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Aviation Safety in Airspace Controlled By  
Two Major FAA Facilities in the Chicago Area

Statement of  
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Before the  
Subcommittee on Government Activities and  
Transportation of the House Committee on  
Government Operations



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Madam Chairwoman and Members of the Subcommittee:

We appreciate this opportunity to appear before you today to discuss the safety of air travel in airspace controlled by the Federal Aviation Administration's (FAA's) Chicago O'Hare International Airport control tower and terminal radar control facility (hereafter referred to as the O'Hare tower) and Chicago air route traffic control center (hereafter referred to as the Chicago center). In response to several congressional requests, we have, over the past several years, done a great deal of work relating to FAA's air traffic controller work force, including addressing conditions within the work force, identifying problems with and suggesting revisions to the way FAA defines the work force, monitoring FAA's progress toward achieving its controller staffing goals, and highlighting the impact of delays in implementing advanced technologies on anticipated controller productivity gains. We have reported our findings to the Congress and made recommendations to FAA directed at correcting identified problems.

As agreed, our testimony today will cover (1) the results of our extensive 1985 survey of the controller work force<sup>1</sup> with emphasis on the O'Hare tower and Chicago center, (2) FAA's response to our recommendations, and (3) recent data we obtained regarding the controller work force at the two Chicago facilities. Let me first, however, provide some perspective on

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<sup>1</sup>Aviation Safety: Serious Problems Concerning the Air Traffic Control Work Force (GAO/RCED-86-121, March 6, 1986).

aviation safety in general to provide a frame of reference for conditions in the Chicago area.

THE AIR TRAFFIC CONTROL SYSTEM  
AND AVIATION SAFETY

The Federal Aviation Act of 1958, as amended, charges the Secretary of Transportation with regulating air commerce in a manner as to best promote its development and safety. FAA promotes the development of air commerce primarily by ensuring the reliability and operational effectiveness of the national air traffic control (ATC) system. The ATC system includes the procedures and techniques for managing and controlling take-offs and landings at airports; the control of aircraft en route from one destination to another; operational flight rules; and the installation, maintenance, and repair of ATC equipment and facilities. The ATC system, in its broadest sense, also includes the development and operation of airports. Thus, it is a system of mutual relationships among airports; air traffic control; flight crews; aircraft; and regulations, procedures, and techniques. Although the primary emphasis is on operational efficiency, safety is an inherent characteristic of the ATC system that cannot be easily separated from reliability and operational effectiveness.

MEASURING THE LEVEL OF AVIATION SAFETY

Overall, FAA has done a good job fulfilling its safety role. The national ATC system is one of the safest in the world and most agree that U.S. aviation is a safe mode of transportation.

Yet, public interest and attention continue to focus on the issue of aviation safety in general, and in particular on whether the controller work force has adequately recovered from the August 1981 strike and subsequent firing of over 11,000 controllers, including 399 or 66 percent of the work force at the O'Hare tower and Chicago center. We think this is because, as Chairman Mineta of the House Subcommittee on Aviation has stated, the American public imposes a far more demanding safety standard on aviation than on most other activities in our society.

FAA points to an aviation accident rate that has fallen over the last 2 decades as an indication that the level of aviation safety has increased. Over the last 3 years, there has been one fatality in the airspace over Chicago that, according to the National Transportation Safety Board (NTSB), may have been directly or indirectly attributable to the ATC system. (A final NTSB report has not been issued, but preliminary investigative data indicate that the ATC system contributed to the accident.) During that time, air traffic at O'Hare has increased from about 741,000 operations in 1984 to almost 795,000 operations in 1986 or by 7 percent, and air traffic at the Chicago center has increased from about 1.95 million operations to about 2.27 million operations or by 16 percent.

The aviation accident rate, however, may not be the best indicator of how safely the ATC system is currently operating. This is because many different things usually have to go wrong before an accident occurs. Investigators have observed that

unsafe operating practices do not inevitably lead to accidents and, unfortunately, accidents can occur in even the best managed ATC system as a result of other causes such as engine failure. In either case, accidents occur so rarely that they cannot be used alone to analyze aviation safety in any detail.

