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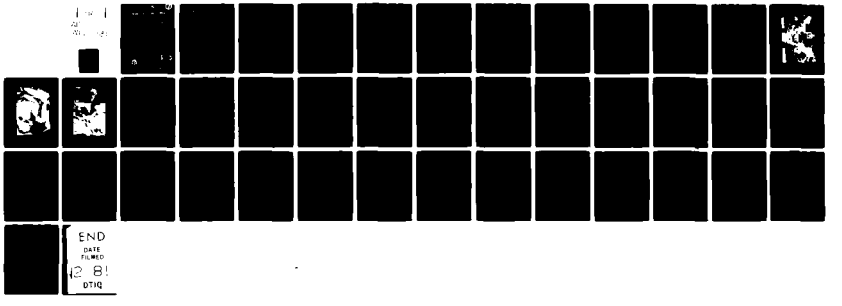

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REPORT BY THE U.S.

General Accounting Office

(6)

Controller Staffing And Training At Four FAA Air Traffic Control Facilities

GAO's review of air traffic controller staffing at the Chicago O'Hare and Denver Stapleton Airports and at the Chicago and Denver en-route traffic control centers indicated staffing level problems only at O'Hare. Some problems with controller training were noted at each facility.

FAA is taking steps to alleviate the staffing problem at O'Hare and to correct some of the training problems.

GAO also found no correlation between aircraft accidents or violations of FAA's separation standards for aircraft and controller staffing levels or training.

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JULY 9, 1981

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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

B-203765

The Honorable Charles H. Percy
United States Senate

The Honorable Robert Whittaker
House of Representatives

This report, prepared in response to your October 14, 1980, request, discusses the controller staffing and training at four Federal Aviation Administration air traffic control facilities.

As requested, we did not obtain written agency comments. However, we reviewed the report's contents with FAA's field and headquarters officials. Their comments are included in the report where appropriate.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of the report until 30 days from its issue date. At that time we will send copies to the Director, Office of Management and Budget; the Secretary of Transportation; the Administrator, Federal Aviation Administration; interested congressional committees; and other parties.

Henry Eschwege

Henry Eschwege
Director

REPORT BY THE
U.S. GENERAL
ACCOUNTING OFFICE

CONTROLLER STAFFING AND TRAINING AT FOUR FAA AIR TRAFFIC CONTROL FACILITIES

D I G E S T

Senator Charles Percy and Representative Robert Whittaker asked GAO to examine conditions related to air traffic controllers at Federal Aviation Administration (FAA) air traffic control facilities in two or three areas in the Nation, including those in the Chicago, Illinois, area. The facilities reviewed were the control towers at Chicago O'Hare and Denver Stapleton Airports and the air route traffic control centers near Chicago, Illinois, and Denver, Colorado.

SOME STAFFING LEVEL PROBLEMS AT O'HARE TOWER

FAA officials, including the past FAA Administrator, controllers, and the Professional Air Traffic Controller Organization, have stated that staffing levels in the radar room at the O'Hare Airport tower are unsatisfactory, and GAO agrees.

GAO found that the radar room is staffed at 68 percent of its authorized level and overtime use is higher than at most airport towers in other major cities. (See pp. 10 and 11.)

Controllers attribute the shortages of staff in the radar room to Chicago's high cost of living and controllers at some less busy airports being paid the same as those at O'Hare. In addition, the controller organization has attempted to discourage controllers from seeking positions at O'Hare. The controller organization published information at least twice stating that controllers should not seek assignments at O'Hare. Also, controllers, for a time, no longer volunteered to provide on-the-job training to O'Hare trainees. (See pp. 9, 11, and 12.)

In an attempt to alleviate the staffing problem at O'Hare, FAA has implemented new recruitment and training programs and given supervisors greater responsibilities in the actual training of trainees. (See p. 12.)

(CED-81-127)

It is too early to evaluate the results of the new programs; however, GAO believes these actions should help correct the staffing problems at O'Hare and is making no recommendations at this time.

STAFFINC LEVEL PROBLEMS NOT INDICATED AT STAPLETON TOWER, AND CHICAGO AND DENVER CENTERS

FAA management at Stapleton tower and at Chicago and Denver centers all believe that the number of controllers currently assigned can adequately provide safe air traffic control service. Many controllers, however, believe that staffing levels are inadequate.

GAO's evaluation of staffing statistics, flight activity levels, overtime usage, and concerns expressed by controllers and the controller organization representatives did not indicate staffing level problems at Stapleton tower or at the Chicago and Denver centers. (See pp. 13 through 18.)

CONTROLLER TRAINING: SOME PROBLEMS NOTED

Developmental training

FAA has standardized programs of instruction for the development of trainees from entrance on duty until they are certified as full performance level controllers. GAO's review of training records at the four facilities showed that trainees had satisfactorily completed all phases of required developmental training prior to their being certified as full performance level controllers. (See p. 19.)

Proficiency training

FAA requires full performance level controllers at facilities like the four GAO reviewed to have a minimum of 40 hours of proficiency refresher training annually to maintain technical competency. FAA also requires that appropriate records be maintained. The controllers at the four facilities reviewed had not met these requirements. (See pp. 19 through 21.)

In response to information provided by GAO on proficiency training deficiencies, FAA headquarters directed its facilities in April

1981 to review and comply with the established requirements. In view of this action GAO is making no recommendations at this time.

Currency in operational performance

Supervisors and staff specialists are required to maintain "currency" by demonstrating a satisfactory level of performance, but FAA provides no specific methods to track currency. Although sign on/off logs are used at each air traffic control position, these cannot be relied on to verify currency as they are not always accurate. (See pp. 21 and 30.)

FAA officials at both O'Hare and Stapleton towers advised GAO that supervisors perform operations on a regular basis which insures their currency. Chicago center officials agreed that supervisors were not maintaining currency. At the completion of GAO's field work, however, methods and record-keeping to aid in determining currency were being implemented at Chicago center. In September 1980 the Denver center established that specific currency records were to be maintained. GAO's review of these records indicated that currency was not being maintained. (See p. 22.)

In February 1981 FAA headquarters advised all its regional air traffic division chiefs that regular discussions with employees together with strong guidance and direction from the regional level are essential steps in ensuring adherence to supervisory currency requirements. (See p. 23.)

FAA's action has the potential for improving supervisory adherence to currency requirements; accordingly, GAO is making no recommendations at this time.

Non-computer training

Air traffic is controlled with the aid of radar and computer-generated data. The computer provides information on speed, altitude, and aircraft identification. When computers are not available because of a malfunction or required maintenance, controllers must be proficient in handling air traffic using broadband radar which is FAA's primary backup system. FAA officials said that simulating an air traffic environment for training purposes which recreates the actual conditions that exist when

the computer is not available is extremely difficult and as a result training has been inadequate.

In January 1981, the Chicago center received and began using a new computerized backup system called a Direct Access Radar Channel system--designed for use at centers only. Denver center's new backup system is scheduled to be operational in mid-1981. However, simulation of actual conditions will continue to be difficult at O'Hare and Stapleton towers. (See p. 23.)

NO APPARENT CORRELATION BETWEEN CONTROLLER STAFFING AND TRAINING AND AIRCRAFT INCIDENTS

Air traffic controllers are seldom identified as a cause or factor in aircraft accidents. For example, during 1978-80, air traffic control personnel were identified as a cause or factor in only 39 of 12,344 general aviation accidents. (See pp. 25 and 26.)

System errors--violations of FAA separation standards for aircraft--were few when compared to the number of aircraft handled. GAO's review of each of the system errors reported at the four facilities in 1980 did not indicate any patterns or trends related to staffing or training deficiencies. The system errors appeared to be attributable to human mistakes. (See pp. 26 through 28.)

Information on near midair collisions is gathered by FAA and the National Aeronautics and Space Administration. Only FAA attempts to determine the underlying causes. An examination of FAA's investigative reports and the related computerized summary data disclosed discrepancies between the information in the summary and that in the reports which raised questions about the accuracy and usefulness of the summary data. Therefore, GAO cannot comment on the number of near midair collisions attributable to air traffic controllers. GAO brought the discrepancies to FAA's attention in May 1981, and FAA advised GAO that it knew of the problems associated with the summary data. GAO subsequently observed that corrections were being made and the data was being presented in a revised format. (See pp. 28 and 29.)

