result of these actions, the Safety Board classified that Safety Recommendation, A-81-145, as "Open—Acceptable Alternate Action" pending followup correspondence from the FAA. No positive action on this matter has been taken by the FAA since that time; however, personnel from the FAA's Office of Aviation Medicine and ATC management personnel told Board investigators that the FAA is relying on the first-line supervisors in ATC facilities as the primary means by which stress and fatigue are monitored in day-to-day operations.

The Safety Board's investigation determined that many controllers continue to work extended hours, especially when providing on-the-job training, and that many of the controllers are at times fatigued and under stress. The growing realization of just how long the attainment of full staffing levels will take, the heavy demands of the training requirements, and the continued lifting of traffic and ATC service restrictions are causing concern among the controllers, and this concern has begun to affect the morale of the controller workforce. The high morale, as a result of the events immediately following the strike, and the "can do" attitude prevalent in the period shortly after the strike, have begun to wane. The traffic peaks at some facilities have reached, and even exceeded at times, the prestrike levels although staffing is still at reduced levels. In spite of this, there still are no programs in ATC facilities for detecting or monitoring the existence or onset of fatigue or stress.

The first-line supervisors, who are expected by FAA management to play an essential role of monitoring a controller's performance, continue to work traffic at the expense of their role as a full-time supervisor. Further, the supervisors have not been given guidance or training in procedures for managing these important human factors. A few supervisors interviewed during the followup investigation have devised their own methods of detecting fatigue and/or stress, have identified persons suffering from the effects of these problems, and have taken actions to correct the situation. These actions are isolated cases, however, and have not been applied in a standard manner systemwide. Other supervisors expressed the desire to receive training and other guidance to fulfill this important part of their responsibilities.

The Safety Board believes that the more than 1 year that has elapsed since the strike has been sufficient time for the FAA to have developed and disseminated basic instructions to its facilities to better prepare the supervisors for their role in dealing with the consequences of stress and fatigue. Therefore, the Board reiterates Safety Recommendation A-81-145 and has reclassified its status as "Open--Unacceptable Action," pending appropriate FAA action to comply with the intent of the recommendation. The Board also believes that the FAA should expedite the establishment of a formal program which should include objective, as well as subjective, means of detecting and managing stress and fatigue. The proposal for an Air Traffic Controller Performance Assessment

Program is commendable but may require several months or even years to implement. The Safety Board believes immediate action is required. In fact, implementation of that program could resolve many of the other concerns about controller training and proficiency, because it proposes to provide an objective means to evaluate controller performance.

The third matter of concern is directly related to the first two aspects. That is, certain facility management practices, especially the regulation of controller workload through traffic volume and flow restrictions, must be examined and modified. The Safety Board is concerned about the continued lifting of traffic restrictions and the increase in other ATC services during the extensive on-the-job training, while many supervisors continue to work control positions. The traffic volumes handled by the ATC system have been allowed to increase to about 100 percent of prestrike levels with only about 50 percent of the prestrike workforce. Return of the ATC system to 100 percent access to users is based on continued overtime and reduced vacation time for many controllers. It should be noted that the status of 100 percent traffic volume refers to the national average based on the July 1981 baseline. Many facilities remain below 100 percent traffic volume, while others are exceeding the 100 percent July 1981 level. The Safety Board is concerned that these increases, before supervisors are released to their previous roles, may have a deleterious impact on the level of safety of ATC operations. The remaining increment of traffic volumes at all facilities to return them to 100 percent access to users should not be assumed to involve a linear relationship to increases in the available numbers or percentages of qualified controllers. As flow restrictions are relaxed, in-trail restrictions reduced, and traffic volumes increased, the controllers' workload is increased and the margins for error are reduced logarithmically. At the same time, the experience level of the workforce is still minimal because of the large number of newly qualified controllers, who were trained under less dense traffic conditions. Therefore, the same decisions and criteria (including the assumptions) used to allow traffic and services to return to the 100 percent level, which have been successful thus far, are not valid for the remaining increments of the traffic volume, especially unrestricted access by users. Essential FAA action to address this situation should include implementation of adequate direct first-line supervision of working controllers before air traffic is allowed to increase and restrictions are lifted.

The Safety Board is aware of, and supports, the revised management structure for ATC facilities which will require first-line supervisors to remain highly proficient at control positions within their purview. Such a requirement will permit them to better evaluate and monitor their subordinates' performance. However, during the periods that they are working a control position, the need for direct supervision still exists and must be provided. As a result of its initial investigation, the Safety Board issued Safety Recommendation A-81-147 on October 14, 1981, that the FAA,

> Require that, at any time that a first-line supervisor is to work a control position in addition to performing supervisory duties, a procedure is in place at the facility through which qualified personnel are immediately available for assistance or coordination.