For these reasons, more specific measures--precursors of safety risk--are needed to identify and direct attention to unsafe or high-risk conditions. FAA uses two precursors, near mid-air collisions and operational errors, as additional indicators of ATC system safety. Near mid-air collisions occur when two airborne aircraft inadvertently come within 500 feet of each other and operational errors occur when there is less than the applicable minimum separation distance between two or more aircraft or between an aircraft and terrain or obstacles and obstructions.

In its July 1986 response to our March 1986 report on the controller work force, the Department of Transportation (DOT) said that a major indicator of how safe the system is being operated is the number of operational errors that occur over a given period of time. The number of operational errors system-wide declined from 1,404 in 1985 to 1,217 in 1986 (13 percent), including a reduction from 104 to 79 (24 percent) at the Chicago center. But the number of operational errors at the O'Hare tower rose from 13 in 1985 to 22 in 1986 (69 percent).

The second indicator of ATC system safety used by FAA--near mid-air collisions--increased nationwide from 758 in 1985 to 823

in 1986 (10 percent) and the number of "critical" ones--those when two airborne aircraft inadvertently come within 100 feet of each other--was about 175 each year<sup>2</sup>. During this period, the number of near mid-air collisions in the Chicago vicinity increased from 7 to 13 (86 percent). And, while there were no critical near mid-air collisions reported in the Chicago area in 1985, there were 2 reported in 1986 that may meet FAA's criteria. (A final FAA report has not been issued, but preliminary data indicate that two near mid-air collisions met FAA's critical criteria.)

Another way to get a sense of the level of ATC system safety is to survey those directly involved to determine the extent to which they believe problems occur within the system. For example, in June 1986, the Air Line Pilots Association (ALPA) surveyed its members to obtain their views on air safety. Their conclusion was that air safety is declining, and respondents identified mid-air collisions, ATC system overload, and a weakening of ATC controls as their top three aviation safety concerns.

GAO'S ASSESSMENT OF ATC SYSTEM  
SAFETY IN THE CHICAGO AREA

In addition to pilots, the other critical human component in the ATC system is the air traffic controller. Our March 1986

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<sup>2</sup>In 1985, FAA implemented a monitoring system intended to enhance the reliability of the near mid-air collision pilot reporting process. According the FAA, the new system contributed to a rise in 1985 pilot report totals compared to prior years.

report included the results of our extensive questionnaire survey of some 4,500 radar qualified controllers; 1,000 first-line supervisors; and the managers of the 20 centers, including Chicago, and the 54 busiest towers, including O'Hare, in the continental United States. Most of the controllers, supervisors, and managers, including those at the O'Hare tower and Chicago center, who answered our questionnaires rated the overall safety of the ATC system as adequate to excellent. But, the controllers and supervisors also had concerns about their ability to maintain system safety.

The controllers and supervisors at the O'Hare tower and the Chicago center identified concerns in four key areas:

- the size and composition of the controller work force,
- controller work load,
- overtime, and
- training of new controllers.

#### Size and composition of the controller work force

When we did our survey in 1985, the O'Hare tower and the Chicago center were staffed with 436 controllers, 166 fewer than were on board at the time of the 1981 strike. In the interim, the air traffic work load at the two facilities had increased substantially compared to pre-strike levels. Even today there are 150 fewer controllers than before the strike.

Just comparing the total number of controllers to air traffic activity, however, doesn't reveal everything one needs to

know about how far along FAA is toward achieving its controller work force staffing goals. Another key indicator of staffing progress is the number of full performance level controllers or FPLs<sup>3</sup> FAA has at its facilities.

Because of the technical complexity of the work, it is essential that at least 75 percent of the controllers at a given facility be FPLs, according to FAA. As of January 1987, however, FAA had 61 FPLs at the O'Hare tower and 118 at the Chicago center representing 67 percent and 32 percent, respectively, of the controllers at the two facilities. Center controllers selected the shortage of controllers who can work radar as the number one reason for their work load being too high.

