



National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Log 2082

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In reply refer to: A-88-81 through -91

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

The National Transportation Safety Board believes that runway incursions and near-midair collisions, with their associated potential for a catastrophic collision, represent two of the most serious problems involving the safety of commercial aviation operations in the United States today. In the past 2 years and to date during 1988, there has been a significant number of air traffic controller operational errors at the Chicago O'Hare International Airport (O'Hare) that resulted in near collisions between air carrier, corporate, and general aviation airplanes during ground operations on the airport and during departure and arrival phases of flight. The Safety Board remains concerned that, although the Federal Aviation Administration (FAA) has implemented procedural and operational changes and other corrective actions at O'Hare, these efforts have not prevented the continuing occurrence of these incidents. The Safety Board is aware that on August 8, 1988, the FAA's Office of Aviation Safety initiated a Systems Safety and Efficiency Review of the O'Hare airport with a view toward making appropriate improvements in the O'Hare airport and its operation. The Safety Board believes that it is important for the FAA to have the results of the Safety Board's special investigation initiated on June 9, 1988.

Between January 1 and June 7, 1988, there were 19 operational errors that involved controllers at the O'Hare air traffic control (ATC) facility. Five errors involved tower controllers, and 14 errors involved controllers in the Terminal Radar Approach Control (TRACON) facility. There were 12 operational errors during calendar year 1987, 3 involving the tower and 9 involving the TRACON. The number of operational errors at O'Hare is significantly higher than at other ATC facilities with similar traffic activity. For example, preliminary comparative data provided by the FAA indicates that for the period January 1 to May 31, 1988, the number of operational errors at O'Hare is four times the number at Atlanta, five times the number at Los Angeles, and three times the number at Dallas-Fort Worth.

The 14 TRACON operational errors involved 2 arrivals and 5 departures to and from O'Hare airport and 7 operations to and from satellite airports in the Chicago metropolitan area. Twelve errors involved one or more air carrier airplanes. Nine involved the performance or actions of individual controllers, while five involved control actions or coordination between two or more controllers. The qualifications of the controllers involved in these errors ranged from senior level supervisors to developmental controllers who were being trained under the supervision of an instructor controller. Controller workload was heavy and complex in two errors, light

and not complex in four errors, and, in the remaining eight errors, the workload was moderate.

Previously, the Safety Board has investigated several other operational errors at O'Hare that occurred during calendar years 1986 and 1987. These investigations focused primarily on operational errors and runway incursions that involved controllers in the tower. As a result of these investigations, the Safety Board issued three recommendation letters to the FAA ^{1/} that included 10 recommendations addressing air traffic controller qualifications and staffing levels, supervisory controller problems, controller requalification after being involved in an error, air traffic flow control programs, and the need for two additional tower coordinator positions. The FAA was responsive and took timely action to fulfill the intent of all but two of these recommendations. The status of the recommendation on flow control, initially rejected by the FAA, is addressed later as part of a discussion of the high-density rule and engineered performance standards at O'Hare.

The FAA also initially rejected the need for two additional coordinator positions in the tower. After two more operational errors involving O'Hare tower controllers, however, the FAA implemented a staffing change that required use of one additional coordinator during periods of busy air traffic. Following the investigation of yet another tower-related operational error, the Safety Board reissued its safety recommendation on March 16, 1988. The Safety Board was pleased, therefore, when it received the FAA's June 13, 1988, response which stated that two additional supervisory coordinators had been added to the O'Hare tower staff. The Safety Board believes that the use of these coordinators should effect a reduction in the number of tower-related operational errors at O'Hare.

Also, the Safety Board has provided testimony to two congressional committees regarding ATC operations at O'Hare. Member Joseph T. Nall testified before the Subcommittee on Government Activities and Transportation, House of Representatives, on February 27, 1987, ^{2/} concerning the operational safety of air traffic control at O'Hare. In addition, Chairman Jim Burnett testified before the Subcommittee on Transportation and Related Agencies, House of Representatives, on March 18, 1988, ^{3/} regarding air carrier operations at O'Hare. Both hearings were held in Chicago, Illinois, and the Safety Board's testimony provided a review of its investigations of operational errors at O'Hare and described the safety recommendations that were issued to the FAA and the FAA's response.

^{1/} Safety Recommendation letter A-86-44 through -46, dated May 27, 1986; Safety Recommendation letter A-87-3 through -7, dated February 6, 1987; and Safety Recommendation letter A-88-47 and -48, dated March 16, 1988.

^{2/} Testimony of Joseph T. Nall, Member, National Transportation Safety Board, before the Subcommittee on Government Activities and Transportation, Committee on Government Operations, House of Representatives, Regarding Air Traffic Control Operations at O'Hare International Airport, Chicago, Illinois, February 27, 1987.