Contents

ABBREVIATIONS

FAA	Federal Aviation Administration
GAO	General Accounting Office
NASA	National Aeronautics and Space Administration
NTSB	National Transportation Safety Board
PATCO	Professional Air Traffic Controllers Organization

CHAPTER 1

INTRODUCTION

In October 1980, Senator Charles H. Percy and Representative Robert Whittaker requested that we review the staffing patterns and conditions at Federal Aviation Administration (FAA) air traffic control facilities. They also requested that we look at the relationship, if any, between aircraft incidents (such as near midair collisions and accidents) and controller staffing, training, and certification.

STRUCTURE OF FAA'S AIR TRAFFIC CONTROL SYSTEM

One of FAA's principal missions is to develop a national aviation system of air navigation and air traffic control that insures the safe and efficient use of national airspace by both civil and military aircraft.

The operation and maintenance of the air traffic control system accounts for a majority of FAA staffing requirements. Over 50 percent of FAA's staff are involved in actually operating the system, with an additional 20 percent involved in installing and maintaining facilities and equipment. The system includes the air route traffic control centers, control towers at airports, and flight service stations.

Centers provide control and separation of aircraft flying in national airspace and certain oceanic routes. A network of 20 centers is located in the continental United States, and 5 additional centers are located in Honolulu, Hawaii; Anchorage, Alaska; San Juan, Puerto Rico; Balboa, Panama; and Guam. Each center is responsible for aircraft within a specific, controlled airspace.

The principal function of control towers is to control aircraft within an area surrounding one or more airports. The level of services provided depends on the density and type of air traffic involved. A control tower may be concerned only with air traffic operations for the airport at which it is located or for adjacent airports as well.

ROLE OF THE AIR TRAFFIC CONTROL SPECIALIST

Air traffic control specialists are directly responsible for the success of the FAA mission by insuring that aircraft are properly separated (the distance between aircraft in flight) and that takeoffs and landings are as safe as possible. As of September 30, 1980, FAA employed 26,210 controllers including supervisors and staff specialists. Thirty-eight percent are involved in enroute control, 44 percent are involved in airport tower control, and 18 percent are involved in flight service station duties.

The controllers at centers are responsible for monitoring air traffic in specified airspace. They use radar and computer surveillance to monitor the speed, altitude, and direction of enroute aircraft. The controllers issue instructions to pilots regarding proper flight headings and altitudes to insure separation. They may alert pilots concerning severe weather conditions and restricted flight areas, such as military operation areas. The center controllers retain control of aircraft until they are released to an adjacent center or to a control tower at an airport.

Controllers at airports are responsible for controlling air traffic at and in the immediate vicinity of the airport. A control tower at a major airport has a tower cab (a glass-enclosed area at the top of the tower) and a radar room. Controllers in the radar room use radar and computer surveillance to monitor the air space. They accept traffic from centers and release it to controllers in the tower cab for landing. On aircraft departures, the procedures are reversed. Controllers in the tower cabs are responsible for guiding aircraft as they land and depart and while they are on the ground.

Figure 1-1 shows the overall structure of the air traffic control system, and figures 1-2, 1-3, and 1-4 show the environment in centers, control tower radar rooms, and control tower cabs, respectively.

AIR TRAFFIC CONTROLLER STAFFING STANDARDS

FAA first used an air traffic controller staffing standards system during the fiscal year 1972 budget process. Due to major automation and other changes introduced to the air traffic control system and an investigation by the House Appropriations Committee staff, FAA began a study in March 1978 to develop new staffing standards. The study involved over 4,000 hours of observations of controller activities at air route traffic control centers and control towers and resulted in revised standards.

The air traffic staffing standards system is designed to produce adequate but not excessive levels of staffing to accomplish variable workload demands at an acceptable level of quality. To accomplish this, the staffing standard consists of air traffic control workload measures including

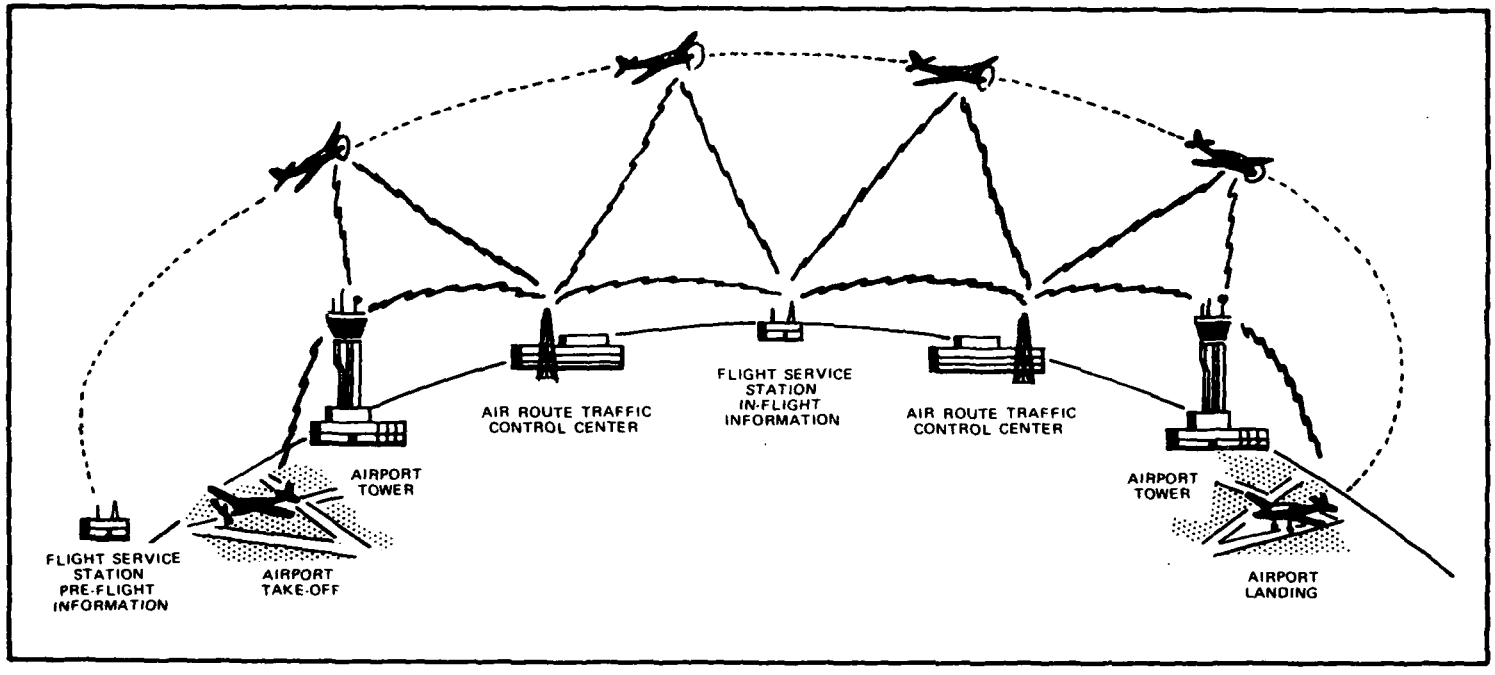
--traffic handled on an hourly basis,

--type of sector or position,

--interval between the time an aircraft enters and exits the sector airspace, and

--average number of aircraft handled for the 2 peak hours per shift.

Figure 1-1



Air traffic control towers, centers, and flight service stations assist pilots from flight planning to takeoff to landing.

Source: Federal Aviation Administration

Figure 1-2 Enroute traffic control center.

Source: Federal Aviation Administration

Figure 1-3 Control tower radar room.

