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TECHNOLOGY AS STRIKEBREAKER:

An Analysis of the Use of Technology to

Replace the 1981 PATCO Strikers

By

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B.A., University of Wisconsin

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Presented in partial fulfillment of the requirements for
the degree of Master of Public Administration

UNIVERSITY OF MONTANA

1985

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Chapter I

INTRODUCTION

On August 3, 1981 more than 12,000 members of the Professional Air Traffic Controller's Organization (PATCO) went on strike. They hoped to bring air traffic in the United States to a virtual standstill and thereby force the Federal Aviation Administration (FAA) to accede to militant union demands highlighted by a \$10,000 pay increase. The government responded quickly, certain that the public would back them rather than allow federal employees, already considered well-paid, to receive raises of such magnitude. First, the FAA used computer technology to institute a flow-control system for air traffic which enabled skeleton crews of non-striking air traffic controllers, with the assistance of supervisors and hastily reassigned military personnel, to maintain air traffic at seventy-five per cent of normal operating levels; and second, they fired all striking PATCO members who refused to return to work within forty-eight hours for their participation in an illegal strike. In addition, government officials successfully wooed media support to their side by taking a strong stand against wage increases for 'overpaid' illegal strikers; and by their repeated reassurances that air traffic would neither suffer in volume nor in safety due to the strike. On August 5, President Reagan, Department of Transportation Secretary Drew Lewis, and FAA Administrator J. Lynn Helms, became the big winners and nearly 12,000 union members joined the ranks of the unemployed.

My paper focuses on the government's claim that sufficient technology existed to replace fired air traffic controllers without negatively affecting the volume or safety of air traffic. It addresses only the internal issues of how the FAA dealt with their technology, their employees, and the strike. It does not attempt to deal with the broader scope of issues in the external environment in which the strike took place, such as the role of the private sector.

Put simply, air traffic control is a system for providing safe air travel by monitoring airplanes from take off to landing to make certain that planes do not fly in unsafe weather conditions, nor fly in too close proximity with other planes. In good visibility, pilots are able to assist with this task, but in bad weather the air traffic control system is entirely responsible for directing pilots who must fly blind. The air traffic control system can be divided into two components -- the technological component and the human component. The technological component consists of computers which process pre-flight data about the type of airplane and the flight plan, as well as data about actual plane movement as monitored by radar, to generate information concerning the plane's location, speed, and projected trajectory on a display screen monitored by an air traffic controller. The air traffic controller (the human component) monitors the screen and radios necessary changes in flight pattern to the pilot. The air traffic controller must determine the correct changes in flight patterns necessary to maintain a safe course for each airplane in his/her area. The controller must also interact with other controllers as s/he 'passes' an airplane from his/her own area to the area of another controller.¹ The strike left only 5,700 out of more than 17,000² air traffic controllers on the job. To maintain air traffic immediately following the strike, the FAA relied on a strike contingency plan which included assigning supervisors to air traffic control duty, bringing in military air traffic controllers temporarily, and using a computerized flow control system. While successfully used to break the strike, the contingency plan proved unsatisfactory as a long-term solution to providing air traffic control. Military air traffic controllers had to be reassigned to their regular duties. Supervisors needed to return to their other duties. The flow-control

¹Hoo-min D. Toong and Amar Gupta, "Automating Air Traffic Control," Technology Review 85 (April 1982) 43-44.

²U.S., Department of Transportation, Federal Aviation Administration, Office of Aviation Medicine, "Adjustments in the Air Traffic Service Following the PATCO Strike," by E.W. Pickrel, in Selection of Air Traffic Controllers, ed. S.B. Sells, John T. Daily, and Evan W. Pickrel, Washington, D.C., 1984, p. 119.

system, which evened out air traffic throughout the day, did not satisfy the commercial airlines, which wanted to schedule commercial flights to coincide with peak morning and evening demand.

Within a month after the strike, the FAA began actively recruiting individuals to train as air traffic controllers. Prior to the strike, individuals who wanted to become air traffic controllers received specialized training and then worked in the field for five or more years before attaining Full Professional Level (FPL). FPL status meant that a controller had qualified to work any position in a facility.³ Even with full replacement in numbers of air traffic controllers during the post-strike period, it would not be possible to replace the level of expertise in manpower which existed during the pre-strike period in less than five years.

The question, then, is did the FAA have or has it put into place the necessary technology to provide adequate air traffic control in the United States following the firing of nearly 12,000 air traffic controllers because of their participation in the PATCO strike. This question can best be answered by comparing pre-strike conditions to post-strike conditions. The immediate post-strike period proved to be exceptional -- both because of the implementation of the strike contingency plan and because the working air traffic controllers and their supervisors displayed a high degree of esprit de corps.⁴ Therefore, I will define three separate time periods for my comparison. These periods are the pre-strike period: three years prior to the strike (mid-1978 to mid-1981); the immediate post-strike period: seven months after the strike (August 1981 to March 1982); and the

³U.S., Department of Transportation, Federal Aviation Administration, Office of Aviation Medicine, Selection of Air Traffic Controllers, ed. S.B. Sells, John T. Daily, and Evan W. Pickrel, Washington, D.C., p. 14.

⁴U.S., Department of Transportation, Federal Aviation Administration, "Management and Employee Relationships Within the Federal Aviation Administration," prepared by Lawrence M. Jones, David G. Bowers, and Stephen H. Fuller in Air Traffic Control Revitalization Act of 1981. Hearings before the Committee on Post Office and Civil Service, 97th Cong., 1st and 2nd sess., 1981-1982, pp. 11-12.

post-strike period: three years after the immediate post-strike period (early 1982 to early 1985). Several indicators will be compared to determine whether or not the FAA had, or has put into place, the necessary technology to replace the fired air traffic controllers.

The first indicator is the technology of air traffic control itself. I will compare the technology in use during the pre-strike period to the technology in use during the post-strike period. The FAA referred to the technology of the ATC system as the National Airspace System (NAS). When first put into place in the 1960s, experts in the field considered NAS to be the cutting edge of 'mainframe' computer technology.⁵ Despite considerable improvements in the efficiency of NAS since the 1960s, by the early 1980s experts called it "dangerously obsolete."⁶ In order to make up for the loss of fully qualified air traffic controllers after the strike, the FAA would need to have put new technology into ATC facilities. A failure to upgrade the technology would be one indication that the government did not have sufficient technology to replace the fired air traffic controllers.

The second indicator is the volume and safety of air traffic during the pre-strike and post-strike periods. Safety can be measured not only by the number of accidents which occurred during the pre- and post-strike periods which can be attributed to a failure in the air traffic control system, but also by the number of near misses recorded; i.e., incidents in which two or more planes came dangerously close to each other. If the FAA had, or put into place, the necessary technology to replace the fired air traffic controllers, I would expect to find the post-strike volume of air traffic to be the same or greater than the pre-strike volume, with an accompanying safety record during the post-strike period which is the same or better than during the pre-strike period.

⁵Hoo-min, "Automating Air Traffic," p. 43

⁶Ibid., p. 40

The third indicator is working conditions for air traffic controllers during the pre- and post-strike periods. The FAA highlighted the demand for increased pay when explaining the cause of the strike. However, prior to the strike, working conditions also dissatisfied most working controllers. If the government had, or put into place, the necessary technology to offset the loss of nearly 12,000 air traffic controllers, then it would be reasonable to expect that working conditions have improved since the strike. Evidence that the government had sufficient technology would include a rise in overall job satisfaction, a decline in the amount of overtime required of workers, and a decline in the level of stress associated with the job.

To summarize, if the government's claim to having sufficient technology to replace the fired air traffic controllers can be upheld, I would expect to find more and better technology available to working air traffic controllers, the same or improved levels of air traffic volume and safety, and improved working conditions among air traffic controllers as evidenced by overall job satisfaction, hours of overtime, and levels of stress. If I find negative changes in one or more of the indicators, then I would conclude that there is reason to doubt the government's claim, and that this doubt must be considered in any discussion of the cost of the government's decision to fire the air traffic controllers who struck in 1981.

Chapter II

THE AIR TRAFFIC CONTROL SYSTEM -- PRE-AUGUST, 1981

The air traffic control (ATC) system in the United States is a federally operated system which provides navigation and landing aid, flight planning and separation to aircraft using the nation's airspace. Since 1958, the Federal Aviation Administration (FAA), currently within the Department of Transportation (DOT), has administered the ATC system. The key air traffic control function which will be discussed in this paper is separation of aircraft. The ATC system, although it has evolved considerably since its beginnings in the 1930s, is a ground-based system heavily dependent on a human component -- the air traffic controllers -- who must interact with the technology developed to track the movement of aircraft and the pilots responsible for flying individual aircraft. Separation is provided to all aircraft flying under instrument flight rules (IFR) which, by the late 1970s, included all aircraft flying in poor visibility as well as all flights requesting to fly IFR even in good visibility. For example, air carriers, aircraft which carry passengers for hire, routinely fly IFR under all weather conditions. There is no legal requirement for an air traffic controller to provide separation services to an aircraft flying under visual flight rules (VFR), nor are air traffic controllers required to provide separation between IFR and VFR aircraft. Controllers need only provide separation between IFR aircraft and other IFR aircraft.⁷

⁷U.S., Congress, House, Committee on Public Works and Transportation, Safety of the Air Traffic Control Systems. Hearings before the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 98th Cong., 1st and 2nd sess., 1983-1984, p. 173.

The Technology of Air Traffic Control

Civilian air traffic control began in the United States in the mid-1930s with the establishment of air traffic control centers in Newark, Cleveland, and Chicago by private airlines.⁸ In 1936, the U.S. Government took over these centers and began expanding the system under the auspices of the Bureau of Air Commerce.⁹ Until after World War II, the technology of ATC consisted of radio communications between pilots and controllers. The pilots radioed in their time of arrival and altitude at established check points along their route. The controllers wrote down this information on pieces of paper called flight strips and directed pilots as necessary to maintain sufficient separation between aircraft to avoid collisions.

This first generation of ATC came to an end with the widespread use of radar to track aircraft flight progress. First introduced to civilian ATC in the mid-1950s, primary surveillance radar (PSR) monitored flight progress both in the vicinity of airports and on en route airways. PSR relied on ground-based equipment which provided data on horizontal flight progress of all aircraft within the range of the radar. PSR could not identify individual flights or provide vertical data, i.e., altitude. In order to obtain this information, the controller still had to contact each pilot by radio.¹⁰

⁸U.S., Congress, Office of Technology Assessment, Airport and Air Traffic Control System, 97th Cong., 2nd sess., 1982, p. 33.

⁹U.S., Congress, House, Committee on Ways and Means, Review of Midair Aviation Safety. Hearing before the subcommittee of the Committee on Ways and Means, 96th Cong., 1st sess., 1979, p. 88.

¹⁰Office of Technology Assessment, Airport, pp. 34-35.

The FAA first used computers in the ATC system in 1959. Throughout the 1960s, computers prepared flight strips and assisted with other bookkeeping tasks.¹¹

The 1960s also saw the development of the third generation of air traffic control. This technology first became operational in the early 1970s and was the state of the art at the time of the PATCO strike. The radar component of this generation, secondary surveillance radar (SSR), interacts with a transponder located on board the aircraft which sends out a signal that can be picked up by the radar. This signal identifies the aircraft and gives its altitude. Other components of the third generation include digitized information systems, computer-driven traffic displays, and automated flight plan processing and dissemination.¹² The computer could now take in data from the radar and then display, on a controller's scope, detailed flight data including aircraft identification and altitude in alphanumeric form. The computer also could print out flight plans for each flight which could be updated by the controller and which the computer could pass from controller to controller as a plane flew from one controller's purview to another's. This eliminated a considerable amount of radio communication between controller and pilot for the exchange of routine flight information as well as telephone contact between controllers as they 'passed' a flight from one area to another.¹³

One way to understand how the technology of air traffic control works is to follow an IFR flight from take off to landing en route from one major airport to another, such as from O'Hare to LaGuardia. Before leaving the gate at O'Hare, the

¹¹Committee on Ways and Means, Review, p. 89.

¹²Office of Technology Assessment, Airport, p. 35.

¹³U.S., Department of Transportation, Federal Aviation Administration, "Automating the Crowded Sky," by Raymond G. Belanger, Washington, D.C., from Airforce Association, July 1975, p. 2. [Mimeographed.]

pilot contacts the tower controller to confirm the flight plan which the controller has previously received from the computer. Upon receiving clearance from the tower controller, the pilot contacts ground control for taxiing instructions. Ground controllers working in the tower rely on both their visual scanning of the runways and airport surface detection equipment (ASDE) or ground radar to keep flights separated during taxiing. When ready for takeoff, the pilot recontacts the tower controller who also relies on both visual scanning of the airport and airport surveillance radar (ASR) to clear the aircraft for takeoff. One mile into flight the tower controller transfers responsibility for the flight to a departure controller also working out of O'Hare airport who directs the pilot to his/her proper course. The departure controller transfers the flight again, at approximately 30 miles out, to the en route center responsible for the Chicago area. Within the en route center, controllers are assigned sectors based both on vertical and horizontal location. As the flight moves both up and east, controllers within the Chicago en route center will transfer responsibility for the flight from one to another. As the flight reaches the edge of the Chicago en route center's area of responsibility, it is transferred to the Cleveland en route center and from the Cleveland en route center to the New York en route center. Within each en route center, several controllers may be responsible for the flight at different times as it moves east and changes altitude. The aircraft, now in descent, is passed to the New York approach-control facility where a controller directs it to its final approach to La Guardia airport. The flight is passed to the tower controller at LaGuardia at about six miles out who monitors the flight's instrument landing. Finally, ground control takes responsibility for the flight as it taxis to the gate.¹⁴

There are three major ATC facilities -- flight service stations (FSSs), terminal control facilities, and en route centers (ARTCCs). FSSs primarily service VFR flights by assisting with flight planning, providing weather information, and

¹⁴Office of Technology Assessment, Airport, p. 39.

aiding pilots with in-flight emergencies. They also provide flight plans for general aviation flights, whether they fly IFR or VFR, to ARTCCs and airport towers, and they assist VFR pilots in transferring to IFR when they hit unexpected bad weather mid-flight.¹⁵ FSSs are only marginally involved in the primary ATC function -- separation of aircraft.