FAA has faced some difficult obstacles in building toward its staffing goals. First, many experienced controllers and supervisors have retired or are approaching retirement. Just since our survey, 17 FPLs and supervisors at the two facilities have retired. And, as of the end of fiscal year 1986, 21 of the 41 supervisors as well as 13 FPLs at the Chicago center were eligible to retire.

Second, the training attrition rate at the two facilities remains higher than FAA originally anticipated. During the first 4 months of fiscal year 1987, the facility attrition rate for those who graduated from the FAA Academy averaged 27 percent at the Chicago center. Since fiscal year 1984, the O'Hare tower has

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<sup>3</sup>A full performance level controller is one who is fully certified to operate all positions in a defined area.



received only four Academy graduates, and all four subsequently withdrew.

In an attempt to improve the FPL staffing situation at en route centers, FAA launched a special effort called the "cross-option" program in 1985 to induce controllers from towers and flight service stations to transfer to one of seven centers, including Chicago. But, the program will not result in much improvement at the Chicago center. Of the 49 persons who applied, only 14 have successfully completed the program, 2 others are in process, and no new applicants are being accepted.

It is important to recognize here that everything we have said today measures FAA's progress against its current staffing goals. Because of their importance to the safety of the ATC system, we are presently evaluating the methodologies and assumptions FAA uses to establish its controller staffing goals and will report our findings to the Congress later this year.

#### Controller work load

A second key area where controllers and supervisors at the two Chicago facilities identified concerns was in their work load.

Controller work load is affected by the number and type of aircraft they are handling at any one time, the complexity of what they have to do, and the amount of time they spend at a control position during their shift. Immediately following the strike, FAA imposed special restrictions that reduced air traffic

activity systemwide by about 20 percent because of the severe shortage of controllers. As FAA hired and trained more controllers, it lifted the last of the restrictions in December 1983, with the exception of flow control which has been used in some form since 1970. Flow control is a centrally-managed national program designed to control aircraft departures and en route flows based on weather conditions and capacity at arrival airports.

A large majority of the controllers at both the Chicago center and O'Hare tower stated in their survey responses that they were typically required to handle more traffic than they believed they should be handling during daily peak periods. We tried to offset the bias inherent in questions that ask people how hard they are working by asking their immediate supervisors similar questions. Supervisors at the two Chicago facilities confirmed the controllers' perspectives. According to the supervisors, many controllers under their supervision were handling more traffic than they should have been.

To provide a context to the questionnaire responses, we obtained the air traffic activity data for the first 6 months of 1985, which included the 2 months during which we made our survey. When compared with the same period in 1981, the data showed a 41 percent increase in traffic at O'Hare and that Chicago center traffic had returned to about the 1981 pre-strike level.

The controllers at the two facilities also reported spending too much time continuously at a radar position without a break or change of position. Again the controllers' concerns were substantiated by their supervisors' responses. At the Chicago center, for example, 71 percent of the supervisors said that controllers they supervised were spending too much time continuously at a radar position.

Among the safety-related consequences of the daily peak traffic work load reported by controllers were that communications and traffic handoffs between controllers were often rushed and there was frequently little time to provide pilots with traffic or weather advisories. The fact that these conditions can adversely affect safety is reflected in a recent NTSB finding that the early transfer of communications and control of two flights from one controller to another at the O'Hare tower was a contributing factor in a near mid-air collision of the two aircraft shortly after takeoff.

#### The use of overtime

The third key area of concern was the use of overtime.

To compensate for the lack of qualified controllers, FAA has been heavily dependent on overtime to operate the ATC system. This has been particularly true at the centers. For example, controllers at the Chicago center worked a total of over 70,000 hours in overtime during fiscal year 1985, which placed them at the top of all the 20 centers in the continental United States.

The 21,000 hours of overtime worked at O'Hare during fiscal year 1985 placed it at the top of the 54 busiest towers. To put the total 91,000 hours of overtime worked at the two facilities in some perspective, it represented over 10 percent of the total overtime worked in the entire ATC system comprised of about 465 towers and centers.

