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GOVERNMENT

AVIATION SAFETY INVESTIGATIONS

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JOINT HEARING BEFORE THE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE AND THE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION HOUSE OF REPRESENTATIVES

NINETY-FIFTH CONGRESS

SECOND SESSION

ON

AVIATION SAFETY

OCTOBER 27, 1978

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AVIATION SAFETY

FRIDAY, OCTOBER 27, 1978

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
HOUSE OF REPRESENTATIVES,
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION,
San Diego, Calif.

The committees met at 9:30 a.m., Luce Auditorium, Naval Training Center, Hon. Howard Cannon, Chairman, Senate Committee on Commerce, Science, and Transportation, presiding.

OPENING STATEMENT BY THE CHAIRMAN

The CHAIRMAN. The hearing will come to order. Today's hearing is a joint hearing of the Senate Committee on Commerce, Science, and Transportation and the House Public Works and Transportation Committee, both of which have jurisdiction over aviation matters. Cochairing the hearing today is Congressman Glenn Anderson, who is Chairman of the House Aviation Subcommittee, and myself, Senator Howard Cannon, Chairman of the Senate Committee on Commerce, Science, and Transportation, and Chairman of the Senate Aviation Subcommittee.

Today is the first day, and only the beginning, of the congressional examination of midair collisions and the systems improvements which will reduce the potential of future tragedies such as the one that occurred in San Diego.

I want to make clear at the beginning that this is not a hearing to find the cause of the San Diego crash. The panel and witnesses will be restricted in the depth to which we can delve into circumstances surrounding that accident at this time. The National Transportation Safety Board (NTSB) has the responsibility to determine the precise cause of the PSA accident, and I for one intend to see that they get the proper opportunity to determine that cause without interference or prejudice from this congressional inquiry.

However, the NTSB investigation need not, and must not, delay the congressional responsibility to make a timely investigation of the institutional safety questions raised by the facts of this and similar collisions. Without knowing the precise cause of the PSA accident, the facts leading up to that and other midairs provide a number of systems and procedural questions about contributors to the potential for two airplanes trying to occupy the same space at the same time.

It is sorely inadequate to say that my sympathy and that of the other panel members goes out to the families of those who were killed by this horrible accident. A tragedy like this is felt emotionally by everyone in the country even if they are not directly affected. So we

are here to do more than say we are sorry. We are here, we hope, to see that those lost lives are remembered with safety improvements which will save many, many more lives in the future.

Clearly, we have a difficult situation with the division of responsibility in this case between the NTSB to determine cause, and the Congress to determined systems improvements to prevent future, similar tragedies. I am certain we can both carry out our separate responsibilities without one prejudicing the other, and I want to ask the press and public to cooperate with us in seeing that these roles, which are in the best interest of aviation safety, are respected.

Personally, I want to see some safety improvements started today. Not rash, cosmetic improvements, but realistic changes in procedures and standards that can help prevent a potential accident tomorrow. I also believe there are a number of long-term improvements, accelerating the development of systems and facilities, that can begin with today.

Friday, October 27, 1978, will not be the end of this inquiry for the Senate Aviation Subcommittee. I plan to introduce next January a bill aimed at, first, the safety issue, and second, the aircraft noise problem, the latter a subject on which legislation has been pioneered by Cochairman Anderson.

Specifically, today, I am interested in questioning witnesses about air traffic control procedures after a conflict alert; the requirement for positive control at more major air carrier airports; the development and installation of both ground-based and airborne collision avoidance systems and what can be done to accelerate the introduction of that safety hardware; and the issue of accelerating the implementation of reliever airports to provide incentives for reducing the mix of general aviation and air carriers at major airports.

I would add that this last issue is one which I find particularly disturbing. There is currently a \$2 billion surplus in the airport and airway trust fund, yet virtually every administration since 1970 has fought increasing expenditures from this user-tax revenue source for aviation safety items: Nav aids, airport construction, and other equipment. I hope that is all behind us and OMB, DOT, and FAA will help Congress next year to increase substantially the funds for facilities and equipment and airport development. Those monies will not come from the taxpayers but from the \$2 billion surplus already collected from aviation users and earmarked for safety items.

Finally, I want to recognize the cooperative effort put into this hearing by Chairman Bizz Johnson, who could not be here today, Chairman Anderson, and my other colleagues from the House Public Works and Transportation Committee. Safety should be and is beyond the bounds of party politics and individual Houses of Congress. I thank the House Members for their cooperation and enthusiastic endorsement of this joint hearing.

We have a number of important witnesses, so I would ask the witnesses and panel members alike to be brief and keep our time constraints in mind.

Congressman Anderson, I would like to call on you for some opening remarks.

OPENING STATEMENT BY REPRESENTATIVE GLENN ANDERSON

Mr. ANDERSON. Thank you, Senator Cannon, for a very fine statement. And a special thank you for the fine leadership and cooperation you have displayed in calling for these hearings. I want to associate myself with your remarks and to reemphasize that we are not here to interfere in any way with the NTSB investigation.

Air disasters are rare, fortunately, but when they occur, the shock waves can be felt far beyond the community most directly affected. Indeed, the tragic accident which occurred here shocked the Nation. Even when all statistics demonstrate that commercial air travel is the safest available means of transportation, we must not content ourselves with the decreasing accident rates, and we cannot afford to believe in the inevitability of such disasters. We must continually seek to minimize the potential for air disasters and to stay ahead of increasing demands on the air traffic system.

I would hope that in the aftermath of this tragedy, we can move ahead toward assuring a safer system rapidly, but deliberately, and without resorting to short-term, quick-fix, bandaid approaches. As Senator Cannon has stated in different words, there is no magic box which will prevent all accidents. However, I am confident there are several things we can be doing now to minimize current problem areas. It is my hope that during these hearings today and our followup investigation, we can explore new traffic procedures, reassess current reliance on the see and be seen concept, look to improve pilot training techniques in scanning for air traffic in their vicinity, improve aircraft lighting, develop a collision avoidance system, and install upgraded and automated navigational aids.

Earlier this year I chaired hearings into the need for FAA to spend more money to purchase radars and other navigation aids and safety equipment. Senator Cannon mentioned a current uncommitted trust fund surplus exceeding \$2 billion, yet funding levels for these essential safety programs are decreasing rather than increasing. This must stop, and I look forward to working with you, Senator Cannon, in reversing this distressing trend.

The last point I would make is that we have rapidly, if not regretably, reached the point in aviation where complete freedom of the skies must be reasonably curtailed. While I would not suggest there is a demonstrated need to restrict aircraft use of airports based on the type of plane or purpose of the flight, particularly in certain crowded terminal areas, we have come to realize the need to bring more airspace users into the system. The development of the terminal control area concept has worked well, and this concept should be extended to more areas. I urge Administrator Bond to move in this direction without delay. And a little later when he comes before us, I will bring that point out.

Thank you very much, Senator.

The CHAIRMAN. Thank you Congressman Anderson.

We have on our congressional panel today Congressman Allen Ertel of Pennsylvania, Congressman Bob Stump of Arizona, Congressman Barry Goldwater of California.

I would like to acknowledge receipt of testimony from Senator Hayakawa. He was originally scheduled to appear before the committee this morning to give his testimony, but was unable to attend due to a conflict of schedule. I'm sorry he can't be here, and I would like to have his testimony included in the hearing record in full.

Our first witness this morning is James King, the Chairman of the National Transportation Safety Board. As I already stated, Mr. King appears under the constraint that he cannot prejudice the NTSB probe by speculating at this time about the cause of the PSA accident. Therefore, to maintain the integrity of the NTSB's investigation, you may please proceed, Mr. King, providing the facts you can about the PSA crash, and I want you to be uninhibited about declining to answer questions which might transgress the bounds of your own accident investigation.

Mr. ANDERSON. Mr. Chairman, one of the members does have a statement that he would like to make.

The CHAIRMAN. Congressman Goldwater.

OPENING STATEMENT BY REPRESENTATIVE GOLDWATER

Mr. GOLDWATER. Mr. Chairman, I think that much good can result from today's hearing. This Nation enjoys the greatest aviation system in the world, but safety remains a problem, and we've got to come up with some solutions.

I consider it appropriate that these hearings are being held, and I compliment our two very fine chairmen, Senator Cannon and Congressman Anderson.

There are so many facets to aviation safety that it is impossible to explore everything that is relevant to the subject of this hearing in the brief time allotted to us today. But, I want to mention one thing right now that is a burr under my saddle—the aviation trust fund. I want the record to reflect how deeply concerned I am about the direction of the Airport and Airway Development Act since its implementation back in 1970.

Since this is the football season and the political season, let's talk about the biggest "political football" of them all—the ADAP Trust Fund. We've got people in this administration just like we've had people in other administrations who have betrayed the trust of the flying public by holding our aviation trust fund politically captive. The trust fund is not supported from general revenues; it is supported by the people who fly. The flying public pays those little inconvenient taxes that make up the trust fund, and the flying public has a right to expect that those taxes go for the reason that they were created in the first place—safety and airport improvement.

Yet, we have seen three administrations use the trust fund as their money. It is our money that they use as a hedge against Federal deficits, deficits that they created in the first place.

Let's look at the record. The Treasury Department reported that the unexpended balance in the trust fund at the end of fiscal 1977 was \$3.2 billion. Of that amount, about \$1.5 billion was committed for airport projects around the country. But that still leaves \$1.7 billion in uncommitted money. Furthermore, some estimates indicated that the uncommitted balance could topple \$3 billion at the end of 1980.

Yet, with all this money on hand, safety problems go unnoticed. For instance, of the 1,700 air-carrier runways in the United States, less than 30 percent have precision ILS's, less than 20 percent have grooved runways to prevent skidding, less than 30 percent have approach lights for night landings, and less than 3 percent of the air carrier airports have a wind shear program. We've got more than enough money in the trust fund to alleviate these significant safety problems immediately.

ADAP is up for renewal next year. Mr. Chairman, if we don't accomplish but one thing today, we'll do the American people a favor by setting the stage for establishing a new criterion for the trust fund. That criterion should be to spend the money that is now idle in the trust fund to improve safety.

While we're at it, I want to mention one other thing and that is the utilization of trust fund money for safety features at privately owned/public use airports. The only way to reduce the number of general aviation aircraft at major air carrier airports is to give general aviation a viable alternative to these larger airports. We can't do this as long as privately owned/public use airports are closing down right and left due to exorbitant taxes, municipal encroachment, and plain neglect. About half of the landing areas in the country are open for public use and approximately 38 percent of them are privately owned. Yet, in the period from 1969 to 1976, the number of such airports decreased by almost 100, and the FAA predicts that the downward trend will continue.

Mr. Chairman, I would just like to close by asking the witnesses that appear before us today to answer some very significant questions that I think need to be addressed not only as they apply to Lindbergh Field and the incident that occurred here but, obviously, as they apply across the country.

For instance, at Lindbergh Field, why wasn't there an ARTS III with an altitude capability ever installed at the airport tower? Why are opposite-approach landings and takeoffs allowed at Lindbergh Field for practice?

Mr. Chairman, I think those are basically the questions that need to be answered as far as this airport is concerned: Why there was not the upgraded radar capability as well as allowing opposite approaches and takeoffs and landings. I would like some of the witnesses to be able to address themselves to these questions.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Congressman Goldwater. Chairman King, you may proceed.

STATEMENT OF JAMES B. KING, CHAIRMAN, NATIONAL TRANSPORTATION SAFETY BOARD; ACCOMPANIED BY LLOYD LaGRANGE, OPERATIONS DIVISION; AND WILLIAM LAYNOR, CHIEF, VEHICLE FACTORS DIVISION

Mr. KING. Thank you.

Mr. Chairman, members of the committee, I am James B. King, Chairman of the NTSB. With me today on my right are Mr. Lloyd LaGrange from our Operations Division and Mr. William Laynor, Chief of the Board's Vehicle Factors Division.

Mr. Chairman, as you know, the Board is holding a comprehensive factfinding hearing beginning November 27, 1978, to determine all of the facts, conditions, and circumstances surrounding the San Diego accident. The Board will analyze these facts and determine probable cause, and will submit recommendations to the FAA and others as to the steps that should be taken to prevent this type of accident from reoccurring.

The NTSB appreciates today's demonstration of your continued dedication to safety. We are here today at your request to present our views on collision avoidance, a complex and critical subject on which we have recommended action over the past 11 years.

We have been asked to focus on the development and implementation of collision avoidance system technologies, the problems created by the mix of general aviation and commercial air carrier traffic at major U.S. airports, and the utilization and development of reliever airports to reduce congestion at major traffic centers. Lastly, Mr. Chairman, we would like to respond to your request for an account of the facts the Board has adduced to date concerning the accident which occurred in this city.

As you know, Mr. Chairman, only a few hours after the tragedy occurred our investigators were on the scene of this Nation's worst civil air disaster here in San Diego on September 25. The fact gathering which started then is continuing and will include a public factfinding hearing to be held in this city during the week of November 27. It will take us until then to assemble and prepare the necessary data needed to have a full and complete discussion of the facts and issues of the accident. After the hearing, the Board will complete a rigorous and exhaustive analysis of the facts, and then issue a full report which, in the language we use, will identify the probable cause or causes of this accident. Our recommendations for improving safety may be made at any time during the investigation, analysis, or preparation of probable cause.

With respect to the San Diego midair collision, these are the facts as we know them:

PSA flight 182 was a regularly scheduled flight on an instrument-flight-rules plan from Sacramento to San Diego with an intermediate stop at Los Angeles. The flight was making its approach to San Diego under the control of the Miramar radar air traffic control facility. After advising Miramar that they were descending out of 9,500 feet to 7,000 feet, and that they had the airport in sight, PSA 182 was cleared for a visual approach to runway 27 and given traffic advisories regarding a Cessna 172 making a practice instrument-landing-system approach, ILS, to runway 9. PSA 182 acknowledged the advisories and informed approach control that they had the traffic in sight.

The Cessna 172, N7711G, was operated by Gibbs Flite Center based at Montgomery Field for instrument qualification of a commercial pilot accompanied by a certified flight instructor. After completing the simulated instrument approach to runway 9, the Cessna 172, also under the control of Miramar, was cleared to climb to an altitude of below 3,500 feet on a northeasterly heading of 070 degrees.

Twenty-two seconds after 9 a.m., the PSA flight was instructed by Miramar to maintain visual separation and contact the Lindbergh tower. Approximately 12 seconds later PSA did contact Lindbergh

tower and was then advised, "PSA 182, Lindbergh tower, traffic 12 o'clock, 1 mile, a Cessna."

Seven seconds later, PSA 182 replied, "OK, we had him there a minute ago." This transmission was acknowledged by the tower 3 seconds later. Two seconds later, at 49 seconds after 9 a.m., PSA again transmitted to the tower, "Think he's passed off to our right." The tower acknowledged this transmission 2 seconds later.

Two seconds after that, at 53 seconds after 9 o'clock, the tower asked PSA 182: "How far are you going to take your downwind, 182? Company traffic is waiting for departure." Four seconds later PSA replied, "Oh, about 3 to 4 miles." Six seconds past 9:01, Lindbergh tower cleared PSA 182 to land; 2 seconds later PSA acknowledged the landing clearance. Twenty seconds later—9:01:28—the conflict alert system at the Miramar approach control facility activated and remained activated until 9:01:59.

At 9:01:46, Miramar approach control transmitted to the Cessna, "Cessna 11 Golf, traffic's in your vicinity. A PSA jet has you in sight, descending for Lindbergh." The collision occurred at approximately 9:01:45. Since Miramar has no recording capability for its automated radar tracking system—ARTS III—it has been necessary for our investigative staff to use recorded radar data from the Los Angeles air route traffic control center located at Palmdale in order to determine if we can precisely identify what other traffic may have been in the area just before and at the time of the collision.

Mr. Chairman, I have with me charts and other materials from other accidents which if any of the committee is interested or would like to be updated on what we're trying to develop from this accident so they might understand fully the extent of time spent on our investigation, we would be more than glad to provide that for them either during this hearing or after or at their convenience, sir.

Mr. GOLDWATER. Would the gentleman explain what that has to do with your testimony.

Mr. KING. There has been from time to time question as to the tying the gap in time between the accident and the completion of our investigation. That has come up. What I want to do is to anticipate that if possible, and say that we do have materials we would be willing to share with you if you would find it useful.

Mr. GOLDWATER. You mean the question on why it appears you're dragging your feet?

Mr. KING. I couldn't imagine that it appears that way. But if there were a question as to what the procedures are that we go through, we would like to be responsive to you.

A total of 144 persons died, 135 persons in the 727, 2 in the Cessna, and 7 on the ground. In addition, 16 persons were injured on the ground.

During the 22 years since the Grand Canyon midair collision between two air carriers, U.S. civil aviation has had 537 midair collisions of which 291 have resulted in fatal injuries to the occupants of one or both aircraft. Midair collisions have accounted for 1,331 fatalities, or 4.3 percent of the total fatalities from all U.S. civil aviation accidents during this period.

Twenty-five of the accidents involved an aircraft operated by a major air carrier; 18 of these were collisions with a light airplane, 5 involved collision with a military airplane, and 2 were collisions of an

air carrier aircraft; 12 of the 25 accidents resulted in fatalities to occupants of the air carrier aircraft, a total of 574.

Thus, while the vast majority of midair collision accidents and fatalities occur between two general aviation aircraft, the high occupancy rate of air carrier aircraft means that a large number of the fatalities have occurred in those relatively few accidents involving air carrier aircraft. During this 22-year period, midair collision accidents have accounted for 9.9 percent of the total number of fatalities resulting from air carrier accidents.

There may be a tendency for some to take these statistics as evidence that the midair collision is not a serious problem. This contention might find even more support since when we look closer we find that over half of the midair accidents involving air carrier aircraft happened between the years 1965 and 1972, a period characterized by rapid growth in air carrier as well as general aviation with perhaps a corresponding lag in the introduction of new air traffic control concepts.

The San Diego accident is the first such accident since June 29, 1972. We of the Safety Board certainly recognize that this is no consolation to those who lost loved ones in that accident. Nor is anyone, particularly those of us whose business is transportation safety, satisfied based on the statistics that the midair collision is no longer a potential threat to air carrier aircraft. The PSA accident proved otherwise.

Too, the statistics would have told a much different story if two wide-bodied aircraft had collided with several hundred passengers aboard. We may remember that this almost happened over Carleton, Mich., when several passengers in a climbing DC-10 were injured as it took evasive action to avoid colliding with an L-1011 which was cruising at 35,000 feet. These two aircraft carried 319 passengers and crew.

Nonetheless, we do believe that the avoidance of major midair accidents over the past 7 years, a period during which the miles flown by air carrier aircraft has remained nearly constant and the miles flown by general aviation aircraft has risen from less than 3½ billion miles to nearly 5 billion miles, is not purely coincidental. Certainly, 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.

Whether or not more positive actions might be taken during this period, actions which would have prevented the PSA collision with the general aviation aircraft on September 25 is one of the questions which the Board will explore in depth at the hearing beginning on November 27, and will attempt to answer in its analysis of the facts of the accident following this hearing.

Several of the accidents involved one aircraft operating under an instrument flight rules flight plan, mostly the air carrier aircraft, which collided with an aircraft operating under visual flight rules, not under air traffic control.

The Safety Board has been concerned for many years that the "see-and-avoid" philosophy still followed in aviation, although it works most of the time, cannot be considered anywhere near 100

percent reliable to assure traffic separation, particularly in an area where there is a mix of controlled and uncontrolled traffic and a wide difference in aircraft performance. The human vision capacity, cockpit window restriction, visual illusions, atmospheric conditions, and aircraft noticeability are all factors affecting the pilot's ability to see another airplane. We know that the largest percentage of midair collisions involving general aviation aircraft occur in clear weather during daylight hours and at or near an uncontrolled airport.

Most of the Board recommendations based on midair collisions have recognized the limitations and reiterated our continuing concern about the see-and-avoid philosophy. We have constantly recommended actions directed toward supplementing the see-and-avoid concept with more positive separation methods. These have included the reduction of traffic mix through increased positive control; the development of collision avoidance hardware; the enhancement of aircraft noticeability, review, and improvement of air traffic control procedures; and other pertinent actions. Throughout this period, the Safety Board has recognized that the see-and-avoid concept was not likely to be completely replaced by positive control at all locations. Therefore, many of our recommendations dealt with calling for increased pilot awareness and positive training in visual scan techniques. In any event, the soundness of the see-and-avoid concept will also be an issue that will be addressed in some depth during the Board's hearing of the facts of this accident.

We have monitored the development of collision avoidance systems for the last 10 years. First the compatible airborne system, then the beacon-based system. We have urged technological development of a system which would automatically detect an impending collision and command the pilot to execute an evasive maneuver without need for human interpretation.

Such collision avoidance systems can make very positive contributions to safety and should be pursued, but even they will not provide a panacea for midair collisions. Other positive programs are also needed.

Regardless of the factors determined causal in the San Diego accident, we must take a closer look at present and predicted airport congestion and particularly the compatibility of general aviation and air carrier aircraft. As the environment becomes more saturated, complexities caused by a mix of users must be understood and managed.

The substantial growth of traffic into the hub areas will require constant surveillance to assure that air traffic control equipment and procedures are upgraded as necessary to keep pace with the problem. San Diego's Miramar facility last year handled almost 1 million flights. The facilities and equipment to handle increases in traffic must be provided as needed if we are to avoid an increase in risk to the traveling public.

Thus far I have addressed the midair collision as it involves air carrier aircraft. I believe that I would be remiss if I did not speak to the Safety Board's concern about collisions on the ground. Everyone, I am sure, is very much aware that the worst collision involving two air carrier aircraft occurred, not in the air, but on the ground at Tenerife in the Canary Islands on March 27, 1977. In this accident, 583 persons were killed.

We of NTSB participated in that investigation. And as you're aware, the Spanish Government released the results of that investigation just last week.

A summary of that, very briefly: A KLM B747 began its takeoff roll in restricted visibility and struck a Pan American B747 which was taxiing down the active runway. The Safety Board investigated an accident having similar circumstances at the Chicago O'Hare Airport in December 1972 in which there were 10 fatalities. We are currently investigating an incident which occurred at La Guardia Airport on June 21, 1978, involving a DC-9 with 93 occupants and a Cessna Citation. The local controller had cleared the Cessna for takeoff while ground control had cleared the DC-9 to backtrack on the same runway.

And, I think as recently as yesterday, we had a DC-8 and a Sabreliner at LAX in yet another incident.

Although solutions to the ground control problem are not directly related to the airborne-collision problem, we believe that any collision may present problems of great magnitude. Unfortunately, the risk of both will grow as the number of operations into the hub areas continues to increase.

The Vice Chairman of the Board, Mr. Elwood T. Driver, testified before the Subcommittee on Oversight of the House Ways and Means Committee on two separate occasions regarding the airport and airway trust fund and its impact on airport safety. The Safety Board's testimony was given on May 19 and September 21 of this year. Similar views were presented earlier by the Safety Board at hearings on January 24, 1978, before that same committee of the House. And I reiterated those views in testimony before your subcommittee, Mr. Anderson, on May 16 of this year.

One of the major points of the Safety Board's testimony on these occasions was the projected growth of aviation and the strain which has been placed upon the existing airports and airway systems. We strongly suggested that FAA work with the Congress to reexamine the funding limitations of the airport development aid program to assure proper emphasis on a major program to increase the capacity of existing airports and to build new ones if the need be. We advocated the development of reliever airports which are equipped with all-weather capabilities.

Mr. Chairman, we will provide that testimony for the record of this hearing with your permission, sir.

The CHAIRMAN. It will be made a part of the record by reference.
Mr. KING. Thank you.

As I have mentioned, the vast majority of midair collisions, about 30 per year, occur between two general aviation aircraft on a clear day in the vicinity of an uncontrolled airport. We can well envision that as traffic into the major hubs increases, so too will commuter and air taxi operations into these small, ill-equipped airports which offer needed service to smaller communities. To our knowledge, there is no program effort to insure that these smaller airports have adequate facilities to serve their increasing traffic.

In summary, the Safety Board recognizes that collision avoidance both in the air and on the ground is a complex problem. We recommend action in five areas.

One, positive control for air carrier from terminal to terminal. Ideally, this would mean such operations should be conducted in designated airspace wherein all traffic is known to air traffic control and is separated in accordance with specified vertical and/or lateral criteria.

Two, minimization of the mix between controlled and uncontrolled traffic. This could also include designation of additional positive control airspace such as terminal control areas and area positive control areas.

Three, minimum equipment standards and pilot standards desirable for general aviation which will jointly share a facility with air carrier aircraft. For example, establish upgraded requirements for mode C transponders to conduct operations within a terminal radar service area or terminal control area II airspace. Student pilot and certain types of training could be excluded from specified terminal areas but that means that we must have No. 4:

Development of reliever airports including facilities for all-weather operation to prevent straining the capacity at major terminals. This requires new airport construction or modernization of existing satellite airports. These airports should be equipped for instrument operations with facilities suitable to meet the needs of the flying public, including student pilots.

Five, the development of hardware and standards for a viable system which will warn pilots, at least those of aircraft carrying persons for hire, of an impending collision and provide them the proper evasive maneuver command without human interpretation.

It is our position that forceful programs are needed in each of these areas to assure aircraft separation.

Mr. Chairman, we wish to offer the report of the Safety Board and its recommendations when they are complete to the committee for entry into the record of this hearing.

The CHAIRMAN. Thank you, Mr. King. We would be very happy to receive the results of the investigation and make them a part of the record at the time they are presented.

Let me ask you: Why did the Board recommend the TRSA for Lindbergh rather than ATC?

Mr. KING. Mr. LaGrange, Lloyd LaGrange.

Mr. LA GRANGE. We recommended a TRSA rather than a TCA as a first step, so to speak. We have another recommendation which we just released yesterday, which restricts operations in a TRSA. So, we are taking a step-by-step process. The TRSA will provide stage 3 radar service at Lindbergh, and then we will take a further step to restrict VFR operations in a TRSA area.

The CHAIRMAN. I ask that in light of the fact that FAA will testify today to an impressive drop in near-miss incidents when comparing the before and after pictures for the existing terminal control areas. So, it seems you might have recommended going directly to a TCA.

Mr. LA GRANGE. We chose to recommend the TRSA as an initial step, sir.

The CHAIRMAN. Is the Board considering any recommendation to the FAA regarding instructions for controllers after a conflict alert is sounded?

Mr. KING. I think one of the problems you have in each of these is an individual situation. It's a question of what has occurred prior to the conflict alert. It is similar, for example, Senator, if I were to ask your permission to leave my seat and approach you, say, with a document. I would be in direct relationship with the gentleman on my right. If you said to me there was a gentleman with glasses and a pin-stripe suit and another gentleman in a gray suit and red tie, "Do you see them?"

And I said, "Yes."

And you say, "OK, then, why don't you bring the documents on up."

At that moment when I stand up, Senator, and turn, I am in a collision path with both of them. But at that time you're not concerned because I have assured you I have seen both people and I'm going to move away from them.

What I'm suggesting is you can have on an electronic device that doesn't have the intelligence, it merely has a program, that has an interpretive base. And that's why to give hard-and-fast rules could create some difficulties in this area. A preciseness of language, yes, but the situation I describe occurs on a regular basis where you ask for movement and a freedom to maneuver. The assumption is that that permits you as the pilot in command a certain freedom and versatility.

The CHAIRMAN. Well, it would seem to me that a controller could still be required to advise the pilot that he's getting a conflict alert on the scope.

Mr. KING. Yes, but what I'm saying, Senator: In many situations, especially at the high-traffic level, it will immediately create an alert depending on the system being used. In many of the systems this will happen. That's when you get a traffic advisory many times, in anticipation of that alert.

The CHAIRMAN. I want to compliment you for your suggestion that FAA reexamine the funding limitations for ADAP. I would add that the funding limitations for an F and E be reexamined as well.

Has the Board ever considered a special study of how aviation system safety might be improved by suggesting accelerating some of FAA's priorities?

Mr. KING. No, we haven't, Senator. One of the things we have done is, quite frankly, to establish a standard where economics isn't a part of the mix. There are other agencies who will speak to the economic side. So, we have not as a rule done anything in economic analysis. What we will do is deal with the straight safety area. Many of these questions are more policy-oriented. What we have spoken to is that we think they ought to take another look at what they see as their priorities.

The CHAIRMAN. Well, it would seem that you could certainly look at the priorities from a safety standpoint without worrying about the economic aspects.

Mr. KING. That we could, sir.

The CHAIRMAN. In your testimony you mentioned that the Board has monitored the development of collision avoidance systems.

Mr. KING. Yes, sir.

The CHAIRMAN. As you are aware, there is a heated controversy between FAA, who promotes the DABS data-link system, on one hand, and ALPA and the developer of the BCAS system on the other. Both make charges of flaws in the other system as well as attacking the time schedule projected by the opposing party.

Does the NTSB believe that FAA is pursuing the proper course in emphasizing DABS over a wholly airborne BCAS?

Mr. KING. Senator, we do not have the capacity in our Board to do the kind of evaluation at that level of technology. All we try to do is set a standard of performance and ask that it be met however the system is organized, as long as it works. We are interested not so much in how it's done but that it is done.

We have been assured across the board that technology is available to do whatever. So, really, we haven't been involved in those discussions. And as I say, we don't have the ability to do that kind of review, sir.

The CHAIRMAN. Has the Board in the past made any recommendations about conducting instrument flight training on an active air carrier runway?

Mr. KING. Say that again.

The CHAIRMAN. Has the Board in the past made any recommendations about conducting instrument flight training on an air carrier runway?

Mr. KING. Let me just check.

Would you take that, Mr. Laynor.

Mr. Laynor has the recommendations before him, Senator.

Mr. LAYNOR. Senator Cannon, I don't believe the Board has made any specific recommendations worded as you put it. However, the Board has made several recommendations in the past concerning the mix of traffic and the separation of air carrier aircraft from general aviation aircraft. Some of these recommendations were oriented toward the establishment of climb corridors, the lowering of PCA to TCA, and also the installation of equipment at satellite airports to allow training to take place in those areas.

The CHAIRMAN. Do you believe that all medium and large hub airports should be made TCA's as soon as possible?

Mr. KING. You are now moving to a policy question. I have no recollection of a Board position.

The CHAIRMAN. Would you check that and provide it for the record, please?

Mr. KING. Yes, sir.

[The following information was subsequently received for the record:]

NATIONAL TRANSPORTATION SAFETY BOARD,
Washington, D.C., October 18, 1978.

HON. LANGHORNE M. BOND,
Administrator,
Federal Aviation Administration,
Washington, D.C.:

SAFETY RECOMMENDATION(S)—A-78-77 AND 78

On September 25, 1978, Pacific Southwest Airlines Flight 182 and a Cessna 172, N7711G, collided in midair over San Diego, California. Flight 182 was on an instrument flight rules flight plan and had been cleared for a visual approach to runway 27 at Lindbergh Airport. The Cessna, which was on a visual flight rules

(VFR) flight plan, had completed a practice instrument landing system approach to runway 9 at Lindbergh Airport and was proceeding northeast. When the collision occurred Flight 182 was communicating with Lindbergh tower, while the Cessna was communicating with the Miramar Radar Air Traffic Control Facility (RATCF).

Investigation has revealed that a Terminal Radar Service Area (TRSA) with Stage III service (radar sequencing and separation service for VFR aircraft) had been established at Miramar Naval Air Station, the primary airport in the San Diego, California, terminal area. Only Stage II service (radar advisory and sequencing for VFR aircraft) is available at Lindbergh Airport, which is classified as a secondary airport. Because of the mixture of air carrier and general aviation aircraft operating in and out of Lindbergh Airport, the Safety Board believes that a TRSA should be implemented for that airport so that other users can benefit from the same level of air traffic control service as is afforded military flights in the San Diego terminal area.

We realize that a TRSA may not have prevented the midair collision between Flight 182 and N711G since visual separation is still being used in all terminal areas. Nevertheless, we believe that a TRSA would lessen the probability of a midair collision and would be a logical first step toward equalizing the ATC services available to all users of airspace in the San Diego terminal area.

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

Implement a Terminal Radar Service Area (TRSA) at Lindbergh Airport, San Diego, California. (Class I-Urgent Action) (A-78-77).

Review procedures at all airports which are used regularly by air carrier and general aviation aircraft to determine which other areas require either a terminal control area or a terminal radar service area, and establish the appropriate one. (Class II-Priority Action) (A-78-77).

King, Chairman, Driver, Vice Chairman, McAdams and Hogue, Members, concurred in the above recommendation.

James B. King, *Chairman*.

The CHAIRMAN. And the final question: Do you have a schedule proposed for releasing the probable cause finding on the San Diego accident?

Mr. KING. We have a schedule for hearing. Once we gather those facts, we go into the analysis phase. We don't have a date certain. We do have an approximate time. It should run about 3 to 4 months following that hearing, if there are no additional technical problems that arise. In some cases we have simulated computer models that we use. Those take a substantial amount of time, Senator, and they have been one of the areas where we do bog down because we use other equipment. Generally, if all the material is up front, it will take us 3 to 4 months to run the cycle from that period, sir.

The CHAIRMAN. Thank you.

Congressman Anderson?

Mr. ANDERSON. Thank you, Senator.

Mr. King, you mentioned that the Board had made several recommendations on the midair collision problem. Have you made any recommendations covering the need to improve pilot training in scanning techniques? And what has been the FAA's response?

Mr. KING. I'll ask Mr. Laynor.

Mr. LAYNOR. Yes, sir, Mr. Chairman, the Board has put out recommendations concerning visual scanning techniques in training and the need therefor. There are several of these recommendations which were released after an accident involving a North Central Convair and an Air Wisconsin Twin Otter in June of 1972. One of the recommendations was to develop standards for visual search techniques to be used by instructors and check pilots in all training, certification, and proficiency check flights when pilots are operating in visual meteorological conditions.

There were other types of recommendations, and the recommendations were in some cases closed unacceptable action. The reason for the closed unacceptable action in most cases is that the recommendations call for a very specific action on the part of the FAA. FAA's response was that they were using other techniques to include visual scanning into the training programs. However, they did not specifically develop and publish standards as we requested.

Mr. ANDERSON. Would you give us a specific example.

Mr. LAYNOR. Well, the one I just read is a specific example: Develop and publish standards for visual search techniques to be used by instructors—

Mr. ANDERSON. When was this published?

Mr. LAYNOR. This was released in 1973. It was released in August—I'm sorry, May of 1973. The FAA response was that they're using a system approach for prevention of midair collisions which has included Federal aviation regulations amendments, improved air traffic equipment, procedures, techniques, and programs.

Training techniques used by instructors are under constant surveillance. Although a specific standard of time sharing between the outside scanning and cockpit instrument scanning is not established, time sharing is stressed to all student pilots and is an in-flight item in all air carrier and air taxi group inspections. This was closed by the Safety Board as unacceptable action primarily because it did not specifically act to our recommendations to develop and publish standards.

Mr. ANDERSON. What you're saying is, then, that the FAA did not follow or accept the Board's recommendation in these cases?

Mr. KING. That's correct, Mr. Chairman.

Mr. ANDERSON. I have other examples here. I was looking at a different one for 1973 where a recommendation was made to develop and publish standards for visual search techniques to be used by instructors and check pilots in all training, certification and proficiency check flights when pilots are operating in VMC. And the NTSB notation was "unacceptable action."

I have another here in 1970 which was, again, in the same area. It required pilots to be given ground training in scanning patterns optimize aircraft detection, et cetera. And, again, the recommendation was unacceptable.

Now, has this been the pattern, your recommendations have been—they say, "We are doing something else, and so we don't like what you recommended"?

Mr. KING. Let me just answer in a broad way. Of the recommendations we have made to the FAA, they have accepted about 64 percent. We have got about 20-some odd percent that had been rejected and about 16 percent were under research, some sort of research was started on the specifics. That's on the broad base.

On the specifics, though, on the scanning techniques, I believe, though, that's been an area where we have had problems in training.

Is that not correct, Mr. Laynor?

Mr. LAYNOR. Yes, sir. We have had some recommendations on training which have been closed acceptable; we have had some which we have closed unacceptable.

Mr. ANDERSON. You say FAA said, "We are using other techniques which we think are better." Did you then agree with their substitute answers to your recommendations?

Mr. KING. No, sir. We closed them unacceptable. The reason is that we have a number that we keep open, that we keep——

Mr. ANDERSON. What happens, then, when there is a disagreement and FAA says, "We're doing something that we think is just as good," and you feel it's not. Do you stop then, or do you keep probing, or what do you do then?

Mr. KING. I have made a policy, since I have been with the Board, that we then evaluate it. If we think it's an important issue, we become a pebble in their shoe. We include it in our testimony. We make it a specific point when we appear before congressional committees, that we highlight those areas whenever possible, where we have a concern.

In some areas, though, there is a question of pushing between various staffs as to which method is better. We offer any agency that we work with flexibility of having alternate action. When we close out as not acceptable, it generally means that there has been just a denial. It's been a problem where they believe the techniques they're using in fact work.

Mr. ANDERSON. Are you going to be looking into this specific area in light of the recent accident here?

Mr. KING. We have had several. We have so much commitment to the see-and-avoid concept and philosophy in the rules. Quite frankly, we were reviewing a midair yesterday, the Memphis accident that occurred in May of this year. We took a look at the rule. The rule is one of those that announces virtue, but it doesn't provide the kinds of equipment to the airman to carry out a full see-and-avoid approach. And that's why the training is part of it.

It's a mix of things, not a single piece of hardware, a single training technique. It's almost a recipe that has many ingredients that are blended together to meet the situation.

Mr. ANDERSON. You answered this partially on Senator Cannon's question before, but I would like to go a little further. In your view, Mr. King, has the terminal control area concept been successful in lessening the possibility of midair collisions?

Mr. KING. The answer is "yes."

Mr. ANDERSON. Has the Board made any recommendations to the FAA to increase the number of TCA's in this country?

Mr. KING. What we're doing today is talking about positive control, and I think we're not—I'm back to what we like to do, is have the standard, or performance standard, rather than saying, "Here is the way we think you ought to do it." We're saying we believe you should have positive control from gate to gate and what it takes to give that. That obviously is aircraft separation. And whatever it takes to do that should be done.

Mr. ANDERSON. I was trying to satisfy in my own mind why we do not have a terminal control area established here in San Diego. And in your comments you mentioned that San Diego had a million——

Mr. KING. Miramar did. What we did is to take a look—I think San Diego has approximately 76,000 or 78,000 flights. There are 14 airports in this area, including Tijuana, which comes in under Miramar. So, from what we could gather just talking to the folks out here, some of the travel patterns in general aviation—for example, commuter

folks traveling 35 to 50 miles. So, they go from one airport to another. So, they're flying through this airspace. It's a mix of controlled and uncontrolled.

So, there is a substantial amount of traffic, as it were, as you look on your screen if you were a controller. And that's why when we talk about the interrelation of reliever airports, we talk about a transponder with mode C. So, we have an idea what's out there. We start to improve the quality of the air traffic control aspect, so then we can start the kind of separation that everyone should have. Fortunately, in this area there's a very heavy mode C transponder utilization.

Mr. ANDERSON. With all the aircraft activity in the San Diego area, I was wondering why it's one of the large cities that has not had the TCA established. I mean, I see them in other communities: Kansas City, New Orleans, and so forth. I would assume San Diego is as active as they are. You put all these other airports in the San Diego area together, I would have thought that it would have almost been a priority. Yet I see that grade I TCA's are operational at New York, Boston, Dallas, Washington, Miami, Chicago, and Atlanta.

Mr. KING. You're looking at the FAA set of priorities. We don't establish those, and I think—

Mr. ANDERSON. We will be asking that of the FAA, but I was wondering what your feeling was as to why San Diego doesn't have a TCA. Have you had any comments on that?

Mr. KING. We don't because we don't do that evaluation as part of our program. If it comes out of accidents, as you have raised, then sometimes we do get involved, as the Senator mentioned, in certain types of special studies. Again, within resources of our Board.

When I say that, that is not a "cop out," Mr. Chairman. I would like to just say that we're probably one of the smallest Federal agencies. Our total number of folks right now is 377. This week we have the marine accident, a collision involving a Coast Guard vessel; we had a gas pipeline explosion in Houston. And we had the San Diego case. All those just in a short period.

So, our folks are just doing catastrophic accidents that we are mandated to do. We don't have the resources to do the sort of reviews you suggest in those areas unless we're specifically directed, and then we try to allocate what limited resources we have left in taking a look at some of these. Then there are some situations we don't have any capacity to act on.

Mr. ANDERSON. We agreed earlier to limit ourselves to 10 minutes, and I've just been told my 10-minute first round is up. Thank you very much.

The CHAIRMAN. Congressman Stump?

Mr. STUMP. I have no questions.

The CHAIRMAN. Congressman Ertel?

Mr. ERTEL. Thank you, Mr. Chairman.

Mr. King, in your statement you had recommended positive control for air carrier aircraft from terminal to terminal.

Mr. KING. Yes, sir.

Mr. ERTEL. In general aviation it's been common practice—and I understand also in air carriers—that you would go IFR and cancel your IFR and go VFR and cut off the time for landing and so forth. Are you recommending that not be done?

Mr. KING. That's correct, sir.

Mr. ERTEL. In other words, you're going to recommend that everything continue through with the IFR with no cancellation at any time?

Mr. KING. With air carriers. What we're into is visual separation. One recommendation we have made on that is that we would like the pilot to have to initiate the request for visual separation, except when sequencing for their final approach with radar monitoring, but we feel that the assurance of separation by see and avoid is questionable. That's what we're talking about, the see-and-avoid concept.

At today's operating speeds, the kinds of problems that seem to occur is going to have to be looked at, and what we're establishing is, quite frankly, a model which you might say might be the ideal. And that's what we're doing. We feel we should have at least established what could be and then have others work with and mold what they feel they can work with. But we feel that way we can get positive assurance of separation.

Mr. ERTEL. Since most of the midair collisions are general aviation accidents, are you suggesting, then, this will be the model, and you would recommend this for general aviation as well?

Mr. KING. No. I think what we're expressing, I believe, in the testimony I gave is that, although air carriers represented a small number of the actual midairs that occur, they have such a substantial number of the actual fatalities, that that's the protection we're concerned with, collision avoidance in air carrier areas.

We would like to permit general aviation, and that was the crucial part of my comments on reliever airports, that many times the general aviation community doesn't have an option. It can't go out and can't train, you know. We want student pilots out there. Quite frankly, everyone in our agency are aviation boosters, and we want them out there. We think they have a place there. We think they serve a need. But we want them to have an opportunity to get the kind of training necessary to have the high level of skills, but be able to do it in a place that would be comfortable to all.

For example, Chicago comes to mind. The average person flying to Chicago in general aviation would rather go to DuPage than go into O'Hare because the facilities are there. So, you have a good reliever airport for general aviation.