There are twenty air route traffic control centers (ARTCCs) in the continental United States. These centers service IFR flights by monitoring their progress through en route airspace. The technological heart of each center is the IBM 9020, a computer derived from the IBM 360 expressly for ATC applications. The computer transforms radar data from the secondary surveillance radar, which provides raw data on horizontal flight location for all flights as well as altitude and flight identity information for aircraft equipped with transponders, into readouts on a controller's scope. This process is known as radar data processing (RDP), or narrow-band to the working controllers. The computer also automates the process of creating flight data strips. This not only cuts down on clerical work and communication of routine data for controllers, but, because the computer can communicate directly with other computers and other facilities, flight data can be passed from controller to controller in advance of the actual passing of responsibility for a flight. Each controller along a flight's path can anticipate and plan for the arrival of the flight into his/her sector with complete data on location, identity, speed, direction and altitude on the screen. The computer also alerts the controller to an impending handoff by causing the data s/he sees on the screen associated with a flight to blink as the flight approaches the edge of a sector and remain blinking until the controller in the new sector pushes a button that tells the computer the handoff is complete.¹⁶

¹⁵Office of Technology Assessment, Airport, p. 33.

¹⁶Federal Aviation Administration, "Automating the Crowded Sky," pp. 2-3.

Terminal control facilities provide service to flights during take off and landing. They also monitor IFR flights as they pass over, enter, or leave a terminal control area. They are not as uniform in the technology they provide as are ARTCCs. The basic component of a terminal control facility is a tower. In 1980, out of nearly 6,000 public use airports with paved runways, only 435 had control towers. However, it should also be noted that only 460 airports in the U.S. received air carrier traffic in 1980.¹⁷ Major airports, in addition to having a tower, have a terminal radar approach control (TRACON) facility which controls sequencing and spacing of approaching aircraft and guides departing aircraft along departure corridors within approximately forty miles of the airport (or airports when more than one major airport is in a small area). Of the 435 airports with towers in 1980, 234 also had TRACONS.¹⁸ While visual scanning is an important activity in towers, towers as well as TRACONS also rely on airport surveillance radar to monitor aircraft.

The computer system available to terminals is the ARTS or automated radar terminal system. By 1980, the FAA had sixty-two ARTS IIIs in place providing computer capability similar to that available at ARTCCs. At the same time, the FAA began installing ARTS IIs in terminals with less traffic density. FAA plans called for eighty terminals to receive the ARTS II.¹⁹ These systems provide somewhat less detailed data to the controllers, but have the capability of being expanded to ARTS III capability if traffic demand warranted such an enhancement.

Landing aids are another important technological component of airport safety, although they are only tangentially related to air traffic control. Improved

¹⁷Office of Technology Assessment, Airport, p. 10.

¹⁸Ibid., pp. 37-38.

¹⁹Committee on Ways and Means, Review, p. 83.

landing systems certainly take pressure off the ATC system if they increase the speed and safety with which aircraft can get out of the sky and onto the ground. Instrument landing systems (ILSs) were the best available landing aid at the time of the PATCO strike. An ILS has two components: a localizer which emits a radio beam along the center line of a runway and a glide slope which emits a radio beam along a fixed approach angle. Together these beams form an approach path along which the pilot aligns his/her plane for landing. Using ILS, a landing cannot be completed entirely under instrument operations because the equipment is not that accurate. At two hundred feet (one hundred feet for some runways) the pilot has to switch to visual operations to bring the plane down.²⁰ To aid with this transition to visual operations, visual approach slope indicators (VASIs) may also be available to provide vertical guidance during the last phase of approach.²¹ Although 2,198 airports had instrumented approaches in 1980, this figure includes non-precision landing aids as well as ILS, VASI, and combinations thereof.²²

Although separation from other aircraft is the main ATC function, separation from bad weather is a related and important function. All three ATC facilities -- FSSs, ARTCCs, and air terminal facilities -- serve as sources of weather information to pilots. Airlines are also required to provide their pilots with weather data. Controllers reroute aircraft to avoid bad weather conditions on their flight path. The main weather collection and dissemination component of the ATC system is the center weather service unit (CWSU) located at each ARTCC. Here, National Weather Service (NWS) meteorologists collect current weather data provided via the NWS air-weather communications system, weather radar (RRDWS),

²⁰Office of Technology Assessment, Airport, p. 30.

²¹U.S., Congress, House, Committee on Public Works and Transportation, FAA Facility and Equipment Programs for Safety. Hearings before the subcommittee on Aviation of the Committee on Public Works and Transportation, 95th Cong., 2nd sess., 1978, p. 3

²²Office of Technology Assessment, Airport, p.10.

and pilot reports that come via controllers. The meteorologists then disseminate the information to FSSs, terminals, and the ARTCC controllers in their region. Dissemination is done by telephone to facilities outside the ARTCC, but usually within the ARTCC a supervisory controller (or weather service co-ordinator) is briefed daily and updated on specific weather hazards. S/he, in turn, updates controllers working affected sectors either verbally or by posting advisories "in the appropriate control sectors." Each controller also has a secondary radar scope channel available to him/her which depicts severe storm activity as "H's" on the screen. This radar scope is not as complete an indicator of weather activity as the radar remote weather display system (RRWDS) available to meteorologists working in the CWSU.²³

The three year pre-strike period saw a gathering storm of protest about the quality of ATC technology and the ability of the FAA to plan and develop an ATC system capable of meeting the demands of the 1980s and beyond. Congress heard testimony criticizing not only the technology currently in use in the ATC system, but also criticizing the FAA for not developing technology much needed in the system. This latter can best be exemplified by looking at the development of collision avoidance systems (CAS).

Although the ATC system's primary function is to separate aircraft using the technology described, making use of the ATC system by flying under IFR does not relieve the pilot of his/her responsibility to see and avoid other aircraft when visual conditions allow it. According to federal aviation regulations (FAR), "the pilot in command is directly responsible for . . . the operation of the aircraft (FAR 91.3); when weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be

²³U.S., Congress, House, Committee on Public Works and Transportation, The Impact of Weather on Aviation Safety. Report of the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, H. Rept., 98th Cong., 2nd sess., 1984, p. 26.

maintained by each person operating an aircraft so as to see and avoid other aircraft . . . (FAR 91.67A).”²⁴

For this reason, pilots and safety experts have long demanded that the FAA develop a collision avoidance system that would provide an independent alert of potential threats, as well as information on how to take evasive action. The National Transportation Safety Board (NTSB), an independent federal agency responsible for investigating transportation accidents and making recommendations for safety improvements, began recommending the development of a CAS to the FAA in 1969. The Board stated then that see-and-avoid was an outmoded concept and continued to assert this position throughout the 1970s.

The FAA tested and rejected several CASs during the 1970s. They rejected a system in 1973 that the Army had used successfully. In 1975, they rejected three more which manufacturers had submitted under contract. Finally, they announced that they would issue national standards for a ground-based system called beacon collision avoidance system (BCAS) by July 1977. They then refined BCAS further as active BCAS and full BCAS. The former, scheduled to be operational by the early 1980s, would not work in dense traffic areas (i.e., terminal areas) because it would emit too many false alarms. Furthermore, it would not show the pilot the location of threatening aircraft, thus mandating a change in altitude, as opposed to a change in direction, as the only response available to the pilot. Full BCAS would address these deficiencies in coordination with other yet to be developed technologies -- the discrete address beacon system and the automatic traffic advisory and resolution system (DABS/ATARS). However, these systems, at best, would be operational only sometime late in the 1980s.

²⁴Quoted in Frank D. Fowler, "Air Traffic Control Problems: A Pilot's View," Human Factors 22 [October 1980] : 652.

Meanwhile, the Air Line Pilots Association (ALPA) regularly testified before Congress in favor of another system -- trimodal BCAS. They believed that this system would provide the same benefits as full BCAS. However, since trimodal BCAS is an airborne system, the pilots believed it could be operational sooner than full BCAS because there would be no need for extensive development of other technologies to make it work. At a hearing held jointly before the Committee on Commerce, Science, and Transportation of the U.S. Senate and the Committee on Public Works and Transportation of the U.S. House of Representatives, Raymond Gerber, U.S. Director of the International Federation of Air Line Pilots Association, listed ALPA's requirements for an effective CAS and then testified that the FAA had failed to develop an effective collision avoidance system for three reasons:

One. The FAA's research and development in collision avoidance continues to receive a low priority. . . . Two. The FAA frequently holds out for the prospect of the perfect solution to all technical problems. Such a Utopian solution is always promised to be just over the horizon. . . . Three. The FAA's long established self-interest in promoting an entirely ground-based collision avoidance system causes it to proceed slowly in developing airborne systems. Also, the not-invented-here syndrome often leads to a rejection of ideas that were developed independently of FAA sponsorship.²⁵

In the summer of 1981, just prior to the PATCO strike, the FAA made a surprise announcement. They had cancelled development work on the ground-based collision avoidance system, BCAS. In its place, they had chosen an air-based system called threat alert and collision avoidance system (TCAS) which they

²⁵U.S., Congress, Joint Committee on Commerce, Science, and Transportation and Committee on Public Works and Transportation, Aviation Safety, Joint Hearing before the Committee on Commerce, Science, and Transportation, United States Senate and the Committee on Public Works and Transportation, House of Representatives, 95th Cong., 2nd sess., 1978, pp. 104-105.

expected to be available in two to three years.²⁶ This system would interact with the transponders already available on most aircraft and would come in two forms -- TCAS I, for air carriers, which would provide the pilot with detailed information on the location of threatening aircraft, and TCAS II, for general aviation, which would merely give warning of a threatening aircraft.²⁷ ALPA's representative, testifying before Congress in 1981, noted that TCAS met all of ALPA's requirements for an effective CAS that Jack Gerber had listed in his 1978 testimony.²⁸ However, as Representative Barry Goldwater, Jr. pointed out at the first congressional hearings on TCAS, "after 12 years . . . there is still no operational CAS, except EYE-CAS. And that is spelled E-Y-E . . . I'm afraid that when TCAS is ready in 3 to 4 years, a new FAA administrator will say, 'Hey, there's something better just down the road,' and dump TCAS for the new system."²⁹

During this same time period, several Congressional committees held hearings to discuss problems with the en route computer system. The IBM 9020s located in ARTCCs used technology developed in the early 1960s, yet the FAA had no intention of beginning replacement of these computers until the late 1980s. The FAA had designed the 9020s using components of IBM 360s. However, IBM had stopped manufacturing 360s, and they had announced that by 1981, they would no longer make replacement parts.³⁰ The FAA had had to order ten years worth of replacement parts in the late 1970s. The committee hearings brought out

²⁶U.S., Congress, House, Committee on Science and Technology, Aircraft Collision Avoidance and Air Traffic Safety. Hearing before the subcommittee on Transportation, Aviation, and Materials of the Committee on Science and Technology, 97th Cong., 1st sess., 1981, p. 5.

²⁷*Ibid.*, p. 24.

²⁸*Ibid.*, p. 34.

²⁹*Ibid.*, p. 5.

³⁰Committee on Ways and Means, Review, p. 6.

evidence that in many ARTCCs the 9020s had nearly reached capacity, that computer outages occurred almost routinely, and that the FAA had failed to address these problems in a manner which would assure that the problems would be resolved in the near future.

The state-of-the-art third generation ATC system depended on the 9020s to function. When the computers went down for a minute or several hours, working air traffic controllers had to switch to the non-computerized radar technology of the second generation. This is called switching from narrowband to broadband. In 1979, at a hearing before the Subcommittee on Oversight of the Committee on Ways and Means of the House of Representatives, Howard Johannssen, President of the Professional Airways Systems Specialists, whose members are responsible for the maintenance and certification of NAS systems and equipment, described such an event as follows:

The effect of a computer outage in an ARTCC is chilling. The narrowband digital display scopes, presenting the identification, location, altitude and speed of hundreds of airplanes, go blank or freeze, the first minute of an outage is crucial to both the controller and to the ten to twenty airplanes he/she is working. He/She must attempt to reconstruct the three dimensional picture he/she had and convert the information to the almost twenty year old broad non-computerized displays which serve as the back-up radar system. It is more that [sic] disconcerting that the FAA has provided no standardized system for alerting controllers of the outage, its severity, or the reliability of the data depicted on their scopes.

Even after the controller lowers the heavy broadband scope into place, if it doesn't get stuck, the problem isn't solved. The broad band system is about as reliable a back-up system to narrow band as two tin cans are to a telephone. Its non-computerized, fuzzy television-type display was never designed to serve the complex and crowded aviation today. It depicts no aircraft information nor can a controller easily locate or distinguish aircraft which are in heavy weather on the scope. Even more importantly, fewer and fewer controllers have any depth of experience with the system and there is less and less emphasis on training for broadband. . . .