^{3/} Testimony of Jim Burnett, Chairman, National Transportation Safety Board, before the Subcommittee on Transportation and Related Agencies, Committee on Appropriations, House of Representatives, Regarding Air Carrier Operations at O'Hare International Airport, Chicago, Illinois, March 18, 1988.

Special Investigation

On June 6, 1988, an operational error occurred involving an air traffic controller in the O'Hare TRACON. This incident, which occurred approximately 30 miles west of O'Hare airport, involved United Airlines flight 8357 (UAL 8357), a Boeing B-727, and a Learjet LR-25, N660TC. UAL 8357 had departed O'Hare on a flight to Ontario, California, and was climbing westbound through 12,000 feet under the control of the Chicago Air Route Traffic Control Center. N660TC had departed DeKalb Taylor airport, under visual flight rules (VFR), and was requesting an ATC clearance to Appleton, Wisconsin. The TRACON controller cleared N660TC to fly on a heading of 070° and to climb to 14,000 feet without coordinating with the adjacent sector controller who was responsible for that specific airspace. The controller also failed to verify the altitude of N660TC before issuing the ATC clearance. Shortly after the clearance was issued, the Learjet ascended through the altitude of UAL 8357. The Learjet pilot stated that the airplanes passed each other in opposite directions with approximately 200 feet horizontal and 0 feet vertical separation. He believed that his airplane would have hit the B-727 airplane if he had not banked it 50° to 60° in an evasive maneuver. He told the controller, "We just about ran smack over a 727 here." The controller stated that traffic conditions were not busy at the time of the incident.

Later that same day, another operational error occurred that involved a controller who was providing on-the-job training (OJT) to a developmental controller in the TRACON. This incident involved United 608 (UAL 608), a Boeing B-727, and Idaho 74, a Cessna 182, which was operating VFR at 6,500 feet while in the Terminal Control Area (TCA); both aircraft were under the direction of the O'Hare TRACON. UAL 608 had departed runway 32L at O'Hare. The developmental controller identified the airplane and cleared the flight to 14,000 feet. The instructor who was aware that UAL 608 would climb through the altitude of Idaho 74, then issued traffic to both flights when they were approximately 1 mile apart. The conflict alert activated and both flights advised the controller of having the other in sight. The incident occurred approximately 10 miles south of O'Hare during light traffic conditions. The instructor did not believe that a loss of separation had occurred and therefore did not report the incident. A later investigation by the facility revealed that an operational error had occurred. During the Safety Board's investigation, the instructor stated that the developmental controller advised him after the occurrence that he was not familiar with TCA separation standards and was not aware that there were separation standards applicable to VFR aircraft operating with an ATC clearance in the TCA.

On June 7, 1988, a third operational error occurred involving American Airlines flight 166 (AAL 166), a McDonnell Douglas DC-10, and Midway Airlines flight 787 (MID 787), a Boeing B-737, approximately 22 miles southeast of O'Hare. The Safety Board's investigation of this error determined that on initial contact with departure control, AAL 166 was advised by the full performance level (FPL) controller that radar contact was established after observing the primary radar target at the end of the departure runway. A developmental controller then sat at the position to begin training. Subsequently, the instructor became aware that there were more flight progress strips on the console than data blocks on the radarscope. Both the instructor and the developmental controller failed to maintain radar identity on the radar target of AAL 166. It was determined that a data block for AAL 166 had not been generated by the computer. A search for the airplane was initiated; however, by the time the airplane's position was determined, the operational error had occurred. AAL 166 passed within 2 miles horizontally and 0 feet vertically of MID 787. Preliminary evidence suggests that AAL 166's transponder was not functioning normally and,

therefore, the computer-generated data block for AAL 166 did not auto-acquire after departure. Traffic was described as being moderate to heavy.

The June 7, 1988, incident was the 14th TRACON-related operational error at O'Hare during 1988. (See attached list.) This significant increase in errors prompted the Safety Board to initiate a special investigation of the O'Hare TRACON to determine if there were common causal factors that contributed to the operational errors and to identify any inadequacies in FAA facility programs that might have an adverse effect on the selection, training, qualification, and performance of controllers. FAA personnel participated in all phases of the investigation which, in addition to the investigation of the three most recent operational errors of June 6 and 7, 1988, included a survey of the TRACON controller workforce. Selected controllers were interviewed and asked to respond to a questionnaire that included 55 questions. The survey results were not intended to be a scientific inquiry, rather it was a survey of opinions by the workforce of safety-related issues at O'Hare.

Sixteen controllers were selected randomly and were interviewed by Safety Board investigators. They included three area supervisors, eight FPL controllers, and five developmental controllers. The supervisors were FPL-rated at O'Hare, and all of the developmental controllers had been FPL-rated at other FAA ATC facilities before their assignment at O'Hare. None of the controllers was involved in the 14 TRACON operational errors that occurred during 1988. The controllers submitted to the interviews voluntarily.