But if you're 50 or 60 miles, 40 miles from where your destination is, going into a general aviation base with all-weather ability, that doesn't become a viable reliever. What we would like to do is see some of the allocation of ADAP funds for this. It's there. We'd like some of those things weighed and developed for reliever airports for aircraft, where the general aviation community can flourish next to that air carrier system.

Mr. ERTEL. If I just may turn to another subject for a moment. You were talking about setting up a visual scanning practice or technique and trying to utilize that as a means of separation of aircraft. It seems to me that's a positive need by a pilot or an observer. He's got to actually exercise that. And we all know that humans are subject to error and they do not continue the vigilance we expect.

Would it not be easier to try and get some sort of system in addition to that which would alert or intrude upon the pilot so that he would not have that positive control at all times?

I'm thinking more of an alarm system, proximity alarm. And, second, is that feasible based on the research at the present time?

Mr. KING. We have it under research, but I would be remiss if I told you I wasn't aware of such a system used in rotor craft. I believe Congressman Goldwater is familiar with it. It's part of a total system. But, again, it's rotor craft. It's a product that is available now.

The closing speeds, as you know, for rotor craft, as opposed to fixed wing, are different. If you talk to the folks that are at the Army training base at Fort Rucker, Ala., they tell you about their training techniques, changes in operating procedures including the use of designated corridors for traffic separation. Everyone agrees that even with the proximity warning devices that are in the cockpit these other changes have likely been a factor in the reduction of midair collision accidents.

By the way, they now use strobes. The base commander at Fort Rucker tells me the Army training facility had six midairs on their last year before they put this whole package together. And in the following 9 years they have had one fatal midair and one incident as compared to six midairs, I believe it was, in 1969. So, in their case they dealt with their particular individual problem at that base, and they have had a great deal of success.

We are now trying to talk about an international system, in many ways. Because we are the world leaders in aviation we want something that will work in a universal setting.

Mr. ERTEL. Thank you very much. I have no further questions.

The CHAIRMAN. Congressman Goldwater.

Mr. GOLDWATER. Thank you, Mr. Chairman.

Mr. King, —

Mr. Chairman, I've got to say that I'm having a very difficult time hearing the witnesses.

Mr. KING. Let's try it from here. If it doesn't work for me, it won't work for anybody.

Mr. GOLDWATER. There's a lot of garble. It sounds like we're on the planet Mars.

Mr. King, earlier this year the NSTB testified before the Ways and Means Committee, and listed seven vital steps necessary for air safety. You recall that testimony?

Mr. KING. I have a recollection of it; yes, sir.

Mr. GOLDWATER. I'm going to list those recommendations that you made, and I would like to have you tell this joint committee if anything from your observations—and I'm sure you monitor those recommendations—has been done by the FAA to alleviate the safety problems in the last 9 or 10 months. I'll list them in the same order you did back in January. And after each one I would like to invite your comment on whether you feel FAA has been responsive, whether they're moving in the right direction, or what have you.

The first one was instrument landing systems.

Mr. KING. Have they been moving? Have they increased the number?

Mr. GOLDWATER. You made that as a recommendation back—

Mr. KING. When we talked—I'm now hearing the same sound.

The CHAIRMAN. Move a little farther away.

Mr. GOLDWATER. Sit back in your seat.

Mr. KING. What we wanted was, again, on the ADAP funds, that increase. This comes to the reliever airport question again. When we're talking reliever, we're talking all-weather. I don't have the latest numbers before me. I would be glad to supply them for the record, of how many ILS's have been installed since then. I do not have the numbers with me.

Mr. GOLDWATER. Does any of your staff?

Mr. KING. I don't believe they do.

Mr. GOLDWATER. What about runway grooving? You made a recommendation that we ought to be doing more of that. Are you satisfied they're moving in that direction?

Mr. KING. Again, unless we see the figures that we would have—we would supply for the record.

Mr. GOLDWATER. How about visual approach slope indicators?

Mr. KING. Same for the record.

Mr. GOLDWATER. How about wind-shear equipment? Are you satisfied the FAA is moving ahead on those recommendations that you have made?

Mr. KING. On the wind shear, I know that NAFEC had put out, I believe, several locations they have selected to have on-ground stations for data. We're still waiting to see what the results are and whether it can have broader application. But we have nothing at this time.

Do you mean have they moved with the sort of speed we would like to have had?

Mr. GOLDWATER. Yes.

Mr. KING. So far, no.

Mr. GOLDWATER. So far no?

Mr. KING. No, sir. But, again, they could respond to you as to what problems they have run into.

Mr. GOLDWATER. What?

Mr. KING. They may wish to respond to you as to what problems they have run into.

Mr. GOLDWATER. I would assume the NTSB, if you make those recommendations, you would be monitoring whether in fact they are responding positively to those recommendations and, if they're not, why?

Mr. KING. Right. I can supply that for the record from our quarterly data. I don't have it with me, sir.

Mr. GOLDWATER. These hearings are about aviation safety.

Mr. KING. Yes, sir.

Mr. GOLDWATER. I would expect our witnesses would have some knowledge about what the FAA is doing in this regard. And why do we need to submit them for the record? It would seem to me that safety is paramount in regard to aviation transportation, and that's one of your jobs.

Mr. KING. Yes, sir.

Mr. GOLDWATER. Don't you monitor that?

Mr. KING. Yes, we do, sir.

Mr. GOLDWATER. Then, why don't you know the answer?

Mr. KING. I don't have the data. I don't carry it with me. Again, the number of questions, as it was laid out for me, we would be glad to have

the material if we have an idea of the direction. We will have the material with us anytime, sir, because we do want to be responsive to the Congress. And the best we can do at this time is to offer it for the record.

Mr. GOLDWATER. It just seems to me that ought to be one of those subjects that's always in the forefront of your mind. Obviously, you're concerned about pipelines and railroads, but aviation safety, when we have an aircraft accident that makes a lot of headlines, it would seem to me you would want to be responsive to any questions that would arise.

Mr. KING. We will be, sir, and we are.

Mr. GOLDWATER. The question is: Why don't you know this information now?

Mr. KING. Quite frankly—

Mr. GOLDWATER. Why don't you know the status of those recommendations that you made almost a year ago? You wouldn't have made those if they weren't important.

Mr. KING. That's correct.

Mr. GOLDWATER. If they were important, obviously, you would monitor those and you would know on a fairly current basis the status, whether the FAA is responsive enough, and you're saying you don't know?

Mr. KING. No, we have the information. We can provide it, sir.

Mr. GOLDWATER. All right. That's what we're holding the hearings for.

Mr. KING. I can't provide it at this moment because the records—these are substantial records. There is a 6 unit flow of information back to us, and I would have to pull the particular items.

Mr. GOLDWATER. That's the purpose of these hearings, to find out. I have a great respect for the NTSB, and I think it's a very useful agency of our Government set up to monitor aviation safety.

Mr. KING. Yes, sir.

Mr. GOLDWATER. It's similar to an arm of the Congress. If that is one of your missions, it would seem to me you would know on a very current basis all of these things that we're talking about that are important to aviation safety, and the recommendations you just don't make in vain and then just go home and walk away from them. You have two members of your staff that obviously are or should be as knowledgeable as yourself on this; that's what these hearings are about, to get some answers, not to be submitted 6 months from now, but to be submitted right now. You're the expert.

Mr. KING. Congressman, we were asked to come to this particular site to talk about midair collisions. We did try to prepare. We do want to be responsive. There is no question about it. Had we known of your interest in the national ILS construction program, we would have had that data, and I would have been able to respond to your specific questions. We would have had these answers ready for you. We do want to be responsive.

Mr. GOLDWATER. I don't want to prolong this discussion, but it just seems to me whether we're having a hearing or not, if I stopped you on the street, you ought to have those kinds of answers because they're just that important. You wouldn't have made those recommendations almost a year ago if you didn't think they were important. If they were important, it would seem to me you would be very current

as to whether the FAA is responding or not and not just waiting for a public hearing to get up to speak, which you didn't really do in this case except for collision avoidance. I'm a little disappointed.

Let me ask you this question: How do you think your relationship with the FAA is at this particular time? Is it a close working relationship?

Mr. KING. I think you might characterize it as remaining a constant one of creative tension.

Mr. GOLDWATER. It's what?

Mr. KING. Creative tension.

Mr. GOLDWATER. Creative tension. What does that mean?

Mr. KING. That means they're somewhat uncomfortable with us. They have a product they have to deliver on a daily basis. We don't. We come in and basically kind of look over their shoulder. We look, you know, into the safety areas through our accident investigations. They are parties to virtually every accident investigation we are in. Most of our recommendations for correction are directed toward FAA where that's felt to be necessary. So I imagine that they view us somewhat guardedly. You know, they're professional folks, but I don't think they're always thrilled to see us when we come over the horizon, sir.

Mr. GOLDWATER. You're a nuisance to them, is what you're saying. But the question I asked: Do you have a good working relationship with them? Do you exchange information? Do you have working dialog on a daily basis? Do you have people that work with their technicians and their experts in various fields?

Mr. KING. On a staff level there is an ongoing relationship.

Mr. GOLDWATER. Are you sure of that?

Mr. KING. To the best of my knowledge, that is true. I have no reason to doubt it. I mean, I see it at meetings, both in the formal quarterly sessions for reviews, which are formal, but I also see it on a basis where I can turn and ask what would be a junior person in our technology section as to what's happening in a given area and giving me very close update as to what's going on in FAA.

Why? Because his colleague is a GS-13 in their technical areas. He is talking with him. There is an exchange of information on a professional level, not really on a agency level. The other thing is physical proximity, Congressman. We would like to say that they're in the NTSB building. They think because we hold only 5 percent of the space in the building we're in the FAA building. So, that gives you at least an idea of the relationship.

Mr. GOLDWATER. Do you feel captive? Is that what you're saying? You want your own building?

Mr. KING. No. When I leave the agency, I hope I can still tell you it's one of the smallest agencies in Government and also one of the most effective.

Mr. GOLDWATER. Are there any problems with this relationship that you see concerning which you could make recommendations for changes?

Mr. KING. I think that one of the things that we have done is, whenever possible, create the climate—and we work with the Congress to create that climate—that change can occur. Again, the directions we take or the suggestions that we make, fit into a total pattern. Some of

them deal in individual accidents and some of them we try to extrapolate from them to reflect on broader issues.

I would say across the board in FAA there are many different opinions, as I'm sure you're aware, Congressman, but they find the NTSB very, very useful. There are those areas of real kinship because we know they're concerned about certain areas of aviation safety, and they know we speak with that voice, so they will bring material, they will raise issues with us. We found the relationship on that staff level very, very productive. We think it's a very wholesome thing. We encourage it.

Mr. GOLDWATER. One last question, Mr. Chairman. I appreciate your tolerance.

Have you made a review of all major airports as to safety questions and made recommendations to the FAA?

Mr. KING. No, sir. We do not have the physical capacity to do that.

Mr. GOLDWATER. Do you have the legal authority to do that?

Mr. KING. Our mandate really is accident investigation. And then from there to separate the issues and to present them both to the agencies and to the Congress in testimony. So, our mandate is really that. At this time we don't have the capacity. If the Congress asked us to or directed us to, we would certainly attempt to do the appropriate thing.

Mr. GOLDWATER. Have you ever made a request?

Mr. KING. No, sir.

Mr. GOLDWATER. Is not one of your mandates to the safety of aviation transportation, and make recommendations?

Mr. KING. Yes, sir.

Mr. GOLDWATER. Do you have to wait until an accident occurs before you make a recommendation?

Mr. KING. Not as a rule, but historically that's what the Board has done.

Mr. GOLDWATER. Historically?

Mr. KING. Yes, sir.

Mr. GOLDWATER. And from now on?

Mr. KING. I think, as I had suggested, we have tried to change that pattern. As we're writing our opinions, we are trying to broaden them. Rather than dealing with each individual accident and saying only things that dealt with that accident. For example, in the recommendation that came out recently, one sentence in there I think is a bit revealing, if I might share it with you.

We realize that a TRSA may not have prevented the midair collision between flight 182 and N7711G since visual separation was still being used in all terminal areas. Nevertheless, we believe that TRSA would lessen the probability of midair collision and would be a logical first step toward the implementation of ATC services available to all users of air space.

You could say that we might be criticized by people saying, "You should stay within the parameters, you know, of the accident and not step out of them." But we are coming out of them.

Mr. GOLDWATER. I would suggest that if you would have made a review of the airport ahead of time you would have found out that they have this opposite approach to practice landings and, hopefully, you would have made a recommendation that that in itself was a dangerous practice. Before an accident happens. Your mandate is to take a look at aviation safety and make very forceful recommendations.

The CHAIRMAN. Thank you.

First, may I say, Congressman Goldwater, in fairness to Mr. King, we requested information on collision avoidance systems, ATC procedures, and other matters directly affecting midair collisions rather than information on all past NTSB recommendations and their current status. But we can certainly ask Chairman King to furnish for the record the current status of past recommendations that have been made from the standpoint of aircraft safety.

In the notice on the hearings here, we said the hearing will focus on the development and implementation of collision avoidance system technologies, the problems created by the mix of general aviation and commercial air carrier traffic at major U.S. airports, and the utilization and development of reliever airports to reduce congestion at major traffic centers. So, we did not ask for as broad a scope as you were actually requesting information on. For instance, the grooving of runways would have little effect on the focus of these hearings. Or the effect of wind shear off the end of the runway. Installation of wind-shear equipment. So, I just wanted to get the record straight. But we will have that information provided.¹

Congressman Anderson, that brings us back to you.

Mr. ANDERSON. I just have one more question, Mr. King. Have you made any recommendations which would require better lighting of aircraft or other means to make aircraft more conspicuous?

Mr. KING. Mr. Laynor.

Mr. LAYNOR. Yes, sir, Mr. Chairman, we have made such recommendations. I could probably dig them out if you wish me to go through a number of pieces of paper here. We have made recommendations since 1969, when we held a hearing on the midair collision problem. One of the recommendations that came out of that hearing was increased conspicuity of aircraft. Anticollision lights and strobe lights were, of course, a part of that recommendation.

Mr. ANDERSON. What has the FAA done with your recommendations?

Mr. LAYNOR. In general, the FAA has encouraged the use of anti-collision lights. They have not required the use of strobe lights. They have responded—

Mr. ANDERSON. Did you ask they just be encouraged or they be mandated?

Mr. LAYNOR. We asked they be required. They are presently not required during daylight hours in VFR conditions.

Mr. KING. Just as an additional item: There is some discussion that in daylight a strobe, although its hits you harder in twilight is no different than the usual anticollision flasher. That is from technical reports. But I found it interesting when we were talking to the folks who said they found that in haze and other kinds of background situations, generally the kind of a white background that you run into, that strobe lights are very effective. We talked to pilot after pilot who said he couldn't make out the aircraft but he could see the light in daylight. And that's one of the reasons that we have pursued this.

I know that our strobe light recommendations go back historically. FAA may wish to respond to that directly themselves.

¹ See p. 26.

Mr. ANDERSON. I have no more questions.

The CHAIRMAN. Question, Mr. Stump?

Congressman Ertel.

Mr. ERTEL. Thank you, Mr. Chairman. Just a quick question.

Did the Cessna have any strobe lights on?

Mr. KING. I would ask Mr. LaGrange, who worked directly with that to answer.

Mr. LA GRANGE. The Cessna was equipped with strobe lights. We have not been able to determine if the strobe lights were turned on at the time of the collision. We did interview a pilot who flew the aircraft the day before the accident, and he used the lights. As to whether or not they were being used at the time of the collision, we have not been able to determine this yet.

Mr. ERTEL. If I may, one further question. Since you testified and I asked you a series of questions, Mr. King, I received an oral summarization and statement of the Airline Pilots Association—have you read that, by chance?

Mr. KING. No, sir, I have not.

Mr. ERTEL. I'll try and summarize it quickly. It's rather extensive. They indicate that in November of 1969 your Board had a hearing as a result of 19 midair collisions on the concept of see and avoid. And you recommended at that time that the FAA develop a collision avoidance system for airlines and other large aircraft, and a proximity warning indicator for smaller aircraft.

Then they followthrough with a series of events leading up to and including February of 1976, where the FAA told the Senate Aviation Subcommittee about its current work on collision avoidance systems. In a letter after that, it said they were developing such a system and expected to issue a national standard for the system by July of 1977. I guess that was changed again and has never been implemented in any way, shape, or form.

Now, you originally had the recommendation in 1969. Not you personally, but your Board.

Mr. KING. Right.

Mr. ERTEL. What have you done to insure such a system?

Mr. KING. We cannot do anything to insure anything happening.

Mr. ERTEL. I understand that. But you said you were the pebble in the shoe. How big a pebble are you?

Mr. KING. I can say as recently as yesterday, upon reviewing the Memphis midair, we have asked the FAA that we would like their benchmarks issued for the public as to what their timetable will be and when they prepare to implement it. And we would like something better. As I suggested, there is a tendency, you know, when we use the calendar as opposed to the stopwatch there are times when we talk to agencies and they respond in terms of the mid-80's. We would like a more precise response so we have some benchmarks to hold everyone to. And then, if there is a problem, that can be articulated in a public arena rather than having it merely set back and rescheduled.

That was as recently as yesterday.

Mr. ERTEL. Does it take a midair collision of this scope to require that you try and force through some implementation? We're talking now of a period almost 9 years.

Mr. KING. Yes, sir.

Mr. ERTEL. And I don't think it's a very technically tough problem to solve, just from the limited experience I have had in that kind of field. It just seems to me somebody should have been addressing this problem before we had this kind of an accident.

Do you have any comment on that at all?

Mr. KING. I don't disagree, sir.

Mr. ERTEL. Thank you very much.

The CHAIRMAN. Congressman Goldwater?

All right. Thank you very much, Mr. King.

Mr. KING. Thank you, Mr. Chairman.

[The following information was referred to on p. 24:]

NATIONAL TRANSPORTATION SAFETY BOARD,
Washington, D.C., October 30, 1978.

Hon. LANGHORNE M. BOND,
Administrator, Federal Aviation Administration,
Washington, D.C.

DEAR MR. BOND: Beginning with the Safety Board's testimony before the Subcommittee on Oversight of the House Committee on Ways and Means on January 24, 1978, and in subsequent hearings, the National Transportation Safety Board has expressed its opinion on the use of Trust Fund monies for the enhancement of airport safety. Among the safety items we have recommended are:

The installation of precision instrument approach systems (ILS/MLS)

The installation of visual approach slope indicators (VASI)

The installation of wind shear measuring equipment

A retrofit program of frangible approach light structures

Runway grooving

The lengthening of extended runway safety areas to 1000 feet

Although the recommended equipment is aimed primarily at air carrier airports, we believe that some of it is applicable to other types of airports as well. In testimony before several Congressional committees, the Safety Board expressed its concern over the adequacy of reliever and air commuter airports and stated its belief that these airports should be equipped to a level comparable to that of air carrier airports.

During the Congressional Hearing in San Diego, California on October 27, 1978, the Chairman was asked for status report on the aforementioned recommendations. We in turn pass the request on to you. Specifically, we would like to know the following:

The number of instrument landing systems (ILS) installed in FY 1978 on air carrier, reliever, air commuter, and general aviation airports;

The number of designated air carrier and commuter airports that are not yet equipped with an ILS;

The number of ILS installations planned for FY 1979, and their locations;

The status of the VASI installation program for nonprecision runways; the planned installation for FY 1979 and their locations;

The number of runways grooved or treated to date;

The status of the frangible approach light structure retrofit program and the number of new frangible structures installed since the program began;

The number of extended runway safety areas that are planned for extension to 1000 feet;

The status of the wind shear measuring equipment research and development programs.

We appreciate your cooperation in this request.

Sincerely,

JAMES B. KING, *Chairman.*

DEPARTMENT OF TRANSPORTATION,
FEDERAL AVIATION ADMINISTRATION,
Washington, D.C., December 27, 1978.

HON. JAMES B. KING,
Chairman, National Transportation Safety Board,
Washington, D.C.

DEAR MR. CHAIRMAN: This letter supplements our interim reply of November 20 in response to your request of October 30, 1978, for status information regarding a number of Federal Aviation Administration plans and programs.

Your request focused on eight specific areas of interest, resulting from questions raised at the Congressional Joint Hearing held in San Diego on October 27.

I believe the enclosures to this letter provide the information which the Board needs for its response to the Congress.

Sincerely,

LANGHORNE BOND, *Administrator.*

Enclosures.

ENCLOSURE 1

INSTRUMENT LANDING SYSTEMS (ILS)

The number of instrument landing systems (ILS) installed in fiscal year 1978 on air carrier, reliever, air commuter, and general aviation airports:

	Full ILS	Partial ILS
Facilities and equipment:		
Air carrier.....	12	30
Reliever.....	0	1
Air commuter.....	1	0
General aviation.....	1	0
ADAP: No ILS installed.		

The number of designated air carrier and commuter airports that are not yet equipped with an ILS:

Air Carrier.....	126
Commuter.....	90

The number of ILS installations planned for FY 1979, and their locations:
No ILS installations for fiscal year 1979 are planned under ADAP.

Under F&E, 68 ILS installations for fiscal year 1979 are scheduled as follows:

	Runway	Scheduled commissioning date	Type installation
Allegheny, Pa.....	9	June 1979	Full ILS.
Baltimore, Md.....	33L	January 1979	Do.
Binghamton, N.Y.....	16	November 1978	Glide slope/ middle marker.
Cedar Rapids, Iowa.....	27	May 1979	Full ILS.
Chattanooga, Tenn.....	2	November 1978	Glide slope/middle marker.
Colorado Springs, Colo.....	17	July 1979	Full ILS.
Denton, Tex.....	17	October 1978	Do.
Escanaba, Mich.....	9	January 1979	Glide slope/middle marker.
Greensboro, N.C.....	5	May 1979	Full ILS.
Houston, Tex.....	32	do.	Do.
La Guardia, N.Y.....	31	September 1979	Do.
Lexington, Ky.....	22	January 1979	Do.
Madison, Wis.....	18	December 1978	Do.
Messena, N.Y.....	5	October 1978	Do.
McAlester, Okla.....	1	June 1979	Partial/just localizer.
New Orleans, La.....	28	March 1979	Full ILS.
Orlando, Fla.....	18R	June 1979	Do.
Pittsburgh, Pa.....	28R	do.	Do.
Portland, Maine.....	29	January 1979	Do.
Rhineland, Wis.....	9	September 1979	Do.
Sioux Falls, S. Dak.....	21	June 1979	Do.
Springfield, Ill.....	22	September 1979	Do.
State College, Pa.....	24	November 1978	Do.
White Plains, N.Y.....	34	August 1979	Do.
Wilkes Barre, Pa.....	22	February 1979	Do.
Youngstown, Ohio.....	14	December 1978	Glide slope/middle marker.
Chamblee, Ga.....	20L	January 1979	Glide Slope.

	Scheduled		
	Runway	commissioning date	Type installation
Dayton (Municipal), Ohio.....	24R	February 1979.....	Glide slope/middle marker.
Detroit (City), Mich.....	15	do.....	Do.
Gary, Ind.....	30	August 1979.....	Do.
Marion, Ind.....	4	May 1979.....	Do.
Martinsburg, W. Va.....	26	August 1979.....	Do.
Montpelier, Vt.....	17	July 1979.....	Do.
Torrance, Calif.....	29R	June 1979.....	Do.
Anderson, S.C.....	5	January 1979.....	Partial/just localizer.
Bellingham, Wash.....	16	May 1979.....	Do.
Brownwood, Tex.....	17	July 1979.....	Do.
Concord, Calif.....	19R	January 1979.....	Partial (localizer-type directional aid), no outer marker.
Cumberland, Md.....	23	March 1979.....	Partial/just localizer.
Danville, Va.....	2	do.....	Do.
Enid, Okla.....	35	April 1979.....	Do.
Fort Leonard, Mo.....	14	May 1979.....	Do.
Gallup, N. Mex.....	6	June 1979.....	Do.
Great Bend, Kans.....	35	December 1978.....	Do.
Harrison, Ark.....	36	March 1979.....	Do.
Hayward, Calif.....	28L	May 1979.....	Partial/just localizer (no outer marker).
Jefferson City, Mo.....	30	December 1973.....	Partial/just localizer.
Kansas City, Fairfax, Kans.....	35	April 1979.....	Do.
Kearney, Nebr.....	36	July 1979.....	Do.
Killeen, Tex.....	1	May 1979.....	Do.
Kirkville, Mo.....	35	November 1978.....	Partial/just localizer (actual commissioning date, Nov. 16, 1978).
Manhattan, Kans.....	3	August 1979.....	Partial/just localizer.
Marion, Ind.....	4	May 1979.....	Do.
Moline, Ill.....	27	September 1979.....	Do.
Newbern, N.C.....	4	January 1979.....	Do.
Ogdensburg, N.Y.....	27	June 1979.....	Do.
Opa Locka, Fla.....	9L	December 1978.....	Do.
Pinehurst, N.C.....	5	May 1979.....	Do.
San Diego, Calif. (Montgomery).....	28	April 1979.....	Do.
Silver City, N. Mex.....	26	do.....	Do.
Sioux City, Iowa.....	13	January 1979.....	Do.
San Luis Obispo, Calif.....	11	March 1979.....	Do.
Ukiah, Calif.....	15	June 1979.....	Do.
Wildwood, N.J.....	19	March 1979.....	Do.
McGrath, Alaska.....	16	September 1979.....	Do.
Minneapolis, Minn.....	11R	March 1979.....	Partial/localizer and middle marker.
Norfolk, Nebr.....	1	January 1979.....	Partial/just localizer.
Unalakleet, Alaska.....	14	September 1979.....	Do.

ENCLOSURE 2

VISUAL APPROACH SLOPE INDICATOR (VASI)

The status of the VASI installation program for nonprecision runways; the planned installation for fiscal year 1979 and their locations:

FAA's policy is to assign the highest priority to Visual Approach Slope Indicators (VASI) installations on nonprecision runways. Although we agree with the principle of providing VASIs on ILS runways where the glide slope is unusable below decision height, we believe the nonprecision runway application must be given first priority. However, as of October 2, 1978, there were 1,013 VASI installations on airports certificated for either full or limited air carrier operations. The FAA operates and maintains 526 of these 1,013 VASI's on runways used by air carriers. In addition, we have installed VASI systems on 87 ILS runways, 5 of which have glide slope restrictions.

VASIs are recommended in the National Airport System Plan for all runway ends. These VASIs are eligible for funding under ADAP. Since the inception of ADAP—fiscal year 1971—, over 660 projects have included the installation of VASIs in the National Airport System. The fiscal year 1979 ADAP is not yet sufficiently stabilized to ascertain the number of VASIs expected for development. It is anticipated, however, that progress similar to that of past years will continue.

FAA has 128 VASI installations included in its Facilities and Equipment program for fiscal year 1979 to be located as follows:

Location	Runway	Scheduled Commissioning date
Abilene, Tex	17R	March 1979.
Do	35L	Do.
Akron Canton, Ohio	14	July 1979.
Do	5	June 1979.
Alamogordo, N. Mex	3	Do.
Albany, N.Y	10	August 1979.
Alton, Ill.	35L	Do.
Do	17R	Do.
Do	11	July 1979.
Appleton, Wis	21	October 1978 (commissioned).
Ardmore, Okla.	30	March 1979.
Do	12	Do.
Athens, Ga	2	February 1979.
Auburn, Wash	16	August 1979.
Bar Harbor, Maine	4	November 1978.
Beaumont, Tex	29	April 1979.
Bennington, Vt.	31	September 1979.
Benton Harbor, Mich	13	June 1979.
Bermuda Dunes, Calif.	29	April 1979.
Biddeford, Maine	6	September 1979.
Block Island, R.I.	10	March 1979.
Bloomington, Ind.	17	August 1979.
Blythe, Calif.	35	May 1979.
Do	17	Do.
Boise, Idaho	28R	September 1979.
Bridgeport, Conn.	24	November 1978.
Do	29	Do.
Buffalo (Airpark) N.Y.	24	September 1979.
Burbank, Calif.	15	November 1978.
Cape Girardeau, Mo	28	March 1979.
Do	2	Do.
Carlsbad, Calif.	6	May 1979.
Champaign, Ill.	4	August 1979.
Charlotte, N.C	23	February 1979.
Cheyenne, Wyo	8	July 1979.
Cleveland (Bkl), Ohio	6L	Do.
Cleveland (Hop), Ohio	23R	August 1979.
College Station, Tex	16	March 1979.
Colorado Springs, Colo	12	December 1978.
Columbia, Mo	20	November 1978.
Concord, N.H	35	October 1978 (commissioned).
Corpus Christi, Tex	31	March 1979.
Crystal, Minn.	31R	July 1979.
Do	5L	Do.
Dallas (Redbird), Tex	31	February 1979.
Danville, Ill	3	October 1978 (commissioned).
Dayton (Gen), Ohio	2	July 1979.
Dayton (Muni), Ohio	36	Do.
Detroit (City), Mich	15	November 1978.
Detroit (Metro), Mich	3C	October 1978 (commissioned).
Do	9	Do.
Do	21C	Do.
Detroit (Wr), Mich	23L	Do.
Douglas, Ariz	17	April 1979.
Elko, Nev	23	December 1978.
Do	5	Do.
Eugene, Oreg	34	November 1978.
Do	3	Do.
Evansville, Ind	36	July 1979.
Farmington, N. Mex	5	May 1979.
Do	23	Do.
Gaithersburg, Md	14	July 1979.
Harrisburg, Pa	12	December 1978.
Do	30	Do.
Hawthorne, Calif	7	July 1979.
Honolulu, Oahu, Hawaii	8R	May 1979.
Hoquiam, Wash	6	November 1978.
Houlton, Maine	5	Do.
Ironwood, Mich	9	July 1979.
Jefferson City, Mo	12	October 1978 (commissioned).
Lansing, Mich	6	September 1979.
Long Beach, Calif	12	March 1979.
Lubbock, Tex	8	Do.
Lufkin, Tex	15	Do.
Lynchburg, Va	21	Do.
Manistee, Mich	27	August 1979.
Martha's Vineyard, Mass	6	April 1979.
Mattoon, Ill	6	July 1979.
McCall, Idaho	34	August 1979.
Midland, Tex	10	February 1979.
Muskegon, Mich	5	July 1979.
Nantucket, Mass	33	March 1979.
Napa, Calif	24	April 1979.

Location	Runway	Scheduled Commissioning date
New Bedford, Mass.....	23	January 1979.
Newark, N.J.....	11	February 1979.
Newport, R.I.....	4	July 1979.
Norfolk, Nebr.....	1	September 1979.
North Central, R.I.....	5	February 1979.
Old Town, Maine.....	22	November 1978.
Oneonta, N.Y.....	6	September 1979.
Palwaukee, Ill.....	34	November 1978.
Pasco, Wash.....	12	February 1979.
Pittsfield, Maine.....	1	August 1979.
Plainview, Tex.....	4	February 1979..
Plattsburgh, N.Y.....	19	June 1979.
Pontiac, Mich.....	27L	August 1979.
Portland, Maine.....	36	December 1978.
Do.....	18	Do.
Providence, R.I.....	5L	February 1979.
Do.....	23R	Do.
Provincetown, Mass.....	7	November 1978.
Racine, Wis.....	22	July 1979.
Redding, Calif.....	16	Do.
Redmond, Oreg.....	4	November 1978.
Do.....	10	Do.
Rexburg, Idaho.....	17	September 1979.
Rock Springs, Wyo.....	13	Do.
Salem, Oreg.....	13	November 1978.
Salmon, Idaho.....	16	September 1979.
Sanford, Maine.....	25	October 1978 (commissioned).
Santa Fe, N. Mex.....	20	July 1979.
Do.....	2	Do.
Shirley, N.Y.....	6	March 1979.
Shreveport, La.....	32	December 1978.
Silver City, N. Mex.....	26	July 1979.
Springfield, Mo.....	13	March 1979.
Springfield, Vt.....	5	October 1978.
Suffolk, N.Y.....	33	December 1978.
Thermal, Calif.....	35	May 1979.
Tyler, Tex.....	31	March 1979.
Umiat, Alaska.....	5	August 1979.
Do.....	23	Do.
Upland, Calif.....	6	June 1979.
Waterville, Maine.....	5	August 1979.
Waukesha, Wis.....	10	July 1979.
West Bend, Wis.....	13	Do.
West Palm Beach, Fla.....	27R	December 1978.
Westerly State, R.I.....	7	July 1979.

ENCLOSURE 3

RUNWAY SURFACE TREATMENT

The number of runways grooved or treated to date:

There are 232 air carrier runways with surface treatment to reduce slipperiness or active projects which include such treatment.

In addition, there are 7 runways with part(s), of the runway treated or a project including treatment.

Treatment includes grooving, porous friction course and wire combing.

ENCLOSURE 4

FRANGIBLE APPROACH LIGHT STRUCTURES

The status of the frangible approach light structure retrofit program and the number of new frangible structures installed since the program began:

As related to the ADAP program, standards for frangible structures were issued by FAA in May of 1973. All installations since then have utilized these structures.

The status of the frangible approach light structure retrofit program under FAA's Facilities and Equipment funding is as follows:

Fiscal year	Number of systems	Value (millions)	Remarks
1977.....	38	\$3.3	4 have been completed.
1978.....	23	4.0	
1979.....	27	8.1	

Under FAA's Facilities and Equipment program, in addition to the retrofit program, all new approach light systems budgeted in fiscal year 1975 and since are being established with low impact resistance towers. Also, some systems budgeted prior to fiscal year 1975 but which had not started construction by fiscal year 1975 were constructed with the low impact resistance towers.

Also, under the Facilities and Equipment program, there is a total of 378 Medium Intensity Approach Light Systems (MALS) and Medium Intensity Approach Light Systems with Runway Alignment Indicator Lights (MALSR). Of these 378 systems, 183 have the frangible feature.

ENCLOSURE 5

RUNWAY SAFETY AREAS

The number of extended runway safety areas that are planned for extension to 1000 feet:

Extended runway safety areas are encouraged by the FAA for all runways used by air carriers with transport category aircraft. However, they are intended for new airports and applicable to existing airports to the extent practical and feasible. It is almost impossible to predict the number of planned extended safety areas because the FAA does not dictate when or if an airport owner/operator will plan or undertake new runway or new airport construction. We estimate that about 30 runway safety areas are now being extended to the full 1000 feet from the runway end or will be extended during fiscal year 1979. Approximately 70 more are to be planned for extension to full length by 1988. In addition, some extended runway safety areas will be improved, but will not reach the full 1000 feet from the runway end. A large part of the improvement of extended runway safety areas is being done in conjunction with projects to lengthen runways.

A Notice of Proposed Rule Making is being developed with the Office of the Chief Counsel that will update the requirements for safety areas and extended safety areas for runways at certificated airports. The proposed change will require that construction projects for new runways or taxiways, or runway or taxiway reconstruction, extensions and overlays will include runway safety areas, taxiway safety areas, and extended runway safety areas in accordance with the appropriate design standards wherever physically feasible and economically possible.

ENCLOSURE 6

WIND SHEAR MEASURING EQUIPMENT

The status of the wind shear measuring equipment research and development program.

The Low Level Wind Shear Alert System (LLWSAS) test phase has been completed. Evaluations were conducted at Atlanta, Denver, Tampa, Houston, J. F. Kennedy, and Oklahoma City. These six systems plus another at Boston are now operational and are being used by ATC.

FAA plans to provide LLWSAS at 110 locations which have benefit cost ratios of at least 1.0. Funds have been authorized for the first 40 systems. Facilities and Equipment budgets for FY 1980 through fiscal year 1983 will contain the funding requests necessary to program the remaining 70 systems. The 110 systems should be installed and operational by mid-1984.

A description of the system and a timetable for implementation is included in FAA Order 1811.2, dated July 13, 1978, (copy attached).

FAA is using and plans to continue using the LLWSAS as advisory information only. The controller will transmit the center field wind and the significantly different winds to the pilot in the wind shear alert message. The pilot will then make his or her own decision as to the appropriate action to take. FAA plans to issue an advisory circular to describe the system and provide general guidelines for appropriate pilot actions in the event of a wind shear alert.

Attachment: FAA Order 1811.2.

DEPARTMENT OF TRANSPORTATION,
FEDERAL AVIATION ADMINISTRATION,
July 13, 1978.
ORDER 1811.2

SYSTEM REQUIREMENTS STATEMENT/ACQUISITION AUTHORIZATION FOR THE LOW
LEVEL WIND SHEAR ALERT SYSTEM (LLWSAS)

1. Problem statement

a. Concise Definition of the Problem.—Since June 1975 there have been four major air carrier accidents in which low level wind shear was a primary causal factor. In each case the wind shear was associated with a thunderstorm. During such conditions the wind directions and speeds at and near the surface varied greatly from one point to another along the approach or departure path. A suitable network of anemometers encircling an airport could provide a warning for such a horizontal low level wind shear. However, a single anemometer sited near the center of the airport (in accordance with Order 6560.3A, Siting Criteria for Airport Wind Sensor) cannot provide a wind shear warning.

b. Background.—(1) On August 7, 1975, a Boeing 727 with 134 people on board was cleared for takeoff on Runway 35L at Denver. Weather was VFR, and winds were reported to the pilot as 230 degrees at 12 knots. According to the National Transportation Safety Board, the actual winds at the north end of the runway were tailwinds in excess of 60 knots caused by the arrival of a thunderstorm gust front. (The gust front had engulfed with north end of the runway but had not reached the south end or the official center field anemometer.) Shortly after the aircraft lifted off, it encountered the wind shear, lost 41 knots of indicated airspeed in 5.0 seconds, and crashed near the north end of the runway. In the accident investigation it was discovered that several workmen near the north end of the runway had taken shelter in their trucks before the accident due to the high winds. In fact, the winds blew the roof completely off a shed. However, the person who needed most to know about the high tailwinds—the pilot—had no such information. A simple anemometer near the north end of the runway would have provided the basic information needed to alert the pilot that an extreme wind shear engulfed his takeoff flightpath. It is believed that such knowledge would lead any reasonable pilot to delay the takeoff, thus avoiding an accident.

(2) On June 24, 1975, a Boeing 727 crashed on approach to JFK airport, killing 113 people and injuring 11 others. Witnesses at the crash site on Rockaway Blvd. stated that a violent wind was blowing there at the time. However, the reported center field wind was only 10 knots, since the thunderstorm winds had not reached there at the time. If there had been an anemometer at the middle marker, it would have shown violent tailwinds in comparison to the 10-knot headwinds at center field. It is felt that if the pilot had been aware of the extreme nature of the horizontal wind shear, he would not have attempted the fatal approach.

(3) A DC-9 crashed on approach to Philadelphia airport during a summer thunderstorm on June 23, 1976. Localized winds were so strong that one trijet refused to takeoff when cleared, because it was being blown so severely while sitting stationary on the taxiway. The accident aircraft separated into several pieces, and 86 of the 106 people on board were seriously injured.

(4) On June 3, 1977, a Boeing 727 was cleared for takeoff in Tucson. A headwind of about 20 knots at the start of the takeoff roll sheared into a tailwind of 25 to 30 knots at the far end of the runway. The aircraft barely got airborne by the end of the runway and struck wires, trees, and poles. Although a fuel tank was ruptured and significant damage was done to the wings, flaps, and landing gear, a safe emergency landing was made. It is believed that the pilot would not have attempted the takeoff if he had known about the large horizontal wind shear between the two ends of the runway.

2. Mission need and operational (functional) requirement

The operational requirement for low level wind shear is included in the FAA general hazardous weather requirement, which is: "To provide hazardous weather information (low level wind shear) to the pilot as well as to the controller with sufficient warning and accuracy to permit the pilot to avoid the hazard and/or the controller to assist the pilot in avoiding the hazard." This System Requirement Statement addresses ground-based equipment which provides wind shear information to the controller for assisting the pilot in avoiding the hazard. As described in paragraph 1, accidents have occurred in the past where a pilot is given a wind report of an innocuous wind direction and speed as measured at center field. The pilot then proceeds to takeoff or land into a region which, in fact,

has been engulfed in the hazardous wind field of a thunderstorm (thunderstorm gust front or thunderstorm downburst cell). A logical way to attempt to avoid this type of accident in the future is to install an anemometer in each runway's takeoff and landing corridors. Any significant difference between the windspeed and /or direction at a peripheral anemometer and the windspeed and/or direction at the center field anemometer constitutes a potentially hazardous horizontal low level wind shear. (This is, in fact, the definition of horizontal low level wind shear.) If such shear occurs, the wind readings at both anemometers should be displayed to the local controller for immediate voice transmission to the affected pilot(s). Suggested guidelines include:

(a) Continuous comparison of the wind at the center field anemometer and the winds at the peripheral anemometers should be performed by a computer rather than a human being.

(b) The wind vector (i.e., wind direction and speed) at each peripheral anemometer should be compared (one at a time) with the wind vector at the center field anemometer. The difference between the two vectors should be computed (every 10 seconds or less). Whenever the magnitude of this vector difference exceeds 15 knots, a wind shear alert should be signalled to the local controller. The center field wind and the wind at the differing anemometer(s) should then both be displayed to the local controller for transmission to the affected pilot(s) as soon as possible. (Note: The 15-knot difference limit given above is approximate and may require adjustment for various sites or peculiar air flow patterns. It may also prove desirable to make the limit a function of the wind velocity.)

(c) The suggested nominal location for each peripheral anemometer is near the respective middle marker site. A location slightly farther out may be more desirable for arrivals, whereas a location slightly closer in may be more desirable for departures. However, the middle marker location is felt to be an adequate compromise for both arrivals and departures. In addition, property ownership and electrical power problems should be minimal at the middle marker location. (If a runway does not have a middle marker, the anemometer should normally be placed about 3500 feet from the threshold near the runway centerline.)

(d) During a very large percentage of the time no significant wind shear will be present at an airport, and only the center field wind need be displayed. However, the capability should exist for the controller to have displayed at will any peripheral wind reading.

3. *Potential rulemaking actions.*—At this time, no rulemaking actions are planned. The wind and wind shear information will be given to the pilots as advisories. It is anticipated that an advisory circular will be prepared to provide pilots with suggested criteria as to when an approach should be abandoned or when a takeoff should not be attempted. It is believed that pilots will exercise due caution upon the receipt of a wind shear alert. If this does not prove to be the case, rulemaking actions can be initiated.

4. *Related factors*

(a) *Potential benefits assessment.*—Since June 1975 there have been four major air carrier accidents attributed to low level horizontal wind shear. The major potential benefit of the LLWSAS is that it will reduce the potential for this type of accident in the future. A benefit/cost analysis of LLWSAS was conducted and the results are summarized in paragraph 5.

(b) *Expected public and user impact.*—The public and users should derive the potential benefit described in paragraph 4a. There are no expected adverse impacts on the public or users.