Source: Federal Aviation Administration

Figure 1-4 Control tower cab. Source: Federal Aviation Administration

The staffing standard uses flight activity on or similar to the 37th busiest day during the fiscal year. This day represents the 90th percentile. Under this concept, approximately 10 percent of the days during the year will have more air traffic and about 90 percent will have less.

Although new standards resulted from the March 1978 study, there were few conceptual changes from the old standard. These changes included using the average of 2 peak hours per shift for staffing instead of using the single peak hour per shift, and standardizing procedures for calculating sector flight time. The study also considered various days lower than the 90th percentile, but the results indicated that staffing at a lower level would affect both efficiency and safety.

The staffing standards are statistical constructions based on data obtained from a sample of air traffic control facilities. Because of the statistical characteristics, FAA recognizes that the standards cannot be used inflexibly at every facility and for every possible control situation. Since the standards are national in scope it is expected that some local conditions may exist where more or less staffing is required than that computed by the standards.

OBJECTIVES, SCOPE, AND METHODOLOGY

Our objectives were to determine if (1) staffing levels were adequate at selected air traffic control facilities, (2) controller training and certification requirements were being met, and (3) a relationship existed between aircraft incidents and controller staffing, training, and certification.

We were requested to restrict our review to two or three air traffic control areas in different parts of the Nation. We were asked specifically to include the Chicago, Illinois, area. Since we had some familiarity with air traffic control facilities in the Denver, Colorado, area, they were also included. The four facilities covered were

--Chicago O'Hare Airport air traffic control tower,

--Aurora Air Route Traffic Control Center near Chicago,

--Denver Stapleton Airport air traffic control tower, and

--Longmont Air Route Traffic Control Center near Denver.

Our review of the four facilities, conducted between October and February 1981, consisted principally of the following:

--We interviewed controllers, FAA officials, and representatives of the Professional Air Traffic Controllers Organization (PATCO) at the four facilities.

--We reviewed logs and other records of staffing levels; overtime; controller time actually controlling traffic; annual leave; sick leave; flight activity; FAA staffing studies; and FAA policies, procedures, and regulations governing controller staffing, training, and certification.

We interviewed officials of FAA's regional offices in Chicago and Denver, and officials in FAA's headquarters, as well as PATCO regional representatives for the Chicago and Denver areas.

To determine the amount of time controllers actually spent controlling traffic, we compiled data from 7 days selected from the period January 1, 1980, through September 30, 1980. The selection included a random start and provided one of each of the days of the week distributed evenly throughout the period.

In an attempt to compare FAA's air traffic controller staffing standard with others, we obtained information on the methods used by the U.S. Air Force, Canada, and the United Kingdom. However, because of time constraints and the limited nature of the data, we did not evaluate this data or include it in this report.

CHAPTER 2

FAA IS ATTEMPTING TO OBTAIN ADDITIONAL CONTROLLERS FOR THE RADAR ROOM AT O'HARE AIRPORT

Unsatisfactory staffing levels have existed at the O'Hare tower radar room for some time. While past efforts to increase the staffing levels have been unsuccessful, FAA is continuing its efforts to correct the problem.

RADAR ROOM STAFFING IS A RECOGNIZED PROBLEM

Staffing problems at O'Hare have been widely recognized. FAA management, controllers, PATCO representatives, and an FAA staffing study all state that staffing levels in the radar room are less than satisfactory. As recent as October 1980, the FAA Administrator expressed concern that past efforts to adequately staff the O'Hare radar room have been unsuccessful. He stated that it was imperative that the staffing situation at the radar room be improved.

Controllers and PATCO representatives attribute the staffing problems to an inability to attract controllers because of Chicago's high cost of living and the fact that controllers at some less busy airports are being paid the same as those at O'Hare.

An FAA staffing study prepared in 1979 stated that O'Hare has a known staffing problem and that several efforts have been made to attract and retain controllers. For example, in

--1973, the radar room and tower cab operations were separated (controllers were no longer required to rotate between the two operations);

--1974, controllers were assigned to other Chicago area facilities for initial training before working at O'Hare;

--1977, O'Hare radar room controllers' base pay was raised to the highest possible level; and

--1979, controllers were guaranteed rotation to a different facility after 5 years as a fully qualified controller at the O'Hare radar room.

The study noted that all of the concepts provided incentives, but staffing problems still persisted.

INDICATORS OF A STAFFING PROBLEM

A comparison of authorized staffing levels and actual staffing levels at the O'Hare radar room as well as an analysis of the use of overtime indicate a staffing problem. At September 30, 1980, the O'Hare radar room was authorized a staffing level of 87 but the actual staffing level was 59 or only 68 percent of the authorized level.

Overtime usage

Extensive use of overtime may be an indication of inadequate staffing levels. The average amount of overtime worked per controller at O'Hare during fiscal years 1979 and 1980 was generally greater than at other major airport towers.

Overtime Used at Major Airport Towers
During Fiscal Years 1979 and 1980

Facility	FY 1979 average overtime per controller	FY 1980 average overtime per controller
O'Hare (note a)	113.2	89.3
Atlanta	12.2	10.1
Boston	28.2	58.6
Dallas	13.2	8.3
Denver	11.2	25.7
Detroit	59.2	37.5
Houston	33.2	18.1
Los Angeles	96.2	65.3
Miami	24.2	7.0
New York	103.2	148.4
Oakland	25.2	24.1
Philadelphia	52.2	39.3
Phoenix	48.2	42.8
Pittsburgh	116.2	46.4
Washington National	10.2	8.2
Average	51.6	49.1

a/A breakdown of annual overtime usage between the radar room and the tower cab was not readily available.

Although not conclusive, an FAA study for the 3-month period ended September 30, 1980, showed that the O'Hare radar room controllers used 1,618 hours of sick leave and that overtime was needed to offset all absences. It would appear that the radar room did not have sufficient staff to absorb any sick leave absences without using overtime. The FAA analysis showed that other major airport towers did not use overtime to offset all

sick leave hours used. For example, Stapleton tower had enough staff to absorb 723 of the 1,189 hours of sick leave used. The following table shows the use of overtime at major airport towers to offset absences due to sick leave.

Use of Overtime to Offset
Sick Leave at Major Airport Towers
July Through September 1980

Facility	Sick leave hours used	Offsetting overtime hours used	Percent of sick leave
O'Hare radar room	1618	1618	100
Atlanta	1639	54	3
Boston	2046	671	33
Dallas	3200	106	3
Denver	1189	466	39
Detroit	1263	592	47
Houston	1900	249	13
Los Angeles	1748	560	32
Miami	1552	35	2
New York	2690	1034	38
Oakland	1719	503	29
Philadelphia	2320	373	16
Phoenix	583	160	27
Pittsburgh	1186	556	47
Washington National	2884	206	7

PATCO DISCOURAGED CONTROLLERS FROM COMING TO O'HARE

In 1979 PATCO clearly discouraged controllers from seeking positions at O'Hare. Its national newsletter stated that controllers should not consider coming to O'Hare until controllers received guaranteed rotation to less busy facilities after 5 years at O'Hare, a guaranteed 2-year salary retention, and an incentive bonus. As stated on page 9, controllers obtained the rotations desired.

In January 1981 the local PATCO at O'Hare made it very clear that trainees were not welcome. It stated in a letter to union members that if trainees still decided to come, they should not blame the O'Hare controllers for their decisions. The letter stated that O'Hare controllers wanted monetary incentives and to obtain these incentives the local union was in a "war of economics." Interviews with controllers at O'Hare also indicated more interest in increased pay than in increased staffing.

Additional problems were related to O'Hare management's dependence upon experienced controllers to provide job training and to recommend trainees for certification. The O'Hare evaluation and proficiency development officer stated that, beginning in January 1980, controllers in the radar room refused to volunteer to train new controllers. Although some first-line supervisors advised us that controllers would train when ordered to do so, trainees we interviewed indicated that limited training was received during this period. In addition, some trainees said that their training was delayed.