The investigation also included an active review of investigative reports concerning other operational errors since January 1, 1988, that had not been addressed by the Safety Board. Six controllers and supervisors who were involved in these errors were interviewed to acquire their assessment of the facts regarding each incident.

Workforce Survey Results

Nearly all of the controllers and supervisors rated the overall safety of the ATC system at O'Hare as good. However, many of these controllers and supervisors voiced concerns about their ability to maintain this level of safety. A synopsis of the controllers' views concerning overtime, staffing, training, traffic, airspace, and equipment is provided below.

Overtime--All of the FPL controllers and supervisors responded that they were scheduled to work overtime and most worked overtime every week. While the majority of controllers reported that their sick leave use had not increased as a result of working overtime, most agreed that only sometimes did they receive adequate rest away from the job. As one supervisor stated, "I work overtime every week, it is mandatory . . . I'm not always rested, and in general, I find overtime a pain." Many controllers stated that they would like to work less overtime than what is required at O'Hare.

Staffing--The majority of supervisors, FPL controllers, and developmental controllers believed that staffing was a problem at O'Hare. They believed that in order to increase the margin of safety and reduce overtime use, the number of FPL controllers must be increased. Controllers stated that staffing levels had been, historically, a problem at O'Hare and that the FAA should consider establishing personnel incentives to encourage the best qualified controllers to "bid" on vacancies both in the tower and the TRACON. The most frequently mentioned incentive was a

salary differential; however, controllers also believed that they should receive an agency commitment which would give them priority to transfer to another facility after working at O'Hare for a specific period.

Training--The majority of controllers, including developmental controllers, believed that developmental controllers are only marginally prepared to begin OJT training. They cited training problems concerning the curricula, time allotted for training, selection of instructors, and the lack of an adequate radar control simulator. Many controllers and supervisors believed: training was not well planned; the time given to developmental controllers during OJT was insufficient; OJT instructors should be screened and selected based on their aptitude to teach, train, and relate to students and their problems; and, the present Enhanced Target Generator (ETG) radar simulator was inadequate for screening and training new controllers at complex facilities with high traffic volume such as O'Hare.

Traffic Volume--Almost all of the controllers believed that they were controlling the appropriate level of air traffic during typical daily peak periods. Some stated, however, that they perceived pressure to control as many aircraft as they were capable on a continual basis. Controllers voiced concerns that during peak traffic periods, frequency congestion was so bad that they often had to repeat clearances and control instructions. Some controllers' comments about traffic volume included: "Number of operations per hour gives too many opportunities for error;" "No more than 75 arrivals per hour . . . this will even traffic flow [arrivals and departures] throughout the day;" and, "too much IFR [instrument flight rules] traffic at Midway; I don't have time to give VFR advisories." Two supervisors recommended that the simultaneous use of three runways for arrival flights at O'Hare be terminated.

Airspace and Procedures--While most of the controllers believed that operating procedures were adequate and followed most of the time, a significant number of controllers believed that improvements could be made in airspace allocation and use, especially in control sector(s) configuration. They were encouraged that the facility was studying the merits of modifying and expanding the south satellite airspace. Controllers were unanimous in agreeing that the O'Hare airspace is very complex and that any changes that would simplify operational procedures and airspace configurations would be welcome.

Equipment--Controllers voiced strong concerns that equipment at O'Hare is outdated. They were perplexed that while O'Hare is one of the busiest ATC facilities, it does not have a high priority for state-of-the-art equipment. Controllers cited low priorities and delays in the installation of Automated Radar Terminal Systems IIIA (ARTS IIIA), Airport Surveillance Radar-9 (ASR-9), Airport Surface Detection Equipment-3 Radar (ASDE-3), and the Integrated Communications Switching System (ICSS). Controllers stated that the "flat top" radar equipment used in the TRACON was difficult to use, and to many it presented a health problem. One controller required medical attention for back and neck strain that resulted from "leaning over" the horizontal display while controlling traffic for long periods.

Discussion

The Safety Board notes that O'Hare is one of the two busiest airports in the United States. On an average day, more than 2,300 flights depart and arrive at the airport. During busy rush periods, there may be up to 170 departures and arrivals in a single hour of operation. In addition, the airport is unique because of its flight operations that use several intersecting runways concurrently. Also, the O'Hare TRACON is the

second busiest radar control facility in the United States. The TRACON, which controls traffic to and from the O'Hare airport and several other satellite airports, handles about 3,300 flights each day and over 1 million flights annually. The Safety Board believes that the high traffic volume and the complexity of flight operations at the O'Hare airport and TRACON can increase the potential for human error.