If the narrowband system stays 'down' for any period of time, the danger remains that the broadband system can also fail, which [recently] happened in New York. With the narrowband down, one of the three radar systems feeding into the ARTCC went out for 40 minutes. For 40 minutes, one third of New York Center had no satisfactory radar coverage of any kind.³¹

The FAA stated that transitioning from broadband to narrowband did not jeopardize safety. Neither, they argued, did the use of broadband by itself jeopardize safety. According to then Deputy Administrator, Quentin Taylor, "the basic impact from using broadband radar rather than RDP [narrowband], or manual control rather than broadband, is a loss of efficiency in the system."³² The FAA also stated that computer interruptions did not create a serious problem -- most lasted less than one minute and occurred as part of the computer's self-maintaining capabilities. However, a House subcommittee report issued in August 1981 concluded that "the Agency's outage reporting system only covers wholly anticipated, sudden, total, and enduring failures. This does not accurately portray the safety-related problems faced by controllers."³³ At about the same time, the Senate Appropriations Committee issued a report which concluded "that the computer workload capacity at each center is unknown; that to keep the software operating, machine-language patching is standard procedure; and that eight of the 20 centers expect computer saturation between 1982 and 1985. Also, it is not uncommon for the centers to drop all non-essential operations and to go to the backup computer to support air traffic control operations during busy periods."³⁴

³¹Ibid., pp. 20-21.

³²Ibid., p. 47.

³³U.S., Congress, House, Committee on Science and Technology, Air Traffic Control En Route Computer Modernization. Report prepared by the subcommittee on Transportation, Aviation, and Materials of the Committee on Science and Technology, H. Rept., 97th Cong., 1st sess., 1981, p. 4.

³⁴Ibid., p. 10.

By the time of the strike, FAA critics agreed that the en route computer system needed to be replaced and the primary roadblock to such a major undertaking could be found in the FAA's own organization.

The FAA . . . [does] not fully recognize the . . . complexity [of full replacement] and [has] not programmed funds to assure its timely completion. The FAA has not established . . . sufficient authority to carry out both the development and procurement. . . . The acquisition schedules and plans . . . appear to lack top level Administration commitment and are therefore subject to frequent changes in response to a variety of expediencies unrelated to the critical need for enhanced air safety.³⁵

The third area of conflict between the FAA and its critics concerned FAA policy over the spending of money, or, to be precise, the non-expenditure of available funds. In 1970, Congress passed the airport development aid program (ADAP), which set up a trust fund to be used primarily for facilities and equipment as well as research and development expenditures. The FAA collected a variety of user fees, such as an eight per cent tax on airline tickets, a seven cent per gallon tax on jet fuel, and a five per cent tax on the weight bill for freight traffic, to support the trust fund. By 1979, the trust fund balance surpassed three billion dollars.³⁶ During the 1970s, the FAA had used these funds for everything from installing the en route computer system and the ARTS computers to providing ILS and VASI to airports. On the research and development side, the fund supported work on collision avoidance systems.

ADAP specifically provided that "not less than \$250 million" would be spent annually on facilities and equipment alone. However, administrative budgets had treated this \$250 million figure as a ceiling, not a floor on expenditures, in spite of

³⁵ *ibid.*, p. 2.

³⁶ Committee on Ways and Means, Review, pp. 15-16.

the fact that the fund had reached a \$3 billion reserve and that many basic needs still existed. For example, in 1978 the NTSB submitted a list of basic needs to Congress that would, in their opinion, contribute the most to increasing aviation safety. This list included: ILS, runway grooving (a technique to keep aircraft from hydroplaning on wet runways), overrun (adding 1000 feet runway safety areas), VASI, windshear equipment, frangible approach light towers, and general aviation airport improvements. In his testimony before Congress, James King, NTSB Chairman, added that "in the apportionment of funds, the large hub airports receive the lion's share, whereas the general aviation airports get the least, and the relievers and air commuters come somewhere in between."³⁷

During the pre-strike period, therefore, the FAA had amassed a three billion dollar excess in the trust fund while not resolving the decade long problem of developing and implementing an effective collision avoidance system, while not taking any action to replace the en route computer system in spite of its many problems, and while not providing even basic facilities and equipment needs at all airports. Major hubs which deplaned large numbers of airline passengers may have been reasonably well-equipped, but smaller airports received less than what the NTSB considered adequate.

In 1980, Congress reacted. When ADAP came up for renewal, they did not grant it. The FAA received a clear message to spend the three billion dollar excess before any more users would be taxed. Congress did this knowing that the en route computer system would need to be replaced in the next decade, a project that could only be accomplished if they renewed ADAP.

³⁷Committee on Public Works and Transportation, Facility and Equipment Programs, pp. 1-3.

The Human Equation: The Air Traffic Controller

The air traffic control system in the United States has always been heavily dependent on human intervention. Even with the most up-to-date third generation equipment, it is still the controller who decides what speed, altitude, and direction each IFR flight should take. An accident killing hundreds of people can occur if the wrong decisions are made, or if the controller lacks alertness to all that is happening in his/her sector. The level of stress associated with the job became a key concern for controllers in the 1970s.

During the pre-strike period, Rose, Jenkins, and Hurst did a definitive study of controller stress. Commissioned by the FAA in the early 1970s to answer a series of questions on the nature and extent of health changes among air traffic controllers, Rose *et al.* completed their three year study in December 1978. They concluded that "controllers had more hypertension than other groups, and possibly some forms of psychiatric problems were also more prevalent." They could not ascertain the cause of increased hypertension among air traffic controllers, saying that increased workload combined with genetic and biological factors of individuals seemed to be related to their likelihood of developing hypertension. The fact that a significant number of highly enthusiastic, competent controllers developed psychiatric problems during the course of the study surprised Rose *et al.* The development of psychiatric problems among these controllers appeared to be correlated with their attitudes towards work rather than with their workloads. These controllers appeared to be highly dissatisfied with their work environment, their co-workers, and/or the FAA.³⁸ Over time, these controllers lost confidence in

³⁸U.S., Department of Transportation, Federal Aviation Administration, Office of Aviation Medicine, "Air Traffic Controller Health Change Study," by Robert M. Rose, C. David Jenkins, and Michael W. Hurst, in Aviation Medical Reports, AM Series, Washington, D.C., 1978, pp. 14-15.

their ability to perform well without any outward signs that, in fact, their work performance had deteriorated.³⁹

It is reasonable to conclude, then, that workload per se does not appear to cause stress, although it may be contributive to the development of hypertension among air traffic controllers. Other theories concerning the stressfulness of air traffic control work focussed on aspects of the job other than workload. Finkelman and Kirschner suggested that information overload, or reaching the "limits of their channel capacity," might result in too much stress for controllers. In other words, if "there is a finite limit in the amount of information an individual can process," and if this limit is constantly pushed up against by the amount of data controllers must take in in order to make decisions, the result may be stress and an increased likelihood of making errors. Finkelman and Kirshner admitted that, for the most part, only anecdotal support existed for their theory, not empirical support.⁴⁰

Jones, Bowers, and Fuller, in a post-strike study which included both striking and non-striking controllers, proposed the theory that air traffic control work leads to acute episodic stress. In this theory, stress is experienced as a short-term reaction to an incident, such as a near miss, which may result in a lack of self-confidence for a few hours or days. If such incidents recur and/or the work environment is perceived as non-supportive, the reaction may be longer and a controller's confidence in his/her ability to do the job may be seriously impaired. Acute episodic stress may be the link needed to explain the findings of Rose *et al.* that controllers likely to experience burnout are highly dissatisfied with their work environment. Jones *et al.* also found that controllers likely to experience burnout are highly dissatisfied with the work environment, as well as more likely to

³⁹*Ibid.*, p. 638.

⁴⁰Jay M. Finkelman and Carl Kirschner, "An Information-Processing Interpretation of Air Traffic Control Stress," Human Factors 22 (October 1980) : 562-563.

experience incidents of acute episodic stress which undermine their confidence and from which they increasingly have trouble bouncing back.⁴¹

As the controllers' elected representatives, PATCO officials spoke frequently during the pre-strike period about the computer problems which plagued ARTCCs. They contended that computer outages, which forced controllers to switch from narrowband to broadband, caused a great deal of stress and could lead to serious safety hazards. When an outage occurred, information would suddenly not be available to controllers. In addition, controllers had no advance warning when an outage would occur, making it difficult to decide if the outage would be of long enough duration to warrant switching. Tom Galloway, an air traffic controller from the Leesburg, VA ARTCC, described what went on from the controllers perspective during an outage:

When you . . . decide to go to broadband mode, the first thing you have to do is get the scope down, which sometimes is easy and sometimes is hard to do. . . .

If I was working a high altitude sector where I was controlling air traffic from 24,000 feet up [then,] when I go to broadband, I see every aircraft in that airspace, approach control aircraft, aircraft at 7,000 feet, 12,000 feet, I see them all. . . .

. . . I tell them all [the pilots of planes he is controlling] to key in 2100. Then I select the same code. That way all the aircraft under my code appear as a double slash, and I can ident them as opposed to aircraft either over me or under my airspace. . . .

At that point, I can see the aircraft I am working, but I don't know which one is which. I have to have the captain ident, push a button on his transponder that will make his target on the radar blossom so that I can be sure that is him.

⁴¹Federal Aviation Administration, "Management and Employee Relationships," pp. 44-60.

While I cannot ask more than one pilot to 'ident' because I will get more than one blossom, we get a 6-second sweep. If I had 20 aircraft, it would take me 2 minutes. . . .

During that same time, I am charged with not letting any aircraft in my sector cross another boundary without a handoff, which is very hard to do when you don't have them identified.⁴²

Furthermore, PATCO believed that increasing numbers of air traffic controllers had not received proper training to use broadband. Prior to 1974, most controllers worked on broadband. Since the widespread introduction of narrowband, however, many new controllers had little or no experience with broadband, while many long-term controllers had not used broadband in several years. In 1979, PATCO estimated that eighty per cent of their membership, which consisted of close to ninety per cent of all controllers, had worked for the agency less than eight years.⁴³ At some ARTCCs, training opportunities to work on broadband existed only during the midnight shift when the computer was down for scheduled maintenance.⁴⁴

Throughout the pre-strike period, many FAA critics questioned the methods used by the FAA to determine staffing levels for ATC facilities. In 1978, Clifton von Kann, President of the Air Transportation Association which represents the scheduled airlines, testified that both the total number of air traffic controllers had declined in several facilities and the ratio of journeymen controllers to developmental controllers had declined.⁴⁵ The FAA countered that they re-

⁴²Committee on Public Works and Transportation, Safety, pp. 393-394.

⁴³Committee on Ways and Means, Review, p. 38.

⁴⁴Committee on Public Works and Transportation, Safety, p.395.

⁴⁵Committee on Public Works and Transportation, Facility and Equipment Programs, p. 77.

evaluated staffing requirements annually at each facility, and that this, in effect, "zero bases each facility."⁴⁶ By using this technique, the FAA made it difficult to determine if staffing levels had declined because the FAA had overstaffed facilities in the past or because the FAA had changed staffing standards to meet perceived budget constraints.

PATCO also charged that a serious problem with overtime existed at some facilities. FAA officials started the year 1981 with the expectation that 600,000 hours of overtime would be worked by air traffic controllers that year which would result in an average of thirty-one hours of overtime per controller. PATCO countered that, in fact, controllers worked little or no overtime in many facilities, while at other facilities controllers worked large amounts of overtime.⁴⁷

Controllers also had problems with getting accurate, up-to-the-minute weather information. Although the FAA placed the center weather service units (CWSU) in ARTCCs during the pre-strike period to improve the timeliness and availability of weather information, they required that meteorologists only report to the weather service co-ordinator in each ARTCC (a duty usually tacked on to the other, primary duties of an ATC supervisor). This meant that during busy periods air traffic controllers often received no weather updates. James King, Chairman of the NTSB, testified before Congress that "only in slack nighttime periods do controllers in high-volume ATC centers have the opportunity to informally participate [sic] in weather information transfer."⁴⁸ The FAA insisted that dissemination of weather information could be improved through research and

⁴⁶Ibid., p. 170.

⁴⁷U.S., Congress, House, Committee on Post Office and Civil Service, Oversight on Grievances of Air Traffic Specialists. Hearings before the subcommittee on Compensation and Employee Benefits of the Committee on Post Office and Civil Service, 97th Cong., 1st sess., 1981, pp. 22-23.

⁴⁸Committee on Public Works and Transportation, Impact of Weather, p. 25.

development of improved systems. However, controllers, the NTSB, and others concerned with the problem saw the solution as one of improved communication. They advocated allowing controllers and meteorologists to speak directly with each other, and/or giving controllers direct access to the weather radar (RRWDS) used by the meteorologists.⁴⁹

The Provision of Services: How Much, How Safe?

There are three categories of users of the national airspace -- air carriers, which include aircraft which transport people and cargo for hire; general aviation, which includes all other civil aviation; and military aircraft. Air carrier traffic can be further divided into large airlines in scheduled service, commuter carriers in scheduled service, and 'on-demand' air taxis in unscheduled operations.⁵⁰ During the pre-strike period, the commuter, air taxi, and general aviation aircraft increased their demand on the air traffic control system, while airline demand remained fairly stable. Table II-1 on page 27 shows the number of IFR aircraft handled at ARTCCs from fiscal year 1978 through fiscal year 1981. Since fiscal years begin October 1 and end September 30, this table includes only two months of post-strike statistics and, therefore, closely matches the defined pre-strike period.