AGENCY ACTIONS

To alleviate these problems, new recruitment and training programs were implemented. O'Hare tower plans to (1) recruit controllers from the top graduates of the FAA training academy, (2) broaden recruiting from other facilities, and (3) recruit applicants who have had previous military experience. Trainees coming to O'Hare tower under these programs would be provided special radar training at the FAA training academy and specific O'Hare-oriented training at FAA's Technical Center at Atlantic City, New Jersey. Controllers from other facilities who fail the training will return to their original facility. Controllers who had no previous radar experience and who fail initial screening at the O'Hare tower will be placed at other facilities within FAA's air traffic control system.

Also, in November 1980, O'Hare management established that in the radar room only one recommendation for certification of a trainee is required. An experienced controller/instructor or a supervisor other than the trainee's supervisor can make this recommendation. In addition, supervisors have been given greater responsibilities in the actual training of trainees.

It is too early to evaluate the results of these new programs; however, we believe these actions should aid in correcting the staffing problems at O'Hare and are making no recommendations at this time.

CHAPTER 3

CONTROLLER STAFFING LEVEL PROBLEMS NOT INDICATED AT STAPLETON TOWER AND CHICAGO AND DENVER CENTERS

FAA management at Stapleton tower and at Chicago and Denver centers all believe that the number of controllers currently assigned can adequately provide safe air traffic control service. Many controllers, however, believe that staffing levels are inadequate. Our analysis and evaluation of staffing statistics, flight activity levels, overtime usage, and concerns expressed by controllers and PATCO representatives did not indicate staffing level problems.

DENVER STAPLETON AIRPORT AIR TRAFFIC CONTROL TOWER

Controllers authorized and assigned

At the close of fiscal year 1980, the actual staffing at Stapleton tower was about 92 percent of its authorized level. It was authorized 71 controllers and had 65 controllers actually assigned. The chief of this tower advised us that he had an adequate number of controllers to handle the traffic.

Overtime usage

FAA records show that each controller at Stapleton tower worked an average of 11 hours overtime in fiscal year 1979 and 26 hours in 1980. These figures are substantially below the national averages of 52 and 49, respectively, for major airport towers.

Based on FAA's analysis of overtime use to offset sick leave during the last 3 months of fiscal year 1980, Stapleton used overtime to offset 39 percent of the sick leave used. For the 3-month period ended December 31, 1980, controllers at Stapleton tower used 2,175 hours of sick leave. Approximately 11 percent or 250 of these hours were offset by the use of overtime. FAA apparently was able to shift personnel or otherwise operate with existing staff during the other periods when sick leave was used.

Stapleton tower officials believed that some daily personnel shortages were resolved by using overtime because it was cost effective. However, we were told that overtime use was carefully controlled. Overtime must be explained and justified regularly. Controller contract constraints also affect overtime use. For example, FAA management can not change controller work schedules to meet operational needs with less than 21 days advance notice unless alternative measures listed in the contract are not considered feasible. The Stapleton tower chief stated that when work schedules could not be changed, someone could always be found to work overtime which is one of the alternatives.

The tower chief said that when operational needs change because of sick leave usage, increased air traffic, or changing weather conditions, overtime may be the only tool management can use. The contract also requires that controllers who work overtime on a regular day off be guaranteed 8 hours and controllers working overtime beyond their regular shift be guaranteed 2 hours. The Stapleton tower chief stated that these constraints, combined with pressures not to use excessive overtime, cause overtime statistics to be less than a true indicator of staffing inadequacies.

Concerns expressed by controllers and PATCO representatives

The controllers interviewed at Stapleton tower and PATCO representatives contend that staffing is inadequate. They cite the following conditions as indicators of a staffing problem:

--Loss of controller breaks.

--Denial of unscheduled annual leave.

--Excessive use of overtime and sick leave.

--Some positions not being staffed during busy periods.

--Excessive amount of time on control positions.

--Supervisory staff working air traffic control positions.

Our review disclosed that no data was available to document whether controllers were denied breaks or unscheduled annual leave. As stated previously, our review did show that the average amount of overtime used at Stapleton tower was far less than the national average for similar towers.

While we noted instances when work positions were not staffed, documents did not exist to enable us to reconstruct the traffic levels or complexity for such periods.

Our analysis of the records at Stapleton tower for seven randomly selected days identified the amount of time controllers were actually controlling air traffic. (See appendix 1 for a discussion of the analysis.) We found instances where supervisory staff worked air traffic control positions. As a general rule, FAA requires most supervisors to periodically work control positions to ensure their proficiency. We could not establish whether proficiency or inadequate staffing precipitated the instances we noted.

The Stapleton tower chief agreed that in certain circumstances, such as poor weather or when a large number of controllers are on annual or sick leave, some of the above

conditions can occur. He believes these instances are isolated and may be an indication of mismanagement rather than inadequate staffing.

The FAA Regional Director stated the level of controller staffing has never compromised safety but the efficiency of operations could be affected. This decrease in efficiency would result in more delays in the movement of air traffic.

Stapleton tower officials have repeatedly stated that controller staffing is adequate at their facility. The tower chief stated that the lack of interruption of day-to-day services to the users and members of the flying public demonstrates the adequacy. We did not make an extensive review of the frequency or extent of aircraft delays, but our 7-day analysis revealed no indication of major loss or interruption of service or any other significant problems.

CHICAGO AIR ROUTE TRAFFIC CONTROL CENTER

Controllers authorized and assigned

At the end of fiscal year 1979, Chicago center was staffed slightly over the authorized level while at the end of fiscal year 1980 it was staffed slightly under the authorized level.

Fiscal year	Authorized staff	Actual staff	Percent of authorized
1979	546	562	103
1980	546	541	99

FAA facilities are authorized specific numbers of controllers with no distinction made between fully qualified controllers and those in training. An evaluation and proficiency development specialist at the Chicago center showed us a local method of measuring the adequacy of the actual staffing levels which considers the mix of fully qualified controllers and trainees. Under this method, various weight factors are assigned to controllers based on their level of experience. The resulting calculation is then compared to the authorized staffing level. If the total of the weight factors for the actual controllers on board equals at least 80 percent of authorized strength, the actual staffing level is considered acceptable. Our analysis of 21 separate days from August 1979 to December 1980 showed a range from 75 to 80 percent of the authorized strength, with an average of 78 percent.

Flight activity

Between fiscal years 1979 and 1980, flight activity levels handled at the Chicago center increased by about 1 percent while the actual year end staffing level decreased from 562 to 541. The data systems officer at Chicago center thought the ability to handle increased traffic with fewer controllers reflected increased controller productivity. We asked the data systems officer and the PATCO representative what level of flight activity controllers could reasonably handle at the Chicago center. Both believed the existing controller staff could reasonably handle a daily traffic volume of 8,000 aircraft. We reviewed flight activity records for fiscal year 1980 and found only 2 days when flight activity exceeded 8,000. Only 12 days exceeded 7,500, while the average flight activity was slightly over 5,800.

Overtime usage

FAA overtime data shows that controllers at all air route traffic control centers worked about 17 hours of overtime in fiscal year 1979 and 12 hours in fiscal year 1980. Chicago center controllers worked an average of 30 hours each above the national average in fiscal year 1979 and 28 hours above the national average in fiscal year 1980. Although Chicago center controllers worked considerably more overtime hours than the national average, their average was less than 1 hour per week in fiscal years 1979 and 1980.

Based on an analysis by FAA for the 3-month period ended September 1980, Chicago center used overtime to offset only 30 percent of the sick leave hours taken by controllers. More recent data for the 3-month period ended December 1980 showed that Chicago center used overtime to offset approximately 12 percent of the sick leave hours.

The Chicago center chief stated that overtime use at the center is not indicative of a staffing shortage. He believed that overtime usage was improperly managed in the past. Our review of overtime reports for fiscal year 1980 showed fluctuation but an overall decline.

Concerns expressed by controllers and PATCO representatives

Controllers expressed differing opinions about staffing. Seven of 13 controllers interviewed indicated their assigned areas were not adequately staffed. They offered examples of why they believed the facility was inadequately staffed; however, we found little evidence to substantiate their claims. For example, some believed the ratio of fully qualified controllers to the total number of controllers was inadequate.