In a majority of cases, when an operational error occurs it is indicative of a performance problem on the part of one or more air traffic controllers. In some cases, the errors result from deficiencies in equipment and procedures. The Safety Board's previous operational error investigations have determined that the contributing factors are varied and seldom involve a single issue. In many of the occurrences, controllers failed to follow the procedures prescribed in the controllers' handbook (7110.65E) or in local facility operations manuals. In others, the deficiencies were characterized directly or indirectly by such human performance factors as excessive workload, lack of attentiveness, forgetting, perceptual problems, fatigue, and excessive time on position without a break. The Safety Board analyzed the data from its operational error investigations and its workforce survey to determine whether procedural omissions, human performance deficiencies, or program shortcomings may have been common to one or more of the incidents at O'Hare.

Several of the operational errors involved controllers who failed to adhere to basic ATC procedures and guidelines. These errors involved radar identification, altitude verification, coordination, and communication. In one incident, the controller issued an ATC clearance to an aircraft that was in another controller's airspace without prior coordination with the other controller. Another involved misidentification of a departing flight, and a third involved a supervisor who could not remember the name of a standard instrument departure and consequently miscommunicated with a tower controller at a satellite airport. A fourth controller stated he was unaware that there were separation standards for VFR aircraft operating in a TCA. The Safety Board is concerned that these controllers, working at one of the nation's busiest terminal radar facilities, failed to act in accordance with basic controller standards and principles. These controllers should have been disciplined to use these fundamental job skills long before their assignment to O'Hare. In addition, controller tape talk and over-the-shoulder evaluations should have identified these basic performance flaws and targeted subsequent recurrent and proficiency training toward correcting them before they contributed to an operational error. The Safety Board believes that all TRACON controllers should periodically receive refresher training in the basic elements of radar identification and control, coordination with other controllers and facilities, effective communications, separation criteria, and other fundamental ATC precepts. The Safety Board is aware of Air Traffic Bulletin 87-3, published in November 1987, which announced a major "back to basics" effort. The Safety Board believes that this effort is commendable and required throughout the ATC system. However, the Safety Board also believes that the O'Hare TRACON, because of its significant increase in operational errors, the majority of which involve the breakdown in basic ATC skills, should implement a "back-to-basics" program which includes refresher training in the fundamental and essential ATC procedures and require that all radar controllers complete the course and be graded on their understanding of the course content.

As a result of its investigation of two operational errors at O'Hare on June 28 and July 2, 1986, the Safety Board issued five safety recommendations to the FAA. ^{4/} One

^{4/} Safety Recommendation letter A-87-3 through -7, dated February 6, 1987.

of these recommendations addressed flow control programs at O'Hare and stated the Safety Board's concern that potential IFR traffic volume could attain a level that exceeds the controllers' capabilities in a complex environment. Specifically, Safety Recommendation A-87-5 recommended that the FAA:

Review the methodology used to establish airport Engineered Performance Standards and the criteria used to establish the "High Density Rule" at the Chicago O'Hare Air Traffic Control facility to ensure that air traffic controller staffing levels and performance limitations are accounted for appropriately and that the air traffic controller team capabilities are not exceeded during peak traffic periods.

The FAA Administrator's response on October 21, 1987, stated that the FAA had scheduled user meetings to discuss scheduling problems at a number of airports including O'Hare. As a result of these meetings, scheduling adjustments were made at O'Hare to spread out all operations. He also stated:

I want to point out that the EPS [Engineered Performance Standard] and high-density rule quotas do not have a direct relationship to controller staffing levels or performance capabilities. Daily traffic loads are controlled through various air traffic management processes which include consideration of airport conditions, runway configurations, weather, and other factors . . . I consider the FAA's action to be completed on this recommendation.

The Safety Board's response on May 31, 1988, disagreed with the FAA view and indicated concern that the FAA needed to complete a comprehensive review of the high-density rule as it pertains to the O'Hare airport. The review should revalidate the present 155 operations per hour standard to make sure that controllers are not being asked to control more aircraft than they can handle safely. Safety Recommendation A-87-5 presently is classified "Open--Unacceptable Action." As a result of this special investigation, the Safety Board reiterates Safety Recommendation A-87-5 to the FAA.

Although the preponderance of TRACON controllers believed that the ATC system at O'Hare was safe, there were indications that at certain periods, they believed that they were working the maximum number of airplanes possible. This issue particularly manifested itself in the comments of controllers regarding traffic volume. Of particular significance were the comments of an area supervisor who stated that he was not allowed to implement flow control restrictions based on the experience level of the controllers during a shift. He also stated that, in his opinion, the high-density rule was not effective because traffic would peak within the first or last 15 minutes of a given 30-minute period. Additionally, the high-density rule did not balance the arrival/departure ratio. For these reasons, the amount of traffic worked could be compressed and the ratio of departures and arrivals skewed within a given hour. He also stated that the "number of operations per hour gives too many opportunities for error." When asked about levels of traffic at O'Hare, another supervisor commented, ". . . eliminate the use of three runways during arrival periods . . . this will reduce peaks and valleys in the traffic flow."