(c) *Regulatory aspects.*—As described in paragraph 3, no regulatory or rulemaking actions are planned at this time.

(d) *Previous congressional attention or mandates.*—Congressional interest in FAA actions to prevent wind shear accidents has been high since June 1975, when 113 people were killed in the JFK wind shear accident.

(e) *Environmental assessment.*—It is anticipated that the LLWSAS will produce no adverse environmental impact.

(f) *Evaluation of proposed alternates.*—See paragraph 6b.

(g) *Anticipated impact on human factors.*—During a LLWSAS alert the local controller's workload will increase, since the extra wind information must be transmitted to the pilot. In addition, the orderly flow of traffic may be temporarily affected since pilots cleared for takeoff may elect to remain on the ground, and pilots cleared to land may elect to miss the approach. Also, the active runway may have to be changed more often than in the past as increased knowledge of the location of wind shears causes pilots to request a change of runways. Fortunately, low level horizontal wind shear conditions generally occur less than 1 percent of

the time, so this increase in controller workload will not occur often. In and case, it is felt that the temporary occasional instances of increased local controller workload are far preferable to the alternative of not warning the pilot of hazardous wind shear. With respect to human factors in the cockpit, all effects of the LLWSAS should be positive.

5. Benefit/cost analysis

(a) A benefit/cost analysis has been performed for the LLWSAS (reference paragraph 11g). The purpose of the analysis was to determine if the LLWSAS is justified economically and, if so, at which airports. A summary of the results are presented in this section.

(b) In conducting the analysis a number of factors were considered, such as:

(1) The cost of installing and maintaining the LLWSAS over its projected life.

(2) The cost of lives, property lost, and injuries sustained due to past wind shear accidents which may have been avoided had an LLWSAS been in operation at the airport.

(3) Thunderstorm activity at candidate airports.

(4) Forecast of air carrier activity at candidate airports.

(c) As would be expected, each airport's benefit/cost ratio was nearly proportional to the number of thunderstorms per year at the airport multiplied by the number of air carrier operations per year at the airport. This, in turn, is proportional to the number of air carrier operations per year which are potentially exposed to thunderstorms and associated wind shear.

(d) Dollar value was calculated for the expected benefits of an LLWSAS installation (over a projected 20-year life) at each of 150 candidate airports. (Ninety-three percent of all U.S. domestic air carrier operations are conducted at these 150 airports.) A dollar value was also calculated for the cost on an LLWSAS installation. This was based on an initial cost of procurement and installation of \$250K and a yearly cost of operation and maintenance of \$15K. The discounted present value of the cost of an LLWSAS installation over 20 years is \$378K. Of the 150 candidate airports, 110 are calculated to have benefit/cost ratios in excess of 1.0. The leading airport is Atlanta with a benefit/cost ratio of 45.

6. Alternatives and milestones

a. *Alternative selected and major reason for this selection.*—As described in paragraph 2, the selected alternative was a computer monitored network of four to six anemometers around the outer periphery of the airport. This selection was finalized in an AOA-1 Decision Paper signed by Administrator McLucas on October 20, 1976. The major reason for this selection lay in the belief that this was the quickest and most economical way to accomplish the goal of preventing further thunderstorm wind shear accidents. This appears valid today.

b. *Rejected alternatives.*—(1) A scanning laser may eventually be developed to detect thunderstorm wind shears along the approach and departure paths. However, this alternative involved too much technical risk and was considered a far-term solution.

(2) A modification to the airport surveillance radar was also proposed. This involved the same general risk and delay as the laser.

(3) A network of about 80 microbarographs (pressure jump sensors) has been installed at Dulles and O'Hare airports to test its capability to detect the approach of thunderstorm wind shears. The system has achieved a measure of success. However, its major drawbacks are inability to determine the magnitude of the wind and wind shear, and inability to determine when the wind shear has ceased.

c. Milestone and decision point schedule for 20 systems in fiscal year 1978

TSARC waiver granted to proceed with procurement of initial 20 systems prior to submission of acquisition paper (AP submission in Oct. 1978).	Mar. 1, 1978.
Delivery of technical data package from ARD/ANA to AAF.	Mar. 15, 1978.
Procurement request to ALG.	June 15, 1978.
Contract award.	Sept. 15, 1978.
Delivery of first system from contractor (4 months from contract award until delivery of first system; delivery of one system per week thereafter).	Jan. 15, 1979.
First site becomes operational.	Mar. 31, 1979.
All fiscal year 1978 systems installed and operational.	Aug. 15, 1979.

d. Milestone and decision point schedule for 40 additional systems (fiscal year 1979 and 1980)

Acquisition paper to TSARC	Oct. 1978.
Procurement request to ALG	Nov. 1978.
Contract award	June 1979.
Delivery of first production system	June 1980.
First system operational	Aug. 1980.
All systems installed, and operational	Apr. 1981.

7. Costs.

a. R & D costs.—In fiscal year 1977, \$350K R&D money was spent. In fiscal year 1978, \$300K has been programmed for NAFEC to complete work on the LLWSAS program.

b. F & E costs (service test and demonstration, six sites).—In fiscal year 1977, \$700K F&E money was spent. In fiscal year 1978, \$225K has been made available to keep those sites on line, and to make improvements and updating changes.

c. Boston site.—To date, \$138K in F&E money has been identified for the Boston LLWSAS; \$32K of that amount has been sent to Boston.

d. F & E costs (production and installation).—The initial estimates are \$150K per site for installations with radio links (fiscal year 1978 buy—20 sites) and \$250K per site with landlines (fiscal year 1979 and thereafter—20 sites in fiscal year 1979; 20 sites in fiscal year 1980). It is hoped that these estimates will decrease as further experience is gained.

e. Life cycle costs:

	Site/year
Personnel—estimated one-third MY/site	\$9K
Recurrent training	1K
Spare parts	4K
Power	1K
Total	15K
One-time initial training: (per site)	6K

f. Total program cost over 20 years (first 60 sites):

20 sites at 150K	\$3, 000K
40 sites at 250K	10, 000K
60 sites x 15K/sites/year x 20 years	18, 000K
Total	31, 000K

g. Present value of total program cost, discounted over 20 years (first 60 sites).—Assuming a 10 percent discount rate and a 20-year system life, the present value cost of each fiscal year 1978 system is \$278K. For each fiscal year 1979 and 1980 system, the figure is \$378K. The total is 20 x \$278K plus 40 x \$378K, or \$20,680K.

8. Minimum benefits of any proposed solution to be acceptable.—Since June 1975 four major air carrier accidents have occurred due to thunderstorm-generated low level wind shears. As a minimum, any proposed solution must decrease the potential for this type of accident by providing pilots with a timely warning of hazardous wind shears.

9. Reliability, maintainability, productivity, safety, energy, environmental, and staffing guidelines governing the system acquisition.—No deviations from current FAA policies and philosophies are required by the LLWSAS for any of the above considerations except that the fiscal year 1978 systems procurement will be "off-the-shelf," and only the normal commercial standards for reliability and maintainability will be provided.

10. Implementation parameters

(a) If total program costs over 20 years for the first 60 installations exceed \$62 million, the requirement should be revalidated. Assessment will be conducted by the program sponsor at appropriate milestone points to ensure that this cost limitation is being met. As a minimum, these reviews should be made when the Acquisition Paper is submitted to TSARC and at contract award.

(b) Operational briefings, indoctrination, and training will be provided for controllers and supervisory personnel at each location in a timely fashion prior to commencing operation.

11. References

- (a) NTSB Aircraft Accident Report No. NTSB-AAR-76-14, Continental Air Lines, Inc., Boeing 727-224, N88777, Stapleton International Airport, Denver, Colorado, August 7, 1975.
- (b) NTSB Aircraft Accident Report No. NTSB-AAR-76-8, Eastern Air Lines, Inc., Boeing 727-225, N8845E, JFK International Airport, Jamaica, New York, June 24, 1975.
- (c) NTSB Aircraft Accident Report No. NTSB-AAR-78-2, Allegheny Airlines, Inc., Douglas DC-9 N994VJ, Philadelphia Pennsylvania, June 23, 1976.
- (d) Decision Paper: Thunderstorm Wind Shear Detection, signed by AOA-1 (McLucas) October 20, 1976.
- (e) Letter from Edwin Kessler, Director of the National Severe Storms Laboratory and Environmental Research Laboratories, NOAA, to Director, FAA Wind Shear Program Office, dated July 30, 1976, proposing a system which developed into LLWSAS.
- (f) An Operational Application of Mesonet Network for Warning of Translating Surface Wind Boundary Changes, R. Craig Goff, FAA NAFEC, April 1978.
- (g) Benefit/Cost Analysis of the Low Level Wind Shear Alert System, K. Lauterstein, ASP-120, April 1978.

12. Acquisition authorization.

- (a) This Acquisition Authorization pertains to the first 60 LLWSAS installations, currently scheduled for funding at the rate of 20 installations per year in fiscal year 1978 through fiscal year 1980. Implementation beyond the first 60 installations will be dependent upon an updating of the benefit/cost analysis after cost figures are further refined.
- (b) Installation of an LLWSAS is certified as a valid System Requirement. This certification is granted subject to the implementation parameters of paragraph 10.
- (c) Authorization is granted for the LLWSAS program and the first 60 installations, as described herein, to move into an implementation phase as defined in Order 1810.1A, System Acquisition Management.

LANGHORNE BOND, *Administrator.*

The CHAIRMAN. Next, Mr. Langhorne Bond, Administrator, Federal Aviation Administration, and panel along with him from the FAA.

All right, sir, you may identify your associates and proceed, Mr. Bond.

STATEMENT OF LANGHORNE BOND, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION; ACCOMPANIED BY BOB AARONSON, ASSOCIATE ADMINISTRATOR FOR AIRPORTS; BILL FLENER, ASSOCIATE ADMINISTRATOR FOR AIR TRAFFIC AND AIRWAYS FACILITIES; AL ALBRECHT, ACTING ASSISTANT ADMINISTRATOR FOR ENGINEERING AND DEVELOPMENT; AND MARTY POZESKY, HEAD, COLLISION AVOIDANCE PROGRAM

Mr. BOND. Thank you, Mr. Chairman and members of the committee.

On my right and your left, Bob Aaronson, our Associate Administrator for Airports; Bill Flener, Associate Administrator for Air Traffic and Airways Facilities; Al Albrecht, is our Assistant Administrator for Engineering and Development, acting; and Marty Pozesky is head of collision avoidance program, technical expert in that field. And I'm the Administrator, of course. We are all from Washington, incidentally. We came out here at the committee's suggestion to talk about the broad issues that are cast here. That is our team.

Now, I have received word that you were hopeful that I could summarize my statement here. I know we're running behind. I'm very happy to do that, Mr. Chairman, if you would be kind enough

to forgive a rather halting pace. But I will do it rather than read it, if you would prefer.

The CHAIRMAN. Well, I'll leave it up to you. We are compressed a little insofar as time is concerned. And if you feel that parts of it need to be read, just indicate to us where you are so—

Mr. BOND. All right, I will certainly do that, Mr. Chairman. I again beg the patience of the members of the committee.

Mr. Chairman, perhaps I could start in my statement and point out that the FAA was established in 1958 as a result of an incident between two air carriers over the Grand Canyon just 20 years ago that prompted the Congress to establish the FAA to work in this field. Generally speaking, the results in terms of statistical progress are very, very encouraging. We believe we have created at Congress direction what is the safest air transportation system in the world. The statistics are, of course, only of interest in the aggregate and they are no excuse for or explanation of a crash of the kind we have had here in San Diego.

But, nevertheless, up to a 5-year period beginning in 1973 we had a total of 12 midair air carrier collisions. At that point, as our radar control and other devices which are mentioned in the text of my statement were put on stream, we have not had a single one until 1978. So, the record went from an average of more than two per year during that period to one in the period of 6 years. I highlight that not as an explanation of this incident here but to point out that we have been making very steady progress in it, and the passenger fatality rates and other dry indexes which we use to measure our progress in this field indicate a great deal of progress.

Let me talk for a moment about some of the specific steps that the FAA, under the supervision of the Congress and with recommendations from the Safety Board, has taken to get us to where we are today. We believe, to begin with, historically, that the responsibility of the pilot for vigilance in scanning for other aircraft must and will remain a vital part of today's system. But with the recognition that high-performance aircraft are now operating in our system, especially over the past 10 to 15 years, we have built layer after layer of additional protection into it to back up eyeball, as it were, separation. Consider the improvement to the traffic environment, for example. We have extended more and more control over flight operations, and we have done that by progressively expanding positive control airspace, establishing terminal control areas. The first of those was in Atlanta, as you will recall, Congressman Goldwater, in 1968. We now have 21 of those.

We have established an expanded radar control service steadily around the country in the form of what we call TRSA's, terminal radar service areas. We are now blanketed in the United States with positive control airspace from 18,000 feet up to 60,000 feet. With that go the requirement for transponders and so forth. All of these things have been steadily added.

We have required maximum speed operating limits of 250 knots below 10,000 feet. That mitigates the high-performance aircraft speed differential problem. Operations above 12,500 feet today require an altitude encoding transponder with very few exceptions.

I'm skipping over some of the material that has been discussed in the hearing so far—we point out our profile descent program, which has both energy-saving and safety impact. Basically, we have tried with

high-performance aircraft, and specifically with air carrier aircraft, to hold them high and to avoid flying around at lower altitudes where both a lot of fuel is used at that altitude because of the requirement for additional lift devices, but also where the mix and exposure to incident with lower performance aircraft is greater. So, the Atlanta example of our profile descent procedures shows that we had achieved up to a 50-percent reduction in time spent by air carrier aircraft at altitudes below 10,000 feet.

I wanted to touch on conflict alert. The program serves as a backup to our controllers and to alert the controllers to a potential problem in time for the controller to take action to avoid a collision. That capability is already installed and operational at all of our en route facilities, all of our en route centers, and it is being added to all ARTS III terminals in our system.

Minimum safe altitude warning is another feature that we are installing. It generates an alert to a controller whenever a controlled aircraft equipped with altitude encoding transponder is predicted by our computer to go below the safe altitude in that particular sector of the scope that the controller is watching. And it permits us to warn the pilot that they're too low.

Here is a point that I would like to also emphasize, since it came up a few minutes ago with Chairman King. We require today all newly manufactured aircraft to have strobe lights, anticollision warning lights built onto them. That is mandated. Older aircraft are not required to have that on board. They are, of course, phasing out of this system anyway. But, more importantly, their electrical systems are not designed in many cases to handle retrofit in the first instance, so they cannot be retrofitted.

I will touch briefly on the collision avoidance issue. The airborne collision avoidance. Actually, of course, our traffic control system, the ATC system, is in itself a collision avoidance system, but we have found that over the years, the development of a collision avoidance system that provides an independent alert to the pilot has proven to be technologically elusive. Despite the intensive efforts of the aviation industry and the FAA over a long period of time to build such a system, there still is not a safe, efficient, and reliable collision avoidance system which is available for aircraft use today.

One problem with systems that have been tested in the past has been their inability to interact with the traffic control system and their tendency to emit false alarms on too frequent a basis unless their capabilities are curtailed.

I testified on the subject before the Congress in the past, but I just want to point out that any system that does not take advantage of knowledge that controllers and our computers on the ground have will not know how to make the distinction between an aircraft that is near the aircraft but properly under radar control even though they're close—and one that is not supposed to be there. Therefore, all of the BCAS systems that we have considered will have a fairly high false alarm rate, and will give orders to the aircrew to climb, to dive, to turn left or right suddenly, when in fact they may not be required to do so for safety purposes and when, if they do, they will create other collision potential hazards in closely monitored and high-density airspace.

Anyone who has made an approach to, for example, Los Angeles airport and who knows how those aircraft are safely vectored with highly skilled crews, knows what a collision hazard will be caused, or potential collision hazard, if the crews suddenly deviate one way or the other under those circumstances. We are sufficiently concerned about that to have felt that is a major obstacle that has not been overcome by any system except the one that we now think is the best long-term hope, and that is our DABS system, which we are in the process of developing.

Incidentally, the technology to implement the DABS/ATAR system, which is covered in my statement here, is based on the use of microcomputers. Their development is a very recent phenomena. It was only last May, I believe, the technical feasibility of a system using such computers was in fact confirmed by a technical report.

One of the major concerns of mine has been the promotion and expansion of reliever airports. I have been discouraged at the progress that the FAA and all of us in the community have been able to make in the expansion of reliever airports. Our new ADAP bill that we will submit to the Congress, to the two subcommittees that you gentlemen head, will provide for additional funding levels for reliever airports in the years ahead. But the problems that exist in these areas go, I must say, well beyond the problems of money. It is basically a community-acceptance problem, and I am sorry to say there are very few communities in metropolitan areas that are very anxious to have reliever airports in the neighborhood; and all sorts of environmental suits, noise, and citizen objections have been raised as obstacles to the implementation of a good reliever airport program. Nonetheless, we believe that it needs additional funding, and we would continue to promote it as best we can.

Now, Mr. Chairman, that review, coupled with my statement, brings me to where we are today. We are about to issue a notice of proposed rulemaking, which I alluded to in testimony before the Congress not long ago. It will reduce the floor of the Continental and Alaskan positive control area to 12,500 feet from its present level of 18,000 feet. Within this airspace from 12,500 feet to 18,000 feet, VFR traffic, which would be covered by a new regulatory concept referred to as Controlled Visual Flight, would be required to comply with air traffic clearances and instructions and maintain applicable VFR weather minimums at the same time. So, in essence, from 12,500 feet upward, all aircraft would be under positive control.

Another key feature of this notice of proposed rulemaking, which will be out probably in the month of December, would be to raise the ceilings of the terminal control areas, which now are generally at 7,000 feet, all the way up to 12,500 feet. This would, in essence, provide for the elimination of the gap between the top of the TCA and the bottom of the currently controlled area. Positive control down to 12,500, tops of the TCA's up to 12,500, providing an unbroken corridor for movement of high-performance aircraft in and out of the larger hubs, which is what our TCA's are for in positive controlled airspace.

Now, we have here a list of actions that I intend to take in the very near future. First, I intend to give even greater recognition to the benefits provided our air transportation system by reliever airports and other general aviation airports that siphon general aviation traffic away from air carrier airports. I have determined that by expanding

our efforts to establish approach and landing aids at key reliever and general aviation airports we may be able to reduce the mix of general aviation and air carriers at congested airports.

The greater availability of such aids will provide alternative training capabilities for general aviation pilots, which will not only serve to reduce such training at major air carrier airports, but will provide greater opportunities for pilot training so they will be able to better function in the national airspace system.

Also, these approach and landing aids will increase the utility of these airports by giving them an all-weather landing capability not previously possible. I intend to do this through an expansion of our establishment criteria for approach and landing aids, an expansion that will give full recognition to the benefit relievers, and other general aviation airports provide the system by redirecting general aviation aircraft away from busy air carrier airports.

Second, we will continue our high priority program for the installation of BRITE TV radar systems in our towers. This system provides great assistance to tower controllers in sequencing traffic.

Beyond that, I have instructed my staff to expedite the installation of BRITE alpha-numeric systems so that tower controllers using these digitized displays will have available the same data presently used by radar controllers. This feature will also provide the tower controller with conflict alert system and minimum safe altitude warning system capabilities.

Last, I have decided that our system has evolved to the point at which the concept of positive separation assurance should be expanded in terminal areas. Early next year we will issue an advance notice of proposed rulemaking proposing a number of alternative actions to expand positive separation in terminal areas. Among the alternatives we will set out for public comment are;

Adding more terminal control areas;

Expanding the geographic coverage of existing terminal control areas;

Implementing the concept of group III terminal control areas. Extending the concept of positive control, as exists at high altitudes, to terminal airspace;

Permitting only instrument flight rules operations within terminal airspace designated as positive control airspace;

Establishing Controlled Visual Flight Rules in terminal airspace designated as positive control airspace;

Applying mode C transponder requirements to any additional positive control airspace;

And, finally, broadening the requirements for the carriage of beacon transponders and altitude encoders to be compatible with separation assurance programs.

We will hold public hearings on this entire package, Mr. Chairman, in the near future.

And that concludes, Mr. Chairman, my summary of my statement. Thank you for your patience.

[The statement follows:]

STATEMENT OF HON. LANGHORNE M. BOND, ADMINISTRATOR FEDERAL AVIATION
ADMINISTRATION

Mr. Chairman and Members of the Committee: I appreciate the opportunity to appear before you today to discuss various safety matters in which you have expressed an interest that relate to the subject of midair collisions; a threat which, although remote, still remains with us as was so tragically brought home recently. I know all of us share a deep sense of loss from this catastrophic accident, and hope that collectively we can work to minimize, to the extent humanly possible, the chance of similar occurrences in the future.

We have recognized for some time the need to continue to reduce the threat of midair collisions and have worked in many ways to refine and further improve upon the air traffic system so that one day the possibility of midair collisions will not exist. We have made significant strides but, in all candor, we are not yet where we want to be. I assure you that is not due to lethargy or indifference, but rather to the complexity of the problem to be solved.

Also, as the members of the Committee know so well, our air transportation system is evolutionary in nature. Certain key building blocks must be in place before additions can be made. Critical decisions must be timely made but with enough deliberation and review to assure that the "solution" to one problem is not the beginning of another.

This is where we are today: we have developed the world's finest air traffic control system—a system that is highly complex and sophisticated, but which must be to fulfill the diverse and growing demands upon it. We have laid many of the necessary building blocks. We have developed a system, with the support of the Congress, that has in place sophisticated long range and terminal radars; we have provided these radars with the capability of giving our controllers aircraft identity, speed and altitude; we have installed back-up emergency communication systems at long range radar sites; we have levied stringent regulatory requirements upon the users of the system; and the list goes on.

We are at the point where fine tuning of certain elements of the system may be called for to permit the further evolution of the system's safety features, and where rapidly developing technology should result in significant advances in collision avoidance that conceptually were not feasible even a short time ago.

I would like to briefly trace the evolution of certain elements of our system designed to foster aviation safety. Later on, I will discuss some actions we are in the process of taking.

Since the FAA was formed by the Congress in 1958, we have strived to assure the safe separation of aircraft. As I stated a moment ago, we have made substantial progress in that time—progress that is borne out by safety statistics over the years. I might add at this point that, notwithstanding the fact that accidents can and do happen, and notwithstanding the fact that our system is not perfect, the U.S. air transportation system is superior to that found anywhere else in the world and the U.S. air traveller has every reason to have confidence in the safety of the system. And the system continues to evolve into a better one every year.

Consider, for example, that in the five year period preceding 1973, there were a total of 12 midair collisions involving air carrier aircraft. In the nearly six years since that time, we have experienced one such tragedy. While this demonstrates the advances made in the system, it also points out that we need to look at the system carefully to identify any areas which may need improvement so that similar tragedies will be averted in the future.

Let me highlight some of the actions we have taken to improve the safety environment in which the air carriers operate. First, let me stress that the whose purpose of the air traffic system is to provide for the safe separation of aircraft. Historically it has been the responsibility of every pilot to be vigilant in scanning for other aircraft which may present the possibility of a collision, and this remains a vital part of today's system. However, the advent of high performance aircraft and increases in traffic have necessitated more sophisticated systems to assist the pilot in assuring aircraft separation. I will describe those systems in a moment.

We have taken firm actions to improve the air traffic environment. First, we have extended control over more and more flight operations. This has been accomplished by progressively expanding positive control airspace, establishing Terminal

Control Areas (TCAs) and implementing expanded radar services in Terminal Radar Service Areas (TRSAs).

The United States is now blanketed in positive control areas from 18,000 feet to 60,000 feet. Further, Terminal Control Area airspace surrounds 21 of our major airports handling large volumes of high performance passenger carrying aircraft. To operate within these TCAs, pilots are required to be appropriately equipped and to obtain clearance. All aircraft operating within such airspace are provided separation.

Expanded radar services in varying degrees have been implemented at over 100 other U.S. airports and traffic advisories are issued throughout the system.

These actions resulted in some degree of public outcry, as they were considered by some to be an infringement on the freedom of transit within the nation's airspace. Nevertheless, the FAA concluded that they were necessary for the safety of the flying public.

We have also sought to improve the capability of pilots to see and avoid by increased flight visibility and cloud clearance requirements as well as by limiting maximum speeds below 10,000 feet to 250 knots. Additionally, at altitudes above 3,000 feet VFR aircraft cannot fly at random, but must conform to certain cruising altitudes to provide separation between uncontrolled aircraft and IFR aircraft.

Moreover, to operate above 12,500 feet, with rare exceptions, all aircraft must have an altitude encoding transponder which appraises the en route controller of aircraft position and altitude thereby enabling the controller to provide traffic advisories and vector aircraft as necessary. Again, above 18,000 feet all aircraft are under positive control.

Terminal Control Areas, which were an outgrowth of an intensive FAA study of near midair collisions in 1968, have proven to be a highly effective means of separating traffic in high density airspace. By exercising more control over all aircraft within a TCA, we have been able to reduce dramatically the number of near midair collisions within this defined airspace. For example, before the implementation of our 21 Terminal Central Areas, there were 254 near mid-air collisions reported to the FAA in a one year period at these locations. In contrast with these 254 near midairs, there were only 24 near midairs reported to the FAA at all these locations combined during 1977. This enormous reduction occurred despite a 10 percent increase in traffic at these airports in the five years from 1973 through the end of 1977.

The FAA has also implemented Terminal Radar Service Areas which provide coverage for 102 airports within the U.S. In our busier TRSAs, VFR aircraft pilots are provided separation from other participating VFR aircraft and all IFR aircraft. FAA figures show that over 90 percent of VFR arrivals and 85 percent of VFR departures participate in this program.

We have continued to seek additional ways to reduce the possibility of midair collisions. For example, Terminal Control Areas are designed to permit high performance aircraft to exit and arrive through the "top" of the TCA, which, depending upon the TCA, ranges in altitude from 7,000 to 12,500 feet. Many of these aircraft operate in this manner. Arriving and departing at this altitude reduces the mix and exposure of air carrier traffic to uncontrolled VFR traffic outside the Terminal Control Area at the lower altitudes.

We also have in effect a high profile descent program which minimizes the exposure time of air carrier aircraft to a VFR mix by using procedures which keep the high performance aircraft at the higher altitudes until close to the destination. At Atlanta, for example, this has resulted in as much as a 50 percent reduction in time spent at altitudes below 10,000 feet by arriving high performance aircraft. A further benefit which results from this program is that, by retaining arrivals at a higher altitude until closer to the airport, departing aircraft can more expeditiously climb out of the terminal airspace thereby reducing their exposure time.

To further minimize the risk of midair collisions, we introduced into our air traffic system a function which is called Conflict Alert. The purpose of this program is to serve as a backup to the controller and to alert the controller to a potential problem in time for the controller to take action to avoid a collision. This capability is already installed and operational in all en route facilities in the continental United States, and is presently being added to all ARTS III terminals in the system.

We also have operational at all ARTS III locations a computer function called Minimum Safe Altitude Warning which generates an alert to the controller whenever a controlled aircraft equipped with an altitude encoding transponder is below, or is predicted by the computer to go below, a predetermined minimum safe altitude with respect to terrain and obstructions.

Further, I might note that by regulation we have worked in other ways to provide for the separation of air traffic. For example, pilots are trained in identifying and reacting to collision potentials; communications are required at all airports having a U.S. control tower; newly manufactured aircraft are required to have strobe lights; efforts to reduce cockpit workload are ongoing; rules of right of way have been developed to create a predictable environment for seeing and avoiding other aircraft; acrobatic flight is prohibited in control zones and in Federal airways; pilots are prohibited from entering airport traffic areas except for the purpose of landing and takeoffs (unless specifically authorized by air traffic control); and, where necessary, special air traffic patterns are prescribed to increase the ability of pilots to anticipate and see each other.

I have highlighted so far some of the actions we have taken to reduce the possibility of midair collisions. We are, of course, continuing to refine the capabilities of our automated system, to improve upon our radar coverage, to improve system reliability, and to add new features to the system designed to make the environment even safer.

One major effort in which we have been vigorously involved has been in the development of a device to provide the pilot with an independent alert of potential collisions to serve as a compatible backup to the air traffic system as a means of further reducing the possibility of midair collisions. Although our entire ground-based air traffic system is intended as a "collision avoidance system", we in the aviation community have nevertheless, through an unfortunate choice of words, perhaps obscured this fact by referring to this alerting device as a Collision Avoidance System.

The development of a Collision Avoidance System has proven over the years to be technologically elusive. In fact, despite the intense efforts of the aviation industry and the FAA over a long period of time to build such a system, there is still not a safe, efficient, and reliable Collision Avoidance System available for aircraft use. One problem with systems that have been tested in the past has been their inability to interact within the air traffic control system and their tendency to emit false alarms on too frequent a basis unless their capabilities were curtailed. Not only would these limitations potentially compromise safety based upon evasive maneuvers that could conflict with other traffic, but it has been amply demonstrated that false alarms undermine the confidence of the user.

The problem of developing an independent but compatible pilot alerting device has proven to be extremely difficult and complex. Over the past ten years, various electronic devices have been developed and proposed using the technology available at the time. One-by-one these relatively simple proposals have been tested and shown to be deficient. The reasons for this span a broad spectrum of problems ranging simply from poor performance to annoying "bells and whistles" in the cockpit. These problems are well known to the aviation community.

The advent of large scale microcomputer technology—now emerging—offers, for the first time, the real potential for a compatible collision warning device which offers the pilot the high quality service necessary to serve as an effective air traffic control back-up.

Today we are at a juncture where the availability of a Collision Avoidance System is rapidly approaching because of these technological capabilities that did not exist a short while ago.

FAA's program for the development of a Collision Avoidance System is three-fold: Active Beacon Collision Avoidance System (Active BCAS), Full Beacon Collision Avoidance System (Full BCAS), and Automated Traffic Advisory and Resolution Service (ATARS).

Automated Traffic Advisory and Resolution Service is a ground-based automated conflict advisory and collision avoidance service which uses the Discrete Address Beacon System (DABS) data link for communication with the aircraft and between aircraft. Through the use of the DABS data base and data link, Automated Traffic Advisory and Resolution Service would provide traffic information and collision avoidance advisories to the pilot. This service would permit every DABS transponder-equipped user to obtain automatic traffic advisory service and ground-derived conflict resolution instructions at a relatively low cost. When supplemented by an Active Beacon Collision Avoidance System, greater protection can be provided in all airspace.

As a ground-based system, ATARS can be readily adapted to peculiarities of specific segments of the airspace and be operationally compatible with the basic air traffic control system. It is designed to function in high density airspace and is scheduled to be available in the mid-1980's. Testing and evaluation of this system should begin in approximately six months at FAA's National Aviation Facilities Experimental Center.

Active Beacon Collision Avoidance System will be compatible with the existing Air Traffic Control Radar Beacon System, the Discrete Address Beacon System, and Automated Traffic Advisory and Resolution Service and will be capable of functioning in low-to-medium density airspace. Active BCAS, by itself, would not be suitable for high-density airspace since the traffic levels would result in numerous false warnings. This system will provide vertical guidance only to the pilot by issuing instructions to descend or climb. Active BCAS can be phased into the system quickly and is expected to be available in the very near-term.

The Full Beacon Collision Avoidance System has significant improvements over Active and provides bearing information which can be portrayed as a situation type display of surrounding traffic. Thus, Full BCAS will provide information to the pilot concerning the need for right or left movement as well as vertical guidance. Full BCAS is still some time away from implementation, and will not be available before 1983 at the earliest.

In the recent past, FAA decided that, although Active BCAS was not the optimum solution to the threat of midair collisions, it nevertheless offers protection which should be made available to pilots. For that reason, it was concluded that development of the Active Beacon Collision Avoidance System should proceed independently but in parallel with the Full Beacon Collision Avoidance System so that earlier protection could be afforded system users. We plan to issue a draft standard by the end of this year to be used by industry for initiating equipment designs.

Since an aircraft equipped with Active BCAS receives protection from aircraft equipped with either an Active BCAS or a beacon transponder with altitude encoder, immediate additional protection would be afforded the equipped user. Further, the Air Traffic Control Radar Beacon System transponder which works with the Beacon Collision Avoidance System is already internationally standardized and carried by military and international air carriers. Thus, without the need for additional action of the International Civil Aviation Organization, BCAS-equipped aircraft would receive comparable protection in international operations.

One issue that is now receiving a high level of attention concerning our air traffic system is the role of the pilot in contrast to that of the controller, or put another way what, if, or how should the present respective functions of pilots and controllers be modified given foreseeable technological advances. This distribution of work functions is referred to as "distributed management."

There are some who believe that the pilot should have more information available and greater responsibilities in the air traffic system. On the other hand, others believe that pilot workload is already great and that too much information could distract pilots and result in delayed reactions to critical situations requiring instantaneous decisions. We are presently examining this subject in two major ways: through user community working groups, and through a joint program with NASA.

There are presently five working groups examining a host of policy and technology issues which need to be considered by the FAA in developing new directions and initiatives in our research, engineering, and development programs. Among the issues under examination are aspects of distributed management in the future air traffic system. We expect to receive the input of the working groups in the near future. We will then distribute this information to the public.

As I mentioned, we are also engaged in a joint program with NASA concerning the distribution of responsibilities between the pilot and the controller. This program is referred to as Cockpit Display of Traffic Information (CDTI). CDTI is a system which would present traffic data to the pilot on a cockpit display, along with map, weather, terrain, and other related information. The concept was first formulated in 1946 and various versions have been explored by NASA, FAA, the military, and universities. The work has shown potential benefits, but also certain potential liabilities such as increased workload, misinterpretation of situations, and decreased attention to other cockpit duties. The successful implementation of the system presently assumes that all aircraft would carry at least an altitude reporting transponder.

Such a system would augment the already existing distributed management concept of the air traffic control system. Today, the system is a cooperative one, and the role of controller and pilot within the system is defined. For example, the practice of visual approaches or visual separation clearly serves the concept of distributed management and places the responsibility for separation on the pilot. The addition of such devices as Collision Avoidance System and Cockpit Display of Traffic Information will enhance the pilots' capability in meeting this responsibility.

This joint program with NASA concerning cockpit traffic displays is to determine their advantages and disadvantages in an operationally complete environment and to establish the best ways of using such systems. The program will re-examine issues associated with Cockpit Display of Traffic Information which may be sensitive to realistic operational constraints, and will explore issues not previously addressed such as traffic control stability and system compatibility. The source of the information could be the ground-derived DABS/ATARS system and/or the Full Beacon Collision Avoidance System.

We are currently developing a test plan, and several cockpits at NASA/Ames, NASA/Langley, and NAFEC are being outfitted for testing. We have been working with interested user groups, and our test plan will be fully coordinated with all interested users. Industry coordination is expected to begin late this winter with initial tests beginning in early spring of 1979.

Additionally, we have a standing committee, the Air Traffic Procedure Advisory Committee whose function is to review existing air traffic control procedures and practices and to make recommendations to us for improvements on any issues of concern. This committee was commissioned in November of 1975, and is comprised of 15 representative organizations which provide an overall viewpoint of aviation and airspace users.

The Committee has expressed an interest in reliever airports; a subject which is both timely and important. All of us recognize that one way to reduce congestion and the mix of general aviation traffic and air carriers at major airports is through greater reliance on reliever airports. I strongly support the concept of relievers and we have tried to encourage and promote their development. Toward this end, from Fiscal Year 1971 through 1978, \$118 million in ADAP funds were provided to reliever airports. One hundred and five of the existing 147 relievers received aid during this period. Most of the money went to rehabilitate aging facilities and improve existing airports. We used our reliever discretionary fund authorization to assure that the high priority needs—specifically safety needs—of these airports are met.

A major problem we see with reliever airports is the fact that new airport construction is often very controversial and acceptable sites are frequently scarce and far from the city center. We have been able to aid the construction of only a handful of new relievers, including Mount Comfort Airport in Indianapolis, Chesterfield City and Chesapeake Municipal Airports in Virginia, and a new airport now being developed for Albuquerque, New Mexico. We have worked closely with many local sponsors to encourage the purchase of privately owned airports or to expand existing facilities at current publicly owned airports. Frequently, strong local opposition stymies these efforts. We have been successful in some cases such as at Whiteman Air Park in California, Glenn L. Martin Field in Baltimore, Caldwell Wright Field in New Jersey, as well as at a few other locations.

Although to date our efforts to encourage the growth of relievers have not been as fruitful as we would like, we will nevertheless continue to promote this concept. I might add that we are concerned not only about the need for future expansion of reliever capacity but with the real possibility that the existing network of relievers might be reduced through local actions.

As you know, we will be coming before you within the next several months to offer our legislative recommendations for extension of airport and airway development legislation for the post-1980 time period. I hope that, through our joint legislative efforts, we can establish a dialogue which will result in meaningful ways we can work together to address the problem of the lack of sufficient reliever airport capacity.

We have also sought to encourage the development of short runways for general aviation at air carrier airports. Naturally, adequate room must exist before such expansion is possible. In many cases, this lack of additional space has prohibited such development. Also, there is a need for adequate levels of general aviation usage before the construction is warranted. We have been successful in encouraging these efforts at a number of airports throughout the country, Baltimore-Washington International being a good example.

I might note that of the 147 existing airports identified in the 1978 National Airport System Plan as reliever airports, we have provided master planning grant funds to 48%. Insofar as facilities and equipment are concerned, it is true that many of these airports are not equipped with sophisticated landing aids. Generally it is our practice, as the Members of the Committee are aware, to install facilities and equipment at locations which meet our established criteria. In the case of relievers, however, we have in several instances installed LIS's where our criteria would not otherwise have called for them.

Mr. Chairman, that largely brings us to where we are today. We have made progress, and our efforts will continue. Insofar, as our plans for the future, I have mentioned our development activities concerning Collision Avoidance Systems. Their use should go a long way toward further reducing the possibility of midair collisions, and their implementation can be none too soon. We will, of course, continue to improve upon the automation in our air traffic system as well as other features of the system.

I know the Committee will be interested in the contents of a Notice of Proposed Rulemaking which we intend to issue in December. The impact of the proposal could be significant in expanding upon our capability to promote the safe separation of traffic. This proposal would make several major changes. It would reduce the floor of the continental and Alaska positive control area to 12,500 feet from its present level of 18,000 feet. Within this airspace from 12,500 feet to 18,000 VFR traffic, which would be covered by a new regulatory concept referred to as Controlled Visual Flight, would be required to comply with air traffic clearances and instructions and maintain applicable VFR weather minima.

Another key feature of the Notice of Proposed Rulemaking would be to raise ceilings of Terminal Control Areas to 12,500 feet. This would provide additional protection to aircraft entering or departing Terminal Control Areas from uncontrolled aircraft. I should note that the specific airspace configuration of individual Terminal Control Areas would be handled through supplementary rulemaking.

As another effort, we are looking to determine if changes may be needed in communication transfer practices used in terminal areas; to see what changes, if any, may be warranted in the application of visual separation; to assess the validity of existing policy and procedures regarding practice approaches; and to identify what the level of pilot knowledge of terminal separation procedures and related responsibilities may be.

We also have other projects underway which should provide further assistance in the future. For example, we have development efforts underway to consolidate and prioritize warning system alerts, both audio and visual, in cockpits. The intent would be to provide the pilot with a single system which will place multiple warnings in priority with directions for correction. We plan to issue a report and guidance for standardized cockpit alert and warning systems by September 1980. We are also evaluating the utility of Head-Up Displays in approach and landing operations. This evaluation, which should be completed by March 1980, will establish the safety implications of the use of such devices.

Mr. Chairman, as I stated earlier, I am deeply disturbed by the recent tragedy here. The world's best aviation safety investigators are carefully sifting through the facts to determine its cause. We await the results in the hope they may point to a solution that will prevent a similar recurrence. Seldom, though, is there a simple solution to problems we face within our complex air transportation system. Nevertheless, I have concluded that, going beyond the many actions we have in process, there are several actions I can initiate now that should make additional contributions to the future safety of our system.

First, I intend to give even greater recognition to the benefits provided our air transportation system by reliever airports and other general aviation airports that siphon general aviation traffic away from air carrier airports. I have determined that by expanding our efforts to establish approach and landing aids at key reliever and general aviation airports we may be able to reduce the mix of general aviation and air carriers at congested airports. The greater availability of such aids will provide alternative training capabilities for general aviation pilots, which will not only serve to reduce such training at major air carrier airports, but will provide greater opportunities for pilot training so they will be able to better function in the national airspace system. Also, these approach and landing aids will increase the utility of these airports by giving them an all weather landing capability not previously possible. I intend to do this through an expansion of our establishment criteria for approach and landing aids; an expansion that will give full recognition to the benefit relievers and other general aviation airports provide the system by redirecting general aviation traffic away from busy, air carrier airports.

Second, we will continue our high priority program for the installation of BRITE (TV) radar systems in our towers.

This system provides great assistance to tower controllers in sequencing traffic. Beyond that, I have instructed my staff to expedite the installation of BRITE alpha-numeric subsystems so that tower controllers using these digitized displays will have available the same data presently used by radar controllers. This feature will also provide the tower controller with conflict alert system and minimum safe altitude warning system capabilities.

Last, I have decided that our system has evolved to the point at which the concept of positive separation assurance should be expanded in terminal areas. Early next year, we will issue an Advance Notice of Proposed Rulemaking proposing a number of alternative actions to expand positive separation in terminal areas. Among the alternatives we will set out for public comment are:

- Adding more Terminal Control Areas;
- Expanding the geographic coverage of existing Terminal Control Areas;
- Implementing the concept of Group III Terminal Control Areas;
- Extending the concept of positive control, as exists at high altitudes, to terminal airspace;
- Permitting only instrument flight rules operations within terminal airspace designated as positive control airspace;
- Establishing Controlled Visual Flight Rules in terminal airspace designated as positive control airspace;
- Applying Mode C transponder requirements to any additional positive control airspace; and
- Broadening the requirements for the carriage of beacon transponders and altitude encoders to be compatible with separation assurance programs.

To assure the full participation of industry, users, and the public in our decision-making process, we will hold a public hearing on the proposals contained in the notice. Based upon the public comment received, we will expedite the development of necessary rules. While it is premature to define the substance or extent of these rules, my expectation is they will result in the application of positive separation procedures at an increased number of busy terminal areas.

In closing, Mr. Chairman, I want to say that we are striving to meet the challenges of the system, both present and future. We have made significant steps forward, and you have my personal assurance that we will continue our efforts to improve the system with all deliberate speed. But again I would stress to the air traveller that the present system is a good one serving well nearly three-quarters of a million fare paying passengers daily.

We welcome your continued support. As our legislative committees of the Congress, you are familiar with the difficult problems we face as well as the even greater difficulty of finding solutions to those problems. Your guidance and legislative assistance have proven invaluable in the past, and are no less necessary today in helping us to further refine and develop a system that will safely meet the needs of the American travelling public in the future.