An analysis of the number of fully qualified controllers compared to the total number of controllers for 21 selected days

between August 1979 and December 1980 showed a range of 60 to 63 percent with an average of 61 percent. According to Chicago center criteria, a percentage of less than 65 indicates a possible staffing problem. As can be seen, the ratio is very close to the criteria.

The Chicago center PATCO representative said he believed controller staffing was not critically short, but also not adequate. He believed that additional staff would allow expanded training and assure that controllers would be relieved hourly from directing traffic.

Chicago center officials did not believe the facility was inadequately staffed with controllers. The data systems officer commented that there have been periodic staff shortages because of unplanned training requirements and special projects but generally the current controller staff levels are adequate. The Chicago center chief said the staffing level was about right.

DENVER AIR ROUTE TRAFFIC CONTROL CENTER

Controllers authorized and assigned

Denver center was staffed at slightly over the authorized level at the end of fiscal year 1979, and slightly under the authorized level at the end of fiscal year 1980, as shown in the following table.

Fiscal year	Authorized staff	Actual staff	Percent of authorized
1979	304	310	102
1980	302	294	97

Flight activity

Flight activity at Denver center increased approximately 3 percent from fiscal year 1979 to 1980 while actual year-end controller staffing decreased about 5 percent. Denver center officials were not asked the level of activity controllers could adequately handle on a daily basis. However, we used the 8,000 aircraft per day figure given us for the Chicago center. Because Denver center had approximately 46 percent fewer controllers at the end of fiscal year 1980 than Chicago center, a comparable flight activity level would be about 4,300 aircraft daily. Denver center's highest daily traffic count was 3,631 during fiscal year 1980.

Controller staffing levels at the end of fiscal year 1980 totaled 294 with 234 being considered fully qualified and the remainder being in training. This results in a ratio of 83 percent fully qualified controllers which appears acceptable based

on Chicago center's criteria of a minimum 65 percent. Denver center officials stated that a ratio of 75 percent fully qualified controllers was adequate.

Overtime usage

During fiscal years 1979 and 1980, the overtime used at Denver center averaged 12 and 10 hours per controller, respectively. National averages for controllers at all centers were 17 hours per controller in fiscal year 1979 and 12 hours in fiscal year 1980. Sick leave usage for fiscal year 1979 and 1980 was approximately 98 and 90 hours per controller, respectively. This indicates that overtime is not used to a large extent to offset sick leave usage.

An FAA analysis of overtime use to offset sick leave during the 3-month period ended December 1980 showed that Denver center used overtime to offset only 4 percent of sick leave taken during the period.

Concerns expressed by controllers and PATCO representatives

The controllers and the PATCO representative we interviewed believe that Denver center is inadequately staffed and/or mismanaged. Similar to controllers at Stapleton tower, they cited loss of breaks, denial of unscheduled annual leave, excessive use of overtime and sick leave, some positions not being staffed during busy periods, and excessive amount of time on control positions. These concerns and our analysis are similar to those discussed beginning on page 14.

The Denver center chief and deputy chief contended that the current controller staffing is adequate to safely handle the air traffic operations. They stated that current staffing, at times, decreased the efficiency of facility operations by causing certain duties to be delayed or foregone. These duties include such things as some aspects of controller training and crew briefings. (See ch. 4.)

The Denver center deputy chief stated that crew briefings are used to inform the controllers of changes in air traffic control procedures and policies. He stated that crew briefings have been delayed at times for as long as a week. However, he stated that the team supervisors are responsible for informing the controllers of changes while they are controlling traffic.

CHAPTER 4

CONTROLLER TRAINING: SOME PROBLEMS NOTED

Entry level trainees are prepared for air traffic control through a lengthy developmental program, and proficiency training is required annually to assure technical competency among full performance level controllers. Supervisors and staff specialists are required to maintain "currency" by demonstrating that they can adequately perform air traffic control operations.

Records and interviews indicated that developmental training requirements are being satisfied before controllers are certified to control air traffic alone. However, some problems were noted with (1) providing proficiency training and (2) assuring that supervisors and staff specialists were maintaining currency. In addition, problems exist with the training being provided to prepare controllers to handle air traffic during periods when the computers are not available. FAA officials said that creating a simulated air traffic environment comparable to actual conditions is extremely difficult.

CONTROLLERS MET ALL TRAINING REQUIREMENTS PRIOR TO BEING CERTIFIED

FAA has standardized programs of instruction for trainees from entrance on duty until they are certified as full performance level controllers. These programs include classroom study, simulated control exercises, and actual control in supervised on-the-job training. Some of the training is done at the FAA academy in Oklahoma City. The training is provided in phases and successful completion of each phase is a prerequisite for continuing through the training program. Training continues until the controller reaches the full performance level for his or her assigned location. Full performance level may vary from facility to facility, depending on the location of the assignment. Promotions are not automatic and depend on developing proficiency within prescribed time periods; however, most controllers reach full performance level in 4 or 5 years.

Our review of selected training records and discussions with controllers at the four facilities indicated that trainees were satisfactorily completing all phases of required developmental training before being certified as qualified to control air traffic at positions alone.

PROFICIENCY TRAINING REQUIREMENTS NOT MET--CORRECTIVE ACTION BEING TAKEN

FAA requires full performance level controllers at facilities like the four we reviewed to have a minimum of 40 hours of proficiency refresher training annually to improve technical competency. Each facility develops its own refresher course. FAA guidance

states that an 8-hour block of time is desirable for those facilities with simulation training capabilities.

Training records are maintained for each controller. As controllers complete the various aspects of the refresher training, appropriate entries are made in the training records.

O'Hare tower

A review of training records at O'Hare showed that fully qualified controllers received an average of 12 hours of proficiency training in fiscal year 1979 and 11 hours in fiscal year 1980.

O'Hare's evaluation and proficiency development officer said that the requirement for a consecutive 8-hour training session cannot be met because controllers are needed to control traffic. We were also told that proficiency refresher training at this facility consisted only of a requirement that controllers read academy refresher booklets. The evaluation and proficiency development officer indicated that proficiency refresher training at a busy facility like O'Hare is unnecessary.

Stapleton tower

Proficiency refresher training at Stapleton consists of simulated control problems and locally developed refresher units. Denver tower controllers praised the use of simulated control problems as extremely realistic and for providing them with the most meaningful training they had seen. However, no simulation training was provided during most of 1980. The senior evaluation and proficiency development specialist stated that the equipment needed for the training was stripped for parts and did not work from March 1980 until about November 1980.

An examination of training records at the Denver tower in January 1981 indicated that no proficiency refresher training had been administered since February 1980.

Chicago center

The Chicago center has attempted to meet the annual 40-hour proficiency refresher training requirement with a combination of classroom and laboratory seminars, briefings, team meetings, and familiarization 1/ trips. A review of selected records

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1/Travel in the cockpit of a scheduled air carrier, military aircraft, or civil non-air carrier aircraft intended to acquaint control personnel with the cockpit environment and to enable them to observe the operation of the air traffic system from that perspective.

showed that during 1979 and 1980 controllers had received an average of 16 hours annually.

During interviews 7 of 13 controllers indicated that the laboratory seminars were not very meaningful and 3 thought the briefings were of questionable use. The Chicago center chief concurred that controllers do not receive the required 40 hours of proficiency training and stated that perhaps 40 hours annually is not really necessary.

Denver center

In 1978 the Denver center developed and provided a 40-hour, week-long course for all controllers. It covered such things as weather and seldom-used procedures. Due to the strain on control room staffing when controllers were away taking the course, it was dropped. In its place, an evaluation and proficiency development specialist advised us that a 16-hour radar course was developed and given to all controllers beginning in February 1979. In addition, controllers were receiving about 13 hours annually, mostly through monthly refresher units developed by FAA's training academy. From February 1979 to August 1980, controllers had less than 30 hours of refresher training available to them.

After an evaluation by the FAA Rocky Mountain Region, the Denver center in August 1980 again established a 40-hour refresher training course which includes the FAA training academy monthly refresher units, quarterly weather procedures units and meteorological briefings, and an intense semiannual broadband radar--FAA's primary backup system when the computer is not available--refresher unit.