The Safety Board continues to be concerned about the current levels of traffic at O'Hare. At least 2 of the 14 operational errors which have occurred at O'Hare during 1988 could be directly attributed to the controller having been overburdened with

traffic at the time of the incident. The Safety Board believes that controller performance limitations need to be considered to avoid exceeding the controller's abilities during peak traffic periods. Safety Board staff has observed and received a briefing on the monitor alert feature that was recently incorporated into the Aircraft Situation Display (ASD) at the FAA's Central Flow Control Facility in Washington, D.C. This system, which is scheduled to be installed at O'Hare in late 1988, can predict, hours in advance, in 15-minute increments, those airports, fixes, and sectors that will become saturated with IFR air traffic. Operational acceptable levels of traffic (OALT) are established for the 15-minute time period and serve as a threshold for activating the monitor alert feature. The Safety Board believes that the FAA should establish at the O'Hare ATC facility, a 15-minute OALT standard for the ASD monitor alert as 25 percent of the hourly traffic limit prescribed in the high-density rule for the airport. The OALT also should include limits for the maximum number of departures and arrivals in a 15-minute period. This 15-minute OALT standard should minimize the problem voiced by controllers of traffic peaking and of adverse skewing of the ratio of departures and arrivals in 15- or 30-minute time periods.

The Safety Board believes that the ASD and its monitor alert feature probably can be a very effective traffic management tool and immediate benefit would be gained once it becomes operational at O'Hare. The Safety Board believes that the FAA should assign a high priority to the installation and operational use of the ASD and its monitor alert feature at the O'Hare ATC facility for use in traffic management and flow control.

The Safety Board has previously addressed safety recommendations ^{5/} to the FAA concerning controller staffing problems at O'Hare. At that time, facility officers stated that the staffing problems exist because of the FAA's difficulty in recruiting controllers to handle the high volume and complex air traffic at O'Hare and because controllers have reservations about living in Chicago with its winter weather problems and high cost of living. Staffing data provided to the Safety Board in July 1986 indicated that the TRACON was authorized 60 controllers, that 49 were onboard, and that 22 were certified as FPL controllers. Staffing data provided during this investigation indicated that the TRACON is now authorized 72 controllers, that there are 54 onboard, and that 34 are qualified as FPL controllers. While the authorized staffing level has been increased 20 percent over the past 2 years, the percentage of onboard to authorized controllers decreased from 81 to 75 percent during the period.

The facility manager stated that, because of staffing shortages and because the facility is currently in its prime summer vacation leave period, mandatory overtime is being scheduled for all controllers. Presently, 1 day a week of overtime is required of each qualified controller in order to meet staffing demands. The facility manager also stated that controllers previously assigned at O'Hare were temporarily being returned to the facility so that vacation leave could be accommodated.

The Safety Board is concerned that staffing shortages continue to exist at O'Hare. While the TRACON's authorized staffing level has been raised by 12 controllers, the number of controllers onboard has increased by only 5 controllers during the past 2 years. Almost all of the controllers who were interviewed indicated that additional staffing was needed and many stated that because of the use of mandatory overtime, they were not always well rested following their usual 1 day off from work. The

^{5/} Safety Recommendation letter A-87-3 through -7, dated February 6, 1987.

Safety Board believes that the FAA should consider the use of financial and personnel incentives to encourage controllers to transfer to "hard-to-staff" facilities such as O'Hare. These incentives could include additional credits toward retirement, priority toward reassignment after a specific time period, and cost-of-living pay differentials. For example, the Safety Board is aware that the FAA had a program at O'Hare, albeit unofficial, which gave controllers who served for 5 years as an operational controller a priority for being transferred to another facility. This was known as the "give O'Hare 5" program. This program is no longer in use, primarily because the FAA could not routinely honor all requests for transfer.

The Safety Board notes that both private industry and the Federal government use incentives to reward employees who work at facilities and locations where full employment has been a problem. The Safety Board is aware that the FAA recently held meetings in Washington, D.C., to study and evaluate the need to provide incentives to attract controllers to work at hard-to-staff ATC facilities. Representatives from FAA headquarters and selected regional offices participated in these sessions and additional meetings are scheduled to be held in August 1988. The Safety Board is encouraged by these initiatives and it believes that the FAA should implement a pilot program that provides financial and personnel incentives to attract experienced air traffic controllers to transfer to the O'Hare ATC facility.

In addition to low staff levels, O'Hare has had a chronic shortage of qualified FPL controllers. The Safety Board believes that this shortage is related to the areas of recruitment and training of developmental controllers. Because the FAA does not offer an incentive program to attract and recruit significant numbers of controllers from other high-density facilities, such as Level IV and Level V terminal radar facilities, many developmental radar controllers have been recruited from lower-level radar facilities and en route ATC centers.