Mr. Chairman, that completes my prepared statement. My associates and I are prepared to respond to your questions and those of other Members of the Committee.

The CHAIRMAN. On these items that you were making recommendations on, the BRITE system was not in place in the tower here at Lindbergh, was it?

Mr. BOND. Yes; there is a BRITE display down there at the Lindbergh tower.

The CHAIRMAN. First, let me say that I am pleased to hear of the positive actions that you have stated that you're going to take. To accomplish the changes you have proposed in your statement, do you intend to draw money away from other priority items, or do you intend to request additional funds to implement these changes?

Mr. BOND. Well, Mr. Chairman, our review of the ADAP program will be submitted to the Congress next May. We intend to request additional funds in order to have F and E programs commensurate with the level of funding that's needed.

We have been somewhat hesitant to make statements about the amount of funds available in the trust fund because until just a few weeks ago, when Congress ended, we had thought that the trust fund balances would be affected by the noise bill which you and Congressman Glenn Anderson provided such leadership in. All of the assumptions on the trust fund balances are now changed as a result of the nonpassage of this legislation by the Congress.

So, a direct answer to your question: yes; we will provide for additional funding in our ADAP program in the next fiscal year.

The CHAIRMAN. Mr. Litchford, the systems developer of BCAS, has projected that it could be completed in 18 months and ready for installation. Why does your testimony indicate that it will be 1983 or beyond to install that system?

Mr. BOND. I would like to have Mr. Albrecht, our Acting Associate Administrator for Engineering and Development, answer that question.

Mr. ALBRECHT. Mr. Chairman, in Mr. Bond's testimony he included a fairly complete description of our separation assurance program. I would like to very, very briefly summarize the major elements that relate to Mr. Litchford's statement and to the issues. As you perhaps know, we have three major portions of our program. One is a full-up BCAS program, beacon collision avoidance system. A simplified version of that can be made available earlier as an active-only BCAS system. The third element is a ground-based system, automated traffic advisory and resolution service. These three elements we're carrying forward as aggressively as we can.

Now, several years ago our airborne collision avoidance program was basically a competition between an active technique and a passive technique. An active technique uses interrogators in the aircraft which interrogate another aircraft, gets a reply back, and determines if there is a problem. The passive technique, which is due entirely to George Litchford's concept, utilizes interrogation from the ground that triggers beacons that are received by the aircraft, who then does some computations and determines whether there is a conflict. Two basically different approaches.

It became clear after evaluation of both of these, they each have their problems and each have their advantages. The passive technique has a major disadvantage in not being effective in areas where there is no surveillance. This is true outside of the continental United States and it's also true in a number of geographical areas where adequate radar coverage is not available. It takes at least two radars illuminating the aircraft in order for the passive technique to work effectively.

The active technique has a major limitation in that it cannot develop heading information. It can only provide up-down commands to resolve conflicts. So that really led to our development of what we call the full BCAS system, which combines both of these techniques and provides some computation capability to sense the environment, to decide which of the two types of sensors are most appropriate for the environment, and use that data to give instructions to the pilot.

The CHAIRMAN. Why do you continue to push the active BCAS system when you say it has to be shut off when you get in a high-density area because of the probabilities or the possibilities of creating other problems?

Mr. ALBRECHT. There are two reasons, Mr. Chairman. The first is: For many, many locations the active BCAS system will be effective. Except for high-density areas, the active system will work. It also is the only way to get protection in the areas where there is no surveillance coverage.

Now, Mr. Litchford's approach is a little different than ours in that he does not base his system on the use of the DABS, discrete address beacon system. The discrete address beacon system is an essential element in the future of air traffic control improvement. It.

provides improved surveillance coverage. It provides a way of discretely addressing each aircraft instead of broadcasting to all aircraft and receiving replies. It decreases the interference, so-called garble; it provides a two-way data link between the ground and the aircraft so we can transmit information to the cockpit and make it available to the pilot and he in turn can retransmit information down to the ground. So, DABS is a building block in our program.

The Litchford approach is not compatible with DABS. We also believe that the Litchford approach, as presently conceived, is capacity-limited. This is the major problem in that in the heavier terminal areas, as with the active-only system, the number of overlapping replies is such that the system would not operate satisfactorily.

Mr. GOLDWATER. Would the gentleman yield? Isn't it a fact you really haven't evaluated the Litchford system? You terminated the contract before he completed the hardware and full testing.

Mr. ALBRECHT. Mr. Goldwater, that's not the case. We have evaluated the Litchford system with a large number of simulations, flight tests. And the contract is not terminated. That was an unfortunate word that was used in stopping some work on some items to avoid an overrun. These are items we didn't feel were necessary. George has made his major contribution, but his contract is not terminated. He is still under contract and should be funded through February, depending on how he spends his money.

Mr. GOLDWATER. To finish what he set out to do?

Mr. ALBRECHT. That's right, which was initially to show the feasibility of the BCAS concept. He has done that, sir. We have no technical concern that given a sufficient amount of engineering from this point ahead that both passive/active techniques will be effective and will work. And this is George's major contribution. But he's done that.

The CHAIRMAN. Wouldn't independent ground and airborne collision avoidance systems provide a positive safety check in case one of them fails?

Mr. ALBRECHT. Yes, Senator Cannon, and we are aggressively pursuing both approaches. It's been said we're enchanted with ground-derived information and the ground-based system is the one that we're pursuing. We are pursuing both. We think we need both. They're backup to each other. The ground system has more information available. It knows local terrain conditions. It has much greater computational capability. It requires much less equipment in a general aviation aircraft. It requires very little equipment compared to BCAS, for example. So, we believe both solutions are necessary, and we are pursuing them as fast as we can.

The CHAIRMAN. In your testimony, Mr. Bond, you refer to changes that may be needed in terminal area procedures and policies. Let me ask you a few specific questions.

Will you change the ATC procedures to require a controller to advise pilots of a conflict alert even if the pilots have previously been given traffic advisories and accepted the separation function?

Mr. BOND. Mr. Chairman, that is a question that arose in association with this San Diego incident here, where the conflict alert did go off in the Miramar Tracon, but the controller, following procedures, did not act on it because the pilot had acknowledged the presence of the aircraft.

Let me go back a notch in the understanding of this problem to point out what a conflict alert permits a controller to do. It permits the controller to get on the radio to the pilot and say there is an aircraft in the vicinity and nothing more. Also, turn one way or the other. That's helpful. But the controller did not do so because the pilot had already been warned and had said, "We have seen this aircraft. I have seen his aircraft."

Now, in the review of what's going on now within the FAA in parallel to what the Safety Board is doing, we are considering just this issue. We are examining every issue that we can find factually and procedurally, and this will be considered as we come up with our report on the accident. Perhaps we can improve our procedures.

The CHAIRMAN. Well, it seems to me that there wouldn't be any harm to again advise a pilot. Then if the alert goes off to have a means of immediately advising the pilot that there is a conflict alert sounding. This would certainly give him much more concern about the fact that there may be some imminent danger.

Mr. BOND. If we find that to be the case, Mr. Chairman, we will change our procedures to do that.

The CHAIRMAN. Now, is it your intention to make the heavier passenger volume terminals—that is, the large and medium hubs—TCA's as soon as possible?

Mr. BOND. My statement was that we will establish new TCA's. The list of new terminal control areas, however, has not yet been determined, and our analysis is shifting from the considerations of the San Diego crash to the implementation of specific changes nationwide, not only here in San Diego, but throughout the United States. We have not yet developed a list of sites where new TCA's will be implemented. That, however, will be made public very shortly, and I can promise you that there will be significant change.

The CHAIRMAN. What do you mean by "very shortly"? How soon?

Mr. BOND. Well, I would hope by the first of the year.

The CHAIRMAN. My time is up.

Congressman Anderson.

Mr. ANDERSON. Thank you, Senator.

Mr. Bond, why are you waiting until next year to put out an advance notice of proposed rulemaking on expanding the TCA concept? Why wouldn't you do that now? It doesn't cost anything to give the advance notice.

Mr. BOND. I'm not sure what you're referring to, but in terms of the list of additional TCA's that we will establish, we must be sure that the ones we establish are right and appropriate. We are not sure yet that is the case. And we are working as hard as we can to make sure that the package we present is feasible, practical, and implementable. That is why we cannot do it now. We do not know yet what to do.

Mr. ANDERSON. I would think the advance notice is just a notification that you're going to be doing this. Advance notice on a proposed rulemaking is something you can do fairly fast.

Mr. BOND. We cannot do it unless we know what goes in it, Mr. Chairman.

Mr. ANDERSON. Two years ago the FAA conducted research into ways to make aircraft more conspicuous in the air. What specifically did you find and what regulatory changes were made as a result of that research?

Mr. BOND. Well, let me tell you first what we found did not make much difference, and that was aircraft color and paint. We have gone all the way from light colors to dark colors to day-glow orange and so on. Our work indicated it didn't make much difference. So, our conclusion was improved air carrier lighting systems such as strobe lights, for example, were the most effective way of detecting aircraft in the air. And we now require that all new aircraft constructed be fitted with strobe lights. And, also, when air carrier aircraft get into terminal control areas, their landing lights go on as well. Most of them turn them on. That helps the controller pick up the aircraft as well.

So, those are the steps we have implemented today that appear to us to be the most feasible. We think they're very effective, incidentally.

Mr. ANDERSON. What percentage of the aircraft being used today have them on?

Mr. BOND. Have strobe lights on?

Mr. FLENER. Air carriers, it's 90 percent.

Mr. BOND. In general aviation.

Mr. FLENER. In general aviation, probably half. I don't have a specific number.

Mr. ANDERSON. Although I question the continued adherence to the see-and-be-seen concept, particularly in crowded terminal areas and where we have sophisticated radar equipment, as long as we still use the see-and-be-seen, it seems to me we should do all we can to enhance the ability of the pilot to see the other aircraft.

Now, Mr. King has testified that some NTSB recommendations on pilot training in aircraft scanning techniques were rejected by the FAA. What is the FAA doing in this area? Why were the Board's recommendations rejected, and what is being done before the new generation of jets is certified in the next few years to improve cockpit visibility?

Mr. BOND. That's a long question. The question of cockpit visibility, to start from the end of your question, we are not prepared to answer today. We did not bring our flight standards folks, who handle this issue, with us. But I would be happy to provide that for the record, Mr. Chairman.¹

In regard to the scanning techniques, it's wise to begin with the understanding that every pilot, as an integral part of his or her training, is required to learn how to look outside of an aircraft. That is engrained in pilots. It is constantly repeated throughout the training cycle for every pilot right from the very beginning of his private license all the way up through the training received by air carrier pilots. It is currently required today.

The difference that we have had with the Safety Board is whether or not specific techniques and procedures should be required, and so far we have not felt that there is a need to go beyond the heavy emphasis that we have today in our training.

Mr. ANDERSON. They recommend specific training techniques, and yours is more just recommending emphasis on the importance of it?

Mr. BOND. Not only on the importance of it but for every pilot constantly to look out of the aircraft and be conscious of what is around them. For example, when I took my pilot's examination,

¹ The information was not supplied by press time, March 15, 1979.

part of it included looking outside of the aircraft, to be sure you know where the aircraft are around you, not to spend all your time staring at the instruments that are inside the aircraft. That continues today. It has been integral in our system.

Mr. ANDERSON. The Board seems to feel there are certain training techniques pilots should be using that would enable them to identify aircraft and to do a better job of scanning.

Mr. BOND. Well, all I can say is that we feel that the strong integral emphasis that we have placed on that matter to date is sufficient.

Mr. ANDERSON. One thing that leaves me puzzled about the recent accident here is that Miramar was equipped with the latest radar, including conflict alert. Yet, when the alert sounded, the controller was not able to immediately contact both aircraft involved in the conflict. Perhaps I am overlooking something, but it seems inconceivable to me that we can develop such a fine piece of equipment to alert us of a potential collision, but we cannot contact the parties involved.

What is your response and what is being done systemwise to enable the controller to instantly pass this information on to the pilot?

Mr. FLENER. Mr. Anderson, the way the system is set up—and that's the way it worked in this particular circumstance—PSA was handed off from the Miramar RATCC to the Lindbergh tower. Each aircraft was on a different frequency. That is normal under the circumstances and is the way it was worked out—the way the letter of agreement was written.

If one frequency were set up or established in which all aircraft would remain on that frequency, it would create very difficult problems of congestion for the total system and the movement of traffic in and out of San Diego. So, they did what they were supposed to do.

Now, it's true one aircraft was on one frequency and the other was on another because of the circumstances of maneuvering of the aircraft at that particular time. But that is normal under the circumstances of the system.

Mr. ERTEL. Would the Chairman yield on the question?

Mr. ANDERSON. Couldn't you have a command frequency?

Mr. FLENER. Yes, you could.

Mr. ANDERSON. Every aircraft that flies into a high-density area could be required to have a single channel emergency command receiver equipped with the proper moot relays and so on—

Mr. FLENER. Yes, sir.

Mr. ANDERSON [continuing]. So when an emergency like this comes up it would immediately go in. It seems to me that—

Mr. FLENER. The military does that today. However, there are certain problems with that. There's 18,800 military aircraft in the total system, and they have very tight control over them. We have almost 200,000 general aviation and air carrier aircraft. If we did the same as the military—which has been proposed by a number of people—and use 121.5, which is the emergency VHF frequency, it could very easily block out all discrete frequencies for 250 or 300 miles radius.

Let me give two examples. One would be on the ground. If the Miramar RATCC or the Lindbergh tower broadcasts on an override guard frequency—they call it Guard in the military—they would block out everything in the entire area, not only on Guard but also on discrete frequencies, because it would have to be an override.

Let's take the second example. If there were an aircraft at 39,000 or 40,000 feet, which is not improbable at all, either where the mike button got stuck or he came up on Guard, he would block out everything for 250 or 300 miles radius on all frequencies. This could involve the sort of situation in which a controller at Miramar, Los Angeles Center, or whatever has two aircraft head on, on a discrete frequency other than Guard which is blocked, totally blocked. He's trying to issue instructions to provide separation, climb, descend, but he can't talk to them. He could have an incident occur as much as 200 miles away because of that. That's the problem with using a Guard type frequency.

Mr. BOND. Let me just fill out this issue a little bit, Mr. Chairman. You are familiar with the emergency locating transmitter, ELT's, that we are required to put in all aircraft today in case they should crash. Well, we have had a lot of trouble in the early years with ELT's because of inadvertent triggering with the ELT, and they transmit and they block everything and they are a terrible nuisance when they go off. And 98 percent of the time they go off incorrectly. They have caused a lot of trouble. So, that is analogous to our fear of the override problem with the Guard frequency.

Mr. ANDERSON. Do they have that trouble in the military?

Mr. BOND. I don't know.

Mr. FLENER. The Air Force basically does not. No, they do not have a problem on Guard.

Mr. ANDERSON. Why would the military not have that problem and why couldn't a civilian system be worked out?

Mr. FLENER. I understand. They control it very, very tightly. They have complete control over the particular pilot or frequency, which we don't always have. I mean completely.

Mr. ANDERSON. I'll yield now. I've got some other questions, but I know I have gone beyond my 10 minutes.

The CHAIRMAN. Congressman Ertel.

Mr. ERTEL. Thank you, Mr. Chairman.

Just if I may return to that point. Inasmuch as many of your people routinely hand off into other sectors, why couldn't the controller who has the conflict alert system have a switch which could plug him into the other system, such as the tower frequency or the frequency in the adjoining sector where he can warn the pilot, and he could only be on two circuits rather than have to block out the entire system?

Mr. FLENER. The answer is yes, sir, that could be done.

Mr. ERTEL. It seems to me that is logical and should have been done already, and it seems to me that would be done in the event you're going to be transferring people from one frequency to another as well as in regard to that other circuit when that guy is being handed off to another controller.

Mr. FLENER. We do have override frequencies.

Mr. ERTEL. Why wasn't it done in this particular instance?

Mr. FLENER. Let me give you an example. At O'Hare, the controller in monitoring final approach when two are in parallel, on parallel approaches. He has the ability to override local control in the tower just to do what you said, sir; override. But we have not done that nationally with the Guard frequency for the purposes of an emergency situation. To begin with, how often would that happen?

Mr. ERTEL. Well, we know it happened once.

Mr. FLENER. It happened once.

Mr. ERTEL. We also know that you're controlling people coming into an airport; and when you're turning them over to a tower, you know there is a certain period of time in which there is a lag there in the aircraft while the man is changing from the one frequency to the tower frequency, where there is a real danger, and that's the dangerous point—where we don't have any communication with the pilot.

Secondly, when you have other pilots coming in there, you're trying to control them from two different places. It seems to me that's the place where you should have the override capability, and it doesn't seem to me it's very difficult to do it.

Mr. FLENER. I have no problem, and it wouldn't be difficult to do; but when you have 806 facilities, which we have in this system, who are handing off constantly one to the other, the ability to override one to the other would be fantastic in cost and hardware and efforts.

Mr. ERTEL. Well, I don't know if you're doing it for that many circuits, sir.

Mr. FLENER. I appreciate the one aircraft situation in San Diego. We move 120 million aircraft every year. Should you go into that type of system, that's the problem.

Mr. ERTEL. But you only have 800 and some systems, and you're only talking about an override facility in 800 and some systems.

Mr. FLENER. No, sir, we are not. Some of those facilities have maybe 40 frequencies.

Mr. ERTEL. Yes; but you're talking about between certain frequencies, especially the tower frequency. That's where you're going to have the most confusion.

Mr. FLENER. I can build that into any system.

Mr. BOND. Mr. Chairman—or Congressman Ertel—

Mr. ERTEL. I'm glad for the promotion. The chairman may have something to say about that.

I'm sorry. Go ahead.

Mr. BOND. I apologize.

We will look at that issue. It's a good idea. We will give consideration to it.

Mr. ERTEL. I would like to turn to something else that Chairman Anderson just made a suggestion on that brought this to mind. You indicated in your testimony, Mr. Bond, that you have cut down on near midair collisions and the reporting of them, especially in terminal control areas. I received a letter some months ago, and I referred it to the FAA. It's written by a chap who flies for Stroehmann Bros. Co., in Williamsport, Pa. He's their chief pilot, and he recites three independent near midair collisions that he had. One back in 1973, one in 1976, and in 1978. He also recites another one which occurred within 6 days of his incident in 1978, and he tried to report each occasion to the facility where the near miss happened. In each and every case he got what he considered to be an attempt, at least, not to accept the near midair collision report.

Let me just read part of it: "He admitted what had occurred and asked that no report be filed because he and the New York Center sector chief could solve the problem." That was in 1973.

The 1976 incident: "About a month later I received a telephone call from"—a chap. I'll leave his name out "of the Philadelphia General Aviation District office asking for information. He stated he never

received the information from the Philadelphia radar facility." That was another report that he made.

In 1978, the same thing happened. When he tried to file a report, they wouldn't accept it in the Philadelphia facility. Then he goes on: "Six days prior to this last occurrence, in a conversation with the pilot for Anchor-Darling he told me he had a near midair collision near the Wing's Airport, and the Philadelphia facility refused to follow up on the situation."

Now, if that is the normal course of action by the various facilities, are we getting proper information to evaluate? What kind of training program and what kind of followup do you have to insure we are getting adequate information back to the FAA so that we can avoid this type of noncompliance?

Second, how to get accurate information so that we know what's going on and we can determine whether there is a possibility of a midair collision.

Mr. BOND. I appreciate that. My reaction, based on a great many conversations and thoughts on this, is that that is an exceptional circumstance and is not representative. But, in any case, there is always a problem in trying to get good data on near midair collisions because, for example, when we have a violation of our separation standards, which in many cases is 3 miles separation, if an aircraft comes 2½ miles apart, it isn't, it isn't a very threatening thing even though it is a technical violation of our standards.

Mr. ERTEL. These indicate 100 feet. And I also had a personal experience going into Washington National about 3 months ago where I had a near midair, where the controller missed it. The guy almost got me. The closest I ever had.

Mr. BOND. Did you report it?

Mr. ERTEL. Yes, I tried to.

Mr. BOND. I would be happy to check on that.

Mr. ERTEL. Fine. I would be happy to have you do it.

It seems to me we're getting more and more of these nonreports rather than the information we need.

[The following information was subsequently received for the record:]

There is no information available in our official near miss reports, or in the Baltimore and Washington National terminal facility records that can be identified with this incident.

See following Congressional Inquiry with Congressman Ertel's office.

I informed the Congressman that I needed more specific information about his near miss that occurred approximately 3 months ago while en route to Washington National.

The Congressman advised me that he was in a Piper Cherokee N8983C IFR at 7,000 feet near Frederick, Md., when a Cessna aircraft passed within 100 yards of his aircraft. He reported the information to Baltimore approach control and assumed that his pilot would file a report upon arrival at Washington National. He stated that the incident took place sometime in August of this year.

Thanked him for the information and told him that we would be able to check into the incident more thoroughly.

The information about this incident is being prepared as part of the Administrator's response to the Cannon committee hearings in San Diego.

Mr. BOND. Well, I think our data is pretty accurate, but it would be silly to say that everything is completely reported because that's just not possible to do. But let me tell you what we have done to try to guard against that likelihood, and that is our NASA reporting

program which we have established and have been working with for several years. It provides essentially pilot immunity for pilots who report incidents of any kind to NASA. They will not be penalized for what they do even if they are themselves at fault. This is undoubtedly a block with pilots as well as perhaps with controllers.

So, with the NASA program an incident is reported to NASA, is analyzed as to its facts, goes into the statistical base, but immunity as to the punitive action from the FAA is assured. So, that is the kind of second side of our reporting system mechanism to insure that as much as possible is reported.

Mr. ERTEL. What special controls do you have to insure that these are followed up and reported?

Mr. BOND. Bill, would you like to try that?

Mr. FLENER. Every morning—let's take a Monday morning for example. I review Friday, Saturday, and Sunday's total systems errors—everything that has occurred.

You're talking about systems errors. I'm familiar with this letter that you wrote. In the case of the three incidents, concerning two of them we blew it.

Mr. ERTEL. You blew it?

Mr. FLENER. And we so wrote you back. I'm sure you left your office before you received the letter.

Mr. ERTEL. The pilot indicated he may be a cat with nine lives.

Mr. FLENER. When we went back into it and checked on it, we found that there was a systems error. Now, a systems error can be, as the Administrator has said, 2½ rather than 3 miles or 100 feet or whatever. This is going to happen. We run one systems error for every 1,400,000 operations. Not too bad when you look at it statistically.

But it's very traumatic for a person like yourself or me or him when it occurs to you. You write a letter. So, this does happen, but we review it daily. Every system error, every failure in the system of any sort, whether it's computerized or whatever it is, we very, very carefully follow up every 24 hours.

Mr. ERTEL. Thank you.

If I may turn to another area because I don't want to belabor that.

Mr. Bond, to what extent, if any, is FAA's continued adherence to this see-and-avoid concept even in the areas covered by the ARTS III equipment dictated by agency concerns that to take more responsibility from the pilot might increase FAA's litigation exposure? In other words, is liability a major concern in your thinking of making system changes?

Mr. BOND. I have a puzzled reaction because I never considered that or heard it considered as a consideration in my dealing with this issue.

Mr. ERTEL. You have never heard of the fact that if the FAA takes on more responsibility in this area you open yourself to more liability and more litigation?

Mr. BOND. That has never been a consideration or an issue with me in the air traffic control procedures.

Mr. ERTEL. I'm glad to hear that. I think that's commendable.

I see my time is over, and I will defer further questions.

The CHAIRMAN. Congressman Goldwater.

Mr. GOLDWATER. Thank you, Mr. Chairman. I would like to follow on Congressman Ertel's question. In your statement you stated that a number of midair collisions have dropped drastically in recent years.

However, I understand that so-called system errors have been increasing from year to year. Is that a fact?

Mr. BOND. Yes, we have had an increase of some dimension in reported systems errors.

Mr. GOLDWATER. What is a system error?

Mr. BOND. Well, basically, it is any deviation—lessened deviation from the standard separation in our system, and it can range, as Bill Flener said here, from a near miss, which is a very serious matter, indeed, to providing separation on only 2½ miles, for example, when the provision is for 3 or more.

Mr. GOLDWATER. Is this an error that the pilot commits?

Mr. FLENER. Sometimes.

Mr. GOLDWATER. Could you give me an example?

Mr. BOND. The culpability can rest in a number of places. Our first is to report it and then find out what caused it. It could be pilot-introduced and it can be our fault.

Mr. GOLDWATER. But are not most system errors occurring within the air traffic control system itself either human error, say, on the part of a controller or tower operator or failure of equipment on the ground?

Mr. BOND. Your question is: Is it either the cause of a machine or a man? Yes.

Mr. GOLDWATER. In the air traffic control system. This is excluding the pilot. I'm saying: Are not most system errors—

Mr. BOND. Let me try and rephrase it. Has our investigation revealed what percentage of it is controllers as opposed to pilot error?

Mr. GOLDWATER. Yes. Or equipment.

Mr. FLENER. It's about 95 percent.

Mr. GOLDWATER. What?

Mr. FLENER. Our ground errors are controller errors.

Mr. GOLDWATER. Are controller errors.

Mr. FLENER. Yes, sir.

Mr. GOLDWATER. And how much would that be as far as equipment failure?

Mr. FLENER. Very small.

Mr. GOLDWATER. Equipment doesn't fail, but the human being does?

Mr. FLENER. Yes.

Mr. GOLDWATER. Primarily, the human being that operates the ground-based equipment?

Mr. FLENER. Right.

Mr. GOLDWATER. Ninety-five percent?

Mr. FLENER. Give or take.

Mr. GOLDWATER. Ninety-five percent of system errors are, in essence, human errors by air traffic controllers or tower operators, what have you, on the ground?

Mr. FLENER. Whatever; yes, sir.

Mr. GOLDWATER. Are these errors investigated by the FAA?

Mr. BOND. Our work begins the next morning. A report is made on every one.

Mr. FLENER. We have a "go" team that goes to work immediately.

Mr. GOLDWATER. And steps are taken, I assume, to reduce this—

Mr. FLENER. Not only to reduce that, but retrain the individual if we find he's at fault.

Mr. GOLDWATER. But it's a fact—and you just stated so, and I assume it's also published in your flight standard report—that there has been an increase in the number of these systems errors?

Mr. BOND. Yes.

Mr. GOLDWATER. One of the things that disturbs me about this fact is, again, addressing ourselves to collision avoidance systems, the FAA, is proposing a DABS/BCAS collision avoidance system, which is a ground-based system. And if system errors are on the increase, then how reliable is this proposal of yours?

Mr. BOND. Let me go back to what—

Mr. GOLDWATER. Does it not raise some questions of credibility and reliability?

Mr. BOND. Let me go back to the answer that Bill Flener gave you a moment ago when he said that very few of our errors are machine-caused. But DABS system, which we call ground-based, is not ground controller-based. It is ground machine- or computer-based. That is the fundamental circumstances of our DABS/ATAR system. The computers will take the knowledge that they have of all the traffic in the area and transmit to aircraft genuine conflict warning advice. Our controllers will not be in that loop. Only the machine will be. And given the extraordinary reliability of our equipment, we believe that this is a very, very reliable and fail-safe system.

Mr. GOLDWATER. Mr. Bond, why are opposite approaches allowed to exist and function at Lindbergh Airport?

Mr. BOND. In opposite directions?

Mr. GOLDWATER. Yes.

Mr. BOND. Because there was no traffic coming in the other direction.

Mr. GOLDWATER. They are allowed because there is no traffic coming in the opposite direction?

Mr. BOND. At the time that that approach was permitted, there was no traffic coming in the other direction. That is fundamental to all operations in two directions of runways.

Mr. GOLDWATER. Well, I would suggest that in this recent accident there in fact was an aircraft coming in the opposite direction.

Mr. BOND. That's not the case. The aircraft was traveling in the same direction when the accident happened. He was downwind.

Mr. GOLDWATER. Making his approach?

Mr. BOND. That's right.

Mr. GOLDWATER. In other words, you set up potential collisions where you allow practice approaches coming in from the opposite direction of the normal flow of traffic that's landing. And the question is: Why would something like that be allowed to continue?

Mr. BOND. Because we don't see any safety hazard that's inherent in it. So long as the separation between aircraft, no matter what direction they're moving in, is sufficient according to our standards, we do not believe there is any inherent difference in hazard or risk whether they're all going in the same direction in trail or intersecting through various pieces of airspace or whether they're approaching the runway from another direction.

Of course, because of the closure-rate problems, we have required much additional separation if they're going to make an approach in opposite directions. Miles and miles of separation. But if there is sufficient space out on the other end of the runway and no one is making an

approach, then we see no hazard involved in making an approach in two directions.

Mr. GOLDWATER. And that is inherently dependent on the air traffic controller or the tower operator to make these determinations?

Mr. BOND. As are all traffic controller decisions, whether they're landing in the same direction or whether they're landing in opposite directions. They all depend upon analysis of radar data, eyeball evaluations, conversations with the pilot.

Mr. GOLDWATER. You say that there is an increase in system errors, and 90 percent of that is human error by air traffic controllers or the tower operators. You allow a situation to exist which has, the potential of causing a midair collision when you allow a practice approach coming one way and normal landing traffic coming the opposite way and the only separation is dependent upon the controller looking at a radar scope or looking out the tower cab? Commonsense would tell me that is inherently potentially dangerous. Would you not agree?

Mr. BOND. No, I would not.

Mr. GOLDWATER. You do not agree?

Mr. BOND. I do not believe that is the case. Providing the separation is safe and adequate, there is no inherent hazard in having aircraft operate both ways on a runway.

Mr. GOLDWATER. As long as you don't have human error—

Mr. BOND. Providing you know an aircraft is coming in the other direction.

Mr. GOLDWATER. As long as there is no human error?

Mr. BOND. As long as there is no human error.

Mr. GOLDWATER. As long as there is no failure of the air traffic controller, the human being, or the tower operator, then it's safe. But as you said, there is an increase in system errors, and 95 percent are human errors, and you have set up a system where you have practice landings coming one way and commercial traffic landing headon to the practice runs. The only dependence on that separation is the human being who has them under control.

Mr. BOND. The fact is that all of our air traffic control separation relies upon human judgment backed up with excellent machinery warning mechanisms and so on. There is nothing inherently more risky operating in both directions on a runway than there is operating in one direction of the runway. We always apply much greater separation standards. We require that distances be much greater. But providing that they are, we allow those type of operations.

Mr. GOLDWATER. Well, that doesn't seem to make much sense to me. It would seem to me that you system has got to be perfected to the point that minimizes any potential error that could occur. And if you set up a headon collision because of the system, or the way that the airport is operated, and there is a potential human error, well, to me that is not good management of an airport. If there is even a 1 percent chance of the controller turning his back and allowing two aircraft to be on a headon collision path, then I suggest you're setting up potential problems, And I would further suggest that may very well be the situation that occurred here in San Diego.

Mr. ERTEL. If the gentleman would yield just a moment.

I think you're basically asking an unfair question because you're postulating a simultaneous landing on the same strip. He has already indicated they separate these aircraft landing. If one lands at 10 o'clock and one lands at 12 o'clock, there is no hazard because they're completely different. And what the gentleman is postulating is separation by time and distance.

Mr. GOLDWATER. It may not occur on the strip. It may occur somewhere in the traffic pattern.

Mr. BOND. But that isn't the question you related to the approach pattern in different directions.

Mr. GOLDWATER. When an airplane that is on a practice landing passes over the runway and continues outbound and you have an inbound aircraft landing in an opposite direction, the collision could occur somewhere in the vicinity of the airport. That's what I'm saying. If you have the airplanes all going the same direction, then you minimize the potential danger of a collision.

I'm not saying it could happen on the runway. It could happen on the runway as, I think, occurred at Los Angeles International Airport just the other day.

The CHAIRMAN. The Congressman's time is up, and we will come back to him so he can pursue that.

If you want to respond now before we proceed with other questions, you may, but I would simply make the observation that if the airplanes are going in the same direction, you're never going to avoid that condition unless they're going in the same direction at the same speed, and they're not doing that with this kind of airplane mix. There is a 250-knot speed on a jet aircraft and a maximum speed on the type of small aircraft that was involved in San Diego of probably 150 miles an hour.

Mr. BOND. Let me just add a thought or two. The problem that you raise, Congressman, is essentially that of aircraft using the same piece of airspace at different times, whether it's flying in two directions on a runway or going over an intersection or having an intersecting runway at an airport. In each case the criteria we use is time-distance separation that is safe. All inherent in the same principles.

Mr. GOLDWATER. I recognize that. I do recognize that. We have got the same thing going at Los Angeles International Airport.

The CHAIRMAN. The Congressman's time is up.

Mr. GOLDWATER. You want to minimize in your operations policy any potential problem that may exist, and I'm saying it's more safe to have them all going around the same direction than it is having them landing and taking off in opposite directions. It is more safe. And I think that's the duty of the FAA, to make aviation as safe as possible.

Mr. BOND. I quite agree.

The CHAIRMAN. Congressman Anderson.

Mr. ANDERSON. Thank you, Senator.

Why are we in a position of having traffic control split between Miramar and Lindbergh tower?

Mr. BOND. I'm not sure I understand the question. The approach control updates that are used throughout the United States are all fairly similar, where there is a radar room, and the handoff is effected to the local controller in the tower. And whether the radar control

facility is located in a darkened room at Miramar or the bottom of the same tower doesn't make too much difference.

Mr. ANDERSON. It seems that Miramar was talking to one and Lindbergh was talking to the other.

Mr. BOND. That's a question of frequency change. That doesn't mean—it hasn't anything to do whether it's at Miramar or here. All of our traffic control procedures, where there is radar coverage, are based on handoffs.

Mr. ANDERSON. How many similar situations exist around the country, where we have the control split like this?

Mr. BOND. All of them, essentially. We would guess at least 200.

Mr. ANDERSON. At least 200 are split?

I was wondering what the cost would be of remoting the ARTS III display from Miramar to the Lindbergh tower.

Mr. BOND. \$300,000 or \$400,000.

Mr. ANDERSON. \$300,000 or \$400,000?

Mr. BOND. That would provide additional readout digitized display on the radar screen that is now in Lindbergh tower.

Mr. ANDERSON. Then, you would have the information they had at Miramar also then at Lindbergh.

In these other 200 cases that you say are around the country where you have the radar split from the control tower, do they have the ARTS display in the control room?

Mr. BOND. The answer is that some do and some do not. If the control room is located relatively nearby within the cable length—that's the same as in the same building—we frequently have digitized display both downstairs in the radar room and up in the tower. For example, National Airport.

Mr. ANDERSON. Is Miramar close enough, then, to have—

Mr. BOND. It is not close enough for cable length, but it is close enough for remote microwave length, which is not installed.

Mr. ANDERSON. Is that currently proposed in your budget?

Mr. BOND. No.

Mr. ANDERSON. Wouldn't such an installation lessen, to some degree, the possibility of a recurrence of a midair collision?

Mr. BOND. That's possible. And if you look at my statement, you will see that we're going to raise the installation rate of ARTS III-type displays in tower cabs.

Mr. ANDERSON. Along the same line, I'm still not clear why there isn't a terminal control area established here in San Diego. I asked this question earlier of Mr. King, and I read your list of the existing number one TCA's, which include the larger areas, I suppose, like New York and Chicago and Los Angeles. Then I saw the number two grouping. It included some communities where there would not be any more aircraft activity, such as Kansas City or New Orleans.

I wondered why there was not a TCA here for the San Diego area with all the airports. You have three or four big general aviation airports like Palomar, Brown, Montgomery, Gillespie. You have Lindbergh Field, you have Miramar, North Island, Imperial Beach. All kinds of aircraft activity. I would have thought this would have a rather high priority for TCA.

Mr. BOND. The reason that isn't here is that it does not meet our air movement criteria. That is to say, it isn't busy enough with the mix of air carrier traffic such to meet our criteria. That's why it's

not here today. We are going to install throughout the country more terminal control areas, and San Diego will be a high priority candidate for that.

Mr. ANDERSON. What would it cost to set up a TCA in this area?

Mr. BOND. Well, we haven't done that calculation yet.

Mr. ANDERSON. Have any unsafe condition reports been filed relative to uncontrolled aircraft in the vicinity of Lindbergh approaches?

Mr. BOND. What was the question?

Mr. ANDERSON. Have any unsafe condition reports been filed relative to uncontrolled aircraft in the vicinity of Lindbergh approaches? If so, what was the nature of the report and what if any response did the FAA make?

Mr. BOND. We would be happy to make available and put in the record of the committee's hearing all of the condition reports for the area here, and our response to them.

Specifically, the most recent one, Bill, would you like to address those?

Mr. FLENER. Yes, Mr. Chairman; we had nationally last year some 2,200 what we call UCR's, or unsatisfactory condition reports. Fourteen of them were here. I personally, as well as the Administrator, reviewed them. Most of them had to do with air-conditioning systems, failures of communications, and so on.

However, there was one filed about, oh, 18 months ago by an individual, a controller who left here and went off to Portland, Oreg., who spoke to the safety problems in this particular area. I do not know the final disposition of that particular report. But, in looking at the entire Nation, all 2,200 reports, Mr. Anderson, 96 percent of them were closed out. That is, they were either accepted and taken care of or the regional office, or here at San Diego, said: "Yes; we have looked at that and we are working on it" or "it's done" or "not being done" or whatever. Four percent had national significance. But I can't tell you the disposition of those.

Mr. ANDERSON. We would like to have a report for the record on that particular one. I was called by one of the Congressmen from this area and told of this particular report, and he said they would try to trace it down. Washington—you did not have it back there. The report pretty well predicted what happened here, and was one that I was wondering why some action wasn't taken on it.

Mr. FLENER. We will see to it that you personally receive it and that the record does show it, but let me make one point, if I may, Mr. Anderson. I was a controller for 15 years at five towers and two centers in the field. If I wanted to make an issue of any safety item, I would "shotgun" it. I would sit down and I would write, which is very simple to do, in longhand any number of unsatisfactory condition reports about anything, any place, any time. Any when something occurs some place, I can point and say "I told you so 5 years ago," or 10 years ago or whatever. That is what happens in this system a great deal, and I think you should be aware of that. A lot of people do that.

Mr. ANDERSON. Thank you, Mr. Chairman.

[The following information was subsequently received for the record:]

An unsatisfactory condition report (UCR) was filed relative to Stage III service, air traffic procedures, and uncontrolled aircraft operating in the vicinity of Lindbergh Field. This report was submitted by a controller (Steven B. Gibby) of Lindbergh Tower on May 13, 1977. In his report, Mr. Gibby cited two near-

midair collisions on the final approach course to Lindbergh Field—on April 16, 1977, between an American Airlines 727 and a Piper Aztec, and on May 4, 1977, between a Western Airlines 727 and a Beech Bonanza. He further stated that “Hundreds of light aircraft cross over final and departure courses daily without contacting us. The potential for a midair collision is constant.”

The UCR was reviewed at the facility and regional levels with the following comments and recommendations.

Facility Review—The majority of aircraft operating across the approach and departure courses contact the tower and are given air traffic service. A staff study which recommended establishment of limited radar approach control service at Lindbergh in two phases (Stage II with upgrading to Stage III) was forwarded to the Western Region for review.

Regional Review.—The region concurred in the staff study and forwarded it to Washington Headquarters for approval. The region considered the UCR closed, since the recommended solution was to establish limited radar approach control service at the Lindbergh Tower.

Washington Review.—The staff study was sent to Washington in March of 1977, and was not acceptable because it did not contain adequate data to objectively evaluate the recommendation. A revised staff study (recommending limited radar approach control with continuation of Stage II service) was forwarded to Washington in October of 1977 and in February of 1978 delegation of limited radar approach control authority at the Lindbergh Tower was approved and became effective in September of 1978.

The CHAIRMAN. Mr. Ertel.

Mr. ERTEL. Thank you, Mr. Chairman. I have two things I would like to follow up on.

I was amazed at the statistic that 95 percent of your system errors were personnel. Now, a system error in the way I would define it—and if I am incorrect, please define it—a system error means an error in procedure which will affect the entire system. It's not an individual error; it's not an individual mistake; it's a system error. It means a design fault in a system that the FAA has promulgated. Am I correct in my definition?

Mr. BOND. No. It means less than a planned system separation, and it encompasses either a design error or personal error. It does not mean the system designed—

Mr. ERTEL. System error usually is something wrong with the system and individual error means he didn't follow the system.

Mr. BOND. Well, perhaps we should change the title. But, in any case, it means less than planned separation.

Mr. ERTEL. Planned separation?

Mr. BOND. Minimal separation.

Mr. ERTEL. I'm not talking about just separation. Are you telling me that 95 percent of those—it's a system that's been designed so that individuals can err 95 percent of the time? Is that what you're telling me?

Mr. BOND. As Bill Flener told you, we have one system error for almost every 2 million incidents. That's considerable. What he said was that of the total system errors that are reported, 95 percent are not machine caused.

Mr. ERTEL. All right. I understand the definition now.

What do you do to correct system error when the individual has fouled up? You say you go back and retrain. Do you have any other procedure other than just retraining? Can you discipline?

Mr. BOND. We can take a whole range of corrective actions. Yes; we can discipline. Yes; we can retrain. We can do all of those.

Mr. ERTEL. Can you fire?

Mr. BOND. I would certainly think so.

Mr. FLENER. The answer is yes.

Mr. ERTEL. You can.

Second, have you seen the testimony which is going to be submitted by the Airline Pilots Association? Have you had a chance to review that?

Mr. BOND. I have not.

Mr. ERTEL. Well, ALPA indicates that in 1969 the NTSB called the concept of see-and-avoid outmoded and recommended in its 1971 report that the FAA develop a collision avoidance system for airliners and other large aircraft, and a proximity warning indicator for smaller aircraft. They go through the entire recitation of what happened, where the FAA is concerned, during the development of that system. And they come to 1976. The FAA told the Senate Aviation Subcommittee about its current work of collision avoidance systems in a letter to update testimony given at the hearings in May 1974. The FAA stated it was continuing to develop the beacon collision avoidance system which makes use of radar transponder RA on most aircraft. The agency also said they expected to issue a national standard for the system by July 1977.

Have you issued that standard?

Mr. BOND. No; we have not.

Mr. ERTEL. Why not?

Mr. ALBRECHT. Mr. Ertel, that letter was written February 1976, and it promised a standard by July 1977. If you remember, I said earlier in that time frame we were considering active and passive systems. They were essentially in competition. We hadn't gone through the system development that led us to the conclusion we needed to combine the capability of both of those systems that would come up with one that would be most effective. Our intent was to issue a performance specification on an active-only system at that time.

Now, this will sound like an excuse, but it's a reason. Two things have happened. We determined that we needed a specification that would contain much more design detail. Performance specifications say what we want; but design specifications goes into much more detail in terms of what design concepts should be used.