Agency action

In response to information we provided FAA about facility deficiencies in meeting proficiency training requirements, it took action in April 1981 aimed at helping insure that the requirements are met and documented. In a letter from FAA's Air Traffic Service, all regional air traffic division chiefs were asked to have their facility chiefs review and comply with the proficiency training requirements and to stress the importance of documenting the training in employee training records. In view of this action we are making no recommendations at this time.

QUESTIONABLE COMPLIANCE WITH CURRENCY REQUIREMENTS--CORRECTIVE ACTION BEING TAKEN

Supervisors and staff specialists are required to maintain currency by demonstrating a satisfactory level of operational proficiency. FAA does not require specific methods to insure

currency. Although facility position sign on/off logs are maintained, these cannot be relied on to verify currency as they are not always accurate. (See discussion of these position records on pp. 30 and 31.)

O'Hare tower

O'Hare's evaluation and proficiency development officer indicated that because staffing at the facility was critical, supervisors are needed to control traffic which ensures their currency.

Stapleton tower

The chief at Stapleton tower advised us that no special effort is involved in maintaining currency because his first-line supervisors perform operations on a regular basis. He said that when first-line supervisors return to work after periods of extended absence, such as sick leave or training, special efforts are made to assure that they are still current.

Chicago center

An April 1980 report by an evaluation team from the FAA Great Lakes Regional Office stated that first-line supervisor currency and operational involvement at the center appeared to be on the decline. The report recommended that the center develop ways to ensure that supervisors meet the currency requirements.

The Chicago center, in responding to this report, admitted that its first-line supervisors were not maintaining currency. Center officials agreed to implement methods to ensure currency and to establish appropriate records. At the completion of our field work, the Chicago center was establishing currency records.

Denver center

The Denver center chief and deputy chief contended that the majority of the first-line supervisors are remaining proficient. However, the majority of the supervisors, staff specialists, and controllers we interviewed stated that currency was not being maintained. In September 1980 the Denver center revised its order covering currency requirements and established that appropriate records were to be kept by those individuals that must actually perform operations to maintain currency.

Our review of 42 records of currency for the 3-month period ended December 31, 1980, showed that only 12 of the individuals involved were in compliance. Three records contained notations that operations had been performed but specific times had not been recorded.

Agency action

In February 1981 FAA headquarters advised all its regional air traffic division chiefs that regular discussions with employees together with strong guidance and direction from the regional level are essential steps in ensuring adherence to supervisory currency requirements.

FAA's action has the potential for improving supervisory adherence to currency requirements. Accordingly, we are making no recommendations at this time.

NON-COMPUTER TRAINING IS A PROBLEM

Air traffic is controlled with the aid of radar and computers. The computer provides information on speed, altitude, and aircraft identification. When computers are not available because of a malfunction or required maintenance, controllers must be proficient in using broadband radar which is FAA's primary backup system.

The four facilities we reviewed provide training to their controllers in handling air traffic without the aid of the computer. This training either uses simulators or is done during late evening and early morning hours when the computer is normally out of service for routine maintenance.

FAA officials at the facilities advised us that the training on the simulator was inadequate because the simulated display does not duplicate the radar display. For example, the true radar display is much darker and less clear than the simulator display. We were advised that training during late night or early morning hours is inadequate primarily due to the light amount of aircraft activity. However, no one suggested that the computer be turned off during busy periods for the purposes of training.

In January 1981 the Chicago center received and began using a new computerized backup system called a Direct Access Radar Channel system--designed for use at centers only. The system has the capability to provide controllers with information on aircraft identity and altitude. Denver center's system is scheduled to begin in mid-1981. However, simulation of actual radar-only conditions will continue to be difficult at O'Hare and Stapleton towers.

CONCERNS EXPRESSED BY MANAGEMENT AND/OR CONTROLLERS

Our discussions with management officials and controllers surfaced a number of concerns about some of FAA's training activities. Primarily because of time constraints, we have not evaluated these concerns or attempted to verify their validity. We have provided a list of these concerns to FAA headquarters for its consideration and disposition.

--FAA academy training materials and equipment need to be updated and improved. The curriculum and course materials from the FAA academy are developed by academy instructors--former controllers who are not qualified for curriculum development. Monthly refresher units are outdated and inaccurate. The burden of revision may be placed on facility training staffs who are already understaffed.

--The training program is too long and inflexible and does not accommodate or provide incentives for rapid advancement.

--On-the-job training received by trainees is provided by full performance level controllers who themselves have had very little training in instructing techniques.

--Although simulation has been very effective in various types of training, Stapleton tower currently has only one of the four simulators authorized.

--The Stapleton tower chief feels that the past training provided to controllers has effectively prepared them to direct traffic in a non-radar environment. Controllers believe, however, that training is almost non-existent and what is provided is of little value.

CHAPTER 5

NO APPARENT CORRELATION BETWEEN CONTROLLER STAFFING AND TRAINING AND AIRCRAFT INCIDENTS

Air traffic controllers are seldom identified as a cause or factor in aircraft accidents. For example, National Transportation Safety Board (NTSB) statistics for calendar years 1978-80 identified air traffic control personnel as a cause or factor in only 39 of 12,344 general aviation accidents.

System errors--violations of FAA separation standards for aircraft--were few when compared to the number of aircraft handled. In calendar year 1980, the four facilities reviewed handled over 4.7 million aircraft and collectively they reported only 39 system errors; none involving an accident.

Our review of FAA's reports on each of the system errors at the four facilities in 1980 did not indicate any patterns or trends related to air traffic controller staffing or training deficiencies. The system errors were primarily attributable to human mistakes.

Information on near midair collisions is gathered by FAA and the National Aeronautics and Space Administration (NASA). Only FAA attempts to determine the underlying causes. An examination of FAA's investigative reports and the related computerized summary data disclosed discrepancies between the information in the summary and that in the reports. This raised questions about the accuracy and usefulness of the summary data.

The statistics on accidents and system errors we reviewed for correlation with controller staffing or training involved incidents which occurred within calendar year 1980 and within the air space of the four facilities visited. Daily staffing records were generally not kept by the facilities longer than 1 year, therefore incidents before 1980 could not be related to specific staffing conditions.

TRAFFIC CONTROL PERSONNEL ARE SELDOM IDENTIFIED AS CAUSE OR FACTOR IN AIRCRAFT ACCIDENTS

NTSB, as an independent agency, is responsible for promoting transportation safety through investigating accidents and conducting special studies. NTSB has reported that weather and the pilot are involved in the vast majority of accidents. FAA air traffic control personnel were identified as a cause or factor in a very small number of accidents as shown in data developed by NTSB.

	Calendar year	Total accidents	FAA air traffic control personnel identified as cause or factor
General aviation			
	1978	4494	20
	1979	4051	14
	1980	a/3799	a/5
		12,344	39
Air carrier			
	1978	24	2
	1979	32	1
	1980	a/20	a/1
		76	4

a/Preliminary data.

According to preliminary NTSB information for 1980, there were 20 air carrier accidents and 3,799 general aviation accidents. Investigative data as of November 25, 1980, cited air traffic control personnel as a cause or factor in six of these accidents, only one of which was in the area of the four facilities we reviewed. The preliminary NTSB investigation of this accident indicated that possible weather information and/or a flight service station was involved.

SYSTEM ERRORS ARE GENERALLY CAUSED BY HUMAN MISTAKES

A system error occurs when two or more aircraft being controlled by FAA air traffic controllers pass within less than a specified distance. When traffic is being controlled by an enroute center, the specified horizontal separation is generally 5 miles. Specified vertical separation is 1,000 feet for traffic up to 29,000 feet and 2,000 feet for traffic above 29,000 feet. The specified separation for traffic being controlled by a tower is generally 3 miles horizontal and 1,000 feet vertical.