Following recruitment, the facility conducts an operational interview (screening) with each candidate where exercises using the ETG are administered in order to assess the candidates' potential ability to certify on radar positions in the O'Hare TRACON and to give the candidates a preview of what will be expected of them should they be selected. Additionally, the facility administers initial training to those candidates who have been selected from the operational interview. This training is administered using a combination of classroom and simulation exercises in the ETG.

The technology available to operate an ETG exercise requires that a data card be typed for each simulated aircraft. This allows the computer to accept any future data inputs for a specific aircraft. Future inputs, such as track start, heading, airspeed and/or altitude change, must be manually entered by a remote operator. The result is that each aircraft must be "hand flown" by the operator and that the volume and type of aircraft movement within each exercise is directly limited to the abilities of the remote operator. Further, the remote operator must act as the pilot, providing voice communication transmissions to the trainee. Comments made by developmental controllers who were interviewed indicated that they were not as well prepared for OJT as they could have been due to the limitations of the ETG simulation. One developmental controller commented that there was a "tremendous" difference in the volume of traffic; that is, the volume during ETG training was significantly less than the volume of traffic experienced in the actual operational environment. The Safety Board believes that because of the limitations of the ETG technology, exercises do not realistically reflect the actual traffic conditions at O'Hare.

The Safety Board believes that labor-intensive training technologies, such as the ETG, have been obsolete for years. Pilots, for example, can complete initial training, checkrides, and recurrent and proficiency training in highly complex aircraft, solely by means of hi-fidelity simulation. If similar technology were used to train air traffic controllers, realistic exercises could be developed to depict actual work conditions, including normal background noise, interphone communications, untracked targets, and targets in communication with other controllers. The Safety Board believes that the use of state-of-the-art ATC simulators would produce a better trained workforce. These simulators could prove invaluable in reducing the amount of actual OJT and total time in which to certify on positions. The Safety Board believes that the O'Hare TRACON, because of its demonstrated need for sophisticated training methods should serve as one of the initial test facilities for installation and implementation of these simulators. The Safety Board believes that the FAA should procure state-of-the-art, stand-alone, full-dimensional, dynamic radar simulators, capable of replaying actual working conditions in a simulated radar environment, for training and certifying radar air traffic controllers.

Safety Board investigators were advised that the facility is currently requesting and trying to obtain new equipment. One of the more common complaints received during interviews with controllers was the need for newer and better equipment. The Safety Board is concerned that the second busiest airport in the United States has not been given a higher priority to receive the most advanced ATC and communications equipment. For example, the ARTS IIIA and ICSS have not yet been installed at O'Hare despite the fact they have been in widespread use at other ATC facilities for several years. Also, 26 other ATC facilities are scheduled to receive the ASR-9 radar system, and 6 others are scheduled to receive the ASDE-3 before they are scheduled to be installed at O'Hare. Therefore, the Safety Board believes that the FAA should assign a higher priority to equip, at the earliest possible time, the Chicago O'Hare Air Traffic Control facility with the most advanced, state-of-the-art radar systems, air traffic control computer hardware and software, communications, and other technical equipment to enhance the traffic management and control of air traffic.

The TRACON provides ATC services not only for air traffic at O'Hare airport, but also for flights to and from several satellite airports. These satellite airports include Chicago Midway, DuPage, Palwaukee, NAS Glenview, and Meigs. Many of these airports are experiencing steady growth in air traffic. For example, Mr. William H. Pollard, Director of the FAA's Great Lakes Region recently testified: ^{6/}

During the years 1978 to 1987, operations at O'Hare airport increased 5 percent to 795,000; and operations at Midway airport grew by 45 percent to 251,000 . . . and by the year 2000 we forecast that operations will grow by an additional 6 percent at O'Hare to 842,700; and by 31 percent at Midway to 329,000

As a result of this traffic growth, the facility has divided the south satellite airport airspace into three sectors and is currently in the process of creating a fourth sector. The Safety Board is not able to assess if this effort will improve operations to and from the south satellite airports, but it believes that the addition of another sector will

^{6/} Testimony of Mr. William H. Pollard, Director, Great Lakes Region, Federal Aviation Administration, before the Subcommittee on Transportation and Related Agencies, Committee on Appropriations, House of Representatives, Regarding Air Carrier Operations at O'Hare International Airport, Chicago, Illinois, March 18, 1988.

create additional staffing needs. Of those controllers interviewed, there were many comments regarding traffic at O'Hare and the satellite airports. One controller stated, "There is too much IFR traffic at Midway." And still another commented, "... need to take a good look at Midway and satellites [about] what improvements can be made."

The Safety Board is aware that current airspace design and configurations at O'Hare are complex and demanding. More importantly, the FAA is forecasting that traffic at O'Hare and the satellite airports is expected to continue its projected growth. The Safety Board believes the FAA has within its organization individuals who possess extensive knowledge in airspace and procedures who collectively would be able to analyze present-day operations at O'Hare and to make viable recommendations or alternatives for more efficient and safer use of the airspace. The Safety Board believes that the FAA should establish a task force of operations and airspace management personnel, including controllers from the local workforce, to conduct an interdisciplinary study of the O'Hare airspace and ATC procedures to determine where changes can be made for safer and more efficient management of the airspace.