The FAA responded, in general, that it did not agree with the recommendation, "since there is no possible means to require available assistance and coordination [first-line supervisor] in every situation 100 percent of the time," because of staffing limitations following the strike. The Board asked the FAA to reconsider its position on this recommendation in view of the need for explicit and formal procedural arrangements to ensure the availability of a first-line supervisor to handle situations requiring his/her

assistance. Because of the Board's concern in this matter and the obvious need for adequate first-line supervision, the Board classified the status of Safety Recommendation A-81-147 as "Open—Unacceptable Action." Followup correspondence, dated May 3, 1982, from the FAA stated that action had been initiated to comply with the intent of Safety Recommendation A-81-147 and that FAA Handbook 7210.3F, "Facility Operation and Administration," would be revised accordingly. However, to date, the handbook has not been revised to incorporate revised management procedures. Therefore, the Safety Board reiterates its earlier Safety Recommendation A-81-147 and urges the FAA to take immediate action to fulfill its stated intent to amend the Facility Operation and Administration Handbook. Besides being "immediately available for assistance and coordination," there should be full-time direct supervision to ensure monitoring of controller performance, the total reporting of errors, control of the workload, and detection of stress and fatigue.

The last issue of concern to the Board involves the adequacy of services being provided by FSS's to users of the system. The followup investigation determined that much of the aviation community, especially the nonscheduled users, was experiencing difficulty in obtaining timely and adequate services, such as weather briefings and flight plans. Many pilots reported to the Board's investigators, and the investigators found first hand that the FSS's were not able to handle the volume of requests that arose during inclement weather. Consequently, some pilots have been flying under visual flight rules in marginal weather, when they desired to fly, and normally would have flown, under positive control of ATC. Also, because of the understaffing of certain FSS's, and the failure of pilots to reach an FSS briefer, pilots have been flying with outdated weather information or no weather briefing. The Board's investigators confirmed the difficulties encountered by these pilots by flying aircraft within the ATC system. Also, interviews with FSS managers and specialists confirmed the lack of ability to respond to the volume of requests from pilots because of FSS staff and equipment limitations.

The Board determined that the FSS modernization and consolidation program being implemented by the FAA is not progressing in accordance with its stated goals of providing services at existing levels. The impact of the additional workload, as a result of the general aviation reservations, tower/en route clearances, and other strike-related factors, coupled with the loss of specialists to ATC facilities and personnel cuts at the same time that the modernization and consolidation plan is being implemented, has created operational and safety-related problems for users of FSS services.

The Safety Board has traditionally encouraged flight in a controlled environment to minimize the midair collision hazard. Moreover, the continued occurrence of weather-involved general aviation accidents, which generally cause a high rate of fatalities per accident, are of major concern to the Board. The availability of timely and adequate weather briefing facilities and flight planning capability for general aviation pilots has been of major importance to the FAA. Because of the apparent decline of capability in this regard, the Safety Board urges the FAA to take immediate action to provide equipment and personnel in order to reestablish the necessary responsive services at FSS's.

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

> Standardize and disseminate immediately as an interim measure basic guidelines and methodology for controller stress and fatigue detection and management, similar to those currently in use by some flight surgeons and facility supervisors and those developed by the Federal

Aviation Administration's Office of Aviation Medicine personnel, to the air traffic control supervisors to assist them to detect and alleviate stress and fatigue among controllers. (Class II, Priority Action) (A-83-35)

Expedite the development and implementation of the Air Traffic Controller Performance Assessment Program currently being developed by the Federal Aviation Administration's Office of Aviation Medicine to assist air traffic control facility supervisors and managers to objectively and subjectively evaluate controller performance and to detect and alleviate stress and fatigue among controllers. (Class II, Priority Action) (A-83-36)

Expedite the development and implementation of computer programming procedures at all appropriately equipped en route and terminal radar facilities by which less-than-standard aircraft separation occurrences are automatically detected and flagged for investigation and analysis of possible controller errors or pilot deviations. (Class II, Priority Action) (A-83-37)

Institute air traffic control directives and procedures to require, when the assigned first-line supervisor is occupied working a control position, that there is appropriate and adequate direct supervision to ensure the detection and reporting of all controller errors or deviations, the detection and monitoring of fatigue and/or stress, and the control of each controller's workload. (Class II, Priority Action) (A-83-38)

Revise immediately air traffic control directives to reduce or eliminate, possibly by means of an immunity program, the punitive nature of controller operational error/deviation investigations in order to encourage reporting of all incidents, with the view toward instituting prevention-oriented quality control measures and training and procedural improvements. (Class II, Priority Action) (A-83-39)

Take action to improve compliance with existing directives and guidance to air traffic controllers and staff on the use of the Federal Aviation Administration sponsored National Aeronautics and Space Administration's Aviation Safety Reporting System program to supplement existing incident reporting programs, with the view toward instituting quality control measures and improvements in the air traffic control system. (Class II, Priority Action) (A-83-40)

Take immediate action to assign adequate staff and to improve equipment capabilities at Flight Service Stations to provide more timely and adequate service to aviation users. (Class II, Priority Action) (A-83-41)

Revise the criteria for lifting restrictions on air traffic control services to postpone planned increases in air traffic volume and services at facilities until sufficient controllers are trained and qualified and have gained sufficient experience to allow supervisors and key staff members to resume direct first-line supervision and oversight of operations. (Class II, Priority Action) (A-83-42)

Take immediate action at all air traffic control facilities equipped with radar data recording equipment to staff the data systems specialist positions on an interim basis with persons who are sufficiently qualified to handle the computer equipment, so that continuous recording and data retrieval capability is reestablished. (Class II, Priority Action) (A-83-43)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations.

By: Jim Burnett
Chairman

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-83-038	1	SIR-86-01	5/6/1986	Runway Incursions at Controlled Airports in the U.S	N/A	N/A	N/A