General aviation flights had the highest aircraft accident and fatality rates during the pre-strike period, followed by air taxis, commuter planes, and airlines. Table II-2 on page 28 gives accident rates per 100,000 hours flight time for each category. Tables II-3, II-4, and II-5 give the total number of accidents for each category, the total number of fatal accidents, and the total number of fatalities for each year. These tables include all aviation accidents, whether or not the plane

⁴⁹Ibid., p. 30.

⁵⁰U.S., Department of Transportation, Federal Aviation Administration, Information Analysis Branch, FAA Statistical Handbook of Aviation, Washington, D.C., 1981, p. 143.

Table II-1: IFR AIR TRAFFIC ACTIVITY FOR FISCAL YEARS 1978-1981

	TOTAL	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY
1978					
<i>Total</i>	33,456,726	10,421,496	3,066,809	16,310,259	3,658,162
<i>Change</i>	+ 6 %	+ 4 %	+20 %	+8 %	- 2 %
1979					
<i>Total</i>	36,225,027	10,737,637	3,657,696	17,907,628	3,922,066
<i>Change</i>	+ 8 %	+ 3 %	+19 %	+10 %	+ 7 %
1980					
<i>Total</i>	38,176,549	10,613,262	4,128,782	19,332,557	4,101,948
<i>Change</i>	+ 5 %	- 1 %	+13 %	+ 8 %	+ 5 %
1981					
<i>Total</i>	37,221,490	10,164,678	4,635,285	18,530,746	3,890,781
<i>Change</i>	- 3 %	- 4 %	+12 %	- 4 %	- 5 %

SOURCE: U.S., Department of Transportation, Federal Aviation Administration, Information Analysis Branch, *FAA Statistical Handbook of Aviation*, Washington, D.C., 1981, p. 12; 1983, p. 14.

was stationary on the ground or in flight, flying VFR or IFR. The numbers indicate that aviation accidents are considerably less fatal than highway accidents in which approximately 50,000 people die each year in the United States.

During the pre-strike period, only one midair collision involving an airline aircraft occurred. This accident killed 163 people in September 1978 in San Diego. It was the first major airline midair collision since 1972. Midair collisions, involving

Table II-2: ACCIDENT RATES FOR CALENDAR YEARS 1978-1981

Rates are for number of accidents per 100,000 hours flight time.

	AIRLINES ^a	COMMUTERS	TAXIS	GENERAL AVIATION ^a
1978				
<i>Total</i>	0.348	4.68	5.58	12.10
<i>Fatal</i>	0.083	1.08	1.52	2.06
1979				
<i>Total</i>	0.358	4.44	4.34	9.90
<i>Fatal</i>	0.060	1.28	0.81	1.65
1980				
<i>Total</i>	0.221	3.23	4.70	9.90
<i>Fatal</i>	0.000	0.68	1.24	1.71
1981				
<i>Total</i>	0.380	2.50	5.42	9.50
<i>Fatal</i>	0.061	0.73	1.38	1.78

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^aRates do not include sabotage/suicide accidents.

major air carriers, although increasingly infrequent, cause a major public outcry because they result in so many deaths at one time and because they occur in an environment which passengers enter and pay for with the expectation that they will be protected. People expect the air traffic control system to perform flawlessly.

Table II-3: AVIATION ACCIDENTS FOR CALENDAR YEARS 1978 - 1981

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION
1978	21	61	198	4,218
1979	24	52	160	3,825
1980	15	38	170	3,597
1981	25	31	157	3,502

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

Table II-4: FATAL AVIATION ACCIDENTS FOR CALENDAR YEARS 1978 - 1981

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION
1978	5	14	54	721
1979	4	15	30	638
1980	0	8	45	622
1981	4	9	40	654

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

Congress established the FAA in response to a 1956 midair collision between two air carriers over the Grand Canyon. Since that time, there have been

Table II-5: FATALITIES IN AVIATION ACCIDENTS FOR CALENDAR YRS. 1978 - 1981

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION ^a
1978	160	48	155	1,558
1979	351	66	77	1,237
1980	0	37	103	1,252
1981	4	34	94	1,282

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^aIncludes air carrier fatalities when in collision with general aviation aircraft.

twenty-five more midair collisions involving an air carrier. Most of these accidents have occurred during visual flight conditions between an air carrier operating under IFR and another aircraft, usually general aviation, flying VFR. Shortly after the 1978 midair collision, James King, Chairman of the NTSB, testified that it was not "purely coincidental" that six years passed between the last two midair collisions. He maintained that "the expansion of radar coverage throughout the national airspace system, the installation of automated radar-tracking services at major terminal facilities, the further addition of systems to alert controllers to potential conflicts, the expansion of positive control airspace have all had an effect on the air carrier aircraft exposure to the collision threat."⁵¹ The number of midair collisions, however, is only one standard by which to judge the safety of the ATC system. It is necessary also to look at statistics on the frequency of near misses,

⁵¹Joint Committee on Commerce, Science, and Transportation and Committee on Public Works and Transportation, *Aviation*, pp. 7-8.

system errors, and computer failures in order to fully judge the system's performance. A system error is when horizontal separation between two aircraft is less than five miles and vertical separation is less than 1000 feet. A near miss is when horizontal separation is less than one mile and vertical separation is less than 500 feet and where one or both pilots is surprised at the presence of the other.⁵² FAA statistics for the nine years from 1970 to 1978 showed that the total number of system errors increased by 200 per cent, while the frequency of system errors based on total traffic handled increased by 160 per cent.⁵³

In April 1976, NASA and the FAA reached an agreement which allowed system errors and near misses to be reported to NASA with limited liability for the individual filing the report. In all probability, this program increased the number of reported system errors and near misses because, under the program, an individual reporting an incident for which s/he bore responsibility could do so anonymously and be guaranteed protection from prosecution if his/her actions had not involved criminal negligence. The FAA argued that NASA did not collect accurate data under this program because NASA could not verify if an alleged incident had, in fact, occurred. Therefore, the FAA and NASA maintained conflicting accounts of the number of incidents which had occurred. For example, in 1978 the FAA listed 503 near midairs, up 176 per cent since 1974; that same year NASA averaged almost 100 reports per month of near midair collisions.⁵⁴

On the other hand, PATCO and many Congressmen criticized the FAA's statistics. At a 1980 Congressional hearing, Representative Bob Whittaker of

⁵²Committee on Public Works and Transportation, Safety, p. 95.

⁵³U.S., Congress, House, Committee on Government Operations, FAA Aviation Safety Reporting System. Hearings before a subcommittee of the House Committee on Government Operations, 96th Cong., 1st sess., 1979, p. 151.

⁵⁴Committee on Ways and Means, Review, p. 49.

Kansas charged that the FAA had covered up system errors and near misses. Representative Whittaker, relying on data collected by the Aviation Safety Institute, an independent organization which gathers data via a toll-free hotline utilized by workers in the aviation industry, charged that twenty-eight near misses had recently occurred and gone unreported by the FAA.⁵⁵

PATCO expressed particular concern that system errors and near misses might increase with the occurrence of computer outages. A computer outage, as defined by the FAA, is "any period of time of greater than one minute in which either the entire computer input or output is unusable."⁵⁶ Interruptions of less than one minute are called startovers. The FAA claimed that unscheduled startovers and outages declined annually from 1976 to 1980 from an average of two unscheduled outages per ARTCC per week to one per week.⁵⁷

FAA critics charged that the internal reporting system could not be relied upon. In 1979 Stanley Lyman, speaking for the electronics technicians of the FAA's field maintenance staff (FASTA), testified before the Subcommittee on Oversight of the House Committee on Ways and Means that:

the Personal Evaluation Records on which [technicians'] annual ratings are based use the failure rate of maintained equipment as a primary basis for evaluation. . . . Technicians responsible for old or unusually faulty equipment, and groups which are severely understaffed, are going to receive poor records through no fault of their own. . . . [This] has made technicians susceptible to subtle but clear pressure from first line supervisors, system engineers and sector managers to make the NAS system look reliable. Consequently, it is all too common for unscheduled

⁵⁵U.S., Congress, House, Committee on Government Operations, Air Traffic Control Computer Failures. Hearings before a subcommittee of the House Committee on Government Operations, 96th Cong., 2nd sess., 1980, p. 32.

⁵⁶Committee on Public Works and Transportation, Safety, p. 94.

⁵⁷Committee on Government Operations, Computer Failures, p. 37.

outages to go down as scheduled ones and for short outages to appear in the records as interruptions. . . . Unscheduled outage reports are further falsified by such administrative decisions as turning an unscheduled outage into a scheduled one when it appears that the system is going to be down for a while.

Furthermore, Lyman charged that the reporting system did not include outages caused by commercial power failures, software problems, or other non-equipment failures.⁵⁸ The FAA apparently accepted at least some of this criticism because in March 1980 they sent a notice to all en route and terminal facilities stating that interruption reports had not consistently differentiated scheduled outages from unscheduled ones, and that this practice must stop.⁵⁹

FAA statistics also indicated that switching from narrowband to broadband and use of broadband did not increase the occurrence of system errors and near misses. Using data compiled from 1977 through 1980, the FAA concluded that the en route centers had used broadband an average of ten per cent of the time in en route centers, yet only four per cent of the system errors which occurred happened during the use of broadband.⁶⁰ PATCO countered that the FAA used these data to mislead the public. Controllers used broadband regularly during the midnight shift when the computer underwent routine maintenance. Since the controllers worked less than five per cent of the total traffic during this shift, any data on broadband which included its use during this shift would not accurately discern whether the use of broadband during sudden outages, in heavy traffic created a safety problem.⁶¹

⁵⁸Committee on Ways and Means, Review, pp. 120-121.

⁵⁹Committee on Government Operations, Computer Failures, p. 44.

⁶⁰*Ibid.*, p.4.

⁶¹Committee on Public Works and Transportation, Safety, p. 395.

Throughout the pre-strike period, specific incidents occurred which indicated that the possibility of a major air carrier midair collision still existed. According to the Aviation Safety Institute, the Indianapolis en route center reported twenty-four outages in August, twenty-seven in September, and sixty-eight in October 1979. The New York ARTCC underwent a forty-eight hour outage in November 1979. In December 1978 two military jets came within seventy-five feet of each other during a two and a half hour computer outage at the Leesburg, VA en route center. In San Diego, a year after the midair collision that killed 163 people, three near misses involving major airline aircraft occurred during one weekend.⁶²

In spite of these incidents, the FAA did not address the problems of an aging computer system and a work environment for controllers that caused some of the most enthusiastic workers to "punch out" because of real or feigned psychiatric problems. FAA officials insisted that switching from narrowband to broadband and even from broadband to a totally manual, first generation system resulted only in a lack of efficiency in the system and a "source of aggravation for our controller workforce."⁶³ They did not address the concern that increased traffic loads (up eighty per cent since 1970),⁶⁴ which could be handled with state-of-the-art equipment, may have been simply unmanageable using broadband or manual control.

Critics charged that the FAA had more concern for appearing to have improved the system than they did for trying to create the safest ATC system possible by actively seeking out and correcting problems within the system. The

⁶²Committee on Ways and Means, Review, pp. 8-9.

⁶³*Ibid.*, p. 91.

⁶⁴Committee on Government Operations, Safety Reporting System, p. 151.

large, unspent balance in the trust fund, the age of the en route computer system and the lack of any developed plans to replace it, the inability of the FAA even to decide on a collision avoidance system much less develop and utilize one, the unmet need for even basic improvements at many airports and the growing dissatisfaction among air traffic controllers that culminated in the 1981 strike strengthened their case.

Chapter III

THE PATCO STRIKE AND THE IMMEDIATE POST-STRIKE PERIOD

When PATCO struck on August 3, 1981, pulling nearly seventy per cent of the controller workforce out of terminals and ARTCCs nationwide, it did not come as a surprise. Both PATCO and the FAA had prepared openly for the strike for at least two years. Congress had held hearings during the early part of 1981 in an attempt to avert the strike, but both sides seemed determined to have a showdown. Langhorne Bond, FAA administrator under President Carter and the initiator of the contingency plan, said in a post-strike interview that as early as 1978 he realized that "normal discourse between labor and management did not seem to apply in a situation where the other party had become so divorced from reality. . . . It did become clear to me that firm response was the only real way to deal with this problem, because that was the only way of bringing reality to these people. At least, hopefully, folks would understand that if they did something illegal, there would be some response to it."⁶⁵ If PATCO believed that the controllers' interests could be achieved through a strike, the FAA appeared to be equally convinced that only a strike would allow them to achieve their interests.

⁶⁵Quoted in Don Francke, "The FAA's Finest Hour . . . An Interview with Langhorne M. Bond, former FAA Administrator," Journal of Air Traffic Control, January-March 1982 in U.S., Congress, House, Committee on Post Office and Civil Service, Air Traffic Control Revitalization Act of 1981. Hearings before the Committee on Post Office and Civil Service, 97th Cong., 1st and 2nd sess., 1981-1982, pp. 395-397.