A system error can be reported by anyone who observes it; for example, controllers, supervisors, or pilots. When a system error is reported, a documentation and reconstruction process begins. This documentation process includes retrieving the tapes recording verbal transmissions and computer output showing aircraft locations. These are used to reconstruct the incident and, ultimately, to determine the cause of the system error. System error statistics for calendar years 1978 through 1980 are shown below:

Facility	Calendar year 1978	1979	1980 (note a)	Aircraft handled in 1980
All facilities nationwide	571	612	525	96,256,000
Chicago center	17	14	19	2,086,000
O'Hare tower	15	12	12	1,027,000
Denver center	8	18	6	1,024,000
Stapleton tower	6	7	2	578,000

a/Preliminary information.

Many of the errors occurred because controllers forgot to coordinate with other controllers as illustrated by the following examples:

--Two aircraft departed Stapleton Airport 1 minute apart and started their ascent to 23,000 feet. The first aircraft was climbing at 240 knots while the second aircraft was ascending at 280 knots. The two aircraft came within 3.8 miles of each other as the second aircraft was overtaking the first before corrective action was initiated. The direct cause was one controller's failure to ensure specified separation before transferring control to another controller.

--An aircraft was approaching Gunnison, Colorado, descending from 37,000 feet to 23,000 feet. A second aircraft was level at 25,000 feet. They came within 2.5 miles of each other. The direct cause was that one controller cleared the descending aircraft within another controller's airspace without prior approval.

Other system errors were caused by pilots, trainee controllers, or equipment. For example:

--An eastbound aircraft ascending from 37,000 to 41,000 feet came within 3.75 miles of a westbound aircraft at 39,000 feet during a rainstorm. The failure of the first aircraft's pilot to ascend to requested altitude in reasonable time was the direct cause.

--A southeast bound aircraft at 35,000 feet was cleared to ascend to 37,000 feet to clear crossing traffic and came within 3/8 of a mile of a northwest bound aircraft at 35,000 feet. A trainee was controlling traffic with an instructor during this

incident. The direct cause was the instructor's failure to take corrective action in time to avoid the head-on traffic situation.

--A westbound aircraft at 21,000 feet passed within less than specified separation from an eastbound aircraft climbing from 15,000 feet to 22,000 feet. This occurred during a series of computer interruptions.

A review of training and certification records of the controllers involved in the system errors at the four facilities indicated that--with two exceptions--all developmental training and certification requirements had been met. The exceptions involved trainees who were controlling traffic under the supervision of an instructor. Errors appeared to relate more to human mistakes than to deficiencies in staffing or training.

NEAR MIDAIR COLLISION REPORTS COLLECTED BY TWO AGENCIES

In addition to FAA's near midair collision reporting system, NASA also collects information on such incidents.

NASA, as part of its Aviation Safety Reporting System established in August 1975, solicits reports from any person who witnesses or is involved in an occurrence which he or she believes poses a potential threat to flight safety. NASA receives an average of 5,500 reports annually on subjects ranging from airport perimeter security to unauthorized take-offs and landings. The main criteria is that the topic be pertinent to aviation safety.

Between July 1, 1976--when NASA's system was implemented--and November 30, 1980, NASA had received a total of 22,308 reports. Of this number 2,586 or about 11.6 percent were analyzed as being near midair collisions.

Reports are entirely voluntary, there is no follow-up investigation, and contributors' names are not made known unless the report contains information about a criminal offense or accident. NASA participates as a third party, in connection with FAA, to facilitate the flow of safety information and to protect the identity of individuals who submit reports.

FAA receives reports of near midair collisions from air crewmembers. The reports are investigated and efforts are made to determine the identity of the aircraft involved. Efforts are also made to determine the type of error contributing to the incident, such as altimeter, pilot, or air traffic system. A comparison of the numbers of reports received by FAA and NASA follows.

Calendar year	Near midair collision reports NASA	FAA
1977	492	384
1978	477	504
1979	a/772	540
1980	515	362 (as of Oct. 1980)

a/NASA had a large publicity campaign to inform people of its reporting system.

There seems to be valid reasons for the differences in the number of reports received. For example, NASA's report contributors may be controllers, pilots, airport managers, mechanics, and even some passengers, while FAA receives reports only from air crewmembers actually involved in the incident.

No uniform criteria defining a near midair collision exists. It is generally said to be "in the eyes of the beholder." Accordingly, cases could exist which are not considered near midair collisions by air crewmembers. Thus no reports are filed with FAA, while one or more other individuals--controllers, passengers, etc.--might file reports with NASA.

FAA maintains computerized data summarizing its near midair collision reports. Among other things, FAA uses this data to answer inquiries from the Congress and the public. At our request, FAA provided us with a computer printout of the reports processed during 1980 up until the date of our request--October 20, 1980. The printout listed data on 362 reports. We attempted to verify the accuracy of the data in the printout by comparing it to selected investigation reports. While this was not an extensive comparison, we noted discrepancies between the information in the summary and that in the reports, raising questions about the accuracy and usefulness of FAA's summary data. Due to time constraints we could not review every investigative report. Therefore, we cannot comment on the number of near midair collisions attributable to air traffic controllers.

We brought the discrepancies to FAA's attention in May 1981. FAA advised us that it knew of the problems associated with the summary data and that it was currently making corrections and putting the data in a revised format. Subsequently, we observed that corrections were being made and the data was being presented in a new format.

ANALYSIS OF TIME THAT CONTROLLERS ACTUALLY CONTROL TRAFFIC

An agreement 1/ between FAA and PATCO states that air traffic controllers who operate continuously under heavy control workloads have their operating efficiency impaired due to various forms of fatigue; accordingly, relief periods away from control positions shall be provided. The past FAA Administrator advised a subcommittee of the House Appropriations Committee in March 1980 that controllers actually control traffic an average of 5 hours out of an 8 hour shift. But, he admitted that FAA does not have accurate data in this regard.

BASIS OF ANALYSIS

In an attempt to obtain data which would be representative of the amount of time that controllers actually controlled traffic, we selected 7 days within the period January 1 to September 30, 1980. We picked the first day by random selection; then picked every 40th day. The selection provided us with each day of the week spread evenly throughout the 9-month period.

We planned to collect data at all four facilities included in our review, but found that data was not available at Chicago center.

LIMITATIONS IN THE DATA

Several inaccuracies in the data resulted because of the condition of the available records. For example, records at O'Hare and Stapleton indicated the time a controller began working a control position but not when the controller left the position. Therefore, we assumed that a controller's time off was the same as the next controller's time on.

On many occasions, a sign-off time could not be determined. In these cases, we did not include any of the potential time worked. For example, if the last controller to sign on a position did not also sign off at the end of the day or the end of the shift, we counted no time worked. Of the 7 days data collected, we could not determine the time worked on 8 percent of the occasions that controllers signed on to positions at O'Hare, 9 percent at Stapleton, and less than 1 percent at Denver center. This lack of data was particularly prevalent during the last several hours during the day. As a result, some observations relative to the last few hours of the days are highly questionable.

1/FAA and PATCO are negotiating an agreement to replace the one which expired March 15, 1981.

We also were told by some controllers and FAA officials that the records are not always accurate and consequently may not show actual conditions. We had no way of verifying this condition.

Finally, we were told that controllers may perform some administrative functions or obtain some type of training when not controlling air traffic, but we did not attempt to ascertain the degree.