The total overtime worked at the two facilities in fiscal year 1986 was reduced substantially by about 32,000 hours--about 24,000 hours at the Chicago center and about 8,000 hours at the O'Hare tower. This reduction was not based, however, on a significantly improved staffing situation, but rather on a reduction in overtime funds, according to the facility managers. While a reduction in overtime for budgetary purposes may look good on paper, without a corresponding increase in controllers, especially FPLs, FAA must find other ways to compensate for increasing air traffic, including requiring supervisors to spend a substantial amount of their time working traffic rather than performing their normal duties, curtailing on-the-job training to provide adequate position coverage, and requiring controllers to work at their positions for longer than desired time periods before receiving a break. An NTSB study issued just this month found all of these conditions to exist at the O'Hare tower. Overtime at the tower is back up in fiscal year 1987, in part, to provide more on-the-job training.

### Training new controllers

Finally, controllers and supervisors at the two Chicago facilities expressed concerns about the amount and quality of training being given new controllers.

The process of rebuilding the controller work force has directly imposed a continuous training burden on those controllers qualified to control traffic. In fact, some new controllers have been pressed into service as instructors.

Overall, we found several problems with training that FAA was also well aware of. In their responses to our survey, controllers and supervisors at the Chicago center viewed the amount and quality of new controller training more negatively than O'Hare tower controllers. The quality of the on-the-job training new controllers were receiving was ranked less than adequate to poor by a majority of the controllers and supervisors at the center in areas such as using back-up systems, controlling traffic in bad weather, and in applying emergency procedures. Training in flow control procedures was also ranked as less than adequate to poor by over 40 percent of both the center's supervisors and controllers. In addition, one out of four supervisors did not believe that new controllers were sufficiently trained in controlling live traffic before being certified on a control position. At O'Hare, NTSB found inadequate quality assurance and training; identifying problems with counseling, training, and recertifying controllers who have been involved in an operational error. According to NTSB, this

was due, in part, to supervisors and training specialists having to work control positions.

#### GAO's CONCLUSIONS AND RECOMMENDATION

When we analyzed the survey responses of controllers and supervisors and FAA's data on staffing, overtime, and air traffic activity, our conclusion was that the growth in air traffic coupled with an inadequate number of FPL controllers was straining the existing controller work force at many major facilities. Controllers at these facilities believed that they were overworked and that the situation could eventually impair their ability to maintain the proper level of safety.

Our consultant, the Flight Safety Foundation,<sup>4</sup> compared the conditions we found with the results of a study it did for FAA in 1981, concluding that conditions within the controller work force had changed since their study and that the system did not provide the same level of safety as before the 1981 strike.

In our March 1986 report, we recommended that FAA restrict air traffic on a general basis until it meets its goals for FPL controller staffing and controller overtime. Beyond that, it is FAA's responsibility to decide where and how to limit traffic.

Our recommendation stemmed primarily from our conclusion that the time it takes for a controller to acquire the training

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<sup>4</sup>The FLight Safety Foundation is an international membership organization established in 1945 dedicated solely to the improvement of flight safety.

and experience to qualify as an FPL coupled with training attrition and retirements add up to a long-term controller staffing problem. Since that time, we have looked for other alternatives available to FAA in dealing with air traffic that has now reached record levels and is expected to continue to grow. For example, FAA could do more with fewer controllers if productivity was increased. Our work to date on FAA's comprehensive \$16 billion National Airspace System (NAS) plan to modernize, automate, and consolidate the existing ATC system has shown, however, that the first major labor-saving features of the new advanced automation system intended to increase controller productivity have been delayed 8 years and are not now expected until the late 1990s.

This leaves ATC regulations, procedures, and techniques by which FAA manages traffic flow as the only short-term alternative available to deal with the controller staffing situation, and FAA is already using these to manage air traffic in the Chicago area and elsewhere. For example, O'Hare has been designated a high-density traffic airport by FAA, thus limiting the maximum hourly number of allocated instrument flight rule takeoffs and landings (slots).