The Strike Contingency Plan

On August 3, the FAA enacted Special Federal Air Regulation (SFAR) 44, also known as the 75-50 plan, so that the strike contingency plan could be enforced. This plan cut scheduled air carrier operations nationwide, allowing only seventy-five per cent of pre-strike operations to occur. It also cut operations at the nation's twenty-three major airports (later changed to twenty-two) by fifty per cent. In addition, the plan forbid aircraft with a gross weight of 12,500 pounds or less to fly IFR, except for scheduled air taxi operations. During the first months of the strike, the FAA made certain adjustments to SFAR 44. One adjustment allowed small planes to fly IFR. Another adjustment changed the arbitrary fifty per cent cut in operations at major airports to a more locally flexible system.⁶⁶ The plan also restricted IFR flights by general aviation and military flights within civilian airspace, resulting in an overall traffic rate of seventy-eight to eighty-two per cent of pre-strike levels.⁶⁷

The ATC system could handle this level of traffic for several reasons. First, the FAA further restricted the air carrier operations allowed to occur by enforcing a flow control plan developed in cooperation with the major airlines. This plan scheduled flights throughout the day, spacing them at a steady rate rather than allowing peaks and valleys of traffic. Prior to the strike, FAA administrator J. Lynn Helms had estimated that the FAA had overstaffed the ATC system by 2,000 to 3,000 controllers primarily because of the FAA policy of staffing all facilities to

⁶⁶U.S., National Transportation Safety Board, "Special Investigation Report. Air Traffic Control System," in Aviation Safety: Air Traffic Control (PATCO Walkout). Hearings before the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 97th Cong., 1st and 2nd sess., 1981-1982, pp. 578-579.

⁶⁷U.S., Congress, House, Committee on Public Works and Transportation, Aviation Safety: Air Traffic Control (PATCO Walkout). Hearings before the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 97th Cong., 1st and 2nd sess., 1981-1982, p. 557.

handle peak traffic periods.⁶⁸ By smoothing out traffic peaks, the FAA decreased the demands on individual controllers which resulted from working heavy traffic. In exchange, however, controllers had to spend more time actually working traffic each shift. They increased their time working traffic from an average of three and a half to four hours per day to at least six hours per day.

Second, the FAA combined individual sectors at many ARTCCs so that an airspace formerly divided between two or more controllers could now be handled by one controller. Again, the flow control plan, which spread the traffic load evenly throughout the day, made combining sectors possible because without peak traffic periods the maximum number of sectors in each facility did not have to be utilized.⁶⁹ In addition, the FAA transferred airspace between some ARTCCs, so that the area of responsibility for ARTCCs where many controllers struck decreased, while the ARTCCs less heavily impacted by the strike increased their areas of responsibility.⁷⁰

Third, the FAA assigned a large number of individuals to control traffic who, before the strike, had not controlled traffic on a regular basis. This included just over a thousand employees in management positions who had previously risen from the ranks of controllers. The FAA had them recertified during the months just prior to the strike. Another 3,000 facility supervisors who regularly did air traffic control work during peak periods became full-time controllers. To assist the working controllers further, the FAA brought in approximately 800 military controllers. The military personnel received on-the-job training to bring them up

⁶⁸Ibid., p. 676.

⁶⁹Ibid., pp. 557-558.

⁷⁰U.S., Congress, House, Committee on Public Works and Transportation, Status of the Air Traffic Control System. Hearings before the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 98th Cong., 1st and 2nd sess., 1983-1984, p. 493.

to civilian ATC standards. The FAA rehired a small number of retired controllers on a reemployed annuitant basis. Fifty-four requalified to work traffic while others performed training, staff, and administrative functions. The FAA also closed seventy less active towers and temporarily reassigned non-striking personnel from these facilities to operating facilities. In addition, other staff, not trained to control traffic, as well as former pilots hired by the FAA, took over bookkeeping duties normally done by controllers.⁷¹

The FAA extended the work week for all employees to sixty hours per week throughout August, while postponing vacation and other leave indefinitely.⁷² In early September, the FAA cut back the scheduled work week to forty-eight hours for seventy per cent of the controllers, while scheduling the remainder to work forty hours per week.⁷³

A significant decrease in computer downtime also helped the working controllers. Although some controversy existed as to why downtime decreased, the NTSB reported that most likely "the lower number of aircraft and flight plans in the system and a restriction on software program revisions and updates"⁷⁴ caused the computers to go down less frequently.

There can be no doubt that, during the first months after the strike the contingency plan successfully maintained the ATC system at a level of operations which satisfied system users. However, a study done by the National Transportation Safety Board during the first two months of the strike pointed out

⁷¹National Transportation Safety Board, "Special Investigation," pp. 580-581.

⁷²Federal Aviation Administration, "Adjustments in Air Traffic Service," p. 119.

⁷³National Transportation Safety Board, "Special Investigation," p. 581.

⁷⁴Committee on Public Works and Transportation, Aviation Safety, p. 559.

several potential problems with the plan. The FAA had no program to deal with stress and fatigue. Initially, most working controllers insisted that they did not suffer from stress and fatigue. In fact, many believed that "the stress walked out on August 3."⁷⁵ The Board, however, believed that long hours with little relief would eventually take their toll. The Board found that although by September, the FAA scheduled maximum work weeks of forty-eight hour, many controllers still worked additional overtime. Also, first line supervisors, who had previously been available to take over for a controller who had too much traffic to handle or who became ill, now worked traffic themselves. This left many facilities without any emergency backup.⁷⁶ Furthermore, the Board found that while the flow control system successfully worked on a nationwide basis, some individual facilities and some individual controllers experienced heavy traffic peaks.

The Board also questioned how the system would be rebuilt. The FAA planned to replace the striking controllers with newly trained controllers by January 1, 1984.⁷⁷ This would be done by having two shifts at a time go through an eleven week training session at the FAA's Oklahoma center, followed by further training in the individual facilities.⁷⁸ The FAA made only three changes from pre-strike training standards. First, prior to the strike, trainee controllers had spent seventeen weeks at the center in Oklahoma, which included a six week course on radar. Since no developmental controller worked on radar until after s/he had trained in a facility for a year, the FAA decided to postpone the six week radar training for one year. This enabled developmental controllers to be in the facilities

⁷⁵Ibid., p.677.

⁷⁶Ibid., p. 558.

⁷⁷Ibid., p. 7.

⁷⁸Federal Aviation Administration, "Adjustments in Air Traffic Service," p. 121.

six weeks earlier, working non-radar positions and learning skills on the job which would presumably increase their proficiency once they began radar training. Second, the FAA accelerated the rate of training so that a controller could reach full performance level (FPL) as soon as s/he could do the work. Previously, it took approximately five years to become an FPL controller. The FAA stated that they had developed the old policy primarily because it took that long to promote controllers through the ranks and not because it took that long to learn the necessary skills to be an FPL controller.⁷⁹ Third, the FAA designated a new category of controller, operational controller. This designation certified that a controller qualified on two or more radar sectors or control positions. Operational controllers did not qualify at all sectors and positions within a facility as did FPL controllers. This provided facilities with controllers fully qualified to work in specialized areas, but lacking the flexibility of FPL controllers.⁸⁰ These changes in training requirements helped keep the ATC system running during the pre-strike period. However, in order to fully rebuild the system, the FAA still had to complete the training of enough operational controllers to replace the controllers who went on strike.

The NTSB investigation found these changes to be reasonable. However, the Board questioned the ability of the FAA to train 6,000 controllers by January 1984. James King, Chairman of the NTSB, stated that a more reasonable expectation would be for the FAA to attain full staffing by January 1985.⁸¹ Second,

⁷⁹Prior to the strike, PATCO and the FAA had not negotiated training standards and practices because the FAA had successfully kept all training decisions to themselves as a management prerogative. The five-year training period for developmental controllers had been dictated by the Office of Personnel Management (OPM). When the FAA changed this policy during the post-strike period, they had to get special dispensation from OPM in order to promote individuals more quickly than civil service standards normally permitted.

⁸⁰Committee on Public Works and Transportation, Aviation Safety, pp. 586-589.

⁸¹*Ibid.*, p. 560.

the report stated that developmental controllers might not be qualified to handle normal traffic loads when the time came because they had trained in facilities with controlled traffic conditions. Also, since many training specialists in the facilities now worked as controllers, the Board expressed concern that quality training programs in the facilities might not be possible to maintain.⁸² Working controllers, many already anxious about the long term effects of working extended hours, expressed reluctance to take on the extra training duties which would be necessary to rebuild the system since such duties "were more tiring . . . and increased the workload."⁸³

The Board also raised the concern that the policy to replace striking air traffic controllers with newly trained controllers did not sufficiently address the basic problems which caused the strike. James King summed up his feelings about the policy when he testified before a Congressional subcommittee. He said, if the FAA keeps the same management and the same management philosophy "we may be back here 12 years from now having the same discussion."⁸⁴ Later in his testimony, Mr. King addressed the issue of stress among the controllers and management's attitude:

The . . . question is, does management presently in the FAA recognize stress? and what have we seen, the general attitude we got, and I will give you a direct quote, 'Anyone here thinks it is stressful, he can get out now.'⁸⁵

Clearly, a contingency plan which only addressed maintaining certain volumes of

⁸²National Transportation Safety Board, "Special Investigation," p. 589.

⁸³Ibid., p. 604.

⁸⁴Committee on Public Works and Transportation, Aviation Safety, p. 653.

⁸⁵Ibid., p. 658.

traffic at certain levels of safety, while replacing certain numbers of controllers, sidestepped the whole question of why the strike had occurred and whether or not the ATC system could be rebuilt in such a way that future labor problems would be solved in a productive and cooperative manner.

For the Record: The Impact on Volume and Safety of Air Traffic

The strike had less of an impact on the volume of air traffic than PATCO expected after pulling out so many controllers. The FAA initially cut air carrier flights by twenty-five per cent, but operations gradually increased during the first two months by eight per cent. In early October, the FAA cut back again by five per cent because of increasing delays and heavy workloads, so that during the remainder of the immediate post-strike period air carrier operations leveled off at seventy-eight per cent of pre-strike levels.⁸⁶

General aviation operations within the ATC system also declined. During the first months of the strike, due to good weather, many general aviation pilots could operate under visual flight rules. With the approach of winter weather, the FAA established a General Aviation Reservation Program which restricted access to the ATC system. During the 1982 fiscal year, general aviation flights decreased twenty-five per cent from the previous year.⁸⁷

During the first months of the strike, the NTSB judged that the ATC system continued to operate safely. However, the Board admitted to many difficulties in making a determination. Five organizations collected data on system errors and near misses during the pre- and immediate post-strike periods -- the FAA, the

⁸⁶National Transportation Safety Board, "Special Investigation," p. 579.

⁸⁷Federal Aviation Administration, Statistical Handbook, 1982, p. 14.

Aviation Safety Institute, the Air Line Pilots Association, PATCO, and NASA. In comparing data from the first four groups, the NTSB report concluded:

Judgments about the ATC system performance based on reports from any one organization are of questionable statistical value because of the lack of correlation among the reports from all sources. However, the fact that 73 per cent of the reported operational errors and near midair collisions occurred within the first 2 weeks of the strike suggests there was some relationship between the errors and the reconstituted controller workforce. Furthermore, only 9 of the 28 near mid air collisions reported by the FAA were recorded by the other three organizations. This fact indicates an apparent lack of reporting effectiveness in the PATCO, ASI, and ALPA systems, a reluctance of persons to file official near midair collision reports with the FAA, or differences in definition by the organizations.

The Board chose to use the data collected by NASA during August and September to make their judgment on the system. Table III-1 shows the tabulation for operational errors. From 1980 to 1981, operational errors decreased in both terminal and ARTCC airspace. In total, operational errors decreased from fifty-four in August 1980 to twenty-four in August 1981 and from fifty-two in September 1980 to twenty-one in September 1981. Near misses also declined from forty-five and forty-four in August and September 1980 to fourteen and twenty-four in August and September 1981, respectively. However, the Board qualified the reliability of these data by noting that the NASA reporting system records incidents by the month a report is received rather than by the month the incident occurred.⁸⁸

The data indicate that system errors and near misses decreased from pre-strike levels. The Board gave two reasons to explain this reduction:

The most obvious reason was the reduction in IFR flying by as much as 20 to 30 per cent at many facilities. The second reason was the

⁸⁸National Transportation Safety Board, "Special Investigation," p. 585.

Table III-1: OPERATIONAL ERRORS REPORTED TO NASA

Table includes all months in NTSB study.

	AUGUST		SEPTEMBER	
	1980	1981	1980	1981
<i>Terminal Areas</i>	26	17	26	15
<i>ARTCCs</i>	28	7	26	6
<i>Total</i>	54	24	52	21

SOURCE: U.S., National Transportation Safety Board, "Special Investigation Report. Air Traffic Control System," in *Aviation Safety: Air Traffic Control [PATCO Walkout]*. Hearings before the Subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 97th Cong., 1st and 2nd sess., 1981-1982, p. 585.

increased separation distances between aircraft that were used in the poststrike ATC system.

The Board also investigated the possibility that incidents did not get reported. They concluded that no organized cover up had occurred, but did indicate that controllers may not have reported some less severe incidents because they did not have enough time to complete the paperwork or because individuals controlling traffic who had not done so routinely prior to the strike might not have known about the NASA reporting program.⁸⁹

In the spring of 1982, the contingency plan could be considered a success. Although two serious air carrier accidents had occurred in January, neither could

⁸⁹ibid.

be attributed to a failure in the ATC system. The FAA had kept the majority of planes in the sky without exposing them to a measurable decline in safety standards. They did this first by cutting the number of flights in the system by approximately twenty-five per cent of pre-strike levels, and second by instituting flow control. This stabilized the number of flights throughout the day and enforced increased separation standards between flights so that controllers did not have to handle peak traffic loads.

The true test of the FAA's ability to take a strike and to fire 11,400 air traffic controllers remained in the future. The ATC system still faced at least three years of slow rebuilding. During these years, the flying public would expect the FAA to increase traffic loads to pre-strike levels or greater. At the same time, the FAA would have to fully train replacement controllers, assure that the demands on working controllers did not become too stressful, and work to alleviate the internal labor problems which brought about the strike in the first place. Most importantly, the FAA would have to build a safe system which could be relied upon at all times and under all conditions.