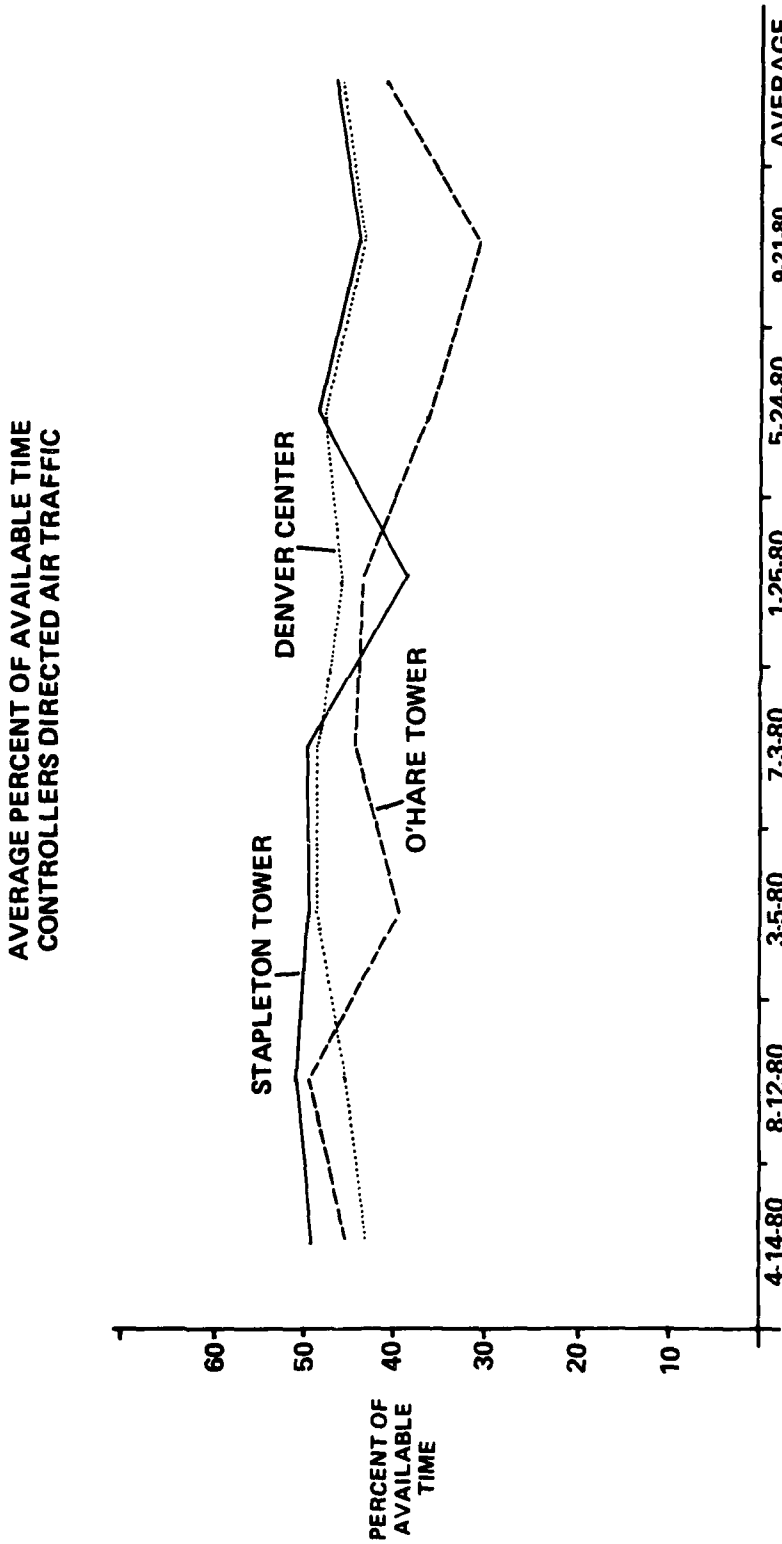
RESULTS OF ANALYSIS

Based on the 7 days of data collected, we found considerable consistency at the three facilities. Generally the controllers spent between 40 and 50 percent of their time controlling air traffic. Chart 1 of this appendix shows a comparison of the periods of time controllers spent directing air traffic at O'Hare tower, Stapleton tower, and Denver center.

An analysis of time worked on an hour-by-hour basis also showed considerable consistency between the three facilities. The first 5 hours of the days showed that controllers averaged working about 45 percent of their time controlling traffic. Patterns show that the percent of time generally is reduced for a few hours; then increases until about 2 o'clock in the afternoon when the percentage returns to the 40s. The percentage again increases to as much as 60 percent but again returns to the low 40s by about 8 o'clock in the evening. Although the remaining percentages are shown, they are based on questionable data, as discussed above. Chart 2 reflects these trends.

APPENDIX I

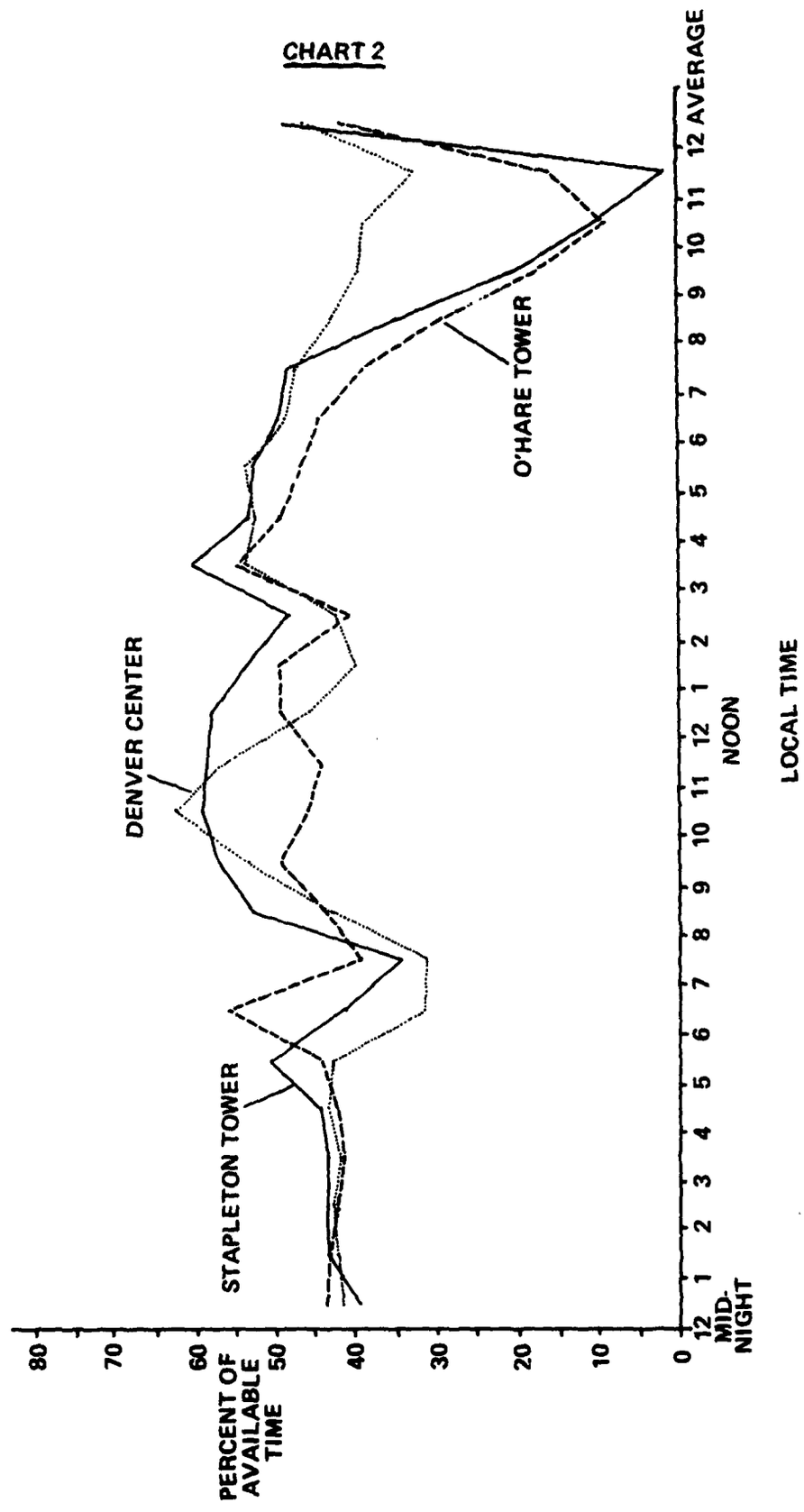
CHART 1



APPENDIX I

CHART 2

AVERAGE PERCENT OF HOURLY TIME
CONTROLLERS DIRECTED AIR TRAFFIC



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