So, we will issue a more detailed specification in December of this year. We're a year late, and that year probably would have been utilized anyway for industry to go from performance information into design specification. So, we're late in accordance with our promise. We changed the intent of that specification, and we will have it available in December of this year. We expect that it will be completed enough so that industry can take a serious look at the problem. We intend to hold an industry conference to review that specification, answer any questions, and then see what they come back with in terms of their response to implementation.

Mr. ERTEL. There was one concluding statement in this you ought to probably be aware of. It says: "Mr. Chairman, we believe this record clearly shows the FAA has been too slow in developing an effective collision avoidance system."

I think a 9-year time period, which doesn't sound like a very complicated system, is a pretty long period of time.

Mr. BOND. Well, we think the system is extremely complicated, and the second order—

Mr. ERTEL. I'm sorry, I can't hear you.

Mr. BOND. I don't think it is a simple matter. Our technical analysis of collision avoidance systems has led us up a number of blind paths or, more accurately, caused us to test a number of systems which, for a variety of reasons, we don't think are good and they create other hazards that we wish to avoid.

Mr. ERTEL. I don't see how a passive system could create other hazards, which would be a warning system to a pilot in an aircraft, which would not require him to take action, but at least would alert him to take action. I don't see how that can be considered a hazard.

Mr. BOND. A system that gives a false alert?

Mr. ERTEL. Not with a system which is passive, which indicates to the pilot that he is in the proximity of another aircraft, and alerts him to the danger, giving him an indication he has got a problem without requiring him to take action.

Mr. BOND. All systems, whether they're passive or active, essentially alert the pilot to aircraft in the vicinity. But if they're in the vicinity because they should be there, then, that is a false alert, and that is where the safety hazard arises. That is our greatest concern about collision avoidance systems in highly congested airspace, and that is why we believe the system that runs through our machinery on the ground, DABS/ATAR, is the safest part.

Mr. ERTEL. I believe that additional information for a pilot is not a hazard if he knows another plane is there even though it should be there. That cannot be a hazard to a pilot. That is more information which he knows, and in the event anything else happens, he knows that aircraft is there.

Mr. BOND. The issue is far more complex than that because if the pilot is to really take full advantage of a collision avoidance system, he has got to obey it or disobey it one way or the other where he does not see an aircraft in the vicinity, which may happen. It may be out of sight, for example.

Mr. ERTEL. I certainly don't want to be argumentative, but may I just interrupt for a moment? If I'm flying an aircraft and the controller tells me I have an aircraft in my vicinity, to be on the alert, I certainly look for that aircraft. Now, if I have a warning signal which says an aircraft is within a thousand feet or a hundred feet of me, whatever it might be, I'm still on the alert. It makes no difference. But what it does is alert the pilot. It does not require affirmative action other than to put him on notice. So, I don't see what's disruptive about that. But it takes it a step beyond the individual air controller who misses that guy.

Mr. POZESKY. Congressman, if I can help, I think what you're referring to is the capability of the BCAS system to provide the pilot with an independent picture when operating in a passive mode.

Mr. ERTEL. Absolutely.

Mr. POZESKY. I think in discussions with the airline pilots and others, in determining the characteristics of a collision avoidance system, the requirement exists not only that a system will work within coverage but a system will work out of coverage as well. So, on a national-type collision avoidance system, both capabilities are desired. The system we're pursuing will work both inside and outside coverage.

Mr. ERTEL. Certainly that would be the perfect system, but there is something less than a perfect system, and we should look to that in the interim. It seems to me the greatest chance of collision is in con-

gested areas. So, therefore, if you have a system that will work there, it would seem to me that one would start there. If you can't get it there but you can get it somewhere else, why not develop the one system and then go ahead with developing the other part of the system rather than wait for both?

Mr. POZESKY. Congressman, I believe we are doing just that. We are pursuing a system which has the traffic information available to it. That is our full system, which works both in and outside coverage, and has an active mode. We don't believe the technical risk of the active mode per se is very high. And, in fact, that is why we have broken it off as a stand-alone capability. So, the addition of just the active capability to the passive is not in and of itself, in our mind, representing a delaying factor per se.

Mr. ERTEL. Are you saying to me you're not delaying the development of a collision avoidance system to get both systems together?

My understanding of your testimony was that you were waiting to get both in the highly congested areas, where you have a lot of activity, and in the less-dense areas you're waiting to get both together rather than doing one at a time.

Mr. POZESKY. No, sir. We are doing an active-only and a combined system simultaneously in parallel as two different systems.

Mr. ERTEL. And neither of them are perfected at this point to be put in an aircraft?

Mr. POZESKY. That's correct. The active is the furthest along.

Mr. BOND. Congressman, let me add one thing. You mention that your impression was that in the high-congested airspace the greatest hazard of collision existed. Statistically, that's not correct. Most of our midair collisions, which obviously occur with general aviation aircraft, are not in highly controlled airspace. They are out of it. That is why the active system—why we believe the earlier implementation of that system is a good idea. Where—

Mr. ERTEL. May I interrupt you? I said congested, not controlled. There's a difference. All congested areas are not controlled. So, there is a difference.

Mr. BOND. Fair point. Nonetheless, in a controlled area, at least, that is not where we have our highest collision hazard.

Mr. ERTEL. Thank you, Mr. Chairman.

THE CHAIRMAN. Congressman Goldwater.

Mr. GOLDWATER. Mr. Chairman, I just have one or two followup questions, but first I would like to make a statement.

I think it should be disturbing to anybody who examines this whole effort in collision avoidance. For 20 years we have been working on collision avoidance devices for separation of aircraft, and that's a long time to wait for this device that's going to aid aviation safety.

I have only been involved in this for a few years, but I can remember hearings on former Senator Moss' bill back in the fall of 1971. I recall David Isreal of the FAA talking about the greatness of synchro-DABS and how that was the panacea of all collision avoidance systems and how that was just around the corner and, boy, we are going to solve this problem. And they used that as a reason to slough off or to avoid accepting an airborne collision avoidance system. But that was the big goal and that was the big push, that was synchro-DABS.

Well, they abandoned that pretty fast. And then back in 1974 they encouraged the Senate not to take steps to make airborne CAS systems

mandatory, and indicated that by no sooner than 1975 they would decide on a national standard for an airborne CAS.

And now here today the FAA made a statement that they're going to establish another standard. I recognize this is not an easy problem and a lot of different minds can differ, but I just feel that we have gone far too long, 20 years, and we still are really no closer to it than we were back when we were talking about synchro-DABS.

Mr. BOND, I would like to pursue this airport procedure just a step further. I read in the paper where an FAA plane struck the tail of a DC-8 at LAX airport. These were two airplanes going in the opposite direction on a runway, one taxiing. The DC-8 had just landed and I think there was an FAA plane, a Saberliner, approaching in the opposite direction, and the Saberliner clipped the tail of the taxiing DC-8. I assume this is another system error, but it could have been avoided if all airplanes—it could have been more safe, is a better way of putting it, if both airplanes had been going in the same direction.

This is the point I'm trying to make. You're not going to totally avoid any kind of accident, but it seems to me that having airplane landing in the same direction and flying the pattern the same direction is a little more safe than having airplanes landing and taking off in opposing directions. To me, that's common sense. Admittedly you're dependent on the air traffic controller and the tower to maintain separation. It just seems to me that having airplanes going in the same direction is far better than having them make opposite approaches. I don't see how you can disagree with that.

And the question I raise subsequent to this crash: Are there any plans to change the policy here at Lindbergh Field?

Mr. BOND. What policy are you talking about?

Mr. GOLDWATER. Allowing opposing approaches at Lindbergh Field.

Mr. BOND. No; we do not.

Mr. GOLDWATER. You do not plan to change that at all?

Mr. BOND. So long as the separation between aircraft is safe and adequate, then we will not have any policy change of having approaches in two different directions.

Mr. GOLDWATER. Mr. Bond, are you familiar with this manual, the air traffic control manual, dated January 1, 1978?

Mr. BOND. I am indeed familiar with it, but I have an expert with me, and that's Mr. Flener.

Mr. GOLDWATER. Are you aware there's a passage in this book that absolves an air traffic controller from further action once a conflict alert has been acknowledged by the pilot; that he could in fact walk away and be absolved?

Let me just read the passage to you. It's page 10, section 33 under "Safety Advisory." It says here: "You may discontinue the issuance of further advisories if the pilot informs you he is taking action to correct the situation or has the other aircraft in sight."

Mr. FLENER. Or has the other aircraft in sight. See-and-be-seen.

Mr. GOLDWATER. It absolves the air traffic controller of further action.

Mr. FLENER. It doesn't really absolve him, Mr. Goldwater.

Mr. GOLDWATER. Well, that's the way I read this.

Mr. FLENER. Some of our systems errors come from that sort of thing.

Mr. GOLDWATER. And they're excused because of this passage.

Mr. FLENER. You can look at it that way.

Mr. GOLDWATER. You could look at it that way? Now, I'm not saying that always occurs and I have a high regard for our air traffic controllers. I think they are the finest and the most professional people. But they are human beings, too.

Mr. FLENER. The Administrator has made a point I think is very pertinent. When you have opposite-direction traffic, which we do have here occasionally, but not really opposite by direction, the 172 in the case of the current accident—

Mr. GOLDWATER. Mr. Flener, I can't hear you.

Mr. FLENER. The 172 in the case of the current incident—

Mr. GOLDWATER. Would you hold just until the traffic passes?

Mr. FLENER. The aircraft making the approach to runway 9 actually broke off the approach before he ever crossed the runway.

Mr. GOLDWATER. You're talking about the Los Angeles—

Mr. FLENER. No; this case here at San Diego. He never actually got to the runway at all. When you look at it—and we have done a radar readout—

Mr. GOLDWATER. You're looking at the PSA flight?

Mr. FLENER. I'm talking about the other aircraft.

Mr. GOLDWATER. The Cessna?

Mr. FLENER. The Cessna. He never really got to the runway. He broke it off as he approached the runway.

Mr. GOLDWATER. That's standard, isn't it?

Mr. FLENER. That's standard.

Mr. GOLDWATER. He made his approach—

Mr. FLENER. And the controllers used good judgment, which, notwithstanding the manual that you showed there, you can't write everything into a book. We have, Lord knows, how many instructions being made every day. You cannot write good judgment in a book, but we expect it. I have specifically read the letter of instruction to the controller regarding the use of runway 9 and low approaches and the use of runway 27 when someone is landing. It's very, very specific.

In addition to that manual—and it tries to build in as well as it can with the words "You shall use good judgment,"—that's what we expect our people to do.

Mr. GOLDWATER. I think that's inherent. I think in most instances this does occur in our traffic control system.

Mr. FLENER. I think it does, too.

Mr. GOLDWATER. As I say, I hang my life on their judgment, and they do a good job, but we're still talking about human error and potential human error. And when we build into the system potential conflicts when we don't have to, I don't see the sense of it. Why set up a potential conflict even as professional as our people are. If you get aircraft coming at each other, I mean, even if it's 1/1000ths of a chance, I don't think we can afford that.

Mr. FLENER. I'll buy that. I'll tell you what the answer is. Let's put in an ILS at Montgomery, which we're in the process of doing.

Mr. GOLDWATER. That's a good idea. And while we're at it, why don't we put in a BRITE 4 ARTS III-B at Lindbergh Field.

Mr. FLENER. We already have a BRITE 4 in Lindbergh tower.

Mr. GOLDWATER. We have a BRITE 4 ARTS III-B?

Mr. FLENER. No, there isn't an ARTS III-B.

Mr. GOLDWATER. We don't have an altitude capability at Lindbergh Field?

Mr. FLENER. No; we do not.

Mr. GOLDWATER. Don't you think that would have helped? Possibly?

Mr. FLENER. Possibly.

Mr. GOLDWATER. Let's put that in too.

Mr. FLENER. OK.

Mr. GOLDWATER. It just seems to me, Mr. Bond, that we ought to take a look at that policy so we can avoid at all cost any potential conflict.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Mr. Bond, if I may redirect the attention just a little bit. PATCO will testify in these hearings that it believes a number of California centers are understaffed with controllers. Specifically, they cite Oakland and Palmdale centers as being staffed at approximately 60 percent of FAA's recommended journeymen levels.

What is your view of the controller staffing situation?

Mr. BOND. We think it's adequate and that it is safe. If there is a problem with below staffing level, then my view is that the staffing levels are in error. We have been handling very large volumes of traffic with little delay or problem with it, and it has increasingly brought into question the correctness of our staffing levels, Senator.

Let me also say that concurrent with the rise in traffic volume, our equipment automation and other devices we have put into our whole system has gotten better and better, and it has therefore caused me, at least, to question whether our staffing levels are right. But because we do not find delay in the system, I personally feel that our staffing levels are not right.

The CHAIRMAN. Well, I wish you would review their testimony and see if you wish to supply anything further for the record, because they say it's only 60 percent of FAA's recommended levels.

Mr. BOND. I'm saying I think our recommended levels may not be right. It is a pretty ancient standard.

The CHAIRMAN. You can supply a response to the record.

[The following information was subsequently received for the record.]

Review of controller staffing at Oakland and Palmdale Centers confirms it is¹ adequate and safe. In a system containing over 400 control facilities, it is inevitable that at any given time some may be temporarily short of staff. Analysis of the two California centers indicates that without further intervention an on-board controller strength of approximately 90 percent of calculated can be reached. At present, it is about 78 percent. The following table is based on fiscal year 1978 end-of-year aircraft activity and staffing data as reported by the facilities.

	FPL controller	Controller complement	Total complement
Palmdale Center:			
Calculated staff ¹	299	398	508
On-board staff.....	277	355	486
Percent of calculated.....	75.9	89.2	95.7
Oakland Center:			
Calculated staff ¹	234	299	396
On-board staff.....	189	272	396
Percent of calculated.....	80.8	91.0	100.0

¹ Calculated staff is computed through application of the staffing standard to aircraft activity deducting productivity gained through automation and other devices.

The CHAIRMAN. PATCO also claims to have heard from a, quote, reliable source, unquote, that BRITE radar was previously purchased for two towers in Sacramento but that the equipment installation will go 2 years past its original scheduled date. Can you give the committee any more details on that situation?

Mr. BOND. I cannot, no; but we can supply it for the record.

The CHAIRMAN. If you will review their testimony and supply that for the record, I will appreciate it.

[The following information was subsequently received for the record.]

Although installation for the two Sacramento area airports (Metro and Executive) was scheduled to be completed earlier, contractual production delays have been experienced for some of the key equipment components for each project. The delivery of television microwave link equipment will not be available at these locations until approximately August 1979. Based on currently known schedule factors, we expect the BRITE radar service will be completed at Metro Airport during September 1979 and at Executive Airport during October 1979.

The CHAIRMAN. Does the FAA continue to hold the see-and-avoid concept in a very high regard, or are you second-thinking this position now?

Mr. BOND. I don't think we want to ever, that I can think of, deviate from constant emphasis on pilots looking around outside the aircraft as important to the preservation of safety. I cannot imagine a circumstance where we would want to lessen the importance of that.

But what we have done over the years is add on top of the pilot responsibility to avoid other traffic controller-based, electronic-based systems which will assist in the total avoidance of other aircraft. When we have implemented a cockpit type of collision avoidance system, that will be another assist in that effort.

But I don't think that we ever want to reduce the strong and continuing interest that we have always had for pilots of the necessity of looking outside the airplane and avoiding traffic. That is an excellent collision avoidance system, also.

The CHAIRMAN. Will you provide the committee, as soon as you can, with your notice of proposed rulemaking on the changes and when you expect to have those effectuated?

Mr. BOND. We will indeed.

[The following information was subsequently received for the record:]

DEPARTMENT OF TRANSPORTATION,
FEDERAL AVIATION ADMINISTRATION,
Washington, D.C., December 15, 1978:

Hon. HOWARD W. CANNON,
Chairman, Subcommittee on Aviation,
Committee on Commerce, Science, and Transportation,
Russell Senate Office Building,
Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for providing us the opportunity to correct the transcript for the October 27 hearing in San Diego.

We are enclosing, along with the transcript, the material requested for the record, and will provide you with a copy of the Notice of Proposed Rulemaking (page 131 of the transcript) when it is issued.¹

Sincerely,

CLARK H. ONSTAD, *Chief Counsel.*

¹The proposed rulemaking had not been received by the committee at press time, March 15, 1979.

The CHAIRMAN. Any other questions?

Thank you very much, Mr. Bond, and gentlemen. We appreciate it. The committee will now stand in recess until 1:15 this afternoon.

AFTERNOON SESSION

The CHAIRMAN. We'll start with the panel composed of Edward Stimpson, president, General Aviation Manufacturers Association, and his associates, John L. Baker, president, Aircraft Owners & Pilots Association, and John H. Winant, president, National Business Aircraft Association. Who else?

Mr. STIMPSON. Mr. Chairman. Thank you. On our panel today, as you indicated, is Mr. Winant here to my right, president, National Business Aircraft Association, Mr. McIntosh, who is director of operational services for the National Business Aircraft Association. To my left, Mr. John Yodice, who is Washington counsel for the Aircraft Owners & Pilots Association. He's representing Mr. Baker today. And to his left is Mr. Charles Spence, vice president of public relations with Aircraft Owners & Pilots Association. And at the end, Mr. Harry Riggs, the secretary and general counsel of the National Association of Flight Instructors.

The CHAIRMAN. Ed, why don't you hold for a couple of minutes more because I think we should wait for more of our colleagues.

Mr. STIMPSON. OK.

The CHAIRMAN. Here's Congressman Wilson now.

Mr. STIMPSON. OK, good.

The CHAIRMAN. Bob, will you please go around there? We'll displace these fellows and let you speak.

Just let Congressman Wilson get right there in the middle.

Mr. WILSON. OK. I don't mind. Just give me one seat.

The CHAIRMAN. I didn't realize you were out there, Bob, until we were all ready to start with this next panel so—if you'll wait just a minute, I think we'll have—Allen will be back here in a minute, hopefully.

Mr. WILSON. OK. All right.

The CHAIRMAN. All right. Our next witness will be Congressman Bob Wilson from the State of California, San Diego.

STATEMENT OF HON. BOB WILSON, U.S. REPRESENTATIVE FROM CALIFORNIA

Mr. WILSON. Thank you, Senator Cannon, Mr. Stump, Mr. Ertel. I want to say a very warm and meaningful thank you to you for so promptly getting into this tragic situation that's developed. I appreciate the fact that the House members are giving up some time on their very crucial campaign to come over here, but it's bound to be the recognition that something must be done as soon as possible to understand the situation and to, if possible, alleviate any such tragic circumstances in the future.

It's a little bit ironic that the GAO came out on October 20 with a report on the status of the FAA microwave landing system, and it's ironic in several ways. In the first place, in talking about flight 182, it mentions that we need a minimum of \$128 million for development of the microwave landing system, which is about 5 years behind sched-

ule, and goes on to give a rather thorough report. And I think your committee should probably look at this particular report. I think there are just two factors that should be taken into consideration with regard to what happened here in last month.

One factor is the equipment and the organization of the Federal agencies responsible for directing aircraft traffic in this area. You've heard testimony, I'm sure, this morning about the complications of Miramar and Lindbergh Field operations. It seems very logical to me that one of the first things that has to be done is to upgrade the equipment at Lindbergh Field to bring it into a better liaison with the equipment at Miramar. I think Miramar has a superior system of controlling the flights incoming and outgoing into the area.

And the one deficiency, obviously, is passing along one flight from one system to another system, and it's probably part of the reason for the problem that resulted. However, the greatest difficulty, aside from not having adequate equipment, is to me the rather inexplicable practices of the Government in allowing ILS landing procedures to be conducted at the same time that commercial aviation is landing and taking off from a major airport like Lindbergh Field. Not only do I understand that ILS training is necessary, but it seems to me that the satellite fields in San Diego County, such as Gillespie and Palomar and other fields could be very easily equipped with ILS equipment for such training procedures and, then, no training allowed on a major airport such as this. But the absurdity of landing the opposing direction from which incoming flights were landing on that particular fatal morning is hard for me as a layman to understand.

I wish Barry Goldwater, was here because he's an expert on that skateboard. To me, bringing a small aircraft in an opposite direction from the commercial aircraft landing and, then, letting it take off and fly into that environment where the aircrafts are circling to come in for a landing would be like putting somebody or allowing as many people as wanted to on a skateboard to come down the Laurel Street hill, which is the street that comes into Lindbergh Field, come down the wrong lane of Laurel Street hill, and you're bound to have an accident with a circumstance like that. It just seems to me hard to believe or understand why that practice would be permitted.

The second factor, in addition to the role of the Federal Government in equipping and regulating the airport, seems to me the location of Lindbergh Field, whether indeed it is the proper location for the major airport in San Diego. Someone has described Lindbergh Field as an airport waiting for an accident to happen. It took 40 years for it to happen; but when it did, it was tragically the most devastating accident of its type in the history of our country. There are other locations I believe around San Diego County where a metropolitan airport could be found. Admittedly, the people of San Diego appreciate the convenience of Lindbergh Field. It's probably the most central airport in almost any community, outside of Hong Kong. I've been in there a few times.

I'm sure you have too, Senator Cannon. If you recall, it was at one time anyway a rather hair-raising event to go in and land at Hong Kong, and they had it out in Kowloon, and they had a number of accidents there before they finally improved it a great deal.

But I'm told by airline pilots that they always landed at Lindbergh Field under emergency conditions. It obviously was a tough field to move in and land, and that was always said was the main reason we never had any accidents, because the pilots were so alert. Well, obviously, it takes more than that, and I think the fact that it's located sort of between two mountains makes it a rather difficult airport to operate from, from a commercial standpoint.

There are other locations that have been under consideration, and I think it is the responsibility of the local community rather than the Federal Government to decide which airport location would be most suitable for the people of our community. Suggestions have been made for joint use of some of the naval aircraft fields in this area, like North Island and Miramar. I would say—and I'm sure you know from your duties on the Senate Armed Services Committee—that joint use is not a very healthy situation, either as far as safety is concerned and certainly when there are training procedures underway, such as they are at Miramar, it becomes almost out of the question for possible joint use.

But there are two former military fields in this area that I think should be considered.

I will say hello to Glenn Anderson. I appreciate your coming down, Glenn. I know you promised to do this a long time ago when we talked about it. I appreciate it very much.

There are two other former fields. One is Ream Field down at the lower end of the bay. It's near the Mexican border, but it is a very flat field that has been put on a standby status. There are some helicopters operating out of there. It's quite comparable in location to the Los Angeles International Airport, in that the runways extend out over the ocean in a westerly direction without any encumbrances, and much of the noise of takeoff would thus be eliminated.

That's one of the problems we have here in San Diego, as you know, from the planes flying over here, and not only the noise, but the hazards of such flights on takeoff and landings are something that must be considered.

Brown Field, of course, is another possible airport, and there has been consideration of Brown Field as an international airport, because it is adjacent on the south to the Tijuana Airport. It is conceivable that an agreement could be made with Mexico to have an improved Brown Field runway situation with a taxiway over into the Tijuana area so that the same control tower could handle both U.S. flights and Mexican flights. The planes could taxi into Mexico, the Mexican airplanes, and yet use the same runway, and eliminate any possible conflict of those two airports that now have a conflict when those are in use.

As I said before, it isn't, in my opinion, the duty of the Federal Government to try to choose the location for an airport. It seems to me that's up to the county of San Diego and the city of San Diego to determine which is the best location for it.

With those remarks, Mr. Chairman, I want to conclude and, again, say thank you for coming here. I really appreciate your sincerity in trying to resolve this problem for us.

The CHAIRMAN. Thank you very much, Congressman Wilson. We appreciate you being here and expressing your concern. We are all deeply concerned of course, about the tragic event that occurred, and are trying to make sure that we do everything possible to prevent this type of occurrence in the future.

Congressman Anderson?

Mr. ANDERSON. I want to welcome Bob here today. As he mentioned, he was one of the Congressmen that originally contacted us and asked us to come down here; and we told you we would come, and so we're here. I've been wondering about the fact that we do not have a terminal control area here in San Diego, this whole area, with all the activity. We have one in the Los Angeles area, one in San Francisco, the bay area, and I was wondering if this had ever been discussed before this accident? Now, everyone seems to imply that it's just a matter of time now before you get a TCA down here; but was this discussed before this accident at all?

Mr. WILSON. I'm sure it was discussed. I was not familiar with it. You've been on the subcommittee which deals with these problems and probably would be more familiar with it; but I understand the main discussion revolved around a TRAS, a system with aircraft separation capability and sequencing service, and such is in service at North Island—I mean, the Naval Air Station, Miramar. If the same TRSA were installed at Lindbergh, I believe that traffic advisories and sequencing, as well as radar information on direction and altitude of inbound and outbound aircraft, would be greatly improved and reduce considerably the type of accident that we had here. But a TCA is more expensive and certainly more complicated.

If there is any question of moving Lindbergh Field, I would say probably that would be deferred until a final decision was to be made.

I'll just say this about the idea of moving Lindbergh Field: We had polled, a number of polls over the past years, which showed that about 70 percent of the people preferred the location here at Lindbergh because it was very convenient, but I can assure you that the people that live in this area right here and on the hills around and certainly on the approach areas too are very unhappy about the noise. The planes come right through Balboa Park, and we have a starlight opera every summer in Balboa Park, and they have to train the actors to stop whatever they're saying and just stand motionless until that airplane flies over and, then, start right in singing again. And it gets to be sort of a game, but it isn't a game and it isn't much fun, when you get right down to it, as far as the audience is concerned.

So, I think there should be some consideration anyway of trying to find a better location; and, therefore, I would doubt if an expensive TCA would be as apt to be approved as a TRSA for Lindbergh Field.

Mr. ANDERSON. That's all.

The CHAIRMAN. Congressman Stump?

Mr. STUMP. Mr. Chairman, I have no questions. I'd just like to thank the gentleman for his very fine testimony today. Thank you, Bob.

Mr. WILSON. I want to tell you gentlemen, I don't know whether it's much of an offer, but I will agree to either come in and speak for you or against you in return for your coming here to help us in this particular campaign. I hope your own campaigns are in good shape.

I know mine is, and I know I will benefit a great deal from the fact that you have taken your time to be here.

The CHAIRMAN. Congressman Ertel?

Mr. ERTEL. Thank you, Mr. Chairman, I appreciate your comments, Congressman Wilson.

Since all military traffic uses Miramar, isn't it ironic that the military is getting funds from the trust fund based on civilian system users?

Mr. WILSON. I would think so. And I don't know why the trust fund hasn't been used. As I understand it from one of my colleagues in the Congress, the trust fund is well funded; and yet I agree it is ironic that—the idea of Miramar taking part of the responsibility was decided a long time ago when the whole concept of FAA was developed; but it is ironic, I would admit, with the military expenditures that we have to rely on a trust fund that is paid for out of commercial usage of aircraft.

Mr. ERTEL. Maybe, if anything positive comes out, we can look at that particular use of the civilian trust fund here.

Mr. WILSON. That's a good point.

Mr. ANDERSON. Why was the ARTS III originally put out at Miramar in the first place?

Mr. WILSON. I presume because it did not have that type of control system when the FAA was originally—I worked on legislation to set up FAA.

Mr. ANDERSON. I would have thought with all the commercial airlines coming into Lindbergh, they would have put it up here.

Mr. WILSON. At that time Lindbergh had a system, and I think they knew they were going to have to put another system in at Miramar, so they got the best they could have, which is better than we had at Lindbergh, is what it amounted to. I'm not speaking from direct knowledge, but it seems to me that would be the logic of it.

Mr. ANDERSON. Thank you.

The CHAIRMAN. Thank you very much. We appreciate you being here.

Mr. WILSON. Thank you.

The CHAIRMAN. Nice talking to you.

All right. Mr. Stimpson, GAMA, and his associates.

STATEMENT OF EDWARD STIMPSON, PRESIDENT, GENERAL AVIATION MANUFACTURERS ASSOCIATION

Mr. STIMPSON. Do you want me to reintroduce the panel or did we accomplish that a minute ago?

The CHAIRMAN. Why don't you do that very quickly, because Congressman Anderson is here now.

Mr. STIMPSON. All right. On our far right here is Mr. Fred McIntosh, director of operational services for National Business Aircraft Association, president of NBAA, Mr. John Winant. On my left, Mr. John Yodice, Washington counsel with the Aircraft Owners & Pilots Association, representing Mr. John Baker of AOPA. To his left Charlie Spence, vice president of public relations of AOPA. And to the far left, Mr. Harry Riggs, secretary and general counsel for National Association of Flight Instructors.

What we'd like to do today, Mr. Chairman, I'll start briefly with our joint statement, and, then, Mr. Yodice will have a short summary of an AOPA statement. Mr. Winant will summarize our joint industry statement. And as I say, we'll try to do that within the time constraints that the committee staff asked us to regard.

In starting with our joint statement today, which is in behalf of all these organizations, plus several others, I'd like to start with the vast majority of the public, and much of the news media, are unaware that fully one-third of all U.S. intercity air travelers go by general aviation aircraft. General aviation accounts for 98 percent of the Nation's airplanes, 96 percent of the pilots, and 79 percent of all the hours flown.

General aviation serves over 14,000 airports, including the 400 served by the scheduled airlines. In fact, the airlines depend heavily on general aviation—since an important feeder function is provided by general aviation, in bringing passengers into the hub airports to connect with airliners. One out of every three business aircraft flights into air carrier served airports carries passengers connecting with scheduled airline flights.

And while some general aviation aircraft must use air carrier served airports for the purpose of exchanging passengers and cargo with the airlines, other operators of general aviation airplanes must use these same airports to transact business with enterprises located on or near the airport. The principal airport often has essential facilities not available elsewhere. The mix of traffic at airports served by both the airlines and general aviation is a basic economic necessity to all concerned, especially the citizens of the communities themselves. In plain words, a ban on general aviation at these airports would precipitate economic disaster. And it would not appreciably improve air safety.

But what should be done to improve air safety? One of the questions most often raised in the wake of the San Diego collision has been: Why was the general aviation pilot using Lindbergh Field for instrument flight training? It so happens that Lindbergh is the only airport in the San Diego area that has an instrument landing system, or ILS, facility. Therefore, it is the only airport in the immediate area where ILS approaches can be practiced. Practice is not only essential if a pilot is to become qualified and retain currency to use the ILS, but such practice is mandated by the Federal air regulations.

It must be conducted at many air carrier served airports, all across the country, simply because there are not enough reliever airports with ILS systems and other adequate equipment. There is a desperate need for reliever airports—a need that is not being met despite the fact that general aviation pilots and other users of our air transportation system have already contributed billions of dollars, and built up a trust fund to pay for these reliever airports. The fact that this money remains unspent, amounts to failure to fulfill a longstanding congressional mandate.

It was certainly gratifying to hear both you chairmen talk this morning that this is going to be a high-priority matter in the next session of Congress.

The Airport/Airways Trust Fund, which pays for airport development and the installation of navigational and safety equipment, currently has a balance of nearly \$4 billion and an uncommitted surplus of over \$2 billion.

At the end of this fiscal year (1979), the surplus will be much larger, particularly since the noise bill and its associated user-charge reductions were not enacted. In addition, the U.S. Government is currently paying interest of about \$230 million a year on the trust fund balance. In view of the urgent safety needs, it is totally unjustifiable not to use these funds for their intended purpose of modernizing and expanding of our airport/airways systems.

The funding authorized for reliever airports—now \$15 million per year—is severely out of balance with both the need—which the FAA estimates as \$700 million over the next 5 years—and the growing surplus in the trust fund. And I repeat: The money in this trust fund came out of the pockets of the users. Spending it on vitally needed reliever airports will not cost taxpayers 1 red cent.

Indeed, for reliever airports, the reliever airports serve the function of siphoning off general aviation traffic from the major metropolitan air carrier served airports. Currently, there are only 147 airports in the United States which are designated by the FAA as reliever airports.

We strongly recommend a high priority be given to this as you consider the act next year.

Since 1970 only five new reliever airports have been built; and this is due to a variety of reasons. Some of these are inadequate funding, another is lack of regional sponsorship, and another is environmental problems in the local areas.

In San Diego area, for instance, the national airport system plan contemplates a new reliever airport at La Mesa, on the east side of the area, at an approximate cost of \$8.3 million. The money is there to do this sort of work now. Additional runways at major airports is another area in which additional money should be spent to increase the capacity to help accommodate general aviation, also.

Another high priority should be the objective to save existing airports, both private and public, in metropolitan areas. In the past 10 years, the United States has lost 2,141 airports. Many key airports around major cities have been or are being lost. In 1949, Los Angeles had 55 general aviation airports. Today it has only 18. At the end of last month, Chicagoland Airport, a key reliever airport in the Chicago area with 180 based aircraft, was sold to a real estate developer and is now closed. All across the country this is happening. There is also an important need to make these funds available to assist privately owned airports like Congressman Goldwater was talking about earlier today.

High priority should be given to the installation of instrument landing systems and other approach aids at existing reliever airports. Of the 147 designated reliever airports, only 29 have instrument landing systems. It is sheer folly that more instrument landing systems have not been installed at reliever airports, particularly when the cost of an ILS is only \$125,000 plus installation cost. None

of the three reliever airports around San Diego has an ILS. The Minneapolis-St. Paul region has one of the best reliever airport systems in the country. Of the six reliever airports, none has an instrument landing system and only St. Paul downtown has any kind of a precision approach system. As a result, much general aviation traffic is forced to use Wold-Chamberlain Field, the air carrier airport, for approximately 50 instrument training flights per day. In the Washington-Baltimore area, general aviation traffic is forced to use the ILS at Dulles or Baltimore-Washington International Airport. Meanwhile, instrument landing systems could be installed at such airports in Frederick, Md., Fredericksburg or Manassas, Va., which are in the vicinity.

The current FAA criteria for the installation of an ILS should be changed immediately. It is based on a complicated formula, which requires the general aviation airport to have many times the instrument operations of the airline served airport.

Consequently, we'd recommend a designated training airport concept, so additional relievers could be equipped with full instruments for all-weather flying. This would be an inexpensive way of creating more training airports, which would serve the primary purpose of facilitating the FAA regulatory requirements in terms of flight currency and proficiency.

And this morning, Administrator Bond talked about the concept of relaxing this criteria, which is certainly a welcome step and something that must be done immediately.

Before turning my presentation over to Mr. Winant, what Congressman Wilson said about joint use of military airports is also excellent. Although we haven't covered it in our statement, it's a topic that deserves a lot more attention. All across the country there are military airports underutilized, military facilities not serving a strategic purpose, which could be used. We see that around Washington, D.C. and other places. And I hope next year we all can conclude it together. [The statement follows:]

STATEMENT OF JOHN L. BAKER, PRESIDENT, AIRCRAFT OWNERS AND PILOTS ASSOCIATION; EDWARD W. STIMPSON, PRESIDENT, GENERAL AVIATION MANUFACTURERS ASSOCIATION; AND JOHN H. WINANT, PRESIDENT, NATIONAL BUSINESS AIRCRAFT ASSOCIATION

The members of this panel are Edward W. Stimpson, President of the General Aviation Manufacturers Association, John L. Baker, President, Aircraft Owners and Pilots Association, and John H. Winant, President of the National Business Aircraft Association. We are also authorized to speak for the National Air Transportation Association, National Association of Flight Instructors, and the Aviation Distributors and Manufacturers Association.

We appreciate the opportunity to present our views on what can be learned from the recent collision here in San Diego, and what may be done to improve the safety of air operations without depriving the nation and its communities of the many benefits made possible by aviation activity.

In previous instances of this kind, a reaction has been to call for the separation of controlled and uncontrolled aircraft, to require that all aircraft be suitably equipped, and to eliminate the aircraft unidentified to the controller. However, based on information already made public, in this case, both aircraft were known to the controller, both were suitably equipped, and both were in fact under control. As a result, responses to the San Diego tragedy have—in many instances—reflected the emotional frustration generated by the absence of any clearcut, readily seen reason for the accident. These responses have ranged from expressions of concern over the mix of aircraft at air carrier airports to demands that general aviation be totally banned from serving the public at such airports.

While we deplore any accident, and feel deep and personal sympathy for those who have suffered loss, experience suggests to us that no simple panacea born out of emotion will yield the complete safety we all seek. We are convinced there are better solutions . . . solutions which will not cause unacceptable disruptions to our air transportation system.

BENEFITS OF GENERAL AVIATION

Consider the facts: Much of our nation's business, industry and commerce depend on general aviation to move its people and deliver its goods. General aviation includes flights for business as well as personal transportation, plus air taxi service, air crew training, agricultural use, and a variety of industrial and special chores such as patrolling pipelines and monitoring rush hour traffic. And general aviation means helicopters and multi-engine business aircraft of all sizes, including business jets and turboprops flown by full-time professional crews. In fact, general aviation even includes large turbojet aircraft commonly thought of as "airliners".

The vast majority of the public, and much of the news media, are unaware that fully one-third of all U.S. intercity air travellers go by general aviation aircraft. General aviation accounts for 98 percent of the nation's airplanes, 96 percent of the pilots, and 79 percent of all the hours flown.

General aviation serves over 14,000 airports, including the 400 served by the scheduled airlines. In fact, the airlines depend heavily on general aviation . . . since an important feeder function is provided by general aviation, in bringing passengers into the hub airports to connect with airliners. One out of every three business aircraft flights into air carrier served airports carries passengers connecting with scheduled airline flights.

And while some general aviation aircraft must use air carrier served airports for the purpose of exchanging passengers and cargo with the airlines, other operators of general aviation airplanes must use these same airports to transact business with enterprises located on or near the airport. The principal airport often has essential facilities not available elsewhere. The mix of traffic at airports served by both the airlines and general aviation is a basic economic necessity to all concerned, especially the citizens of the communities themselves. In plain words, a ban on general aviation at these airports would precipitate economic disaster. And it would not appreciably improve air safety.

WHAT SHOULD BE DONE—USE OF HUGE TRUST FUND SURPLUS

But what should be done to improve air safety? One of the questions most often raised in the wake of the San Diego collision has been: Why was the general aviation pilot using Lindbergh Field for instrument flight training? It so happens that Lindbergh is the only airport in the San Diego area that has an Instrument Landing System, or ILS, facility. Therefore, it is the only airport in the immediate area where ILS approaches may be practiced. Practice is not only essential if a pilot is to become qualified and retain currency to use the ILS, such practice is mandated by the Federal Air Regulations.

It must be conducted at many air carrier served airports, all across the country, simply because there are not enough reliever airports with ILS systems and other adequate equipment. There is a desperate need for reliever airports . . . a need that is not being met despite the fact that general aviation pilots and other users of our air transportation system have already contributed billions of dollars, and built up a trust fund to pay for these reliever airports. The fact that this money remains unspent amounts to failure to fulfill a longstanding Congressional mandate!

The Airport/Airways Trust Fund, which pays for airport development and the installation of navigational and safety equipment, currently has a balance of nearly \$4 billion and an uncommitted surplus of over \$2 billion! At the end of this fiscal year (1979), the surplus will be much larger, particularly since the noise bill and its associated user-charge reductions were not enacted. In addition, the U.S. Government is currently paying interest of about \$230 million a year on the Trust Fund balance. In view of the urgent safety needs, it is totally unjustifiable not to use these funds for their intended purpose; modernization and expansion of our airport/airways systems.

The funding authorized for reliever airports . . . now \$15 million per year . . . is severely out of balance with both the need—which the FAA estimates as \$700 million over the next five years—and the growing surplus in the trust. And I

repeat: The money in this Trust Fund came out of the pockets of the users. Spending it on vitally needed reliever airports will not cost taxpayers one red cent

NEED FOR RELIEVER AIRPORTS

The development and expansion of additional and better equipped airports in the major metropolitan areas is a basic and long overdue step. These reliever airports serve the function of siphoning off general aviation traffic from the major metropolitan air carrier served airports. Currently, there are only 147 airports in the United States which are designated by the FAA as reliever airports. There is a desperate need for both more reliever airports and for better equipped relievers.

We strongly recommend that high priority be given to the development of new reliever airports. Since the enactment of the Airport and Airway Development Act of 1970, only five new reliever airports have been built! Community resistance to new airport development, primarily due to the lack of proper regional planning sponsorship, and to the lack of adequate funding, are reasons for this extremely disappointing result. In the San Diego area, for instance, the National Airport System Plan contemplates a new reliever airport at LaMesa—on the east side of the area—at an approximate cost of \$8.3 million. The money to build it is there, now, in the Trust Fund.

ADDITIONAL RUNWAYS AT MAJOR AIRPORTS

There is a need to construct more parallel runways for large aircraft and short parallel runways for small aircraft on air carrier served airports. This would allow separation of arriving and departing aircraft operations for both air carriers and general aviation where necessary. Moreover, it would improve traffic flow, reduce delays, reduce wake vortex problems and improve safety for all concerned.

PRESERVATION OF EXISTING AIRPORTS

Another priority action should be the objective to save existing airports, both private and public, in metropolitan areas. In the past 10 years, the U.S. has lost 2141 airports. Many key airports around major cities have been, or are being lost. In 1949, Los Angeles had 55 general aviation airports. Today it has only 18. At the end of last month, Chicagoland Airport, a key reliever airport in the Chicago area with 180 based aircraft, was sold to a real estate developer and is now closed. All across the country, places that were once airports are now shopping centers or housing developments. ADAP or other funding programs should be made immediately available to purchase these important private airports and keep them in the airport inventory. There is also an urgent need to make ADAP funds available for safety related improvements at privately owned-public use airports.

NEED FOR PRECISION APPROACH AIDS

Equal priority should be given to the installation of instrument landing systems and other approach aids at existing reliever airports. Of the 147 designated reliever airports, only 29 have instrument landing systems. It is sheer folly that more instrument landing systems have not been installed at reliever airports, particularly when the cost of an ILS is only \$125,000 plus installation cost. None of the three reliever airports around San Diego has an ILS. The Minneapolis-St. Paul region has one of the best reliever airport systems in the country. Of the six reliever airports, none has an instrument landing system and only St. Paul Downtown has any kind of a precision approach system. As a result, much general aviation traffic is forced to use Wold-Chamberlain Field, the air carrier airport, for approximately 50 instrument training flights per day. In the Washington-Baltimore area, general aviation traffic is forced to use the ILS at Dulles or Baltimore-Washington International Airport. Meanwhile, instrument landing systems could be installed at such airports as Frederick, Maryland, Fredericksburg or Manassas, Virginia, which are in the vicinity.

The current FAA criteria for the installation of an ILS should be changed immediately. It is based on a complicated formula, which requires the general aviation airport to have many times the instrument operations of the airline serve airport.

CREATION OF DESIGNATED "TRAINING" AIRPORTS

Additional reliever airports equipped with full instrumentation for all weather flying will create considerable reduction of air traffic at the major hubs. But, why not take a further step in reducing congestion—an innovative, inexpensive concept

of designating a number of airports as training airports? A training airport would serve the primary purpose of facilitating the FAA regulatory requirements for maintenance of flight currency and proficiency. Designation of these airports by the FAA could be based on aircraft registration, pilot population, geographical suitability, and need.