Chapter IV

THREE YEARS LATER: HAS TECHNOLOGY REPLACED THE STRIKERS?

Developments in Technology Since the Strike

Since the PATCO strike, the FAA has made one major technological contribution to the development of the National Airspace System -- the National Airspace System Plan. First proposed in January 1982, the Office of Technology Assessment called it "a significant and even bold step compared to previous FAA efforts to chart a future course for the ATC system."⁹⁰ While this plan directly responded to the problems and concerns about the adequacy of NAS technology raised during the pre-strike period, it also recognized that during the first years after the strike no significant changes in technology would occur. Instead, through 1985, the plan called for maintaining and improving the efficiency of NAS components where possible, while developing and procuring new technologies which would be implemented beginning in the late 1980s.

For example, in en route centers the plan calls for rehosting software with some improvements on IBM 4341 computers by 1986. During the interim, the FAA implemented minor improvements to the 9020 hardware. At terminals with ARTS, the post-strike period saw improvements in efficiency primarily aimed at providing controllers with conflict alerts. During this period, the FAA also replaced vacuum-tube ILS equipment with solid-state equipment. Work on developing and implementing TCAS also continued throughout the post-strike period. In the area of improved weather technology, the House Subcommittee on Investigations and

⁹⁰U.S., Congress, Office of Technology Assessment, Review of the FAA 1982 National Airspace System Plan, 97th Cong., 2nd sess., 1982, p. 9.

Oversight of the Committee on Public Works and Transportation issued a report in November 1984. This report stated that in spite of major R & D expenditures, the FAA had made no significant improvements since the strike in weather-related aviation technology, nor had they made improvements in simply communicating weather hazards to the controllers and pilots who needed the information.⁹¹

The FAA made one technological improvement available to post-strike controllers. They had implemented the direct access radar channel (DARC) at most en route centers during the summer of 1981. The FAA promoted DARC as a backup system to narrowband during a computer failure. DARC interprets raw data from the secondary surveillance radar so that the controller is provided with data on each flight in alphanumeric form. However, controllers shifting to DARC must still manually shift their display screens from a vertical to a horizontal position. Furthermore, the data provided by DARC is not actually displayed on the screen, thus, the controller must make up an identifying marker for each flight s/he is working.⁹² DARC cut down on some of the communication necessary between controller and pilot during a computer failure, but still required controllers to perform several distracting tasks in order to continue tracking airplanes.

Computer downtime became a non-issue during the post-strike period. John Galipault, President of the Aviation Safety Institute, believes that the FAA has deliberately tried to bury any knowledge of what's going on.⁹³ In April 1984, the FAA sponsored a National Automation Conference attended by the people who develop and maintain ATC system software. The conference turned into a planning session to save the automation system. In a summary of conference proceedings,

⁹¹Committee on Public Works and Transportation, Impact of Weather, p. 11.

⁹²Office of Technology Assessment, Airport and Air Traffic Control, p. 72.

⁹³Interview with John Galipault, Aviation Safety Institute, Worthington, Ohio, 15 February 1985.

Bob Kelm, Assistant Manager for Automation at Los Angeles TRACON, stated that "automation in the Air Traffic Service, if not in the FAA, has reached a crisis." He described the primary problems as loss of automation specialists to the private sector, cutbacks in trainees at the FAA Academy, splitting up of automation responsibilities within the FAA resulting in "responsibilities falling through cracks," and loss of configuration management so that national problems have to be solved locally. The report tells of automation specialists required to put in "illegal patches" and of others using "their own home computers for system debugging." Although the report concludes that if the recovery plan developed during the conference is put into action the system can be saved "before breakdowns occur," it is obvious that the management of the automation system has deteriorated during the post-strike period.⁹⁴

Throughout the post-strike period, the air traffic controllers have worked with the same technology as their pre-strike counterparts. In developing a long range plan, the FAA has taken a necessary and major step toward implementing state-of-the-art technology and advancing the ATC system into a new generation. It has not, however, aided post-strike controllers in performing their job, nor has it contributed to the overall safety of the ATC system since the 1981 strike.

On the Job: The Working Air Traffic Controllers in a Post-Strike Environment

In March 1982, Robert Jones *et al.* published a report which described the attitudes air traffic controllers had towards their work. The study included both working and striking controllers as well as other FAA employees working in the ATC system. Any study of working controllers three years after the strike would have to use the Jones report as a model.

⁹⁴U.S., Department of Transportation, Federal Aviation Administration, Los Angeles TRACON, "Report from the National Automation Conference," by Robert Kelm, pp. 1-3. (Mimeographed.)

Jones *et al.* used the *Survey of Organizations* (SOO) to determine how FAA employees perceived organizational climate, supervisory leadership, peer relationships and outcomes, i.e., "conditions of teamwork, satisfaction, and motivation."⁹⁵ In addition, they asked respondents forty-six supplementary questions which dealt with such problems as stress and burnout, Theory X management beliefs, and equipment outages.⁹⁶ The results showed that out of twenty-one job classifications within the FAA, only secretaries and clerical employees among bottom-ranked classifications, and top level management in five categories -- Assistant Chiefs, Deputy Chiefs and assistant Sector Managers, System Engineers, Facility Staff Officers, and Division Chiefs and their Assistants -- gave the FAA a positive rating.⁹⁷ All other employees, including striking and non-striking controllers, facility chiefs, regional and Washington office specialists and technicians, team supervisors, administrative personnel, etc., rated the FAA negatively, with the difference between classifications being primarily to what degree they rated the job negatively.⁹⁸ Jones *et al.* concluded that for most FAA employees:

Morale is very poor, at almost all levels. Stress, while at no time widely characteristic of the controller work force, is real, episodic in form, and affects a majority of longer-service controllers. A generation gap of considerable magnitude, around the treatment of employees, exists in Air Traffic. Negative organizational conditions, treatment, and experiences,

⁹⁵Federal Aviation Administration, "Management and Employee Relationships," p. 17.

⁹⁶David G. Bowers, "What Would Make 11,500 People Quit Their Jobs?" Organizational Dynamics 11 (Winter 1983) : 9.

⁹⁷Federal Aviation Administration, "Management and Employee Relationships," p. 64.

⁹⁸Bowers, "What Would Make?" p. 11.

not peer pressure, caused most individuals to decide to strike. Other groups still working, display many of these same perceptions.⁹⁹

By the fall of 1983, evidence began to mount that working controllers again felt strong dissatisfaction with the workplace, replacing any lingering esprit de corps that helped make the immediate post-strike period so successful. In October of that year, the House Subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation heard testimony from three controllers and a military liaison and security specialist representing the Los Angeles and Leesburg, VA ARTCCs. Gregory McGuirk, a controller from Leesburg, testified that:

The fabric of the work force is strained to a point of near collapse. We have seen traffic increase over the last six to eight months to volumes that have exceeded the pre-1981 traffic levels. We have been providing this air traffic control with fewer than 50 per cent of the FPL controllers that we had prior to the strike. In addition to that, we have been in constant training situations.¹⁰⁰

Throughout 1984, the Subcommittee received a steady record of testimony from controllers, facility managers and, organizations such as ALPA and ASI to the effect that, within the ATC system, the volume of traffic handled had increased faster than had staffing to control the traffic. Many FPL controllers still worked six-day weeks, or six-day weeks alternated with five day weeks. As the summer approached, facilities reported that, for the third consecutive summer, vacation time would only be granted with increased overtime, or that the amount of vacation time granted each controller would have to be limited. In June, a controller, a supervisor, and a facility manager representing Atlanta, Cleveland and Salt Lake City respectively, testified that supervisors in their facilities still worked

⁹⁹Federal Aviation Administration, "Management and Employee Relationships," p. 68.

¹⁰⁰Committee on Public Works and Transportation, Status, p. 238.

traffic on a regular basis which meant that the facilities provided no backup to working controllers. The individuals who testified believed that supervisors still routinely controlled traffic throughout the system. Controllers from the Atlanta ARTCC testified that, in their center, supervisors routinely denied controllers sick leave. As morale dropped, controllers began advocating joining a union. One controller testified that "morale at the Washington Center started going downhill in the summer of 1983 and it has been going downhill ever since, and controllers are beginning to feel the only way that they will have a voice that can really be heard by the FAA is if they organize formally and officially."¹⁰¹

The FAA did not deny that morale problems existed. During the fall of 1983 and into the summer of 1984, its administration changed hands. J. Lynn Helms left the post of administrator, and Michael Fenello temporarily replaced him. Donald Engen, in turn, permanently replaced Mr. Fenello. Each testified that they had implemented recommendations made in the Jones Report aimed at improving morale, but that the effort would take several years before positive results could be expected.

In response to questions about overtime, Michael Fenello testified that it still occurred in 1984, but "that every effort is made to excuse a controller who does not wish to work the overtime . . . [although] this is not possible in every case."¹⁰² In recognizing that a problem might exist, Fenello made a major step forward. In 1983, J. Lynn Helms had testified that controllers no longer had to work overtime. Helms stated that, on average, controllers worked 40.9 hours per week. Later, the Subcommittee determined that the FAA had arrived at this average only by including new controllers in training at the FAA Academy as well as personnel assigned to administrative duties.

¹⁰¹ *Ibid.*, p. 1373.

¹⁰² *Ibid.*, p. 1041.

Stress among air traffic controllers continued to be a concern. The Subcommittee devoted three days to hearing testimony on how to identify and relieve stress among controllers. Dr. Robert Rose, who had headed up a major pre-strike study on controller stress, testified before the Subcommittee. He again emphasized that the one finding that had surprised him and his co-workers the most had been the extent to which low morale and alienation contributed to the amount of stress controllers experienced on the job.¹⁰³ Dr. Rose added that, for the most part, the FAA had not acted upon the recommendations included in the report for dealing with stress. In fact, FAA officials had told him that he had overstepped his bounds, that his contract required him "to study stress and not attitude." The FAA technical assistant at the time Dr. Rose submitted the report, Dr. Stanley Mohler, agreed with Dr. Rose that, while the report received a great deal of attention from many offices within the FAA, overall, the FAA had given it a poor reception. He testified that in the medical offices where he had worked many individuals "denied that there was such a phenomenon as stress. . . . Our medical scientists in Oklahoma City were ordered to delete the word from their manuscripts for a period."¹⁰⁴

Given the testimony before the Subcommittee throughout 1983 and 1984, it is reasonable to conclude that, at least since the immediate post-strike period, job satisfaction among air traffic controllers had declined, overtime remained a problem for controllers in major facilities, and controllers still experienced stress on the job due both to the type of work involved and the environment in which it took place. The only reasonable way to compare levels of job satisfaction and stress to the pre-strike period would be to repeat the *Survey of Organizations*, with the supplemental questions devised in the Jones Report, among a cross-

¹⁰³ *Ibid.*, p. 862.

¹⁰⁴ *Ibid.*, pp. 882-883.

section of working controllers. Although Jones *et al.* administered the questionnaire after the strike, it is the best indicator of pre-strike conditions because it included striking controllers. The original survey sampled fifty-seven per cent of the controllers, selected randomly, along with paired samples of striking controllers. Working controllers received the questionnaire through the mail, while interviewers surveyed striking controllers in group sessions. Fifty-five per cent of striking controllers responded, and forty-five per cent of working controllers responded.¹⁰⁵ To repeat the survey in 1985 would involve selecting the same proportion of working controllers, i.e., fifty-seven per cent, at random and reissuing the survey through the mail.

Comparisons of pre-strike and post-strike overtime worked by air traffic controllers could be done by comparing both scheduled work weeks at facilities for individuals performing air traffic control duties and overtime hours for selected pay periods. The former would be necessary since, in the post-strike period, many controllers had regularly scheduled work weeks that exceeded forty hours. The testimony of FAA officials before Congress indicates that overtime hours for selected pay periods is compiled for FAA use. It would be appropriate to compare overtime hours by selecting weeks representing different seasons of the year, since for many facilities summer is a peak season for overtime, while at other facilities, such as the Miami terminal, winter may be the peak season. Therefore, records would have to be selected for one week of each quarter of the year for the years 1978 to 1984, i.e., the third week of February, the third week of May, the third week of August, and the third week of November.

Throughout 1983 and 1984, FAA officials admitted before Congress that many ATC facilities nationwide still required overtime in order to keep the system operating. In September 1983, a report issued by the Human Relations Committee

¹⁰⁵Federal Aviation Administration, "Management and Employee Relationships," p. 15.

Task Group at the Leesburg, VA ARTCC (a committee set up by the FAA in response to recommendations in the Jones Report) stated:

There is confusion about whether or not controllers can refuse overtime if ordered to work. There is no written policy regarding overtime and the requirement to work it or not. The word 'forced overtime' has been used. A better word to use would be intimidation.¹⁰⁶

Any review of overtime hours worked would, without question, indicate that, in some, if not all, major facilities, the amount of overtime worked by experienced controllers had increased significantly in comparison with the pre-strike period. Overtime, up to eight hours a week per controller, continued to be a requirement in the fall of 1984.¹⁰⁷

That fall, Lawrence Jones revisited several ATC facilities at the request of Donald Engen, Administrator of the FAA, to determine whether or not the FAA had carried out the recommendations made in the Jones Report. Furthermore, the FAA asked Mr. Jones to determine if any changes they had made had had a beneficial impact on employee morale. Mr. Jones concluded, in a December 1984 report, that many employees viewed the Human Relations Committees and the Facility Advisory Boards set up by the FAA to improve communication and employee-management relations, as "inconsequential windowdressing." Furthermore, the report stated that the increase in traffic volume exceeded "the capacity of the human-technical system." In speaking of employee morale, the report stated that "conditions are as bad as in 1981, or perhaps a bit worse."¹⁰⁸ Mr. Jones's statements give strong support to the expectation that job satisfaction and stress among controllers has not improved in comparison to pre-strike conditions.