The Safety Board is concerned that, in an atmosphere of constant training and chronic staffing shortages, conditions may exist where less than highly proficient, seasoned controllers may be selected to provide OJT. While the Safety Board recognizes that controllers who provide OJT are both current and proficient, they may not have acquired the necessary breadth and depth of experience that seasoned controllers have acquired. During one interview, an area supervisor expressed concerns that many of the controllers who remained in the workforce after the labor dispute during August 1981, although current, were not controllers who possessed high operational proficiency, and thus, some of the better techniques and not-often-used procedures may not have been passed to controllers to whom they provided OJT and who were subsequently certified. The Safety Board agrees with this supervisor's view and believes that, as a result, a lack of quality OJT instruction may, on occasion, exist today at O'Hare and compromise the total training effort. The Safety Board believes that such conditions could be responsible, directly or indirectly, for an increase in operational errors.

The Safety Board recognizes that controller candidates are selected for their ability to control aircraft. Further, the Safety Board recognizes that controllers are given a brief seminar in OJT instruction. However, all controllers, whose primary function is the active control of aircraft--a function that requires a high level of technical proficiency--may not possess the teaching, communications, and human relations skills necessary to provide high-quality, effective OJT. Therefore, the Safety Board believes that the FAA should remove from the General Performance Appraisal Document (GPAD) for all ATC specialists the requirement to provide OJT. Instead of requiring all controllers to provide OJT, the Safety Board believes that the FAA should identify and select OJT training instructors who possess superior technical and teaching skills and implement an annual incentive program for them.

The Safety Board is concerned that the FAA's national quality assurance program did not respond more aggressively to the dramatic increase in operational errors at O'Hare. The Safety Board investigated five errors and received facility briefings on two more that occurred between February 19 and May 17, 1988. On May 18, 1988, Safety Board and FAA senior staff met to discuss possible solutions to resolve the sudden increase in operational errors at O'Hare. Following this meeting and as a result of four more errors, the Safety Board initiated its special investigation. FAA

national air traffic quality assurance and safety staff participated in all phases of this special investigation. Since the June 7, 1988, incident, there have been three more operational errors at the O'Hare TRACON. During this time, the Safety Board is unaware of any comprehensive investigations or recommendations from FAA's national quality assurance organization to reduce the number of errors at O'Hare. Instead, it appears that all remedial actions have been left to the discretion of the facility manager.

The Safety Board is concerned that the FAA has no system to monitor the safety performance of the ATC system and, where appropriate, detect a sudden increase in operational errors at a specific facility. Such a system should include system error thresholds which, when exceeded, would require an investigation to formulate immediate corrective actions. The Safety Board believes that, without this system surveillance, the FAA lacks a proactive quality assurance program. Therefore, the Safety Board believes that the FAA should establish a system to monitor the total ATC system to detect significant increases in operational errors and other system deficiencies and initiate appropriate investigative and preventive actions.

Also, the Safety Board believes that the reduced effectiveness of FAA's national quality assurance program may be, in part, because of its organizational location. This program reports to the Associate Administrator for Air Traffic, who is responsible for the operation and safety of the total ATC system. The Safety Board believes that the quality assurance function would be more effective and objective if it was located, organizationally, outside the air traffic service and reported directly to the FAA Administrator. The Safety Board notes that in private industry, production and inspection have separate responsibilities and report independently to the corporation leadership. The U.S. military employs the same concept by having the responsibilities of the inspector general separate from the line organizations. The Safety Board believes that the FAA should establish an independent national division that would be responsible for the quality assurance of the ATC system and that would report directly to the FAA Administrator.

The Safety Board is aware that in previous years, the FAA's Great Lakes Regional Office, because of budgetary constraints, curtailed funds designated for training, travel, overtime, and permanent changes of station. These reductions previously have included O'Hare and have seriously curtailed the recruiting, staffing, and training of controllers at the O'Hare TRACON. The Safety Board notes that an FAA O'Hare Operational Review, which was conducted between June 15-24, 1987, identified staffing as the number one problem to be resolved. The Safety Board believes that staffing remains the number one problem today. Further, the Safety Board is aware that the Great Lakes Region is again curtailing those funds. Although these reductions have not affected the efforts underway at the O'Hare TRACON, the Safety Board remains concerned that should further reductions be needed, the O'Hare TRACON may not remain unaffected.

The Safety Board, while recognizing the need to establish and maintain fiscal accountability, believes that the FAA should ensure that the Great Lakes Region is able to fully fund the O'Hare ATC facility's training, overtime, equipment, and permanent change of station programs until authorized staffing is achieved and the number of FPL controllers in each--the tower and the TRACON--is equal to 75 percent of the number of authorized controllers.