TERMINAL CONTROL AREAS

The function of TCA's has become a widely discussed subject. A recent study by NASA's Aviation Safety Reporting System (ASRS) suggests that TCA's may be causing as many or more problems than they cure. San Diego-Miramar, which serves Lindbergh for instance, has had a terminal radar service area (TRSA) since December 1974 and the aircraft involved in the recent collision were both under control as would have been the case had a TCA been in place. TCA's should be reduced in size and perhaps reconfigured to encompass only the airspace necessary for profile descent and departure climb paths of high performance large aircraft. Turbojet aircraft should be required to utilize only these paths so that other aircraft operators will know where to expect them, where to look for them and to fly to avoid them. In recognition of the various views concerning the effectiveness and value of TCA's, we recommend that FAA conduct a comprehensive evaluation of the TCA structure. Appropriate urging by this joint Congressional Committee would, we believe, expedite action.

PUT SAFETY DATA IN PROPER PERSPECTIVE

It is a statistical fact that the number of flights completed without fatality is for the airlines 99.99994 percent and for general aviation 99.999916 percent (1977 data). This is an excellent record by any measurement, for any form of transportation.

The improvement of air safety is a consuming manifold objective of general aviation. Joint efforts by our industry with the FAA, over the years, have resulted in steadily reduced accident rates. And the establishment of FAA-sponsored Accident Prevention Seminars across the nation, utilizing safety education materials prepared with the energy and resources of the general aviation community, constitute but one more example of the continuing efforts which have the enthusiastic support and participation of the organizations represented here today. Perhaps, with the encouragement of Congressional interest to ensure increased FAA staff participation and funding, these safety efforts could reach even larger audiences than the 250,000 pilots who voluntarily attended seminars last year.

COLLISION AVOIDANCE

The entire aviation community, which includes General Aviation, air carrier, military and other government interests, shares the concerns of this Committee about the risks of mid-air collisions and finding better methods of managing those risks.

The two tools used now for avoiding collision are the human eye and ground-based air traffic control. Within its limits, the human eye in a trained observer is the best collision avoidance device yet conceived. Human eyes and brains can detect color, motion, bearing and changes in bearing and estimate distance by apparent size. With this information, the brain can rapidly assess the risk of collision and direct appropriate evasive actions.

The human eye needs assistance whenever it cannot see other aircraft in time to avoid collision, for reasons of either speed or reduced visibility, or when traffic density reaches the point that collision risks may be increased due to the interaction of many pilots making independent decisions to avoid collision. To answer this need, the air traffic control system was developed for the purpose of collision avoidance and efficient flow of air traffic. In our opinion, the air traffic control system in the United States is the best in the world and does an excellent job in handling the nearly 200,000 landings and take-offs at airports with towers and over 80,000 instrument operations each day. Failures within this system, whether by pilots or controllers, are rare indeed.

Notwithstanding the effectiveness and excellent record of both the human eye under "see and avoid" conditions and the air traffic control system under all conditions, the entire aviation community has long dreamed of a device that could be carried in an airplane that would, as a minimum, function as a back-up collision avoidance device when either the eye or the air traffic control system failed, or, ideally, would be so effective that it could either replace or reduce the need for the ground ATC system in many areas.

The matter of collision avoidance systems has acquired an importance that limits merit consideration of complex technical detail too extensive for inclusion in this statement. Therefore, we have provided them in an attachment and summarize the issue as follows.

The manufacturers are eager to build and the users are anxious to buy collision avoidance, even proximity warning devices that will provide adequate time exposure for collision evasion maneuvers; avoid the creation of new collision problems, be within the physical capacities of small as well as large aircraft to carry and operate, and be economically feasible.

On January of last year, our three associations joined along with a number of others in presenting a paper to FAA which made a number of recommendations which included the continued development of BCAS, as the concept shows promise for providing protection for air carriers with increasing numbers of general aviation aircraft.

No such device or systems now exist despite extensive efforts to develop one for more than two decades. If adequate knowledge was available to make a choice of system today, we believe the decision would have been made and we would be equipping our aircraft with the devices.

It is true that a type of collision avoidance device has been used successfully within the constraints of military type situations such as those primarily dealing with helicopter operations, at Ft. Rucker. Thus far, no such device or system has been demonstrated to meet the needs of the bulk and variety of civil aviation without producing excessive false alarms or precipitating secondary conflicts as a result of evasive actions on account of the initial conflict. Therefore, we recommend that maximum efforts and financial support be given to the continued search for and development of a collision avoidance device or system. The FAA should then promptly establish a national standard upon which manufacture and implementation can be based. Pending those developments, statutory or regulatory requirements for collision avoidance systems would be premature and could produce problems of a greater magnitude than have been encountered in the case of emergency locator transmitter and ground proximity warning systems.

CONSTRAINTS ON FAA PERFORMANCE

On several occasions, Committees of the 95th Congress conducted oversight hearings on the sufficiency of FAA's activities in the area of aviation safety. Committees with jurisdiction over FAA also requested and received periodic reports from the Administration and the aviation industry on the need for and implementation of safety-related research, engineering, development and operational programs.

The organizations for which we speak participated by invitation or our request in most of those hearings. It seems appropriate, then, that we present to the Aviation Subcommittees our views on the institutional capabilities of FAA with respect to aviation safety.

FAA's safety responsibilities are statutorily defined. When Congress created the Department of Transportation in 1966 it took care to preserve and continue FAA's independent responsibilities related to safety. Section 6, (c)(1) of the Act transferred all functions, powers and duties of FAA to the new Department, "... provided, however, that there are hereby transferred to the Federal Aviation Administrator and it shall be his duty to exercise the functions, powers and duties of the Secretary pertaining to aviation safety. . . ."

The FAA thus became a modal agency of DOT, largely to provide for Cabinet-level development of policy related to coordinated, effective administration of transportation programs. Safety aspects of the aviation system, meanwhile remained as a specific FAA responsibility, with the FAA Administrator granted the power to make decisions "which shall be administratively final."

The aviation industry was not enthusiastic over creation of the Department of Transportation. Its reservations centered on concerns that the national aviation system might not be aggressively developed and improved if political expediency made national aviation policy subservient to national policy on highway development, or on mass transit systems.

The aviation community, however, supported those provisions of the 1966 Act which vested in the FAA Administrator continuing responsibilities for aviation safety.

Over the years, many elements of the aviation community have come to believe that their initial reaction to the 1966 Act was entirely correct. They feel that the Department of Transportation has failed to create a strong statement of national transportation policy, and within that framework, a strong national air trans-

portation policy. Likewise, it has failed to develop sound policy to accommodate general aviation growth and development. Deficiencies in the national aviation system have been the result. We must note that we now find ourselves with a system which will need the kinds of improvements mentioned earlier if it is to provide the capacity needed to handle air transportation growth over the next decade.

An air transportation system whose capacity cannot match demand is obviously a system susceptible to delay, to inconvenience, and to the creation of unsafe conditions in the air. We see in this the threat of a classic cause and effect relationship of tragic proportions.

The discharge of FAA's responsibility to provide for safety in the system may be prejudiced by constraints imposed on the system itself, constraints imposed from outside FAA's jurisdiction.

As noted earlier, the Congress eight years ago recognized an urgent need to improve and further develop the national aviation system. It enacted the Airport and Airway Development Act of 1970. That Act mapped out a plan for developing and improving airports, the nation's airways system, and for funding research and development of equipment to more expeditiously and safely move air traffic. The Act also created a series of taxes, all paid by users of the aviation system, as a special trust fund to pay for the improvements.

The Trust Fund—and through it airport and airway improvement—has in our view become a captive of the Office of Management and Budget "hold the line" financial policies, and to attempts by various Administrations to make the Federal budget look slightly less imbalanced.

Improvements in the aviation system—many of them directly related to safety—have been denied. Trust fund receipts from users of the aviation system have been held captive and used to balance out deficits in programs funded by general, undesignated tax receipts.

A very recent attempt by the Congress to add \$100 million to airport development funds this fiscal year failed in the last hours of the 95th Congress because agreement could not be reached on the Airport and Aircraft Noise Reduction Act.

On balance, and in view of the constraints imposed upon it, we do not feel that the FAA has been neglectful in carrying out its safety-related responsibilities. However, we are deeply concerned with the lack of national policy on development of an aviation system capable of meeting the requirements of all users and accommodating general aviation's growth.

We note, also, that personnel reductions now are being made in FAA. We support such reductions in non-essential programs. We do not support any which adversely affect safety-related functions. We suggest that your Subcommittee ask for an accounting of personnel reductions by FAA programs and identify those which are essential and non-essential. Further, and in spite of recent FAA actions, we have not been satisfied with FAA's research and development efforts. Those recent actions have aimed at identifying FAA initiatives for research and development programs which will match system capabilities to system demand in future years. It is our sincere hope that the views of the aviation user communities, as expressed in the "initiatives" studies, will be given fullest weight in terms of new research and development programs.

IN SUMMARY

There are many things which can and should be done to improve air safety.

1. Available Trust Funds should be used for high priority developments such as:
 - a. additional general aviation airports and reliever airports in metropolitan areas,
 - b. steps must be taken to preserve privately owned-public use airports and public airports.
 - c. additional parallel runways on primary airports for accommodating large and small aircraft; and
 - d. provision of ILS and other approach aids at general aviation and reliever airports for both operations and training purposes.
2. The airport/airway program should be restructured to meet priority needs and bring Trust Fund receipts and expenditures into balance. The Trust Fund should not be allowed to build up billions of unused dollars.
3. Government aviation policy should set clearly established goals which include the accommodation of general aviation's potential for growth.
4. Government programs should be established to enhance official and public acceptance of improvements required for the enhancement of air safety and aviation systems capacity.

5. Accelerate the development of a collision avoidance system which can lead to a national standard.

It is essential that some capabilities be preserved:

1. "See and Avoid" is the primary collision avoidance system for all users; general aviation, air carrier and military, but we must continue to work to supplement that system.

2. It is recognized that we have an integrated air transportation system and properly equipped and flown general aviation aircraft can safely operate into the same airports as the air carriers.

3. A continuing requirement will exist for practice instrument approaches at airports which have precision approach facilities to maintain pilot proficiency and competency

Finally: The association we represent are deeply concerned for air safety as well as airport and airway system capacity. We hope our comments and recommendations point the way to the improvement of both, for air transportation is indispensable to the well being of the nation and its people.

We appreciate your consideration.

SUPPLEMENTAL STATEMENT ON COLLISION AVOIDANCE

The two tools used now for avoiding collision are the human eye and ground-based air traffic control. Within its limits, the human eye in a trained observer is the best collision avoidance device yet conceived. Human eyes and brains can detect color, motion, bearing and changes in bearing and estimate distance by apparent size. With this information, the brain can rapidly assess the risk of collision and direct appropriate evasive actions.

The human eye needs assistance whenever it cannot see other aircraft in time to avoid collision, for reasons of either speed or reduced visibility, or when traffic density reaches the point that collision risks may be increased due to the interaction of many pilots making independent decisions to avoid collision. To answer this need, the air traffic control system was developed for the purpose of collision avoidance and efficient flow of air traffic. In our opinion, the air traffic control system in the United States is the best in the world and does an excellent job in handling the nearly 200,000 landings and take-offs at airports with towers and over 80,000 instrument operations each day. Failures within this system, whether by pilots or controllers, are rare indeed.

Notwithstanding the effectiveness and excellent record of both the human eye under "see and avoid" conditions and the air traffic control system under all conditions, the entire aviation community has long dreamed of a device that could be carried in an airplane that would, as a minimum, function as a back-up collision avoidance device when either the eye or the air traffic control system failed, or, ideally, would be so effective that it could either replace or reduce the need for the ground ATC system in many areas.

The Civil Aeronautics Administration, predecessor to the Federal Aviation Administration, was engaged in the development of a "vertical separation indicator" prior to World War II. In his book on "Air Traffic Control", Glen A. Gilbert, then Chief of the Air Traffic Control Division, CAA, stated, "It is extremely important that experimentation and development be continued in an effort to provide, with least possible delay, a collision warning device that will give complete protection, yet will be light and inexpensive and simple to operate."

Twenty-five years later, in 1970, the National Transportation Safety Board, in its Report No. NTSB-AAS-70-2; "Report of the Proceedings of the NTSB into the Mid-Air Collision Problem, Nov. 4 through Nov. 10, 1969", called for:

"The development and implementation of collision avoidance systems for transport category aircraft."

"A pilot warning indicator for all aircraft or a device for small aircraft compatible with collision warning systems."

Eight years after the NTSB report, we are still seeking some type of an airborne collision avoidance device that might have prevented the terrible tragedy at San Diego.

The need for a collision avoidance system has been stated simply and effectively for several decades, but solutions have been elusive despite the expenditure of millions of dollars by private industry and by the government. The problem has been studied thoroughly and exhaustively as evidenced by a bibliography compiled by the FAA listing some hundreds of published papers. It is obvious that there is no simple answer to what some may consider to be a simple problem.

Collision Avoidance Devices may be considered in three broad categories:

1. NONCOOPERATIVE

This category would operate independently and would not require any cooperating equipment in other aircraft or on the ground. At the present time, there are no known devices suitable for civil aviation that will meet this requirement.

It is true that some military aircraft have airborne radar equipment that detect non-cooperating aircraft by the use of very large antennas or other special equipment which make them unsuitable for civil aircraft even if price was no consideration.

The airborne radar carried in civil aircraft is designed for detecting severe weather conditions, and is of no value in detecting aircraft.

2. COOPERATING SYSTEMS INDEPENDENT OF GROUND SYSTEMS (ACAS)

This category includes those airborne systems which communicate with each other and exchange information on altitude and can compute range (distance between aircraft), range rate (closing velocity) and time remaining to closest proximity by range divided by range-rate.

Airborne Collision Avoidance System (ACAS) developed so far and used operationally do not have bearing information and provide for escape maneuvers in the vertical plane only.

3. COOPERATING SYSTEMS THAT USE THE ATC RADAR TRANSPONDER (BCAS)

As now conceived, there are airborne systems which add collision avoidance capability to airborne air traffic control radar transponder (beacon) systems.

Beacon-based Collision Avoidance Systems (BCAS) are not developed fully and none have been used operationally, but are now under test and development by FAA.

BCAS systems, if extended to cooperate with the ground based ATC system, would offer the capability of working with a ground based computer facility that should also search for conflicts, notify controllers of potential conflicts so that they could intervene, and if a controller did not intervene, then issue escape maneuver orders to the aircraft concerned. Thus, BCAS would work compatibly with the ATC system and controllers would have full knowledge of detected conflicts and the opportunity to act to resolve the conflict.

BCAS systems would also have the capability of acting independently outside of ATC beacon coverage by communicating directly with other similarly equipped aircraft.

The basic issue is whether to concentrate on ACAS or BCAS solutions and the answer is not clear with the present state of development of both types.

ACAS.—The system independent of the ground—has the following advantages:

1. There has been one ACAS developed to the operational stage, and continued development offers the least technical risk. A second ACAS has been developed and operationally evaluated which offers a low cost approach and appears to be a low risk technical solution.

2. Any ACAS system—by definition—is independent of and redundant to the ground ATC system and will back up failures in the ATC system including ground electronic failures.

ACAS has some equally strong disadvantages:

1. The protection offered by ACAS varies with the percentage of other aircraft equipped with the device. For effective operations, all aircraft in a given airspace would have to carry this equipment.

2. ACAS provides for escape maneuvers in the vertical plane only which, some predict, could react adversely on other traffic in high density areas. Although present escape maneuver logic is now confined to the vertical plane, due to the absence of bearing information, the possibility of developing a device with bearing information and both horizontal and vertical escape maneuvers should not be discounted.

3. Since ACAS systems do not know the intent of other pilots and predict collisions based on each aircraft continuing its current flight path, it becomes limited in high density traffic situations where airplanes are turning and climbing and descending in patterns that avoid conflict, but may cause nuisance workings in an ACAS device due to instantaneous projected interfering flight paths.

BCAS.—The System that could cooperate with the ground—also has strong advantages and disadvantages. Its advantages are:

1. BCAS equipped aircraft would be provided protection against all aircraft with operating altitude reporting transponders, rather than just against all BCAS equipped airplanes.

2. BCAS could operate as a part of the ATC system rather than independent of it, and would be less likely to adversely affect other traffic.

The addition of a communications link between BCAS and ground-based computers opens the possibility that BCAS may be more useful in terminal areas than ACAS. Computer programs could be tailored to specific airport locations and recognize established traffic patterns for each runway rather than relying on generalized programs in airborne computers. However, this idea has not been tested sufficiently to determine its feasibility.

3. Dual use would be made of transponders for both ATC and collision avoidance.

The disadvantages are:

1. BCAS is not yet fully developed and the technical risk of BCAS is greater than ACAS.

2. There is considerable doubt that BCAS will be useful for a long lifespan due to multiple aircraft target overlaps on the controller's radar display, unless the present day mode of beacon operation is changed. A need for change, independent of the possible existence of BCAS, due to target overlaps in high density areas has long been recognized and changing from present broadcast modes to discrete address modes (whereby each transponder replies only when specifically addressed) is under active consideration now as the result of comprehensive work done by the FAA on the frequency interference problem. It is considered that a change to a Discrete Address Beacon System (DABS) will permit full use of BCAS for a significantly longer time period.

3. Plans for transitioning from the present beacon system to the DABS system have been initiated.

Thus, we are faced with a dilemma. A system with less future promise offers the least technical risk for early implementation and a system that appears to offer many more operational advantages and increased protection from the outset incurs greater technical risks. The major aviation associations joined in January 1977 in presenting a paper entitled "Policy on Collision Avoidance and Separation Assurance" to the Administrator of the Federal Aviation Administration which made a number of recommendations, including:

1. Continue the development of BCAS as the concept shows promise for providing protection for air carrier aircraft with increasing numbers of general aviation aircraft.

2. Explore the development of DABS as the air-to-air link of BCAS as well as future use with the ground DABS environment.

3. In spite of the long term advantages of the BCAS concept, no effort should be made to introduce it into the system until complete and thorough service testing has been accomplished.

4. The selected CAS must function both within and outside the coverage of the ground system, including within mixed airspace.

A review of these recommendations expressed in the January 1977 paper indicate they are still valid, and we urge that no decisions be made regarding the carriage of collision avoidance devices until tests have been completed on BCAS concepts. We believe that any regulatory or legislative action mandating adoption of any system in its present status would be premature and could be a deterrent to developing the most effective solution.

Industry manufacturers are ready, willing and able to manufacture any device that is adopted as a standard, and pilots and corporations are ready to purchase any devices they believe will provide them with economical and beneficial use.

If adequate knowledge was available to make a choice of systems today, we believe the decision would have been made and we would now be equipping our aircraft with the devices.

Mr. STIMPSON. Now, Mr. Chairman, I'd like to turn the platform over to Mr. Yodice of AOPA.

STATEMENT OF JOHN YODICE, WASHINGTON COUNSEL, AIRCRAFT OWNERS & PILOTS ASSOCIATION

Mr. YODICE. Mr. Chairman, members of the committee, first I'd like to offer the regrets and apologies of Mr. Baker, who is unable to be with us today.

AOPA is a nonprofit membership association of over 215,000 aircraft owners and pilots. Our members own over 70 percent of the general aviation in this country and fly 65 percent of the general aviation hours flown. So, we have a vital interest in the questions being raised in this hearing.

I'd like to highlight and supplement just a few points of our joint statement. AOPA recognizes that these hearings were precipitated by the recent, tragic midair collision over San Diego. As with any such disaster, our association is working very hard along with the rest of the aviation community to determine the causes of this accident, and possible measures which will prevent similar accidents in the future, and we appreciate the opportunity to be here with our brethren in the general aviation community giving you our views on how aviation safety can be improved.

On the other hand, we all recognize that the initial hysteria following this tragic accident tended to make general aviation a whipping boy. Without prejudging the investigation of this accident, I think it should be made very clear that the facts disclosed to date show the general aviation aircraft was doing just what it should have been doing under Federal Air Traffic Control when it was struck from behind.

Now, I listened very carefully to Chairman King's summary of the accident this morning, and I think he has verified the statement I've just made. The facts so far just do not justify the antigeneral aviation questions which have been raised in the public press, some of which are being considered in this hearing. The very concept of seeking to separate air traffic by category of general aviation and airline is unacceptable as a starting point for seeking conclusions to air traffic problems.

General aviation is the largest user of our national airspace system. It is more than 98 percent of the civilian aircraft fleet operating more than twice as many turbine-powered aircraft as the airlines. It flies 38 million hours a year compared to 6 million for the airlines. As you've heard it serves 14,000 airports, compared to the 600 for the airlines. It transports more than 100 million persons in intercity transportation each year. That's more than the combined total of 26 of the 31 federally-certificated airlines.

And general aviation is more than moving people. It's moving cargo. It's an invaluable aid to agriculture, photography, police work, pipeline and power control, and a host of other activities.

The air carriers, on the other hand, concentrate their activities at a few major airports. More than 50 percent of the departures are at only 25 locations.

To even suggest that general aviation be barred from these airports is impractical and foolhardy. It is general aviation which integrates the total airport system for this Nation. Aside from the first 30 or 40 airports used by the airlines, general aviation supports and dominates the other airports also served by the airlines. As to those 30 or 40, general aviation uses them for very important reasons—to connect with the airlines or because that's the only facility available or because the type of aircraft being operated needs the more sophisticated facilities of that particular airport.

For example, Lindbergh Field accommodates only 12 percent of the general aviation activity in the San Diego area. Completely separate airports just won't work.

I think in the interest of time, gentlemen, I'd like to hit just one or two more points; and I'm confident that the other points will be covered in the question and answer period. We were delighted to hear from virtually all of the speakers who appeared here today that it is their hope that the money in the trust fund will be utilized to build general aviation airports and to install NAVAIDS at those airports. We believe that it borders on a national scandal that there are over \$2 billion of uncommitted funds in the trust fund, where there are localities in dire need of airport facilities.

Just one further point. There was some discussion this morning about the importance of scan training, and I'd like to underscore what the Administrator said. Anyone familiar with training operations in general aviation is well aware of the emphasis which is placed on scan training and searching for traffic. This is a very, very important consideration and one which I think bears emphasis. Thank you.

[The statement follows:]

STATEMENT OF JOHN L. BAKER, PRESIDENT, AIRCRAFT OWNERS AND PILOTS ASSOCIATION

I am John L. Baker, President of the Aircraft Owners and Pilots Association. AOPA is a nonprofit membership association of over 215,000 aircraft owners and pilots. Our members own over 70 percent of the general aviation aircraft in this country, and fly 65 percent of the general aviation hours flown. So, we have a vital interest in the questions being raised in this hearing.

We'd like to highlight and supplement some of the points made in our joint statement.

AOPA recognizes these hearings were precipitated by the recent tragic mid-air collision over San Diego. As with any such aviation disaster, our Association is working very hard along with the rest of the aviation community to determine the causes of this accident, and possible measures that will prevent similar accidents in the future. And, we appreciate the opportunity to be here participating with other general aviation associations in giving you our views on how air safety can be improved.

On the other hand, we also recognize that initial hysteria following this tragic accident tended to make general aviation a whipping boy. Without prejudging the investigation, the facts disclosed to date show that the general aviation aircraft was doing just what it should have been doing, under Federal air traffic control, when it was struck from behind. The facts so far just do not justify the anti-general aviation questions which have been raised in the public press, some of which are being considered in this hearing.

The very concept of seeking to separate air traffic by category of general aviation and airline is unacceptable as a starting point for seeking solutions to air traffic problems.

General aviation is the largest user of our national airspace system. It is more than 98 percent of the civil aircraft fleet, operating more than twice as many turbine powered aircraft as do the airlines. It flies 38 million hours a year compared to 6 million for the airlines. It serves 14,000 airports compared to 600 for the airlines. It transports more than 100 million persons inter-city each year—that's more than the combined total of 26 of the 31 Federally certificated airlines. And, general aviation is more than moving people, it's moving cargo, it's an invaluable aid to agriculture, photography, police work, pipeline and power line patrol and a host of other activities.

The air carriers concentrate their activities at a few major airports. More than 50 percent of the departures are at only 25 locations.

To even suggest that general aviation be barred from these airports is impractical and foolhardy. It is general aviation which integrates the total airport system for this nation. Aside from the first thirty to forty airports used by the airlines, general aviation supports and dominates the other airports served by the airlines. At those thirty to forty airports, general aviation uses them to connect with the airlines, or because there are no alternate facilities available, or because it is operating air carrier type aircraft which need the longer runways and other facilities. For example, Lindbergh Field accommodates only 12 percent of the

general aviation activity in the San Diego area. Completely separate airports just won't work.

With respect to our specific proposals for improving air safety, we'd like to highlight a few.

First, those few aircraft which have difficulty operating under the present system must be kept at high altitude for the en-route portions of their flights. They must have more clearly defined paths to and from airports so other air travellers may be properly aware of their proposed positions. Not only would this provide for greater safety, it would also significantly reduce the sound levels by avoiding the long and wandering paths these aircraft now take to and from airports.

Second, we again urge adoption of our recommendations given you earlier this year for restructuring the airport-airway program. There is an urgent need to release money from the Aviation Trust Fund for the preservation and development of more airports. At present general aviation is facing a severe blockage of service merely because the facilities are not available for parking or for efficient operations. It borders on a national scandal that there is over two billions of uncommitted funds in the Trust fund while there are localities in dire need of airport facilities.

Third, additional safety and operational facilities are required in smaller airports. Of the 147 airports designated "reliever" (a term with which we do not agree) only 29 have instrument landing systems. None of the three airports around Lindbergh, for instance, has an ILS. There are six airports in the Minneapolis/St. Paul area ringing Wold Chamberlain field. None of these smaller airports have ILS facilities.

Again, the trust fund monies must be released for these safety aids so that people may use and may train and may benefit from more airports.

In the long range, it is necessary to begin formulating an airport and air traffic management system which will accommodate growth. The present system fails to do so. Because it will not accommodate growth, the users are being forced to take restraints, restrictions, and a patchwork program. There is little wrong with the present system if there is no growth. There are serious problems if air transportation is to achieve its full potential of service to the people. The technicalities of these immediate and long range proposals are too complex to present in a brief hearing such as this. We have and will continue to present more complete recommendations to the Congress and the Federal Aviation Administration.

One final remark—collision avoidance is a goal of all who are reasonable persons. But those who call for a mechanical device in the aircraft as the present ultimate solution either do not know the state of the art or seek to cloud the issue with dangerous rhetoric. Collision avoidance systems are not yet capable of performing satisfactorily in the terminal areas where they are needed. In addition, the proposal to equip all aircraft with them would cause utter chaos with the present Air Traffic Control System. Imagine a controller trying to keep aircraft separated if the aircraft for which he is responsible are turning, climbing, twisting, and turning at will.

The best collision avoidance system still is the human eye making a concerted effort to see. This is a responsibility for all pilots. We in general aviation pledge ourselves to seek proper solutions. We pledge ourselves to continually strive for perfect safety knowing full well such a record is unachievable. We pledge to keep trying . . . because the only way to be safe is to never feel secure.

Thank you. I stand ready to respond to your questions.

Mr. STIMPSON. Mr. Winant, National Business Aircraft Association.

STATEMENT OF JOHN H. WINANT, PRESIDENT, NATIONAL BUSINESS AIRCRAFT ASSOCIATION

Mr. WINANT. Gentlemen, good afternoon.

NBAA represents the interests of the entire business aviation community in the United States. Our membership consists of 1,800 companies which own and operate approximately 3,500 aircraft, most of which are of the twin piston engine, turboprop or turbojet types. In most cases these aircraft are flown by full-time, professionally highly rated pilots. I'd like to cover those subjects which begin on page 11 of our prepared joint statement, gentlemen, and I'll be as

brief as I can, and, then, all of us here at the table will do our best to answer your questions.

The organizations for which we speak have participated over the years either by invitation or by their request in most of the hearings which have aimed at measuring the sufficiency of FAA activities in the area of safety. The committee did ask us to come prepared today to comment with our views on the institutional capabilities of the FAA, and that I shall do at this point.

The safety responsibilities vested in the FAA, of course, are statutorily defined. They derive from the Department of Transportation Act of 1966, which turned over to the new department most of the powers and functions of the predecessor Federal Aviation Agency, but continued to vest in the Administrator of the FAA those functions, powers, and duties which pertained to aviation safety.

In our view then the FAA thus became a modal agency of DOT, largely to serve the purpose of providing cabinet-level development of policy related to coordinated, effective administration of the various national transportation programs.

The aviation industry, as you well remember, as a whole was not enthusiastic over creation of the DOT. Our reservations centered on concerns that the national aviation system might not be aggressively developed and improved if political expediency made national aviation policy subservient to national policy on highway development or on mass transit systems.

The community did, however, support those positions of the Act which vested in the FAA Administrator continuing responsibility for aviation safety.

Over the years, many elements of the aviation community have come to believe that their initial reaction to the 1966 Act was entirely correct. They feel that the Department of Transportation has failed to create a strong statement of national transportation policy, and within that framework, a strong national air transportation policy. We feel it has failed to develop policy to accommodate general aviation growth and development and that the result consists of deficiencies in the national aviation system. We find ourselves with a system which will need the kinds of improvements mentioned in our statement, if the system is to provide the capacity needed to handle air transportation over the next decade. An air transportation system whose capacity cannot match demand is a system susceptible to delay, to inconvenience, and to the creation of unsafe conditions in the air.

We agree wholeheartedly with views expressed here today by Chairman Cannon, Chairman Anderson, several of the other members of the subcommittees, and by previous witnesses, that the aviation trust fund created by the 1970 Airport/Airway Development Act has, in our view, become a captive of the Office of Management and Budget "hold-the-line" financial policies and to attempts by various administrations to make the Federal budget look ever so slightly less imbalanced.

Improvements in the aviation system, many of them directly related to safety, have been denied. In view of constraints imposed upon it, we do not feel that the FAA has been neglectful in carrying out safety-related responsibilities, but we do wish to make the point that we're deeply concerned with lack of national policy on development

of an aviation system capable of meeting the requirements of all users, and in so doing, accommodating general aviation growth.

In summary, I would like to stress to your good committees the several constructive improvements we suggest in our paper. Available trust funds should be used for high-priority developments, including additional general aviation airports and reliever airports in metropolitan areas. Steps must be taken to preserve privately-owned public use airports and public airports. Additional parallel runways on primary airports are needed for accommodating both large and small aircraft. We recommend provision of ILS or other approach aids at general aviation and reliever airports, both for operations and training purposes.

The airport/airway program, the ADAP program, should be restructured to meet priority needs and trust fund receipts and expenditures should be brought into balance. The trust fund should not be allowed to build up billions of unused dollars. Government aviation policy should set clearly established goals, which include the accommodation of general aviation's potential for growth. Government programs, should be established to enhance the official and public acceptance of improvements required for the enhancement of air safety and aviation systems capacity. Finally, we recommend acceleration of the development of a collision avoidance system, which can lead to a national standard.

In doing the foregoing, we urge that certain capabilities within the system be preserved. See-and-avoid is the primary collision avoidance system for all users, general aviation, air carrier, and military. We must continue to work to supplement that basic system. It is recognized that we have an integrated air transportation system; and properly equipped and flown, general aviation aircraft can safely operate into the same airports as the air carriers.

Finally, a continuing requirement will exist for practice instrument approaches at airports which have precision approach facilities to maintain pilot proficiency and pilot competency.

All of us at the table are deeply concerned for air safety as well as for airport and airway system capacity. We hope our comments help point the way to improvement of both, and we deeply appreciate your consideration in having us with you today.

Mr. STIMPSON. I'd be glad to answer any questions you have, Mr. Chairman.

The CHAIRMAN. Do any of the other gentlemen have anything to add now?

Mr. STIMPSON. They are going to be answering primarily questions of your committee.

The CHAIRMAN. You noted that the see-and-avoid is the primary collision avoidance system for all users and that this must be preserved, and general aviation, air carrier, and military must be used to supplement that system. How do you propose to supplement the system without additional collision avoidance equipment?

Mr. WINANT. We meant, Mr. Chairman, to suggest just that.

The CHAIRMAN. I see.

Mr. WINANT. We do feel as a group—and I think we share that opinion with all the other users of the system—that the human eye, the trained human eye, is the primary collision avoidance system. We are in favor of the development of that piece of hardware, that

piece of equipment, which will lead to the development of a true national standard; and the owners and the operators of the aircraft for whom we speak today are eager for such equipment once a national standard is developed.

The CHAIRMAN. You state that "properly equipped and flown, general aviation aircraft can safely operate into the same airport as the air carriers." I agree with that as a basic statement and as a desired goal. I would ask then, why is it unreasonable to require that general aviation aircraft wishing to use major airports be properly equipped with a transponder and an encoding altimeter?

Mr. STIMPSON. I don't think we're disagreeing with that, as this requirement exists at the big, major airports today. Mr. Yodice, do you want to elaborate further?

Mr. YODICE. Mr. Chairman, perhaps we can suggest that that is already required and being accommodated. General aviation, which uses the major airports, certainly the 21 airports with terminal control areas, are required to have encoders, encoding altimeters and transponders, as well as two-way radio communications and clearances, and that is being accomplished.

The CHAIRMAN. Well, here are some of the airports that seem to qualify for some form of TCA, but don't have that requirement now. For example, Honolulu, Kansas City, San Diego, Phoenix, Fort Lauderdale, Memphis, Orlando, San Juan, Portland, Oreg., Buffalo, Salt Lake City, Baltimore—and I could go on.

Mr. STIMPSON. Yes.

The CHAIRMAN. Wouldn't it appear to you that some of those airports ought to have that kind of requirement?

Mr. STIMPSON. I'll let Mr. Yodice talk on that, and I think Mr. McIntosh also has a comment to make on that.

Mr. YODICE. Mr. Chairman, I was very encouraged when you this morning said that you were hoping that we would not have any "rash, cosmetic improvements," these were I think the words you used, and Chairman Anderson also talked about avoiding "short-term, quick-fix magic solutions." And, then, as the conversation developed, we heard more and more about imposing additional TCA's; and if you'll forgive me gentlemen, I think that is a rash cosmetic improvement. The present TCA's are established based upon certain criteria, and these criteria are based on air carrier enplanements aircraft as well as the volume of traffic, and informed judgment was made that the TCA's be established where they are.

I think what's happening now is that the FAA is being pressured to put TCA's where they earlier made the judgment they were not required. Furthermore, I think it's important to note that we're getting some information from the NASA safety reporting system that may indicate to us that TCA's are not all that they're cracked up to be. We certainly heard a lot of testimony about what the abatement of the midair collision has been within the TCA, but we heard nothing about the midair collisions that may be being created around the periphery of the TCA's or above the TCA's, where general aviation traffic is trying to avoid the strictures of the TCA. I think very soon we're going to have some information from NASA which will fill us out on that particular safety aspect.

Last, I think it's important to talk about the notice of proposed rulemaking which the Administrator discussed this morning, which would provide the insulated airspace to the high-performance air carrier aircraft, and this sounds very much like what AOPA has proposed to the FAA and has mentioned to your committees in the past. The only thing we didn't hear the Administrator talk about was reconfiguring the TCA so that it would free up additional airspace around the TCA to accommodate the traffic which was not going into the TCA. The concept is a sound one and one which we subscribe to, at least until we get a chance to look at the notice of proposed rulemaking more carefully.

The CHAIRMAN. I must say that I was impressed by the FAA testimony that in the 21 TCA's, the number of near misses has gone from 254 before TCA to 24 after over a 1-year period. Would you say that's quite impressive or would you credit that to other factors?

Mr. STIMPSON. Do you have a comment on that, Fred?

Mr. McINTOSH. Yes; I'd like to comment on that, Senator Cannon. This would be expected in any area in which surveillance is carried to that point. I do not believe that these comparable statistics are available in the various areas in which you read off the list of possible, potential areas for TCA's, because it still requires a Federal employee under some mechanism to be able to keep those statistics.

May I expand on Mr. Yodice's comments on the TCA? In listening to the testimony today, it's quite obvious that the TCA is held up as perhaps an immediate solution, and the fact remains we have to consider that we are here because of the tragic accident. So, the implication is that a TCA would have perhaps alleviated or caused conditions under which this accident would not occur. I think Chairman King put it very honestly. Nothing that we have heard to date would indicate that the existence of the TCA, either here or in Memphis, Tenn., also a midair—the conditions, the equipment, the techniques and the procedures, and the controllers involved would be identical whether there was a TCA there or not. So, I urge you, please, not to use the TCA concept that Mr. Yodice points out as a mandate, because it would not have been applicable here.

Also, you want to have conflict alert. Both would have been alerted by controllers, and in both cases they were under the control of the control system.

Mr. ANDERSON. Can someone yield there?

If we had a TCA, we would have an ARTS III at Lindbergh and we wouldn't have had that gap in time. What they saw on the radar would have been immediately sent there, and there was a break in time with one not being able to get through?

Mr. McINTOSH. I'm afraid I didn't follow your reason, sir.

Mr. ANDERSON. If there had been a TCA here, there would have been an ARTS III at Lindbergh Field, and you wouldn't have had that gap in communication.

Mr. McINTOSH. I believe the gap in communication was related to the fact that one aircraft was in the approach mode and the other one had been handed off to the tower, and this too would occur in the TCA.

Mr. ANDERSON. At least Miramar could have been in contact with the PSA plane under those circumstances, but they weren't because PSA was in contact with the tower at Lindbergh rather than the one at Miramar?

Mr. McINTOSH. The PSA contact would have been in contact with the tower at the airport in which he was landing.

Mr. ANDERSON. So, if they had that ARTS III at Lindbergh, they would have had the conflict alert information there?

Mr. McINTOSH. You're saying give the approach to Lindbergh as well?

Mr. ANDERSON. No; with a TCA the radar information that they have at Miramar would be in there at Lindbergh.

The CHAIRMAN. What he's really saying I think is, if you had a TCA and had an ARTS III system, the information would be there available to the tower operator as well. But here, when the controller turned the aircraft over to the tower operator, which was on a different frequency, then the controller received the collision alert signal, he had no control through the tower operator to the aircraft, as I understand it.

Mr. ANDERSON. Yes.

Mr. McINTOSH. I will have to go back and check my figures on it. It may be that you're entirely correct. Offhand, we have reviewed this with all parties who expect to be parties for the public hearing, and the information we have received indicates to date that it would have been identical, but I will check it out, sir.

Mr. STIMPSON. Mr. Yodice has something to add to that, also.

Mr. YODICE. Yes, sir. I think there may be a basic misunderstanding, and I think the importance of having the radar in the control tower has been exaggerated. It's a fact—

Mr. ANDERSON. Well, it gets the information from the radar.

Mr. YODICE. Yes, but the information would have been a traffic alert, and it happens in our airspace with great frequency that there will be a traffic alert. But when the controller has satisfied himself that that two aircraft are providing their own visual separation, he would not communicate that information to the aircraft; and so even had that information been available in the tower, I doubt that the local controller would have acted any different.

Now, of course, as it's been suggested, this is a matter of investigation, and we'll get into it in greater detail. But I'm fearful that the importance is becoming exaggerated. In fact, I agree that if we had had the TCA at Lindbergh or even a TRSA at Lindbergh, it would not have altered the circumstances of this accident.

Mr. ERTEL. It appeared from the testimony we had earlier that the real problem was not with the radar system as much as the communications. There was no means of communicating to both aircraft from Miramar, which had the conflict alert system. If that system were at Lindbergh, Lindbergh may not have had the capability of communicating with both aircraft either, because one was being controlled on the approach, the other was being controlled by the tower. So, without a switching device to put them both in the same circuit, a communication would fail; and what this is, it seems to me, is a failure of communication.

Mr. YODICE. I have a great deal of trouble with that, sir. I think the evidence which is disclosed to date was that there was communication and that traffic was called to the PSA jet, as well as being called to the Cessna 172.

Mr. ERTEL. Yes; they both said they had each other in sight, but the problem was that the controller who then had knowledge that the collision was imminent did not advise him until 1 second after the collision occurred.

Mr. YODICE. I suggest to you, sir, it probably would not have been any different.

Mr. ERTEL. That may have been.

The CHAIRMAN. That may have been, but that point is correct. Once the man at approach control had notified the PSA aircraft of another plane in the vicinity and received the response that the pilot had him in sight then turned him over to the tower operator who was on a different frequency; it was after that handoff that the controller got the collision alert signal and couldn't go through the tower operator to notify the PSA aircraft. As the sequence went, it may not have really meant anything under the circumstances. We'll find that out when the investigation is complete. But it was something that caught my attention, to think that the approach controller, when he found the collision alert indicator, didn't have a way of getting back to the PSA pilot.

Mr. STIMPSON. If we could sum up, Mr. Chairman, on the TCA question, as we say in our prepared statement, that we think there are some things that can be done. Perhaps some reconfiguring of TCA in order to expedite the flow of traffic in them. And I think we're all concerned with the same objective here in that as the Administrator proposes the additional TCA's, we'll have public hearings and we'll be able to express our views in greater detail, what the proposals will be.

The CHAIRMAN. And I must say that I don't believe in this knee-jerk reaction that says you must immediately get all the general aviation flying out of air carrier airports. I don't think that is the solution. I agree with most of you people, but we have to find some kind of a solution to reduce this particular hazard. I think you made a very good number of suggestions here, the need for more reliever airports and better facilities at some air carrier airports; and I wish you would provide us, for the record, with a listing of the top priority improvements that general aviation would like to see at the large and medium hubs around the country. I think that might be helpful to us.

On one other point that you make regarding the acquisition of more reliever and general aviation airports, we're in kind of an unfortunate situation because the owners find the value of the land going up so high, they're willing to sell the land off for other purposes. Have you some recommended solutions to that kind of a problem?

Mr. STIMPSON. It's a tough problem. In some cases we can save the airports. We have cases like Caldwell Wright in New Jersey, Addison in Texas, where airports were about to be lost that were saved. We have another case now in St. Louis, which is a very busy terminal area. They have a request into the FAA for \$9 million or \$10 million to buy the Spirit of St. Louis private reliever airport, but this is dragging on because the money isn't available. That's why I think with

adequate funding we're going to get some of these. We're not going to get all we want, but we'll certainly make a big step forward.

The CHAIRMAN. You people, of course, are very aware, but I think it ought to be made clear for the record that both the Senate and the House passed legislation for more money for reliever airports, for improvement of general aviation facilities, and for safety-related activities. Unfortunately, that legislation did not get through. We tried to negotiate an agreement with the executive branch on the dollar amounts of our proposals. They felt our figures were too high, and I know the House had much higher figures. We do hope however, to get some legislation through early next year.