FAA'S RESPONSE TO RESTRICTING AIR TRAFFIC AND GAO'S EVALUATION

In its response to our report and in hearings, FAA has stated that its existing traffic management system prevents controllers from having to control more traffic than they can

safely handle and that the safety level of the ATC system is not being adversely affected. They stated that, while controllers may perceive that they are overworked, the traffic management system includes a number of safeguards to preclude overload from happening.

In addition to its central flow control program, FAA identified the following safeguards: (1) recent improvements to the traffic management system to predict overload and alert flow control, (2) local traffic management units or TMUs at each of the 20 centers and at designated towers responsible for monitoring traffic flow and ensuring that safe levels of air traffic are not exceeded, (3) first-line supervisors responsible for monitoring individual sectors and adjusting traffic flows, and (4) the controllers, themselves, who are responsible for making individual judgments on how much traffic they can safely handle.

As we see it, there are several problems with FAA's assertion that the existing traffic management system safeguards the level of ATC system safety. First, the existing flow control program is designed to control aircraft departures and en route flows based primarily on weather conditions and capacity at arrival airports rather than controller work load at the centers. Moreover, the en route sector loading program, intended to predict overloads in specific en route sectors and alert flow control, will not be fully operational for several more years because of limited computer capacity. These conditions may



explain why 75 percent of the controllers at the Chicago center who believed that their work load was too high selected inadequate flow control procedures as a reason.

In addition to flow control, FAA looks to its traffic management coordinators, supervisors, and controllers to make judgments on how much traffic can be safely handled. But, as of last month, the Chicago center traffic management unit was staffed with only four coordinators, the fewest of any of the 20 centers, which average nine coordinators. Further, first-line supervisors at the Chicago center in responding to our survey said they typically spent 60 percent of their time working traffic, and over 60 percent of them said that this hindered their ability to coordinate airspace and perform other procedural or operational matters. Half of them also said that they did not believe that they had sufficient say in determining the volume and complexity of traffic the controllers they supervised were expected to handle.

Controllers at the O'Hare tower are faced with a similar situation. As of last month, the tower's traffic management unit was not staffed at all. While hourly traffic capacity acceptance rates have been determined for the airport, according to NTSB, they do not directly consider controller staffing levels and performance limitations or the capabilities of the controllers who are actually on duty to safely handle various traffic flow complexities.

So FAA's "safeguards" to preclude ATC system overload around Chicago boil down primarily to depending on controllers to make individual judgments about how much traffic they can safely handle on the basis of their own professional knowledge, experience, and skill. FAA, noting that there is no national or local policy requiring controllers to handle more traffic during daily peak periods than they should be handling, places ultimate responsibility on the controllers to stop traffic from entering their sectors when they believe they are receiving more traffic than they can safely manage.

While we agree that professional judgment is invaluable, we also agree with NTSB's May 1983 conclusion that "the external management of controller work load through effective traffic volume metering and restrictions to ATC services should continue until the effective means to measure and monitor controller proficiency and performance are in place and have been validated."<sup>5</sup> Towards this end, NTSB, in its recent study on O'Hare recommended FAA establish traffic capacity acceptance rates that "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."

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<sup>5</sup>Special Investigation Report - Followup Study of the United States Air Traffic Control System (NTSB/SIR -83/01, May 12, 1983).

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To summarize Madam Chairwoman, we believe the evidence we have presented here today for the O'Hare tower and Chicago center clearly supports our conclusion of last March that FAA needs to more fully consider the implications of the growing demand for air traffic services on its controller work force.

Our work confirms that NTSB's recommendation is a reasonable approach both at O'Hare and for purposes of identifying other facilities where FAA should consider bringing air traffic demand in line with controller capabilities. In other words, controller capacity must be given weight along with airport capacity in determining appropriate levels of air traffic.

This concludes my testimony, Madam Chairwoman. I will be happy to answer any questions you or other Subcommittee Members may have at this time.