The Safety Board is aware that the facility manager has served less than 1 year at the O'Hare ATC facility. In this capacity, he has served as the catalyst for changes

that have been made. During May 1988, he established a "blue ribbon committee," consisting of facility controllers and staff and regional specialists which focused on operational error prevention. The Safety Board has requested and is awaiting a final report from the committee. The Safety Board is encouraged by these efforts; nevertheless, it believes that the occurrence of 14 TRACON-related operational errors between January 1 and June 7, 1988, justifies the highest level of FAA attention and action.

As a result of its special investigation of the O'Hare TRACON, the National Transportation Safety Board reiterates Safety Recommendation A-87-5 to the Federal Aviation Administration and further recommends that the Federal Aviation Administration:

Implement a "back-to-basics" program at the Chicago O'Hare Terminal Radar Approach Control facility which includes refresher training in the fundamental and essential air traffic control procedures and require that all radar controllers complete the course and be graded on their understanding of the course content. (Class II, Priority Action) (A-88-81)

At the Chicago O'Hare Air Traffic Control facility, establish the 15-minute operational acceptable level of traffic standard for the Aircraft Situation Display's monitor alert as 25 percent of the hourly traffic limit prescribed in the high-density rule for the airport. (Class II, Priority Action) (A-88-82)

Assign a high priority to the installation and operational use of the Aircraft Situation Display and its monitor alert feature at the Chicago O'Hare Air Traffic Control facility for use in traffic management and flow control. (Class II, Priority Action) (A-88-83)

Implement a pilot program that provides financial and personnel incentives to attract experienced air traffic controllers to transfer to the Chicago O'Hare Air Traffic Control facility. (Class II, Priority Action) (A-88-84)

Procure state-of-the-art, stand-alone, full-dimensional, dynamic radar simulators, capable of replaying actual working conditions in a simulated radar environment, for training and certifying radar air traffic controllers. (Class III, Longer Term Action) (A-88-85)

Assign a higher priority to equip, at the earliest possible time, the Chicago O'Hare Air Traffic Control facility with the most advanced, state-of-the-art radar system, air traffic control computer hardware and software, communications, and other technical equipment to enhance the traffic management and control of air traffic. (Class II, Priority Action) (A-88-86)

Establish a task force of operations and airspace management personnel, including controllers from the local workforce, to conduct an interdisciplinary study of the Chicago O'Hare airspace and air traffic control procedures to determine where changes can be made for safer and more efficient management of the airspace. (Class III, Longer Term Action) (A-88-87)

OPERATIONAL ERRORS - CHICAGO O'HARE TRACON
January 1 through June 7, 1988

<u>No.</u>	<u>Date</u>	<u>Aircraft</u>	<u>Tracon Position</u>
1	01/04/88	United Air Lines B-727/United Air Lines B-727	Departure
2	01/28/88	Cessna Citation 650/Piper Navajo	Departure
3	02/11/88	Midway Airlines DC-9/Southwest Airlines B-737	Satellite
4	03/07/88	Swearingen Merlin/Piper Cheyenne	Satellite
5	03/14/88	Midway Airlines DC-9/Britt Airlines Metroliner	Satellite
6	04/06/88	United Air Lines B-727/United Air Lines B-727	Arrival
7	04/15/88	Midway Dornier 228/Midstates Metroliner	Satellite
8	05/10/88	Midway Airlines DC-9/Beechcraft Super Kingair	Satellite
9	05/11/88	Condor Airlines DC-10/ Piper Cheyenne IV	Departure
10	05/17/88	United Air Lines B-727/Simmons Airlines SDH6	Arrival
11	05/20/88	Britt Airlines Fokker 227/Cessna 425	Satellite
12	06/06/88	United Air Lines B-727/Learjet 25	Satellite
13	06/06/88	United Air Lines B-727/Cessna 182	Departure
14	06/07/88	American Airlines DC-10/Midway Airlines B-737	Departure

Identify and select on-the-job training instructors who possess superior technical and teaching skills, and implement an annual incentive program for them. (Class III, Longer Term Action) (A-88-88)

Establish a system to monitor the total air traffic control system to detect significant increases in operational errors and other system deficiencies, and initiate appropriate investigative and preventive actions. (Class II, Priority Action) (A-88-89)

Establish an independent national division that would be responsible for the quality assurance of the air traffic control system and that would report directly to the Administrator of the Federal Aviation Administration. (Class II, Priority Action) (A-88-90)

Ensure that the Great Lakes Region is able to fully fund the Chicago O'Hare Air Traffic Control facility's training, overtime, equipment, and permanent change of station programs until authorized staffing is achieved and the number of full performance level controllers in each--the tower and the terminal radar approach control--is equal to 75 percent of the number of authorized controllers. (Class II, Priority Action) (A-88-91)

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


By: Jim Burnett
Chairman