Mr. STIMPSON. In addition, Mr. Chairman, we're currently doing a project on surveying the top 30 airports, which started prior to this tragic accident, to see what the needs of relievers are in this area. Shortly we'll have some pretty credible figures that will aid the committee in deliberations next year.

The CHAIRMAN. Congressman Anderson?

Mr. ANDERSON. Thank you, Senator.

Mr. YODICE, in the discussion on scanning techniques I sense a difference in philosophy here that hasn't become too clear for me, where you people and the FAA seem to think that just placing the emphasis on scanning is more important than actually training in the techniques of scanning. Now, it would seem to me that the actual practicing of techniques and the training of people to see certain things would be better than just trying to increase the emphasis on it.

Mr. YODICE. Well, sir, I can't speak for the FAA, but I can tell you that our AOPA air safety foundation has done precisely what you're talking about. For the past 5 years they have been going around the country teaching the people, using audiovisual techniques, teaching pilots how to scan, teaching pilots about the physiology of the eye, time sharing, and the importance of collision avoidance.

And we haven't been talking in the abstract as we do now. We've been talking in detail exactly how to do it, how to divide your time in the cockpit, how to look for traffic.

Mr. ANDERSON. I'm glad you made that clear. In the Army I was in the anti-aircraft group, and I know that we spent hundreds of hours, literally, learning techniques on different kinds of lights, different kinds of objects, how quick we could observe them, etc., and I know going through those courses I learned a lot. Just trying to emphasize upon me the importance of it wouldn't have gotten me anywhere, but the fact that I had to sit hour after hour and train continuously, I know that I learned things. I have the impression this morning and from your statement now that there was one way of doing it, that's emphasis, and the other way of doing it was the actual technique. And you people believed in just the emphasis.

Mr. YODICE. No, sir.

Mr. ANDERSON. Now, if you do actually believe in training, then I think you would be more in line with what the NTSB was recommending—

Mr. YODICE. Yes, sir.

Mr. ANDERSON [continuing]. Because they recommend these training techniques, and they were toned down by the FAA.

Mr. STIMPSON. I might also say that Mr. Riggs might have a comment on that from the flight instructors' standpoint.

Mr. RIGGS. Thank you very much. Every 2 years flight instructors have to renew their certificate. Their license to give flight instruction is limited to 24 months, and we attend seminars and our organization conducts seminars in cooperation with the FAA in safety instruction. We've constantly stressed scan training. I've lectured to approximately 2,000 or 3,000 pilots, flight instructors, in the last 2 years; and we're the first to express that concept both there and in our publications.

Mr. ANDERSON. But, then, how does that get down to the average pilot?

Mr. RIGGS. All right. We tell them if—hopefully, if your pilot is one of our students, then he will be taught how to look around in the cockpit and he will be instructed by perhaps his instructor the importance of eyeball movement and the things that Mr. Yodice has described. But we're stressing that constantly.

Mr. ANDERSON. And another thing, Mr. Yodice, I was listening to your explanation of the TCA's, and I got the impression you said, "OK, we've got them at the 21 large airports, but let's not expand them." Did you support the establishment of the 21 that we have?

Mr. YODICE. No, sir.

Mr. ANDERSON. I have the impression that the general aviation groups were very much opposed to implementing TCA's at any airport, but now that we have 21, you say change the configuration a little bit, but don't increase the number. I think we ought to put that out on the table to know that you didn't like the TCA concept to start with.

Mr. YODICE. That's correct. We were not enamored of the TCA concept, but now that we have the TCA concept, we are working with the FAA to provide a way to provide to the high-performance aircraft a method from climbing out from the airport up to positive control airspace and make his descent back to the airport in insulated airspace, in airspace in which all the traffic is controlled, very similar to the discussions that were being made by the FAA this morning.

Mr. ANDERSON. But you don't want it expanded beyond the 21 that we now have?

Mr. YODICE. Yes, sir; that's correct. I should also say that with respect to our support to that program, it's entirely dependent upon the permission to use controlled visual flight rules that would allow VFR traffic into that airspace, but controlled, and that we reconfigure some of the control area to free some up, additional airspace.

Mr. ANDERSON. Mr. Winant, I was a little disappointed in your testimony. I thought when you were stating what the solution should be, you said in effect, "Give us some money out of the trust fund, I want to see more general aviation and reliever airports in metropolitan areas, preserve privately owned airports," and so on; but you really didn't say anything about a collision avoidance system until Senator Cannon first asked you. And then you talked about equipment system improvement. I would have hoped that you would have recognized that we want to see additional money for these various things you're talking about, but I think you also ought to put some real thought on how you can avoid collisions up there too. I think there are techniques. I think there is equipment. I think there are systems that you could have and should have maybe investigated more than say maybe "just give us some of that \$2 billion to \$4 billion that is trust fund money for more general, more reliever, and more private airports."

Mr. WINANT. Your point is well made, Mr. Anderson.

Mr. ANDERSON. Anyway, the Senator here saved you. He made it all right before it got to me.

Mr. WINANT. If I may, I will just comment a little further. All of us, all three of us who were the spokesmen for the joint statement, attempted to be as brief as we could. The fifth point among the list of improvements we were discussing—maybe I said this too quickly and it went right by both you and Chairman Cannon—was No. 5, "Accelerate the development of a collision avoidance system which can lead to a national standard." I hope I did make that point. I think I did, but maybe I was stumbling along so quickly that it wasn't perceptible to the ear.

We do have in our statement, Chairman Anderson—I think this should be pointed out for the record, as it may be helpful to you—a very long dissertation on the subject of collision avoidance. And in the interest of brevity because the subject has been discussed so much this morning, we all at lunch opted to skip over it and handle the matter in question. We have an attachment that runs eight pages on the subject of collision avoidance, in which we take really I think a very constructive position, that we feel, along with most of the other elements in the aviation community, that the so-called BCAS technology merits best, first consideration; and we recommend that the FAA move as rapidly as it can with full development of that concept with field testing, extensive testing equipment. Then, if all systems are go, that the FAA rapidly develop a thoughtful national standard.

And I do make the point that the owners of the aircraft whom we represent, the private aircraft, personal aircraft, business aircraft, are ready, eager, and willing to purchase the equipment so—

Mr. ANDERSON. I have one last question.

Mr. WINANT. I hope that helps you.

Mr. ANDERSON. Mr. Riggs and Mr. Stimpson, I notice in your statement on the need for more reliever airports where you cite the case of San Diego, "New reliever airport at La Mesa—on the east side of the area—at an approximate cost of \$8,300,000," as one of the national airport system plan projects. But I think you have to go beyond that. You know that the establishment of an airport in such an area is not a popular thing. As a matter of fact, you know just the reverse is happening, and yet out of that \$8,300,000 we're going to say, "You people out there locally are going to have to come up with not just the consent to have the airport, but 20 percent of the funds." They don't get it all out of ADAP; they have to reach out of their own taxes and raise \$1,600,000 for something that they probably don't want.

Now, how do we get over that hurdle? How do we get that matching money, that 20 percent? Do we reduce that 20 percent?

Mr. STIMPSON. I would like to suggest a couple of things. Maybe you would want to retain 90 percent for relievers. And maybe there are some other incentives that we should look at to promote reliever development. Ninety percent—

Mr. ANDERSON. I don't know about the site of La Meas, but I would have a hunch if you went out to the site today and said, "We want to put an airport in your area," even without costing them anything, they would be reluctant. In addition they've got to put up 20 percent, which would just make that vote twice as hard against it.

Maybe if we cut it down to 10 percent, there would be a little less opposition. I still think there will be resistance.

Mr. STIMPSON. It's a tough selling job on the local level and on the funding side that we just discussed. Nobody wants an airport in their backyard, and they want to put it in somebody else's backyard. And it's a very tough situation. That comes back again sometimes to utilization of these military fields, for example, which are existing airports. We can't afford to lose any of these, like Mr. Wilson was talking about earlier.

So, our number one priority should be saving the airports we have today and taking advantage of joint use, and, third, keep working on the new reliever concept, recognizing that's probably the toughest one of the batch.

Mr. ANDERSON. Thank you.

The CHAIRMAN. Mr. Ertel?

Mr. ERTEL. Thank you, Mr. Chairman. I've got a note here that they now have a commissioned ILS at Palomar. Are you aware of that? I think your statements were there were no other ILS systems in this area.

The CHAIRMAN. Excuse me. He says that in his statement?

Mr. ERTEL. He does.

Mr. YODICE. Except for facilities 27 miles away, sir.

The CHAIRMAN. Except facilities 27 miles away.

Mr. STIMPSON. Yes; we were talking about Gillespie, Montgomery—

Mr. ERTEL. If you're going to practice, 27 miles in my neighborhood isn't very far. Maybe here it is.

Mr. YODICE. Well, that's not the only consideration though. Because it's an ILS 27 miles away, it's also very actively used, and they're beginning to have problems of their own at the Palomar Airport.

Mr. ERTEL. Are you saying it's overcrowded and if they did not allow Lindbergh for ILS practices, that there would not be capacity—

Mr. YODICE. What I understand at Palomar is the noise, the amount of traffic using the ILS for practices generating noise for them.

Mr. ERTEL. I guess we find that anywhere. It seems to be a common problem anymore.

I notice one thing you talked about, most of you are interested in this scanning idea, trying to see-and-avoid aircraft as a device. Obviously, that's probably the primary device you'd use to separate aircraft; but don't you recognize there are blindspots and weather conditions and other things that cause you not to see? And whether or not you advocate a complete, quick development of a collision avoidance system, I noticed your statement here right at the end, "If adequate knowledge was available to make a choice of systems today, we believe the decision would have been made and we would now be equipping our aircraft with the devices"—are you pushing for them to develop such a system?

Mr. STIMPSON. Yes. And I'll let Mr. McIntosh talk in further detail.

Mr. McINTOSH. When you look at CAS, as you call it, you've got to look at it in essence of about 20 years of argument. Two major points stand out, sir. One is the fact that all of the midair collisions after the Grand Canyon occurred have occurred in terminal areas of

any magnitude; so the problem has been addressed by the Government essentially to the terminal area. And, quite honestly, we've spent many years before it was finally accepted that no electronic-mechanical collision avoidance system would be able to operate in the terminal area without upsetting the ATC system where the controller was actually needed to put airplanes closer together.

When you get right down to it, human beings are operating airplanes; so we speak of time to nearest contact in terms of TAU's, T-A-U, and we speak of a 40-second TAU as being desirable to give us time for the pilot to make a decision and the automation to make a decision.

Meanwhile, aviation was growing in numbers, and the problem for all of us, including our friends in the air carriers and the air taxi business, as well as the Government, has been how we can get maximum coverage; and a decision was made after many false starts that hopefully we could use something that was in the airplane. And that decision, without the verbiage that goes with it, has come down to the use of the beacon system in its various forms.

There are technical arguments, which some of you raised today, as to the passive versus the dual mode system, and so forth, for the FAA.

So, in answer to your question, do we advocate this, those of us who have been hoping for this over these many years, it appears to us after a complete evaluation of this that the beacon system has the potential for helping us the most, the quickest; but we would ask you also to help us not let the FAA drag their feet.

Mr. ERTEL. Well, I guess the question is: Has the FAA been dragging their feet since they had a study in 1969? We're now in 1978. It doesn't seem that we have a system yet.

Mr. STIMPSON. Well, I suppose, Mr. Ertel, we could say, yes, in hindsight they haven't moved fast enough; but I think it's significant from an industry standpoint that basically all aviation organizations are together on this. Last year we submitted a paper, which was signed off by everybody, to the FAA recommending our views; and we were certainly in unanimous feeling to move ahead, please, FAA at the most expeditious fashion.

Mr. McINTOSH. May I add a clarification to the scanning, sir, that you brought up. Everything that has been said here and what you have said about scanning and the ability to train is all very valid. One of the problems in passing a recommendation from NTSB, one bureaucratic organization, to the FAA, which is a massive bureaucracy with a policy, to the Administrator is that the end product must be a standard and it must be a regulation. We were involved in some degree. NASA has an ability to tell you and teach you how much you can and cannot scan, and the techniques are well known and used by everyone.

However, the problem comes, how do you develop a regulation or a standard that says, "My scanning technique meets the Federal regulations"? And this is one of the prime reasons there is not now a standard or a regulation.

Mr. ERTEL. Thank you. I have no further questions, Mr. Chairman. The CHAIRMAN. Thank you. Just one or two comments.

First, you were talking about the ILS in this area. Now, I'm advised by the FAA that Montgomery is scheduled for an ILS, which would certainly help alleviate the problem.

Second, on permitting the opposite-headed traffic, the ILS is from west to east here, not from east to west, as much of your landing pattern is. So, if a pilot is going to get training on the ILS here, they must train on the front side of it, unless it's back-side approach. And this isn't the only airport in the country that permits that type of activity.

As we heard this morning, the Cessna broke off before it ever got to the runway. So those two airplanes, the Cessna and the PSA airplane, were both flying in generally the same direction, one letting down and the other climbing, one perhaps climbing to the left and the other letting down to the right. So, for example, Phoenix, which is quite a wide-open airport, permits training in that form, in opposite direction at the Phoenix Airport.

I sat in on the collision avoidance hearings that were held a number of years ago in the Senate, and I was impressed by the case that was made at that time that we were really not far enough along on getting the type of a system that could do the job that we wanted done. Now, maybe something is better than nothing. Maybe the BCAS system now with the capability that it has is better than nothing. Obviously, both systems together would be the best certainly, but you must look at the cost factor, and the cost factor of your ground combination is pretty. Of course, with an air carrier, that's no particular problem for they can afford it. But the general aviation operator, those you are concerned with, I guess that gets to be a pretty important factor.

Would you want to address yourself to that?

Mr. STIMPSON. Very much so, Mr. Chairman. Both the development of technology so you can get a black box that works in the cockpit that's compatible in the airway system and the cost factor for the individual owner are important factors. And Mr. Yodice may want to comment further on that from your standpoint.

Mr. YODICE. Yes, I think it's very important that we get not only a product that works, but it be economically feasible. And, you're right, that the systems that have been discussed of late, are very, very expensive. When it becomes economically feasible, general aviation will use it.

Mr. STIMPSON. And that is one thing about the BCAS system too. More people can participate in the system without everybody having a new, big black box in their cockpit.

The CHAIRMAN. Do you have anything on the cost estimates of the current BCAS system now?

Mr. MCINTOSH. I'll take a flier at that, because even that is changing quickly. A full dual-function BCAS, meaning the ability to work passively as well as actively, the last figures I've seen on an air carrier for business jet type box would be approximately \$20,000 and up. The general aviation system which would be in essence a transponder with the ability to reply would be in the neighborhood of \$1,500 to \$1,800, although \$2,500 is heard generally; but when you talk in terms of the conversion that will be expected for the DABS transponder downstream, all of this comes into one package, mode C, DABS, and the basic transponder and BCAS, all in one unit.

May I address myself one moment, please, to—we speak about the 10 and 12 years, and the chairman and I shared the jumpseat together several years ago in a successful flight demonstration of the airborne CAS at that moment. One of the problems always was that you had to either equip the aircraft very rapidly, all aircraft, with a box that did nothing else but serve collision avoidance at an expensive time, at one time using a McDonnell-Douglas system, the time frequency system, and the cheapest general aviation box was quoted as high as \$5,000—and, obviously, this would never equip the fleet. Technical problems continued to delay all this, and, then, it became obvious that a system that permits the first airplane to put it aboard to be protected was really what we wanted. And that is the use of the present transponder system. And the BCAS in its experimental role today, you monitor it in an airplane; and if he should take off in an area, a TCA if you will, where everyone has a transponder mode C, that first airplane will be protected from all others. And this, gentlemen, is really what the Utopia is that we'll all try to get to.

The CHAIRMAN. Thank you very much, gentlemen. We appreciate you being here.

Mr. STIMPSON. Thank you.

The CHAIRMAN. Capt. Raymond Gerber, U.S. director of International Federation of Air Line Pilots Association, John O'Brien, manager of engineering and operations for ALPA, Jack Howell, assistant executive central air safety chairman for the Air Line Pilots Association.

STATEMENT OF CAPT. RAYMOND GERBER, U.S. DIRECTOR OF INTERNATIONAL FEDERATION OF AIR LINE PILOTS ASSOCIATION; ACCOMPANIED BY JACK HOWELL, ALPA'S ASSISTANT EXECUTIVE CENTRAL AIR SAFETY CHAIRMAN; AND JOHN O'BRIEN, MANAGER OF ENGINEERING AND OPERATIONS

Captain GERBER. Good afternoon. I'm Capt. Raymond C. Gerber, representing Capt. J. J. O'Donnell, president of the Air Line Pilots Association. I have served as executive central air safety chairman of ALPA and presently am the coordinator of all air safety matters between ALPA and the International Federation of Air Line Pilots Associations, which is IFALPA.

With me today are Jack Howell, on my left, your right, ALPA's assistant executive central air safety chairman, and John O'Brien on my right, manager of engineering and operations for ALPA.

We are indeed grateful for this opportunity to present our views; and what I'm reading from is the paper entitled "Oral Summary." We had submitted a draft summary previously and now I would like to summarize it in this oral summary, which I believe you all have a copy of.

Let me preface it by saying we almost felt like we wouldn't have to appear. Mr. Ertel has quoted quite a bit from our paper and other people have covered quite a few of our points; however, in order to present a cohesive picture, I'd like to do this oral summary. And, then, I'm sure we'll be able to answer all of your questions.

We feel a deep sense of regret, Mr. Chairman, that his hearing is necessary at all.

The FAA was established following three midair collisions that occurred between June 1956 and April 1958. These accidents emphasized the need for better air traffic control systems to prevent such disasters. The Federal Aviation Act of 1958 created the FAA and gave it expanded authority in air safety.

And yet, here we are—20 years later—a month after the worst aviation accident in the United States, still seeking solutions to the problem of midair collisions. Of course, there have been many improvements in the air traffic control (ATC) system during the past 20 years. At the same time, however, both the number of aircraft and the speed of most aircraft have increased enormously. The result is that the ATC system is reaching its capacity to deal with the increasing burdens placed on it.

The burdens on the system will continue to increase. The FAA estimates the number of aircraft in this country will grow from 185,000 now to as many as 375,000 by the year 2000. Takeoffs and landings at airports with control towers, which now number about 64 million annually, are expected to reach 118 million by the end of the century.

But the amount of airspace will not increase; thus, the skies will become more and more crowded in the future. If recent experience is any guide, much of this growth will occur around the larger airports, which already have large volumes of traffic.

This growing traffic in the terminal area will mean an increase in the probability of midair collisions unless all of us in aviation take positive measures to reduce this threat.

There are several steps that can be taken to reduce the threat of midair collisions. One is to change the procedures used in the air traffic control system. After its inception in 1958, the FAA concentrated for several years on developing better procedures. However, the continuation of midair collisions led to the realization that procedures alone are not the entire answer.

Another step would be to develop more airports, to spread the traffic around and thereby lessen the congestion at the busiest airports. This step is needed, but again, it is not the entire solution.

Finally, the single most important step toward eliminating the threat of midair collisions would be for the FAA to take immediate, expedited action to complete evaluation of already developed and apparently effective airborne collision avoidance systems.

As far back as July 1969, following a series of midair collisions and near-misses, an FAA study group said a "principal problem" is "the difficulty encountered by pilots, for whatever reasons, in seeing and avoiding other aircraft soon enough to avoid a hazardous, near-midair collision situation." The FAA study group recommended "an extensive avoidance system, with cockpit displays, as a prime solution to the * * * problem."

Unfortunately, the FAA has not followed the clear recommendation of its own study group.

ALPA has already provided the committees with extensive documentation that illustrates the failure of the FAA—for whatever reasons—to develop an effective collision avoidance system.¹ I would like to highlight, briefly, some of the facts in this documentation.

¹ The documents referred to are in the committee files.

The NTSB has recommended six times that the FAA develop such a system. These recommendations were made in July 1969, August 1969, November 1970, February 1971, September 1972, and May 1973.

In November 1969, spurred by 19 midair collisions earlier that year, the NTSB held extensive public hearings on the problem. After hearing 26 witnesses from Government agencies, the aviation industry and the public, the Board called the concept of "see-and-avoid" outmoded, and recommended in its February 1971 report that the FAA develop a collision avoidance system for airliners and other large aircraft and a proximity warning indicator (PWI) for smaller aircraft.

In April 1971, a majority of those at the FAA's National Aviation System Planning Review Conference found that little progress had been made on developing a collision avoidance system and called the need for such a system "urgent."

And yet, within 2 years, in 1973, the FAA withdrew a proposal for the flight testing of different PWI techniques, claiming that PWI was inappropriate for the complete spectrum of aviation. This ended the PWI concept, which the Army had been using with extraordinary success in its helicopter training program.

Then, in 1975, the FAA completed testing of airborne collision avoidance systems developed by three manufacturers and rejected all three. The main reason given by the FAA was that each of the three would require additional equipment in all aircraft to provide full protection. In addition, there were problems of false alarms and incompatibility with present and future air traffic control equipment.

In February 1976, the FAA told the Senate Aviation Subcommittee about its current work on collision avoidance systems. In a letter to update testimony given at hearings in May 1974, the FAA said it was proceeding to develop a beacon collision avoidance system (BCAS), which makes use of the radar transponder already on most aircraft. The agency also said it expected to issue a national standard for this system by July 1977.

The next change to the FAA's plans for collision avoidance appeared in the FAA's separation assurance program of January 1977. This program announced that the discrete address beacon system and the new ground-based automatic traffic advisory and resolution system (DABS/ATARS) would become the primary protection against mid-air collisions.

Incidentally, in November 1977—in spite of findings by an FAA study group that the "principal midair collision problem is the inability of the pilot to see-and-avoid other traffic" and an 8-year-old NTSB finding that described the see-and-avoid concept as outmoded—FAA Administrator Langhorne Bond told the House Subcommittee on Government Activities and Transportation: "Common sense dictates that the see-and-avoid concept be a basic touchstone within our air traffic system."

In the most recent development, the FAA published in April of this year another concept for collision avoidance systems. This concept called for a collision avoidance system that would not work in high-density terminal areas where most of the aviation traffic is. This system was offered as the first step toward development of a full-capability system some years in the future. A draft national standard for this system was due to be issued late this year or early in 1979, according to the FAA. A final standard is due to be published in the spring of

1980. If that schedule is met, the limited-capability equipment could begin to be installed on aircraft in 1982.

Mr. Chairman, we believe this record clearly proves the FAA has been too slow in developing an effective collision avoidance system. Why? This is the key question. We think there are three reasons:

One. The FAA's research and development in collision avoidance continues to receive a low priority. Just a few days ago, the agency cancelled the contract for development of the trimodal beacon collision avoidance system, but it managed to find \$300,000 for paper studies of the concept of towing aircraft from the ramp to the runway to save fuel and pollution. That idea is at least 5 years old. While we recognize the need to save fuel, we believe it is more important to save lives.

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. In the meantime, it provides an excuse for not proceeding quickly in developing and implementing an effective, but less-than-ideal solution.

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.

If we can believe the FAA will stick to its current plans—and we're not holding our breath—we in ALPA find it hard to understand the push for the FAA's active-mode-only system. It has several disadvantages. It will not show the relative location of the threatening aircraft; thus it requires the pilot to change altitude to avoid the threat. In addition, this system must be turned off if traffic is heavy in the terminal area—where the greatest danger of collision exists. The problem is electronic interference with other aircraft. According to the FAA's own estimate, traffic in 1985 will be so high at 34 airports that this active-only system will be ineffective in these terminal areas. This includes such busy terminals as Kennedy, O'Hare, Los Angeles, and San Diego.

A competing development, the trimodal or full capability collision avoidance system—which appears to have been rejected by the FAA—does not have these disadvantages. It provides the relative location of the potential threat and thus enables the pilot to avoid it without necessarily changing altitude. The trimodal system also has the important capability of working in terminal areas with heavy traffic. It works equally well in areas not covered by radar. It is based on an existing international standard for both transponders and radars; but perhaps most importantly of all is the fact that the first plane to carry it gets the protection immediately without waiting for others to be so equipped.

Earlier this year, an FAA team studied 15 midair collisions involving air carriers between 1964 and 1972 and concluded that a full-capability beacon collision avoidance system could have prevented 13 of these 15 accidents and reduced the total number of fatalities 99 percent.

But, trimodal BCAS was not born at the FAA so FAA says a trimodal system is far in the future and very costly. Instead, the Agency prefers a system that requires a still-to-be-developed data

link between the ground and aircraft and a series of computers on the ground to determine if there is any danger of a midair collision. This is the discrete address beacon system, and the automatic traffic advisory and resolution system, DABS/ATARS. We would suggest, Mr. Chairman, that this alternative is even more in the future and even more costly than the trimodal system. Furthermore, it lacks the independence of the primary surveillance system that is so essential to the backup role.

ALPA and many other aviation groups believe it is unwise to rely solely on a ground-based system, and even the FAA's DABS/ATARS system will work only in areas where the necessary ground equipment is installed. It cannot work over the ocean or in remote areas. Another objection to DABS/ATARS is that it would take years to develop an international standard so it could be used worldwide.

There are other serious reservations about DABS/ATARS. For example, we are concerned about possible interference with other civil and military communications and navigations systems.

Then there are questions about the DABS data link. How much capacity does it have? Can it provide information on traffic as well as auxiliary data, and, if so, how much?

There are questions concerning the availability of DABS/ATARS. When could DABS be available if the decision were made today to implement it? We have heard estimates ranging from 5 up to 15 years before the FAA will have a fully functioning system.

If these time estimates are correct, we wonder why the FAA is basing its full-capacity collision avoidance system on the availability of DABS, which is years away. We question the Agency's continued reliance on such an unproven communications link.

To date, we have had little more than verbal assurances that DABS will be able to do all the FAA says it will. More justification is needed to support continued development.

On the other hand, ALPA does have some positive ideas on how to deal with the midair collision threat. This is far from a new problem. We formed a collision avoidance committee in 1966 to represent our views to the industry. Mr. Chairman, all the original members of that committee have long since retired from airline flying. This is how long this has been going on.

Additionally, ALPA has developed a set of technical and operational criteria needed to make any collision avoidance system truly effective.

Mr. Albrecht was talking before about coming out with a national standard in, I believe, December of this year. That is his target date to come up with a proposed notice of rulemaking. We would like to suggest that this would be our technical and operational criteria for a BCAS:

- Be as independent as possible from the ground-based systems;
- Offer maximum protection to the aircraft regardless of whether other aircraft are CAS equipped;
- Be equally effective under visual and instrument conditions;
- Function properly in all geographic areas, regardless of whether radar coverage is available;
- Provide the pilot with sufficient information to take corrective action in the event of a threat;
- Impose no limitations on normal aircraft maneuvers;

Be compatible with the aircraft's full performance range;
 Display threat information so it is integrated with other cockpit data;

Work in cooperation with existing air traffic control systems;
 Allow the pilot to monitor the integrity of the air traffic control system;

Offer reliability comparable to that of primary navigation systems;
 Generate a minimum of false warnings, and

Be able to operate with future as well as current traffic densities.

ALPA also believes that the cockpit display of traffic information (CDTI) offers the best method of displaying collision-avoidance information in the cockpit. It also offers the potential to improve management of the increasingly heavy traffic in the terminal area by enabling the pilot to share the workload with controllers on the ground. The next-generation airline transports will offer cockpit displays that could be used for this purpose.

This cockpit display would offer greater flexibility in the use of limited airspace and would give the pilot an increased awareness of traffic and other conditions surrounding his flight, such as weather, terrain, and navigation data. Then a pilot would be better able to manage his aircraft to fly the safest and most efficient route.

Currently, the FAA has a joint program with the National Aeronautics and Space Administration to study CDTI. However, our impression is that this program is not receiving the attention and support it deserves within the FAA. Also, it could be tied in with the collision avoidance program to avoid potential duplication of effort.

For example, the FAA has already tested the airborne trimodal collision avoidance system that would enable traffic information to be displayed to the pilot. However, the agency suddenly canceled its contract last June with the developer of this system. ALPA has never received a valid explanation from the FAA as to why it canceled this contract, and that makes us wonder if the agency's real reason was to eliminate threats to its own ground-based system.

The FAA's deep attachment to a completely ground-based system of air traffic control is causing it to lag behind in development of a cockpit display of traffic information.

Even worse is the fact that the equipment developed under the FAA contract is now sitting on a shelf, and the agency refuses to let NASA run its own flight tests on this idle hardware.

Adding to the collision avoidance problem is the fact that the FAA has been slow in developing airports and their facilities.

As I have indicated already, one of the more serious problems in aviation today is the growing congestion at airports, particularly the major hubs. One underlying reason is the lack of adequately equipped reliever airports for general aviation around the hubs. Thus, general aviation aircraft are forced to use the larger hub airports, particularly in bad weather, because they have nowhere else to go.

ALPA has long supported faster development of a system of reliever airports. It is vital that these relievers have instrument landing systems (ILS) and other navigational aids such as visual approach slope indicators (VASI) and proper approach lights if they are to be useful to general aviation.

At airports where it is necessary that airlines and general aviation coexist, ALPA encourages development of separate runways and approach aids so that slower general aviation aircraft and special performance ones such as helicopters are segregated from airliners in the interest of safety.

A collision between an airline transport and a general aviation aircraft always leads to demands that general aviation be banned from airline airports. ALPA does not support this proposal. We recognize the right of all users to have access to the airspace; we simply do not want to run into anyone. We see no sense in determining access to airspace by the weight of the aircraft or the number of seats. The avionics on the aircraft and the qualifications of the pilot should determine whether a particular aircraft is allowed in a crowded terminal area.

In conclusion, Mr. Chairman, we wish to offer four recommendations for your consideration as solutions to the longstanding problem of collision avoidance.

First, the FAA should be required to validate the already-developed airborne trimodal collision avoidance system and to issue promptly a national standard for it. Then, these systems should be required on all airline aircraft.

Second, Congress and the administration should set a higher priority on developing properly equipped reliever airports with money already in the aviation trust fund.

Third, the FAA should be directed to proceed as quickly as possible with testing of cockpit displays that would not only provide collision avoidance information but also give the pilot much more data about other factors affecting his flight.

Fourth, the Congress may wish to direct its agencies such as the GAO and the Office of Technology Assessment to examine the definite bias of the FAA in quietly promoting ground-based collision avoidance systems with their attendant delays and added costs.

I'd like to add one thing in here, two things really; that is, several of you have commented on the excess ADAP funds available. We don't want to get into a long discussion of that here. We're mainly concerned with midair collisions; but if you do have hearings on that, we are fully prepared to indicate the areas of critical safety that need these funds, the approach areas to the airport, ILS, VASI's the runways themselves, grooving, length, lighting systems, crash and fire equipment, capability to operate, and the same with the aircraft. We have a multitude of ways that that idle money should have been spent long ago for aviation safety.

Second, there's been a lot of discussion on system errors. We had a definition. I believe Mr. Ertel took exception to the FAA's definition of systems errors, but we're stuck with that definition of it. The definition is no matter what the cause, be it human, procedural, or equipment malfunction, if an aircraft gets out of the planned separation standard, it is a system error. As was indicated by Mr. Flener, they have no lack of system errors to investigate. Daily they do this. There are a lot of them. The ATC system is a good one, but it is subject to error. What we are talking about is when there errors occur, what recourse do we have? We say that we need an airborne collision avoidance system for the times when there are system errors in the ATC system.

When the last resort—when two aircraft are coming nose to nose, eyeball to eyeball, what do they have to help them? The FAA has nothing. “We had a system error, sorry, old boy, watch out.” That is not enough. We think this available technology, a BCAS, a collision avoidance system, is the solution to this problem. We’re not talking about a new ATC system. All we’re talking about is something to overcome the errors that must be present, that are admittedly present in the present system. They’re happening every day at the rate of about 1 a day, around 300 a year, if you look back through the last report. That’s what you’re having, one a day almost.

What happens? We think it’s absolutely essential, long overdue that this collision avoidance system be available.

We commend both committees, Mr. Chairman, for holding this timely and needed hearing. We hope it will motivate the FAA to act quickly so a disaster such as happened here just a month ago will not occur again.

For many years, the Nation’s airline pilots have joined in the call for an effective collision avoidance system. The tragic accident here last month underscores the need for such a system.

The record is clear. The duty of all of us in aviation to save lives by preventing aircraft accidents is manifest. The technology and the money to prevent midair collisions are at hand. Now it is up to the FAA.

We deeply hope, Mr. Chairman, that this is the last time we will have to testify after an accident about the need for collision avoidance systems.

We thank you for this opportunity to present our views on this truly vital subject, and we are ready to answer any questions.

[The attachments referred to follow:]

ATTACHMENT 1

GENERAL ELECTRIC CF-6 ENGINE

This case involves insufficient testing of a new jet engine by the manufacturer and the Federal Aviation Administration and the failure of the FAA to apply adequate certification standards. These lapses led to at least three incidents of engine failure in passenger-carrying DC-10’s. The FAA’s response to this evidence of a weakness in the engine was half-hearted. Only after another engine failure—in which a DC-10 valued at about \$30 million was destroyed—did the agency require changes to the engine itself to prevent future failures.

The CF-6 fan blades in the front of the engine rotate thousands of times each minute at near supersonic speed. They must be able to withstand ice, birds or other objects that are occasionally drawn into the engine. Otherwise, the blades will break and hurl metal fragments through the engine and into the wing or fuselage. Three important problems were revealed by the early service experience:

Fan blades with holes drilled in the tips to save weight has a tendency to break up into fragments when struck by birds, ice or other foreign objects. These blades are still allowed in service, but when used in the No. 2 (tail-mounted) engine of the DC-10, a special armor is required to protect fuel lines against damage from blade fragments.

The fan blades seemed susceptible to damage from bird ingestion. No remedy has been applied to the problem and proposals for modifying the bird ingestion testing requirements of FAR 33 are included in the FAA’s Engine Regulatory Review Program.

The epoxy material used for shrouding the blades could be abraded into particles fine enough to explode in the engines. The remedy was to require replacement of the epoxy material with aluminum honeycomb.

Evidence accumulated by a special investigations subcommittee of the House Interstate and Foreign Commerce Committee revealed a critical breakdown in the airworthiness certification process as administered by the FAA.

In January of 1970, the FAA certificated the CF-6 engine as "safe." Despite the fact the engine had new technology that advanced the state-of-the-art by several stages, a five-year-old and, as it turned out—unsatisfactory—certification standard was applied to the engine under the "special conditions" authority vested in the FAA. Special conditions basically allow manufacturers to set their own certification standards if they can provide to FAA a satisfactory design and engineering basis for an exception to existing rules.

This was done for the CF-6 engine.

The company sought special conditions for certification of its new engine with drilled-tip blades, which had never been used before, based on the FAA's earlier certification of the Pratt & Whitney JT9D engine, which powers most Boeing 747s. The JT9D was the first high-bypass-ratio engine to enter commercial service. It and the CF-6 engine use advanced technology to produce about three times more power than earlier engines on such aircraft as the 727 and DC-9.

The JT9D was gaining service experience during the time period of the CF-6 certification program. Service difficulties on the new engine were known to FAA engineers; however, it is not known whether, or to what extent, that information was used to modify or add emphasis to parts of the CF-6 testing.

When certification of the JT9D was requested, the FAA did not have certification standards for high-bypass-ratio engines. Therefore, the JT9D was certificated in accordance with Advisory Circulars (ACs) covering older, less-powerful engines. A new AC for high-bypass-ratio engine testing was being written when General Electric requested certification of the CF-6. The company argued successfully that it would be an economic hardship if the FAA were to apply the new AC to its engine when it had not been applied to the earlier JT9D. Of course, the certification criteria in the new AC could not have been applied to the JT9D because they had not yet been formulated.

Thus, the FAA bowed to the manufacturer's economic arguments and did not employ the most current and stringent technical standards when it certificated the CF-6.

The House subcommittee report noted three accidents over a 14-month span of CF-6 operation during which ample evidence of difficulties with drilled-tip compressor blades was gathered. Despite these findings, however, the FAA declined to issue an Airworthiness Directive (AD) to replace drilled-tip blades with those of more conventional manufacture.

General Electric switched to solid-tip compressor blades in all its production engines, including the CF-6, in December, 1973. This did not, of course, solve the problem of several hundred CF-6 engines with drilled tips already in service. The Air Transport Association, an airline trade association, according to the subcommittee report, estimated that it would cost \$47,000,000 to convert drilled-tip CF-6's to solid tips, and opposed an Airworthiness Directive which would have mandated the conversion.

The House subcommittee investigation also disclosed that icing tests made by the Great Lakes Region of the FAA were nowhere near what could be described as exhaustive. In fact, the subcommittee report declared that test aircraft did not penetrate known icing conditions for any length of time at all in certification tests. Even at lesser icing conditions, test engines suffered damage. Nevertheless, certification proceeded.

FAA did issue an Airworthiness Directive (AD) on the CF-6. The AD, however, did not call for a fix of the engine. Rather, it called for protection of fuel lines and other control conduits on the DC-10, particularly to the No. 2, or tail-mounted engine.

That AD, issued August 23, 1974, provided only that the main fuel line to the tail engine of the DC-10 be shielded on GE-powered aircraft. Less than two months later, on October 15, the original AD was amended to provide special shielding was necessary only on GE-powered DC-10's with drilled-tip compressor blades.

On November 12, 1975, an Overseas National Airways DC-10 began its takeoff roll at John F. Kennedy Airport. Midway down the runway, the DC-10 encountered a flock of gulls feeding from a nearby garbage dump. One of the plane's wing-mounted engines—not the high, tail-mounted engine that was the subject of the FAA's two airworthiness directives—ingested some of the flock. Its drilled-tip blades disintegrated into shrapnel that blasted through the engine shroud and into the wing and fuselage. Portions of the disintegrating engine ripped through fuel lines causing jet fuel to ignite. The pilot ultimately fought the blazing aircraft to a halt off the end of the runway. His actions allowed the 139 passengers to escape, but the DC-10 was consumed by fire.

As a result of the ONA DC-10 accident at JFK, the NTSB held two public hearings. One of these hearings dealt specifically with the CF-6 engine—the engine certification requirements, type of engine failure, etc.

After the hearings, the NTSB determined that the probable cause of this accident was, “the disintegration and subsequent fire in the No. 3 engine when it ingested a large number of sea gulls.” A contributory factor to the accident according to the NTSB was, “the Federal Aviation Administration and the General Electric Company failed to consider the effects of rotor imbalance on the abradable epoxy shroud material when the engine was tested for certification.”

The FAA then issued an Airworthiness Directive (AD) requiring a modification to the engine shroud. This AD also required a retrofit for the shroud on existing engines.

Among the six recommendations the NTSB issued on the CF-6 engine were that the FAA “increase the maximum number of birds in the various size categories required to be ingested into turbine engines with large inlets. These increased numbers and sizes should be consistent with the birds ingested during service experience of these engines.”

The FAA has not yet acted on the last recommendation of the NTSB. Action was withheld pending the agency’s Engine Regulatory Review Program. Results of that program have not yet been made public.

Of the CF-6 episode, the House subcommittee commented:

“ . . . when the FAA is engaging in its critical function of certifying an engine or an aircraft, it must resolve any doubts on the side of caution. It did not do that in this instance. The CF-6 engine had drilled turbofan blades and a different anti-icing capability than previous engines. The FAA should have required simulated flight testing before certifying the engine. Moreover, when damage to the engines occurred during the icing flight tests of the aircraft, additional testing under comparable conditions should have been required of the manufacturer.”

The subcommittee concluded:

“When the engine and later the aircraft (the DC-10) encountered certification difficulties, the respective manufacturers of each descended on the FAA to forestall further testing and to expedite the certification process. This can no doubt be expected, but *the FAA must resist any such pressures to shortcut its procedures. There can be no accommodation when considerations of safety must be paramount.*” (Emphasis added.)

ATTACHMENT 2

WET RUNWAY PERFORMANCE

Current certification standards require that aircraft be tested only on dry runways. This failure of the Federal Aviation Administration to require testing under such a common operating condition as a wet runway has been directly responsible for many accidents and incidents. There were 21 accidents in the 1967-1977 period, and there are about 30 incidents each year involving wet runways. Modern airliners weigh as much as 300 tons and are traveling at about 150 m.p.h. when they land. Clearly, whether the runway is wet or dry will have a major effect on how much distance the aircraft will need to stop safely because aircraft perform far differently on wet runways than on dry ones.

For example, many transport aircraft have spoilers—devices on the top of the wing that pop up after landing to “spoil” the lift of the wing and thereby keep the aircraft on the ground and shorten the stopping distance. These spoilers are usually deployed automatically as soon as the aircraft wheels start going around. That works well on dry runways but not so well on wet ones.

On runways with a thin layer of water on top, the aircraft wheels often skim across the top of the water and do not touch the hard surface underneath. This phenomenon is called hydroplaning. In addition to making the aircraft brakes ineffective, hydroplaning also causes the spoilers not to deploy automatically because the wheels are not turning. The pilots can deploy the spoilers manually, but that takes time. During that time, the aircraft is traveling hundreds of feet down the runway.

It must be remembered that approach and landing is one of the highest periods of crew workload. There are many manual and mental tasks to perform during touchdown. Any additional tasks, mental or manual, placed on the pilot by the failure of an automatic system can only be a detriment to safety.

The adverse impact that wet runways have on aircraft performance and therefore on safety means that wet-runway performance should be included in the certification process. ALPA has recommended that several times in the past 15 years. For example, in 1973, we told the FAA that its Flight Test Handbook, which tells manufacturers how to test their aircraft for certification, should include testing on wet runways. When the Handbook appeared, however, it contained no mention of wet-runway testing. In 1974, we recommended to the FAA's Airworthiness Review a proposed rule covering aircraft performance on wet runways. So far, we have heard nothing; the FAA has neither acted on nor rejected our proposed rule.

The distance for landing on a dry runway as determined by the FAA through testing includes an allowance for such operational variables as landing long, i.e., farther down the runway than usual, and landing faster than usual. However, the experience built up over the years by airline pilots clearly shows that this allowance is insufficient when the runway is wet.

But the FAA has not required additional testing to determine scientifically what the wet runway stopping distance should be. Instead, it has glossed over this deficiency in the certification process by adding an arbitrary 15 percent to the dry runway stopping distance to arrive at the wet runway distance.

There are two serious flaws in this procedure. First, the FAA does not define what a wet runway is. Second, the agency allows the manufacturer to demonstrate shorter landing distances than required by the 15 percent rule. Such a provision can be almost meaningless if there is no definition of a wet runway.

That is graphically illustrated by the Boeing 727. The company was able to convince the FAA that the 727 required only 7-8 percent more to stop on a wet runway instead of the agency's estimate of 15 percent, and the aircraft was allowed to use the shorter distance.