¹⁰⁶Committee on Public Works and Transportation, Status, p. 385.

¹⁰⁷Donald Engen, FAA Administrator, told the New York Times (December 16, 1984) that the FAA would end requirements for abnormal overtime by June 1985.

¹⁰⁸Quoted in Joan Walsh, "Air Controllers Unite," In These Times 9 (9-15 January 1985) : 2.

Are the Skies Safe? The Volume and Safety of Air Traffic, 1982–1985

In April 1982, the FAA began a steady increase in IFR traffic accepted into NAS. By May 1983, they announced that they had achieved their goal, on schedule, of having the capability, within the system, to handle 100 per cent of pre-strike traffic with flow control in place. By December 1983, the FAA had lifted flow control restrictions at all but the four largest airports, and the FAA lifted these restrictions during 1984. Table IV-1 on page 57 gives traffic data for fiscal years 1978–1983. The total volume of traffic handled in 1983 remained lower than pre-strike levels, which the FAA attributed to a weak economy rather than the capabilities of NAS. However, the turn around for NAS certainly occurred in 1983 when, for the first time since the strike, the volume of IFR traffic handled increased in all categories. Air taxi traffic surged to a new high with more than half a billion IFR flights. Air carrier and military traffic recovered from their 1982 low so that the amount of traffic in these categories in 1983 almost equaled 1981 levels. General aviation, hardest hit by the strike, also showed a small increase in 1983.

During the post-strike period, air traffic not only increased, but its distribution nationwide shifted. This shift occurred as airlines adjusted to deregulation, which spurred the rapid growth of air taxi service and encouraged many airlines to practice a 'hub and spoke' method of scheduling. Under this type of scheduling, air carriers arrived at and departed from their base airport within a brief morning and afternoon period so that travellers could make connections quickly and conveniently on the same airline. This resulted in intense traffic peaks at key airports and ARTCCs throughout the nation. As early as September 1982, the NTSB found three terminals and two ARTCCs in a study of twenty-five

Table IV-1: IFR AIR TRAFFIC ACTIVITY FOR FISCAL YEARS 1978-1983

	TOTAL	AIR CARRIER	AIR TAXI	GENERAL AVIATION	MILITARY
1978					
<i>Total</i>	33,456,726	10,421,496	3,066,809	16,310,259	3,658,162
<i>Change</i>	+ 6 %	+ 4 %	+20 %	+8 %	- 2 %
1979					
<i>Total</i>	36,225,027	10,737,637	3,657,696	17,907,628	3,922,066
<i>Change</i>	+ 8 %	+ 3 %	+19 %	+10 %	+ 7 %
1980					
<i>Total</i>	38,176,549	10,613,262	4,128,782	19,332,557	4,101,948
<i>Change</i>	+ 5 %	- 1 %	+13 %	+ 8 %	+ 5 %
1981					
<i>Total</i>	37,221,490	10,164,678	4,635,285	18,530,746	3,890,781
<i>Change</i>	- 3 %	- 4 %	+12 %	- 4 %	- 5 %
1982					
<i>Total</i>	31,662,987	9,520,107	4,633,905	13,907,533	3,601,442
<i>Change</i>	-15 %	- 6 %	^a	-25 %	- 7 %
1983 ^P					
<i>Total</i>	34,039,181	10,126,868	5,346,419	14,755,146	3,810,748
<i>Change</i>	+ 8 %	+ 6 %	+15 %	+ 6 %	+ 6 %

SOURCE: U.S., Department of Transportation, Federal Aviation Administration, Information Analysis Branch, *FAA Statistical Handbook of Aviation*, Washington, D.C., 1981, p. 12; 1983, p. 14.

^aLess than 0.5 % change.

^PPreliminary data.

terminals and sixteen ARTCCs, which, when compared on a month to month basis, handled traffic at greater than 100 per cent of pre-strike levels.¹⁰⁹

The total number of aircraft accidents and fatalities fell during the post-strike period for all aircraft types except airlines. Airline accidents and fatalities stayed approximately the same in comparison to pre-strike levels. Tables IV-2, IV-3, and IV-4 give the total number of accidents for each aircraft category, the total number of fatal accidents, and the total number of fatalities for the years 1978 to 1983. Data are not available for 1984. The rate of accidents per 100,000 hours flight time, however, remains approximately the same for each flight category, except commuter flights which show a significant drop in accident rates in the post-strike period. Table IV-5 on page 62 provides these data for the years 1978 to 1983. These accident statistics include all airline accidents which occurred during these years, except for sabotage and/or suicide accidents. In both their 1982 and 1983 Annual Reports, the National Transportation Safety Board found no reason to cite the ATC system for causing more accidents during the post-strike period as compared to the pre-strike period.¹¹⁰

The Board, however, did express concern that staffing levels lagged behind increases in traffic volume.¹¹¹ Not only did the FAA have fewer people controlling traffic, but the ratio of FPL controllers to developmental controllers remained low. In March 1983, J. Lynn Helms testified that the FAA employed 13,388 controllers,

¹⁰⁹U.S., National Transportation Safety Board, "Special Investigation: Followup Study of the Air Traffic Control System," in Status of the Air Traffic Control System. Hearings before the subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, 98th Cong., 1st and 2nd sess., 1983-1984, pp. 50-52.

¹¹⁰U.S., National Transportation Safety Board, Annual Report to Congress, Washington, D.C., 1983, p. 14.

¹¹¹*Ibid.*

Table IV-2: AVIATION ACCIDENTS FOR CALENDAR YEARS 1978 - 1983

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION
1978	21	61	198	4,218
1979	24	52	160	3,825
1980	15	38	170	3,597
1981	25	31	157	3,502
1982	16	27	133	3,216
1983 ^P	20	17	141	3,091

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^PPreliminary data.

with 1,000 more in the academy.¹¹² In February 1984, Michael Fenello testified that the FAA had 13,274 employees working air traffic, of whom 4,388 worked as developmentals or assistants who could not actually control traffic.¹¹³ During 1983, therefore, the FAA apparently made no progress toward achieving their goal of having 14,300 FPL controllers staffing ATC facilities. Facility managers at seventeen facilities, out of thirty-six surveyed in the fall of 1982, believed that they would not have full staffing until the summer of 1984, or even 1985, although the FAA expected their facilities to handle traffic at 100 per cent of pre-strike levels by the summer of 1983 at the latest. Other managers expected full staffing by 1983,

¹¹²Committee on Public Works and Transportation, *Status*, p. 14.

¹¹³*Ibid.*, p. 1040.

Table IV-3: FATAL AVIATION ACCIDENTS FOR CALENDAR YEARS 1978 - 1983

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION
1978	5	14	54	721
1979	4	15	30	638
1980	0	8	45	622
1981	4	9	40	654
1982	5	5	30	578
1983 ^P	4	2	28	548

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^PPreliminary data.

but had already been notified that the FAA considered their facilities capable of handling full traffic levels.¹¹⁴ In March 1984, six ARTCC managers testified before Congress, representing Indianapolis, Chicago, Atlanta, New York, Cleveland, and Los Angeles. Each testified that the FAA had authorized fewer controllers for his center than had been authorized prior to the strike, but that the authorized staffing level for his center would be sufficient to handle operations. However, each manager also testified that he had fewer controllers working for him than the FAA had authorized for his center. All the managers testified that they particularly needed FPL controllers.¹¹⁵

¹¹⁴National Transportation Safety Board, "Special Investigation: Followup," pp. 55-56.

¹¹⁵Committee on Public Works and Transportation, *Safety*, pp. 486-496.

Table IV-4: FATALITIES IN AVIATION ACCIDENTS FOR CAL. YEARS 1978 - 1983

YEAR	AIRLINES	COMMUTERS	TAXIS	GENERAL AVIATION ^a
1978	160	48	155	1,558
1979	351	66	77	1,237
1980	0	37	103	1,252
1981	4	34	94	1,282
1982	235	14	70	1,161
1983 ^p	15	11	60	1,049

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^aIncludes air carrier fatalities when in collision with general aviation aircraft.

^pPreliminary data.

In the fall of 1982, the National Transportation Safety Board did a follow-up study on safety in the ATC system. Their conclusions included the following:

1. There has not been an increase in ATC-involved accidents since the controllers' strike, nor have there been any accidents attributed to strike-related causes.
2. Operational errors and operational deviations are occurring, but are not being reported or investigated in a standardized manner, as prescribed by FAA directives.
3. Pilot deviations are occurring, but are not being reported or investigated adequately in many cases, as prescribed by FAA directives.
4. The FAA does not have an adequate measure of system safety

Table IV-5: ACCIDENT RATES FOR CALENDAR YEARS 1978-1983

Rates are for number of accidents per 100,000 hours flight time.

	AIRLINES ^a	COMMUTERS	TAXIS	GENERAL AVIATION ^a
1978				
<i>Total</i>	0.348	4.68	5.58	12.10
<i>Fatal</i>	0.083	1.08	1.52	2.06
1979				
<i>Total</i>	0.358	4.44	4.34	9.90
<i>Fatal</i>	0.060	1.28	0.81	1.65
1980				
<i>Total</i>	0.221	3.23	4.70	9.90
<i>Fatal</i>	0.000	0.68	1.24	1.71
1981				
<i>Total</i>	0.380	2.50	5.42	9.50
<i>Fatal</i>	0.061	0.73	1.38	1.78
1982				
<i>Total</i>	0.234	2.08	4.08	10.00
<i>Fatal</i>	0.062	0.38	0.92	1.79
1983 ^P				
<i>Total</i>	0.306	1.23	4.55	9.40
<i>Fatal</i>	0.061	0.15	0.90	1.67

SOURCE: U.S., National Transportation Safety Board, *Annual Report to Congress*, Washington, D.C., 1978-1983.

^aRates do not include sabotage/suicide accidents.

^PPreliminary data.

indicators in place for use as 'performance standards' for controllers and to assess quality or safety of the ATC system, nor has the FAA developed a standard reporting base.¹¹⁶

System safety indicators include system errors and near misses. The Board reported that, given FAA data on system errors, near misses, and traffic volume, incidents had decreased significantly. For example, in comparing the twelve months prior to the strike with the twelve months after the strike, system errors decreased 34.9 per cent at en route centers and 44.5 per cent at terminals.¹¹⁷

The Board based its determination, that system safety indicator statistics could not be relied upon, on anecdotal information as well as computer records of conflict alerts. The computer data, which the Board had randomly selected, revealed "several cases of unreported operational errors or pilot deviations" from FAA separation standards.¹¹⁸ As an alternative to FAA data, the Board had relied on NASA data for its previous study. In 1982, the Board reported that many facilities did not make the NASA forms "readily available" to controllers, while at other facilities controllers either did not know that the purely voluntary program existed or did not bother to fill out the reports.¹¹⁹

In January 1985, the Aviation Consumer Action Project (ACAP) came out with a study which compared pilot reports of near misses submitted to three of the FAA's nine regional offices with near miss data put out by the FAA in Washington, D.C. The ACAP study found sixty-three reports filed in 1983 and 1984

¹¹⁶National Transportation Safety Board, "Special Investigation: Followup," p. 120.

¹¹⁷*Ibid.*, p. 14.

¹¹⁸*Ibid.*, p. 16.

¹¹⁹*Ibid.*, p. 21.

at the regional level which had not been included in national summaries of near misses collected by the FAA. Furthermore, when ABC news contacted the FAA, a spokesperson admitted that an additional thirty-nine incidents reported as operational errors had, in fact, been near misses.

Ample evidence exists, therefore, that any study of published FAA statistics on near misses and operational errors would not be accurate. Donald Engen testified before Congress, shortly before ACAP released its study, that "near mid-air collisions have decreased by 50 per cent over the last four-and-a-half years. The total has dropped from 568 in 1980 to 299 in 1984."¹²⁰ If all the near misses reported by ACAP are accurate, the total for 1984 would increase. In addition, six other regional offices may also have records of near misses which the FAA Washington office did not report. Also, since the ACAP researchers only looked at written logs, there may still be a problem with non-reporting of incidents which can only be determined by a detailed review of computer tapes.

NASA data are also unreliable because reporting is voluntary, and because the FAA has not made certain that controllers are both aware of the program and participating in it. During the pre-strike period, PATCO controllers, anxious to prove the ATC system unsafe, had an incentive to report incidents. No such incentive exists among working controllers today, and, at least for the first months after the strike, controllers may not have wanted to report incidents which would make the system look bad. A voluntary program for reporting incidents, run by an outside agency, will not work unless the FAA actively endorses and promotes the program or allows the outside agency into the workplace on a regular basis to promote the program and make certain controllers are participating in it.

¹²⁰Ralph Nader and Christopher J. Witkowski, letter to Elizabeth Hanford Dole, Secretary of Transportation, 11 January 1985, pp. 1-2. (Photocopied.)

The question of safety of the ATC system during the post-strike period remains unanswerable. The fact that it is unanswerable leads to the obvious question: if the FAA's primary goal is to provide the safest ATC system possible, why are they not generating the necessary data which would enable them to assess the safety of the system and to assess what steps must be taken to increase safety? There are two reasonable explanations as to why accurate system safety indicators are unavailable. One is that the FAA is performing its job incompetently. In this case, the problem is that, although the data exist on computer, the FAA is not collecting them in an adequate manner. The second explanation is that the FAA is more concerned about appearing safe than achieving safety. Controllers testifying before Congress in 1983 and 1984 called the conflict alert system 'squeal-a-deal' and indicated that reporting incidents, even when they took the necessary steps to resolve conflicts before they became serious, could lead to disciplinary action.

Donald Engen testified in June 1984 that only "four controllers have received written warnings in the major category of these errors."¹²¹ Whether or not Mr. Engen is accurate, if controllers believe they will be disciplined for self-reporting incidents, and if they know that the computer record will probably not be checked, then they have no incentive to report incidents for which they may be responsible. At some level between Mr. Engen and the working controllers, the appearance of safety seems to have more credence than actual safety. Until this problem can be resolved, the FAA will not be able to achieve the safest ATC system possible.

¹²¹Committee on Public Works and Transportation, Status, p. 1401.

Chapter V

CONCLUSION

Although the data needed to make a final conclusion are not available, there is certainly strong evidence to support the conclusion that technology has not replaced the fired air traffic controllers. First, the FAA has made no new technology available to working controllers since the 1981 strike. Second, since the strike, the FAA has placed excessive demands on working controllers in order to keep the system going. Working controllers have had to put in long overtime hours in busy facilities; they have had to help train and work side by side with large numbers of developmental controllers who may or may not have the skills necessary to handle incidents that occur; and they have had to work in an environment which has changed little since prior to the strike, in spite of the fact that nearly 12,000 employees risked losing their jobs in an attempt to bring about change. Third, although the aviation accident rate has not risen since the strike, evidence exists which indicates that the FAA has not make a system-wide attempt to collect the data necessary to determine system safety. If developing a safe ATC system is truly an FAA priority, the inability or refusal to collect these data adequately is inexcusable. For it is these data that would best indicate when and where incidents occur and how they might be corrected before tragedy occurs.

Technology as Strikebreaker

The FAA broke the air traffic controllers' strike, and eventually PATCO itself, by developing and implementing a contingency plan which relied on a computerized flow control system to regulate air traffic across the nation. Without this plan, the FAA could not have maintained adequate levels of air traffic in the face of such a massive walkout and would, no doubt, have succumbed to political

pressure to negotiate with PATCO. Robert Poli, the president of PATCO at the time of the strike, certainly believed that "no American government would take a chance of provoking a strike costing \$250 million per day in lost business and, inevitably, one which risked so many lives."¹²²

Computers can be used to break strikes successfully when they "provide continued operations with a reduced or fill-in work force -- often composed of people with fewer skills" -- and when they enable management "to transfer work out of a location that is on strike."¹²³ In the case of the PATCO strike, the FAA did both. They used management and other staff to fill in for striking controllers in the short-run, and developmental controllers to fill in for striking controllers in the long run. They also transferred work in some locations by shifting airspace between neighboring ARTCCs. In this way, ARTCCs heavily impacted by the strike reduced their workload while ARTCCs lightly impacted by the strike increased theirs.

Unlike many other industries which take advantage of computer technology to alleviate the impact of a strike, the ATC system has a responsibility to provide service in an environment that is highly dangerous. Both PATCO and the FAA tried to use the safety issue to strengthen their case in the public eye. PATCO officials convinced themselves that the FAA could not operate safely without their members, and therefore would not take a strike. Furthermore, they contended that the stress caused by working air traffic control, where a mistake could result in hundreds of deaths, justified their demands for higher pay. However, higher pay for air traffic controllers does not increase safety. When the controllers struck, the FAA called PATCO's bluff, took the strike, and successfully turned the safety

¹²²Quoted in David Morgan, "Terminal Flight: The Air Traffic Controllers' Strike of 1981," Journal of American Studies 18 (August 1984) : 167.

¹²³Harley Shaiken, "Computers as Strikebreakers," Technology Review 85 (April 1982) : 51.

argument against the controllers. How could any group, so concerned about the safety of the aviation system, walk off their jobs and endanger the lives of hundreds of thousands of people? The FAA became the safety 'good guys' during the immediate post-strike period with Drew Lewis, Secretary of Transportation, appearing daily "on all three networks stressing 'safety first'."¹²⁴ Although the FAA won the public's support as the side most concerned about safety, in reality they did no more to address the real issues of safety in the ATC system than had PATCO.

For both sides, the emotional issue of 'who cares more about safety' outstripped the real issues of safety. The FAA cannot be expected to create a completely accident-free ATC system given that the American people want readily accessible air space to all who want to enter it a minimum cost for users. Neither can they be expected to eliminate system errors and near misses altogether. While such incidents are indicators of possible safety problems, they are also, frequently, indicators that the ATC system is working because recovery occurred before an accident happened.

A safe ATC system is one in which everything is done, within reason, to maximize safety. It is not a system in which a higher priority is put on the appearance of safety than on exposing problems which must be resolved in order to provide safety. Before it can be said that the FAA is working towards achieving the safest possible ATC system the following must be done:

* The FAA must improve incident reporting.

- The program for reporting system errors and near misses must be improved so that all incidents are reported routinely. First-line supervisors must be given responsibility for assuring that controllers working under them report all incidents in accord with

¹²⁴Linda Godsen, DOT spokeswoman, quoted in Morgan, Terminal Flight, p. 180.

FAA standards. The FAA must also review computer tapes routinely to determine if incidents are going unreported, or they must develop improved software capable of issuing incident reports. Again, the goal must be to determine under what conditions incidents occur and what can be done to decrease the likelihood of similar incidents occurring in the future. In order to assure that incidents are reported, incident reports should be used as an internal training tool and not as a justification for disciplinary action, unless criminal negligence is involved. This will encourage accurate reporting by removing the incentive to coverup incidents to avoid being disciplined.

- An outside agency, such as NASA, must be brought into the FAA on a regular basis to review the reporting system. This will provide further assurance that incidents are being accurately reported, both at the level of working controllers and at each higher level in the FAA. The outside agency should have access to computer tapes, interviews with controllers, and data collected at each level within the FAA. It is more appropriate that an outside agency should serve as a check on the reporting system than provide a reporting system because an outside agency does not have internal accountability. The FAA, as an organization, can be held accountable for its overall program to an outside agency, but individual employees of the FAA, responsible for administering the program, can not be responsible to an outside agency.

* The FAA must improve NAS computer systems.

- The 9020 computers in en route centers must be replaced with IBM 4341 or comparable computers capable of handling the demands of current and future aviation traffic.
- Computer automation improvement (i.e., software) must become an FAA priority. Steps must be taken to slow down the loss of automation specialists to the private sector. National automation standards must be implemented. The FAA must clearly define areas of responsibility and see that the offices in charge of each such area fulfill their automation responsibilities.
- A program for reporting computer outages and startovers must be initiated by the FAA with the goal of determining how frequently they occur and what impact they have on the overall

ATC system. In order to assure that outages are accurately reported, the FAA must not use reports to discipline employees, except when criminal negligence is involved. If outage reports are used to compile accurate statistics that will help improve the system, and not to discipline the individuals who make the reports, a strong incentive to coverup outages will be removed.

- * Traffic peaks must be contained so that individual controllers and individual facilities are not handling traffic loads beyond their capabilities. The FAA must set a standard maximum load per controller, and then make certain that this maximum load is not surpassed. This may require reinstating some form of flow control or having flexible staffing so that sufficient numbers of controllers are available to service peak traffic loads.
- * Every effort must be made to develop and implement the threat alert and collision avoidance system (TCAS) so that pilots are provided with a back-up to ground control in a conflict situation.
- * The FAA must improve weather information dissemination by assuring that air traffic controllers have direct access to hazardous weather information. This can be done by enabling meteorologists to speak directly to controllers and by giving controllers direct access to the radar remote weather display system (RRWDS). In turn, controllers must receive training to assure that they properly communicate weather hazard information to pilots.
- * The money in the Airport and Airway Trust Fund must be spent on facilities and equipment and on research and development as intended. The FAA must convince Congress that the fund is being spent in accord with the original legislation. In order for the FAA to complete the replacement of the 9020s in en route centers, as well as carry out the goals of the National Airspace System Plan, Congress must reinstitute the user fees which originally provided for the trust fund.

In order for these recommendations to succeed, the FAA must develop a management style that is not authoritarian, which promotes trust, and which includes controllers in the problem-solving process. A new management style would also lower stress among controllers, if, in fact, the work environment is a major contributing factor to air traffic controller stress. On the way to achieving a

new management style, the FAA must do the following:

- * The FAA must establish a program to train supervisors and controllers in methods of recognizing and alleviating stress, whether or not stress is caused by the job or outside factors.
- * The FAA must establish a policy on staffing levels for ATC facilities. This policy must be based on measurable criteria including the amount of traffic handled, the amount of airspace for which a facility is responsible, and any documented features which require special considerations for a given facility, i.e. , mountainous terrain surrounding a terminal.
- * The FAA must establish a clear policy on overtime. This policy must delineate under what circumstances overtime is mandatory. Furthermore, it must set maximum limits on overtime for each controller within a given time period, i.e., no more than eight hours overtime per week and no more than sixteen hours overtime in every twenty-eight day period. Even controllers who volunteer for overtime should not be allowed to work excessive amounts.
- * The FAA must provide ongoing physical health monitoring for air traffic controllers taking into account the findings of previous studies on stress, such as the Rose report.
- * The FAA must provide and encourage opportunities for controllers to seek counseling from mental health experts.

The FAA used technology successfully to break PATCO, but technology has not yet proven to be the sole answer to creating a safe ATC system. The limitations on current technology require the FAA to develop a professional cadre of air traffic controllers, not to mention technicians, automation specialists, etc., to make and communicate decisions which, in the ATC system, are still essentially human functions. To do this, the FAA will have to learn to maximize human efficiency by, in part, recognizing human frailty. Until this is done, or until it is possible to replace human controllers with machines, it is doubtful that the safest available ATC system will be in place.

The Price of Upholding a Principle: The Illegal Strike in the Public Sector

Aside from taking advantage of the technology available to them to break the strike, the FAA had another powerful weapon on their side -- the illegality of strikes in the public sector.¹²⁵ This meant that when PATCO struck, the FAA knew that they would be able to move quickly to fire all striking air traffic controllers. They would never have to negotiate with the strikers again; they would never have to integrate them back into the workplace again; and they would never have to respond to their demands, whether or not the strikers' demands had legitimacy. In order to succeed in breaking the union, the FAA also needed public support for their actions. The strike coincided with a rise in conservative political power which had reached a new high with the 1980 elections. This increased conservatism in public opinion provided a political climate supportive of the actions taken by the FAA.

In Drew Lewis's morning television sessions during the strike, he emphasized not just safety, but the illegality of the strikers' actions.¹²⁶ Striking put the air traffic controllers more firmly on the side of the 'bad guys' because they had broken the law and their oath to the federal government. In the short

¹²⁵An alternative consideration, which this paper does not explore, is that the negotiating process between the FAA and PATCO only secondarily contributed to their losses. The strike occurred only two years after airline deregulation went into effect -- a major step in a political movement to remove government from the decision-making process of the private sector. The strike effectively eliminated PATCO, but it may just have successfully contributed to the limitation of the FAA's role in regulating air traffic in the long run. During the post-strike period, the FAA succeeded in returning to full capacity in two to two and a half years, with greatly increased productivity, and no major changes in technology. They did this, however, with an accompanying inability to regulate the volume of air traffic and either an inability or a disinclination to assure the safety of air traffic. This means that at least some of the safety costs of air travel (a calculation which can only be determined with great difficulty and no moral certainty) has been passed back to the flying public. In the end, if there is a winner of the PATCO strike, it may be the private airlines who have passed the cost of safety on to their customers.

¹²⁶Ibid.

run, this made it easier for the FAA to win the strike. Some air traffic controllers, dissatisfied with their work environment, would not go so far as to participate in an illegal strike. Other individuals may have applied more willingly for air traffic control work because the strike had been illegal. Instead of being a scab by working air traffic, these individuals became heroes in 1981, upholding patriotic values in a national crisis.

Although the FAA won the strike, they lost just as much as the air traffic controllers did in the negotiating process. Successful negotiations occur when two or more parties are able to address mutual problems and reach a solution which is acceptable to both sides. The goal is not to win everything for fear that the alternative is to lose everything. Rather, it is to work together to solve problems in a mutually beneficial way.

Both the FAA and PATCO approached negotiations as if the only outcome was to win everything or lose everything. Robert Poli believed that the walkout would cripple the ATC system and, therefore, the controllers would win big. Langhorne Bond, FAA Administrator when the negotiations began, believed that PATCO could not be negotiated with because the leadership had become "divorced from reality."¹²⁷ Instead, the controllers active in PATCO needed to be taught a lesson, even fired, so that the FAA could be the big winner.

With the help of computer technology, the FAA got their big win, but the problems which the FAA and PATCO should have addressed and resolved in negotiations never had a chance to be aired. The FAA is left with those problems still a part of the ATC system. If their attempts to carry out the recommendations of the Jones Report are the windowdressing they're accused of being, this indicates that the FAA still has not learned to solve problems mutually with the air traffic controllers.

¹²⁷Quoted in Francke, "FAA's Finest Hour," p. 395.

The result of not learning may well be new militancy among the ranks of the air traffic controllers. In that case, the strike, rather than solving any problems, may merely have postponed the day when a well-organized union will come along and force the FAA into another confrontation with consequences that could be even worse for the ATC system. More certainly, the result will be an inability to achieve the safest air traffic control system possible because the safest possible system is one in which problems are solved cooperatively between those responsible for administering the system and those responsible for working air traffic control on a daily basis.

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