However, later tests by the FAA and the National Aeronautics and Space Administration showed that the 727 on a truly wet runway far exceeded even the 15 percent margin. In some cases, the aircraft took about twice the dry-runway distance to stop on a wet runway. The reason is that brake application just after touchdown caused the wheels to lock. That in turn induced extensive hydroplaning, which led to the excessive runway stopping distances.

The lack of wet runway standards in the certification process has resulted in pilots developing their own techniques to cope with the problem. There have been many incidents and accidents stemming from hydroplaning; that there have not been more is a tribute to the skill and experience of airline pilots, not to the FAA's certification procedures.

ATTACHMENT 3

AUTOMATIC LANDING SYSTEMS

Equipment and techniques that would enable airliners to land automatically in very bad weather have been under development since 1959. At that time, the ceiling, or the bottom of the clouds, had to be at least 300 feet above the ground and visibility along the runway had to be at least three-quarters of a mile before the aircraft could attempt a landing.

Last year, the Federal Aviation Administration certificated an automatic landing (autoland) system for the Boeing 727 that requires a decision height of only 50 feet above the ground and runway visibility of only 700 feet.

The Air Line Pilots Association believes the FAA criteria for such poor-weather landings are a safety hazard. The FAA approved these landings without adequate research and testing and without requiring certain mandatory features found in autoland systems used successfully in Europe. The members of ALPA, who have thousands of hours or airline operational experience, believe the system certificated by the FAA is unacceptable. Other technology exists that would permit safe autoland operations to the low minimums already approved by the FAA.

In August, 1975, the FAA announced its intention to establish requirements for certification of airline landings in very bad weather for the Boeing 727 and other aircraft such as the Boeing 737 and the McDonnell Douglas DC-9 that have autoland systems installed. The new weather minimum criteria (Category IIIA) were visibility along the runway (RVR) of 700 feet, and a decision height of 50 feet. (Decision height (DH) is the height above the ground at which the pilot either must see the runway ahead or end the approach and climb.)

As justification for its decision, the FAA cited the following:

The French have successfully conducted such operations.

Boeing has completed all Category III requirements for the 727 autoland system.

The feasibility of conducting operations to such low weather minima was discussed at an industry meeting in August, 1973.

The FAA conducted a series of autoland approaches with a 727 in January, 1974.

Additional tests were run at the FAA's National Aviation Facilities Experimental Center (NAFEC) in April and July, 1974.

The Air Line Pilots Association formally protested the autoland certification in letters to the FAA on April 20, June 23, and September 15, 1977. The FAA certificated the system August 12, 1977, without responding satisfactorily to ALPA pleas to delay certification pending more complete testing and research.

ALPA has undertaken its own lengthy investigation of the FAA's justification. What we learned makes us question whether the FAA's autoland system will provide an adequate margin of safety.

French Operations.—In citing the "European experience" for certifying fail-passive autoland systems to the lowest possible limits, the FAA overlooked a number of important factors. The FAA cited specifically Air Inter, a French domestic airline, which operates to minimums of 50 feet above the runway and 150 meters (492 feet) of runway visibility.

For these operations, however, Air Inter requires:

Three-man cockpit crews, even though the aircraft may be flown with just two pilots.

Detailed crew procedures.

Specially-qualified and trained pilots.

Automatic throttles and so-called "decrab" capability.

Ability to fly a missed approach automatically.

If the automatic system for a missed approach fails, the pilot can take over and fly the aircraft manually using an independent gyroscopic attitude indicator.

FAA's new criteria include none of those safeguards, which ALPA believes are essential if full safety is to be assured.

Boeing Data.—Clearly, Boeing has complied with the FAA criteria for certification of its autoland system and did collect all data specified by those criteria. The analysis of these data and the conclusions reached are largely dependent upon a few basic assumptions that we believe are open to question. The most notable of these are that:

All go-around attempts following a failure in the autoland system will be successful because the failure will leave the aircraft in a position that assures a successful go-around.

Runway visual range (RVR) of 700 feet is assumed to be adequate, according to Boeing, because that is the figure the FAA uses. The FAA says that the 700-foot distance is based on Boeing data.

Conventional cockpit instruments are adequate to monitor the autoland system during the critical phases of approach and landing.

The ground portion of the instrument landing system (ILS) is 100 percent reliable.

ALPA believes that a complete, scientific certification program is needed to answer the serious questions raised by these unstated assumptions in the Boeing data. Answers are particularly needed to questions about the safety of operating to 50-foot decision height and 700-foot runway visibility with fail-passive autoland systems.

Industry Meeting.—The transcript of the August, 1973 meeting, which had representatives from virtually every segment of the airline industry, shows there was a strong consensus that:

Fail-passive autoland systems should not be authorized for operating to minima lower than Category II unless the total system reliability for such operations would be on the order of 10^{-9} .

Establishment of the reliability would need to be demonstrated by an adequate program of test and analysis.

This test and analysis program would necessarily consider, among other factors, the frequency of missed approach initiation at and below decision height and the risk associated with executing a missed approach at these altitudes.

Criteria for fail-passive autoland operations below Category II limits should include consideration of aircraft geometry and pilot eye height and should require independent go-around guidance.

Flight Demonstrations.—The FAA conducted 20 automatic landings at Oklahoma City. The data given to ALPA on these tests consisted of two pages: one a memo and the other a tabulation of the flights. The memo says that the RVR on the 20 flights varied from 1,000 feet to 2,200 feet. The tabulation covers only the first 14 flights and shows RVR's of 1,000 to 3,000 feet. The memo and the tabulation thus do not agree. In any event, the FAA has not tested the autoland system at the RVR of 700 feet that it proposes to allow for airline operations. Current Category II operations permit RVRs as short as 1,200 feet.

NAFEC Tests.—The script for the tests called for 49 anomalies in the ILS localizer and glide slope to be introduced during the tests. Only seven were actually introduced, and none of these involved the glide slope, which provides guidance on the proper angle of descent during approach. In none of the 44 attempted autolandings, the pilot disconnected the autoland system because he considered the aircraft sink rate, drift rate or position to be unacceptable. Thus, the pilot took over in more than 20 percent of the approaches in good weather. Clearly, the capability of the pilots to take control of the aircraft under the poor weather of Category III is important and needs to be established. ALPA has found no evidence that the FAA has done so.

It is obvious that the tests run at NAFEC and the flight demonstrations at Oklahoma City are not sufficient to declare the proposed autoland system safe for airline operations.

In the latest response to ALPA, in January of this year, the FAA said it has "serious doubts as to whether continuing this long-standing series of correspondence can serve any useful purpose since substantial amounts of time in both your organization and ours are being devoted to unproductive correspondence on this subject. No new information has been forthcoming, and much of our effort, which needs to be devoted to bona fide safety questions, is being diverted unnecessarily."

Rather than go away quietly, as the FAA clearly would prefer, ALPA will continue to push for higher standards of safety in commercial aviation.

CONCLUSIONS

Due to the philosophy of its design and the manner in which it has been certified, ALPA believes the FAA has certified a system that is unacceptable for Category III operations by itself. We believe it is superior to the conventional Category II, single-channel autopilot in all respects. We also believe that if a suitable head-up display (HUD) were used in conjunction with this system, it would be possible to operate safely into conditions as low as Category IIIA, providing that the display made sufficient information available to the pilot to enable him to perform all the tasks such a system would require him to do.

ATTACHMENT 4

COLLISION AVOIDANCE SYSTEMS

The Federal Aviation Administration was established partly as a result of a 1956 midair collision that cost the lives of 128 passengers. One of FAA's responsibilities was to improve the air traffic control system to prevent similar tragedies. More than two decades have elapsed, and the FAA is still testing and researching in its quest for a technologically "adequate" system, while it continues to depend on the outmoded "see-and-be-seen" concept.

During the 1960's, the FAA examined various concepts of independent airborne collision avoidance systems only to abandon the idea as unworkable and incompatible with a ground-based air traffic control system. Instead, the agency decided to look at the long-range development of a ground-based concept called Intermittent Positive Control (IPC). This system relayed advisory and maneuver information from ground controllers to cockpit displays. The IPC would be designed to transmit this information to the aircraft only when necessary to avoid hazardous situations.

The National Transportation Safety Board in November, 1969, convened a public hearing to investigate the causes and prevention of midair collisions. NTSB statistics showed a critical deficiency in the Nation's air traffic control system: from 1959 to 1968, there were 223 midair collisions involving U.S. registered aircraft. Nearly half, 109, were fatal, resulting in 528 deaths. Although commercial aircraft were involved in only 6.7 percent of the accidents, the passengers of the commercial aircraft accounted for 66 percent of the fatalities.

ALPA has been calling on the FAA for many years to develop and certificate an effective CAS for airline use. We have not favored any one technology; there are several that could accomplish the mission. However, we have maintained that any CAS should be installed in the aircraft to give the pilot direct, immediate knowledge of any impending threat. The FAA, on the other hand, has favored a system that would rely on computers on the ground to detect a possible collision and transmit a warning to the aircraft. In addition to taking responsibility away from the pilot, the system proposed by the FAA would not provide any backup warning to the pilot if the ground-based equipment failed.

In the early 1970's, Congress expressed concern over the FAA's delay in solving the collision avoidance problem. This concern was sharpened by the fact that airborne collision avoidance designs that could provide some protection for commercial air carriers and other aircraft were available. In 1973, a government advisory group reached much the same conclusion. This group challenged FAA's assertion that the ground-based IPC system, though years from implementation, was the best solution.

The problem of near midair collisions intensified in the 1972-1975 period. The FAA reported a total of 1,219 air traffic control system errors—either human, equipment or procedural failures—that resulted in 105 near midair collisions.

By 1976, Congress was demanding a solution to the collision avoidance system problem, but the FAA hedged. It reported to the Senate Aviation Subcommittee that it had tested CAS designs from three avionics corporations, but that new developments made it necessary to wait until 1977 to set CAS criteria. Characteristically, the FAA failed to meet this self-set goal.

As far back as early 1972, ALPA was critical of the FAA for showing a lack of urgency in developing equipment that will enable the pilot to know when a mid-air collision is imminent. Early last year, the FAA told the Senate aviation subcommittee it intended to pursue an airborne system known as the beacon collision avoidance system (BCAS) and would have a national standard by June, 1977. At about the same time, ALPA called on the FAA to push development of BCAS and presented a list of minimal technical and operational criteria, including data to be displayed to the pilots.

In June of last year, ALPA pointed out the BCAS is compatible with the FAA's ground-based system known as the discrete address beacon system (DABS). Therefore, it should not be considered an interim system to be used only until DABS becomes operational. Earlier this month, the FAA indicated it will issue a draft national standard for a basic BCAS by the end of this year. Under the most recent development schedule, the first operational equipment for airplanes would be available in 1982.

This BCAS, however, cannot be used in heavy-traffic areas. It will not be mandatory to install it in airline transports; thus there is no requirement for an airline to buy it. In the meantime, the FAA says it will begin to develop a concept for a more-capable BCAS that can be used in heavy traffic areas.

However, the recent experience of airline pilots has clearly shown that the danger of midair collisions continues to grow not only at the large and busy airports but also at the more numerous smaller ones. There is a mix of airline transports flying under control from the ground and other aircraft that frequently fly without such control at the smaller airports. This mix of controlled and uncontrolled aircraft is not found at the large airports.

The airline aircraft and the uncontrolled ones come close together near the airport. It is there, during approach and landing and during takeoff and climbout, that the workload of the airline flight crew is at its peak. Thus, the pilots have little time to spend looking out the window for other aircraft and, therefore, would benefit greatly from having an effective CAS in the cockpit.

The increasingly crowded air traffic control environment and crew workload are subjects that the FAA should be paying particular attention to as it prepares to certificate the transports of the future. The agency's attitude toward workload measurement is indicative of its inadequate foresight. The FAA still looks at workload as it was measured in the 1960's, with the emphasis on manual tasks. Many experts in this area point out that advances in computers and other avionics means that the pilot of the future will have fewer manual tasks and be more of a system monitor. Thus, the FAA will have to apply the new measuring techniques being developed to understand fully the future air transport environment and the demands it will place on the cockpit crew.

Crew workload is clearly an element to be considered by FAA flight test personnel under FAA Order 8110.4, Paragraph 165. It states:

"Particular attention and emphasis are to be given to the entire system in which an airman and his aircraft must operate. The system includes not only the airman and the aircraft but airports, air navigation facilities, the air traffic system, the safety rules and operating procedures as well as environmental factors, such as weather."

Clearly, the FAA has not fully considered the present and future operational environment in certification; if it had done so, it would have moved far more effectively to develop and certificate a CAS. As it now stands, we are no closer to certifying an effective operational collision avoidance system than we were five years ago.

ATTACHMENT 5

DC-10 CARGO DOOR

On March 3, 1974, a McDonnell Douglas DC-10 wide-bodied jet transport crashed in a forest near Paris, killing all 346 persons on board. It was the worst single-plane aircraft disaster in history. What was particularly shocking is that this tragedy was due directly to breakdowns in the aircraft certification process.

What happened has been extensively documented in two Congressional investigations and in three books. Basically, the problem was that the latching mechanisms on the doors of the cargo compartments did not always close properly. If a door was not latched properly, it could pop open in flight after the cabin was pressurized and the aircraft reached an altitude of about 12,000 or 13,000 feet. The sudden opening of a door would suck air out of the cargo compartment, causing the floor of the passenger cabin to collapse into the cargo compartment below. Collapse of the floor would damage or even sever control lines from the cockpit to the tail. With these lines damaged, the pilots could not control the aircraft.

The first hint of trouble came in May, 1970 when a cargo door latch failed and the door opened during a static test at the McDonnell Douglas plant. In November of that year, an engineer for General Dynamics, a main subcontractor for the DC-10 fuselage, wrote an internal memorandum questioning the design of the door latch mechanism and the strength of the cabin floor. Unaware of these reservations, the Federal Aviation Administration certificated the DC-10 in July, 1971.

Not quite a year later, in June of 1972, a cargo door blew out on an American Airlines DC-10 over Ontario. Fortunately, there were few passengers on the plane, and the lightly-loaded floor in the rear of the cabin did not collapse completely. Still, the control lines were damaged, and the controls jammed. The pilots, through skillful use of the two engines on the wings, were able to land safely.

Normally, the FAA would have issued an Airworthiness Directive (AD), a mandatory order with the force of law directing the manufacturer to correct the flaw revealed by the accident. However, the FAA, at the behest of the manufacturer, did not issue an AD. Instead, the manufacturer said it would correct the door latch problem by sending service bulletins to airlines flying the DC-10. These bulletins do not have the impact of ADs, and compliance with them is voluntary.

Investigators for the Investigations Subcommittee of the House Committee on Interstate and Foreign Commerce reported that ADs are often considered marks against an aircraft. There were no ADs on the DC-10 at the time of the American Airlines accident, and the company's efforts to reach quiet agreement with the FAA should be understood in light of the fact that ADs can have an adverse effect on aircraft sales, the Congressional investigators said.

For reasons never uncovered, the cargo door modifications called for in the service bulletins were never made to the Turkish Airline DC-10—even though the aircraft had not yet left the McDonnell Douglas plant when the bulletins were issued and company documents indicated the modifications had been made.

The FAA did issue an AD after the Turkish Airlines crash.

In its 1975 report reviewing the FAA's performance, the House subcommittee found "a tendency for the agency to avoid the role of leadership in advancing air safety. . . . In some instances, this abdication of responsibility has been coupled with administrative lethargy—a sluggishness which at times approaches an attitude of indifference to public safety."

ATTACHMENT 6

DC-8 GROUND SPOILERS

Three serious accidents, caused by accidental deployment of the ground spoilers in the air, killed 170 persons and injured at least 38 others before the Federal Aviation Administration issued a mandatory Airworthiness Directive (AD) to correct the problem.

Ground spoilers are hinged plates on the top of the wing that are designed to pop up and "spoil" the lift of the wing after the aircraft touches the runway. The spoilers help to keep the aircraft on the ground and shorten the stopping distance. When deployed in the air, however, they cause the aircraft to drop rapidly and often strike the ground.

The basic design flaw in the DC-8 ground spoilers was that the control arm was so sensitive that a slight movement in the wrong direction could deploy the spoilers immediately instead of positioning them to deploy automatically as soon as the aircraft landed.

The first sign of a problem with the spoilers occurred in 1968 with a Scandinavian Airlines System DC-8 approaching Bergen, Norway. Although there was no accident, the incident should have served as a warning to the FAA and the industry.

The second time the problem appeared, it could not be ignored. An Air Canada aircraft crashed while landing at Toronto in July, 1972 after the spoilers deployed prematurely, killing 109 persons. Later that year the FAA, over the objections of McDonnell Douglas, issued an AD advising pilots not to deploy the ground spoilers in flight. A House subcommittee called this AD "almost totally worthless" and said it did little more than tell pilots not to crash their airplanes.

Another accident occurred in November, 1972 when a Japan Air Lines DC-8 crashed after taking off from Moscow. Inadvertent deployment of the ground spoilers was suspected as the cause of that accident, which killed 61 of the 76 persons on board.

The third accident happened just seven months later when an Icelandic Airlines transport was landing at New York. The aircraft was substantially damaged, and 38 of the 128 persons on board were injured.

Not until late in that year and at the request of airlines flying the DC-8 did McDonnell Douglas devise a modification to eliminate the possibility of inadvertent spoiler deployment. The FAA issued an AD in January, 1974 requiring this modification—almost six years after the first sign of a problem and seven months after the third accident.

ATTACHMENT 7

GROUND PROXIMITY WARNING SYSTEMS

These devices give an audible warning to the pilots when the aircraft gets too close to the ground or is descending too rapidly. They are now required on all U.S. airliners, but it took years of pleading—and several fatal crashes—before the Federal Aviation Administration overcame its inertia and made them mandatory.

Flying a properly functioning airplane into the ground has been a prime factor in more than half of the airline accidents in the past 20 years. In the United States alone, from 1959 to 1976, there were 59 airline crashes in which the aircraft flew into the ground. These crashes killed 2,194 persons. The majority occurred during the approach and landing phase of flight and at night or in bad weather. Pilot workload is at its height under these conditions, and pilots are often distracted. The GPWS was developed to provide an independent warning of possible danger.

Beginning in 1968, the Air Line Pilots Association recommended to the FAA that the agency require a GPWS in each airline transport. The National Transportation Safety Board, following its investigations of three crashes in 1970 and 1971, recommended each time that the FAA develop a GPWS. In 1972, the NTSB strengthened its comment by saying that a GPWS should be required. In its annual report to Congress in 1973, the Board said it "repeatedly has recommended that FAA require use of ground proximity warning equipment in airline aircraft as the single most effective means of preventing approach and landing accidents. . . ."

In April of 1973, the FAA did ask for comments on a proposed rule that would require a GPWS in each airliner. The agency was still evaluating these comments almost 18 months later when a Congressional subcommittee began looking into the issue. On December 1, 1974, an airliner hit a mountain while approaching Dulles International Airport, killing all 92 on board. Three days later, two senior members of the House subcommittee investigating the FAA's handling of the GPWS situation called for mandatory installation of such a warning system in all airline aircraft as soon as possible.

The FAA issued a rule two weeks later requiring all airliners to be equipped with a GPWS.

Considering this record, is it any wonder that the House subcommittee termed the FAA's performance "... a sorry example of administrative inaction and delay."

ATTACHMENT 8

HEAD-UP DISPLAY

It has long been recognized that the aviation community had little understanding of the role of outside visual cues to the pilot in the final approach and landing of an aircraft. Today, more than half of all airline accidents occur during the approach and landing phases and the majority of these have human performance and crew workload as contributing factors.

The number of accidents in this relatively short phase of flight has led to a search for a better way to display critical information to the pilot.

Recent advances in the technology of display systems have provided the tools necessary to undertake a new approach to the problem. It is unlikely that technology is any longer a limitation to the development of techniques and systems which have the potential of resolving the visual cues question.

For the past 15 years, the Federal Aviation Administration, has been studying use of an aircraft information display device that could significantly reduce the number of approach and landing accidents. This device has been operational on U.S. military aircraft for the past 10 years and is currently used by air carriers in Europe, Canada, and the Peoples Republic of China.

In bad weather the greatest danger facing the pilot as he maneuvers up to 300 tons of airplane traveling at 100 yards every 1.3 seconds is the repeated "yo-yo" transition from the instrument panel to the outside. These critical transitions are made at Decision Height when a pilot must switch from instruments to the "eyeball" technique of landing his aircraft. With modern large aircraft, the need to eliminate this critical transition phase—when a pilot must shift eye focus from instruments to the outside world—becomes increasingly important.

As far back as 1963, the FAA began development studies of a device known as Head-Up Display (HUD), that would eliminate the "yo-yo" eye focusing technique from instruments to outside. The HUD projects crucial flight path information on a glass directly in front of the pilot's vision. The display provides a pilot the same data in color symbology as that on his instruments as he looks through the windshield at the runway before him. In this manner, he receives real visual cues enabling him to determine if he is too high, too low, or too far left or too far right. The display eliminates changing eye focus and losing precious fractions of seconds at such a critical time.

Following extensive research, the U.S. Air Force, more than a decade ago, began using a Head-Up Display for low-level navigation of high-speed combat aircraft.

At about the same time, December 1966, the FAA reported continuing research on the HUDs, but that "none of our efforts have been devoted to the refinement of hardware in the sense of prototype equipment." In response to this FAA report, the Air Line Pilots Association provided a recommendation to FAA concerning the formulating of a program to further evaluate these displays. ALPA added:

"We feel the U.S. is already far behind in our commercial applications of Head-Up . . . Sweden and Britain have already flight tested and installed numerous systems . . . France has excellent concepts and our Navy and Air Force have very sophisticated equipment of this nature."

In November, 1971, FAA completed a contract head-up display study program at the University of California's fog chamber. Study results concluded that a prototype head-up device was extremely helpful in low-visibility conditions.

In early 1972, ALPA reminded the FAA that a program conducted for it by Sperry Gyroscope Company, which began in 1963, revealed highly favorable pilot performance with the head-up display under test conditions. Further, ALPA noted, "... the time has come for the FAA to move to implement the recom-

mendations derived from the FAA-sponsored Sperry test. If the state-of-the-art was adequate then, it is surely more so now." Also, ALPA asked the FAA to participate in NASA's research and development program for a head-up display format. The FAA refused the invitation! In a February 15, 1972 letter, the FAA published a report outlining its fog chamber testing and installation of a HUD on a Convair-880 jet transport to gain flight experience. The FAA also stated, "No operational requirement has been clearly identified for HUD."

In December 1973, the FAA began another test. In conjunction with the U.S. Air Force, it initiated a scientifically thorough study of low-visibility landing problems, including use of a HUD with a simulator. But, two years later and before actual flights were undertaken, the FAA withdrew program funding following the "recommendation" of the Air Transport Association (the organization that represents most U.S. scheduled airlines).

According to an article entitled "The Air-Safety Challenge," published in the August, 1977 issue of National Geographic, the ATA felt that FAA's study program had proceeded without their consultation and was being conducted with military hardware that might not be applicable to the needs of civil aviation.

On August 11, 1975, William T. Hardaker, ATA Vice President, wrote to FAA: "Our Committee had found little relation in that work statement to real needs of the all weather operations efforts, and little reason to justify expenditure of FAA funds. Our Committee therefore recommends that work under the contract be stopped and the contract terminated, or that it be converted to useful work upon which agreement can be reached with those who are to benefit."

The FAA stopped work on its head-up research.

An FAA official told National Geographic that "his agency considered the simulator 'inadequate'." A researcher on the program said he "agreed that the simulator was not adequate, nor was the study intended to address safety issues from the regulatory point of view." But, the researcher added, "the simulator was entirely adequate to examine the study's basic question: 'What must the pilot see, and for how long, to land an airplane in low visibility?'" This question is still unanswered.

In the meantime, FAA continues its research, test and development efforts on technology—already operational for a decade in military aircraft—that could significantly reduce the hazards of landing.

FAA now faces an additional problem. Two U.S. aircraft manufacturers want to certificate a head-up display for use by air carriers, but the FAA has no criteria by which to certificate this equipment. Had any of these previously mentioned research efforts been completed, the FAA would have been in a much better position to fulfill its mandate of providing the traveling public with aircraft and equipment certificated to the highest safety standards.

ATTACHMENT 9

DC-9 STALL WARNING HORN

A stall warning horn was built into the DC-9 because the aircraft—unlike most—gives no warning of its own to the pilots that it is entering a stall. Under certain conditions, an aircraft stops flying when the wings do not generate enough lift to support the weight of the airplane. When that happens, the aircraft is said to "stall". This usually happens at low speeds and with the nose raised—that is, during takeoff or approach when the pilot workload is at its highest.

The problem with the DC-9 stall warning horn is its loudness—slightly greater than that of the Concorde supersonic transport when it is taking off. The Federal Aviation Administration required the manufacturer to make the warning horn loud enough to be heard by pilots wearing the old earmuff-type earphones (which are rarely worn today) while flying close to thunder. The FAA apparently did not consider the effects on pilots when the stall warning horn sounds accidentally.

The Air Line Pilots Association reported in early 1970 that DC-9 pilots were complaining about the loudness of the stall warning. In August, 1971, the warning horn on a Southern Airways DC-9 accidentally sounded. After the incident, the captain reported, "The noise was so distracting that normal thought processes and troubleshooting were hampered, I can imagine what the potential could be if this system activated on some dark night on approach. It would be impossible to communicate to the tower or even initiate a go-around, as commands to the first officer to raise the gear and flaps would not be heard."

Two months later, a North Central Airlines DC-9 captain told an FAA inspector the stall warning horn "was so loud it caused virtually a partial incapacitation of the thought processes of both my first officer and myself."

ALPA complained to the FAA about the loudness of the stall warning in August, 1971, and in October, 1973, asked the agency to issue a mandatory Airworthiness Directive requiring a quieter, less distracting stall warning.

Except for a voluntary service bulletin allowing airlines to modify the warning horn, the Agency still has taken no action on this five-year-old request.

The CHAIRMAN. Thank you very much, Mr. Gerber. We certainly agree with you on that part of your testimony, and hope that this is the last time you have to testify on this subject after such a tragic event.

Captain GERBER. There have been too many.

The CHAIRMAN. Does ALPA agree or disagree with current FAA policy which in effect allows the pilot to override the conflict alert system by informing traffic control that the pilot has the traffic in sight?

Captain GERBER. You want to answer that, John?

Go ahead.

He's been working with them on this particular problem.

Mr. O'BRIEN. Senator Canyon, let me respond to that question in a little bit of a roundabout way. The conflict alert system, ground-based conflict alert system, has a number of deficiencies. One is the communication between the controller and the pilot. Another is the time delay in this communication link and the possibility that a controller, even if he is in direct communication with the pilot on the same frequency, for example, may experience a delay in being able to communicate with this particular aircraft because of maybe working six or eight aircraft at any one time. So, under the most ideal conditions, there are still critical seconds involved where things can develop to disastrous potential. And, therefore, we do not think that the conflict alert system is the ideal solution to the midair collision problem.

Now, your question about do we agree with the FAA philosophy concerning the pilot having the final authority or the ability to take matters into his own hands; I'd rather look at it from another viewpoint. The controller is primarily responsible for the separation of traffic. The pilot is primarily responsible for the safety of the flight. Now, all the pilot can do under a circumstance of a warning of a potential midair is act on the information that is transferred to him. If the information is that there's an aircraft in his vicinity, he responds whether he has this aircraft in sight or not. The problem is, does he have the correct airplane in sight? Is it the one that the controller has and does he understand that its maneuvering in the proper direction?

Now, all of these things were examined in great detail by the NTSB back in 1969, and that's when the Board came out with the recommendation that the "see-and-avoid" concept was outmoded. The same thing was recognized by the FAA. So, even with the conflict alert system, we come down to the same "see-and-avoid" problem if the information is transferred to the pilot and he assumes he sees the traffic that the controller is talking about.

So, it is not a solution, and I apologize if I didn't answer your question specifically.

The CHAIRMAN. It's been implied that some pilots are urged by their companies to avoid the use of IFR approaches whenever possible in order to conserve fuel. Is there any truth in that contention and are

the pilots penalized for using excess fuel or rewarded for conserving fuel?

Captain GERBER. I can speak for my own airline, and I think most other ones, that this simply is not done. In fact, in all of our jet operations, we are on IFR flight plans at all times. There is no such thing as a VFR operation on our jets. If they have positive control, we want to be under positive control under all circumstances.

In this regard, we've heard a lot of comments about the "see-and-avoid" concept. We commented on it in our paper about how both the FAA and NTSB have said quite emphatically that in the modern day and age this is an outmoded, unreliable, unsatisfactory solution to aircraft separation; and the FAA and also some of our general aviation friends here have made quite a point in both their testimonies that this is a primary means of aircraft separation. Yet the FAA said, "We have not had any midair collisions in air carriers in 6 years, mainly because we have gone to positive control, to TCA's, to relieve the pilots of the see-and-avoid concept." And statistics show that most midair collisions are between two general aviation aircraft at uncontrolled airports where the only means of separation is the eyeball.

Now, it seems a little illogical that they are both contending that "see and avoid" is the primary means, yet the FAA has gone the other way to avoid midair collisions in air carriers. They have produced a system which does not depend on "see-and-be-seen". And the general aviation people do not have an enviable record in uncontrolled airports in "see-and-be-seen."

So, I would love the luxury of being able in my airliner of looking out the window. I don't spend a lot of time doing it for two reasons. One, the aircraft is so constructed that I can't see a hell of a lot, particularly down and to the sides. Second is that the workload in a cockpit pretty much precludes much looking out the window.

I'll give you an example. I had a flight, Boston to Washington, an hour and 17 minutes. We logged the number of frequency changes, contacts, times we had to have our head in the cockpit, one man flying all the time, abiding by the clearances, the other man operating the communications. I made the communications. I made 131 frequency changes and contacts where my head was down. I could not be looking out the window. I would love the luxury of looking out the window, but I don't have it. It's impractical. In the present day and age, it's totally impractical.

The CHAIRMAN. That is a good point you've raised because we have received very conflicting reports on the question of the cockpit displays.

Captain GERBER. You have.

The CHAIRMAN. Your statement is very strong on this, and many individual pilots have either told us or the FAA informally that they're skeptical about another piece of equipment in the cockpit. They tell us they have enough to do without trying to duplicate the controller's job as well. Now, isn't there a point where additional equipment becomes useless or dangerous?

Captain GERBER. John, would you like that, or Jack?

Mr. HOWELL. I'd like to answer that.

Captain GERBER. All right, fine. Mr. Howell.

Mr. HOWELL. The display that we're advocating in our paper, we hope to bring it to the point where it will inform the pilot visually

and simultaneously of all the factors that are affecting his routine of flight. The "T" in CDTI right now stands for "traffic." In my own mind, I would like to see it stand for the word "total," the cockpit display of total information, please tell me everything that the system knows about my flight.

What I'm saying is that we hope with the CDTI to assimilate in a single location information on all the factors that are affecting the route of my flight.

Mr. O'BRIEN. I'd like to add just one thought to what Jack just said. What we're talking about is not a new or additional display in the cockpit. That one statement we had in Ray's comments was to the effect that the new generation of aircraft, Boeing 757, 767, will have several of these types of displays in the cockpit; it is part of the basic instrument panel display, and all this information we're talking about can be displayed along with the regular information or data that you use to normally conduct your flight. It's not additional workload. It's utilizing the data that is available in a more efficient manner.

The CHAIRMAN. Are you saying that it wouldn't really increase the pilot's workload by the addition of that equipment?

Mr. O'BRIEN. Just the opposite. It would reduce the pilot's workload by better utilizing the information that's available.

The CHAIRMAN. If the FAA DABS system does, in fact, perform as advertised, it would provide better protection to many more aircraft because of the ground-based computer potential at a relatively low cost to the private aircraft owners. Would it make sense to ALPA to continue developing both the DABS and BCAS, which is compatible with DABS, once that system is implemented?

Captain GERBER. John?

Mr. O'BRIEN. Yes. What we would propose is parallel development. We have voiced several statements of concern over the cancellation of the trimodal BCAS development work. We do not propose the cancellation of the DABS link or ATARS. What we would propose is that the FAA spend a few hundred thousand dollars that are required to complete the joint development. It's not actually development work. It's actually demonstration evaluations to show that the concept is valid.

So, what we're advocating is parallel programs here, and the primary reason is not because we're endorsing a particular concept or a particular manufacturer's proposal, but because we understand that the trimodal BCAS offers a full capability system in a much shorter time span than the FAA full capability system. If this is true, we should concentrate on it.

The CHAIRMAN. From your point of view, should a controller be required to inform a pilot that he's getting a conflict alert, despite the fact that the pilot has previously acknowledged he has visual separation with the aircraft?

Captain GERBER. Absolutely. We would like as much information as he has. There should be no secrets. We don't believe there should be any secrets between us.

The CHAIRMAN. You stated that the FAA's priority on CAS is too low. The FAA 1979 budget called for \$9.4 million to be spent on DABS and \$5.8 million to be spent on BCAS. That's approximately 19 percent of the FAA's total R. & D. budget, which sounds like a fairly high priority that the FAA has placed on that item.

Mr. O'BRIEN. Granted, those figures sound pretty impressive, but, you know, some of those DABS and the DABS data link dollar figures came about because of a substantial cost overrun in the early development of DABS. The basic reason we're working on DABS is not for collision avoidance. That's a spinoff of the DABS system. So, if we were to look at that money to find out what part of it was actually specifically expended on collision avoidance work, I think that the figures might be a little different.

The CHAIRMAN. Of course, the \$5.8 million alone on BCAS is pretty substantial, isn't it?

Mr. O'BRIEN. That's correct. But, again, if we look at the amount of money spent on the trimodal system versus the FAA full-capability system and the cost of running programs in parallel, we're going to spend a little money, but we feel that the expenditures were less on the more promising system, on the system that could have been available in a year rather than longer.

The CHAIRMAN. Congressman Anderson?

Mr. ANDERSON. I have no questions. I just want to commend Captain Gerber and Jack Howell and Mr. O'Brien for their very fine presentation.

The CHAIRMAN. Mr. Ertel?

Mr. ERTEL. Thank you, Mr. Chairman. I only have two questions.

Captain, you seem to indicate because of the greater number, general aviation has experienced more collisions, there's a lot more of them than the air carriers. That seemed to condemn general aviation. Do they do a lot more operations than the air carriers?

Captain GERBER. I didn't catch the question.

Mr. ERTEL. Do the general aviation aircraft conduct a lot more operations than the air carriers, so you have a higher incidence just by probabilities?

Captain GERBER. That is true.

Mr. ERTEL. I just wanted to make that clear.

Captain GERBER. The point on the see-and-be-seen concept—the point I wanted to make clear—is where they're having the collisions, a majority of them, is where they're depending on the see-and-be-seen concept. In the high-density traffic areas where they have positive controls, where they have TCA's, the midair collision has almost been eliminated or had been for 6 years; so we think this is the proper direction to be going, positive control, to better control and not depending on the eyeball.

Sir, the human eye is easily deceived. You remember the old tricks concerning your perception and everything else. It's one of the most easily deceived things in the world. And you cannot depend on it for things such as this. I've just had too many bad experiences with trying to pick something up out the window.

Just as an example, coming into Kennedy, a controller very logically said, "Your traffic is a United DC-8." Clear day, you know, unusual in that in the New York area it was a clear day. You could see a hundred miles. And we're coming on approach from out over the water; and he said, "Your traffic at 12 o'clock, 3 miles, is a United DC-8, do you have him in sight?"

I said, "Yes."

He said, "Follow your traffic." As you indicated before, it is now my responsibility. The controller has passed me the ball. He has no responsibility now once I accept that.

Suddenly, my copilot says, "Hey, there's a guy off to the right. Who is he?" Well, we had one aircraft like this and another coming like this at 90° to him. I had seen this aircraft, but the United DC-8 was this one. I was too far away. I didn't know he was United. I didn't know he was a DC-8 and certainly couldn't read the tail markings on it. But I had accepted the fact that that aircraft was the one the controller was talking about. I never did that again. I never did that again.

And this is the type of thing you get into with see-and-be-seen. In perfectly clear weather, the eye can make a mistake. You can make a mistake in distinguishing aircraft. It's not the safest. I would much rather have positive control.

Mr. ERTEL. I understand your position on that; but there's also another reason possibly for more crashes in uncontrolled airspace. You might have less sophisticated pilots there and more sophisticated pilots will come into the TCA's positive control space. Would that also be true, a lot more experience—

Captain GERBER. Yes, true.

Mr. ERTEL. I just wanted to point that out.

Captain GERBER. True.

Mr. ERTEL. I think those things ought to be used—

Captain GERBER. I'm not trying to be critical or put a burden on the general aviation pilot. I'm simply pointing out what the facts are, what the statistics show, and this is what they show.

Mr. ERTEL. Of course, statistics show a lot of things. There's a lot of reasons behind statistics, as we're all aware.

One more question. The trimodal that you're talking about, do you have any idea what that's going to cost?

Captain GERBER. John?

Mr. O'BRIEN. I believe that estimate is \$20,000, depending on what type of airplane you're putting it on. If the airplane has a sophisticated computer capability, it's a matter of a few printed circuit boards put into the basic computer on that airplane; so it's not very expensive at all. If you're talking about an old 727 or DC-8, then you're talking about doing something up in the cockpit in addition to adding a black box; it's much more expensive.

Mr. ERTEL. Are you suggesting this for anyone, in addition to the general aviation, or a more simplified system for general aircraft?

Captain GERBER. That's correct. The general aviation aircraft receives protection from the air carriers because the general aviation aircraft need have nothing additional at all.

Mr. ERTEL. I was just trying to make sure if you were making a distinction.

Captain GERBER. This is one of the things that is most attractive about the trimodal BCAS; that is, when you spend your money, you get the protection. The other guy also gets some fringe benefits, because you're not going to run into him. You spend your money, and you get your money back.

The other one is it operates in the remote areas over oceans, for instance, where the DABS will not operate. You have to have ground equipment every place for DABS, whereas the BCAS, the trimodal one particularly, has the advantage of both worlds.

You'll notice that Mr. Albrecht of the FAA this morning made quite a point of the difference between the active and the passive, and he spoke as if they were competitive with each other. The thing about the trimodal, it has active, it has passive, and a combination. It has the best of all worlds, and this is precisely why we have advocated that this is the way to go, and there's nothing wrong with it.

The fact that BCAS is not going to be needed when the DABS comes up 15 years from now is beside the point. We need it now, and we think it's available.

Mr. ERTEL. Well, I think you've answered all my questions. I thank you very much.

The CHAIRMAN. Do you have an estimate for what it would cost to outfit the entire civil air fleet?

Mr. O'BRIEN. No, but we could calculate that and supply it to you.

The CHAIRMAN. I wish you would supply that information for the record, because based on the estimate that I have, it amounts to about \$250 million. That's the figure for the whole fleet.

[The following information was subsequently received for the record:]

The estimated cost of equipping an aircraft already in airline service is \$70,000. Based on the current total of 2,375 aircraft in airline service under FAR Part 121, the total estimated cost of equipping the entire civil air fleet would be approximately \$166 million.

The estimated cost for installation in a new aircraft model such as the Boeing 767 would be \$20,000 if the aircraft already had a cathode ray tube (CRT) display installed. If a CRT had to be installed as well, the cost would approximately double.

Bear in mind that these costs are initial estimates. Also, many of the current airline aircraft will be retired before a collision avoidance system is ready for installation in them.

Captain GERBER. That could very well be; but, remember, the airlines have gone and equipped their fleets with the INS navigational system. On our airline we have three of them on each airplane. I think originally it was like \$30,000 or \$40,000 apiece. I believe when we first did it, it was \$125,000 an airplane. So, you're talking about an investment, but you're talking about getting something back. And they had no trepidation about doing that.

Mr. O'BRIEN. You'll also remember the ground proximity warning system that came into being after a serious safety hazard caused a significant initial investment. The cost went down very significantly after the thing went into production though, and there may be some benefits there at the—

The CHAIRMAN. I'm sure there would be. There's bound to be. Thank you very much, gentlemen.

Captain GERBER. At the present rate that lawsuits are going at, if you prevented one collision, it would pay for the whole industry being outfitted.

The CHAIRMAN. Thank you very much, sir.

Congressman Van Deerlin, we're very happy to have you here and take time from your busy schedule to come over and visit with us on this very important subject.

STATEMENT OF HON. LIONEL VAN DEERLIN, U.S. REPRESENTATIVE FROM CALIFORNIA

MR. VAN DEERLIN. Thank you, Chairman Cannon, Chairman Anderson, and members. I want to join those who have thanked you for scheduling so promptly a hearing in this particular locality on a subject which has been very much on the mind of this locality for the past 33 days. It's quite an experience and a shocking one to learn that your own congressional district can become the site of history's worst domestic air collision.

I suppose that we in public office have to resist certain temptations in the circumstances. One is a rush to judgment, to point an accusing finger of blame, to try to ascribe responsibility for a tragedy of this dimension. Another clearly is for a layman to try and play the role of an expert and try to determine from what information is available what equipment should have been in use that was not in use and to ask why it wasn't in use. I tried to resist both those temptations.

I do think, however, and I know that you representing the appropriate committees of the House and Senate know that it is the task of public officials not only to ferret out the claims and the counterclaims, to try to ascertain where the merit of an argument lies, but also at times to find out where in the responsible agencies the processes of making these determinations may have fallen down. Just 4 days after the crash of the PSA airliner in my district, my San Diego office received a telephone call from a young air controller then working in Portland, Oreg., who introduced himself as Steve Gibby. I know that there's been mention of that man earlier in the hearing today. He said that he had gotten in touch with the office of one of our colleagues in the House, Representative Mike McCormick of Washington, a member of the Science and Technology Committee. Mr. McCormick's office had suggested that he get in touch with the Congressman in whose area the tragedy had occurred.

Mr. Gibby had worked for more than 3 years in the control tower at Lindbergh Field. During that time he became so concerned over the proper equipment to deal with the traffic problems that were presented daily to the controller in that tower, that way back in May of 1977 he submitted to the FAA on what they call their form 1800, unsatisfactory condition report, a detailed rundown of what he saw as a tragedy in the making here. He referred specifically to the potential tragedy of air carrier midair collision over heavily populated East San Diego and in his report offered almost a textbook description of what later occurred.

Not satisfied with the lack of action that had followed his first UCR, as they call it, unsatisfactory condition report, he submitted a second one in July of 1977. When I forwarded both of his reports, copies of his reports, to the NTSB, we discovered that both of them had been dealt with at the regional level and had been rejected out of hand.

When Mr. Gibby came down to San Diego to make his first call at my office—and, incidentally, he has come again on his third trip, all at his own expense—he thought so seriously of the shortcomings of the Lindbergh Field tower operation, that strange as it seems, he flew as far as Long Beach from Portland, then rented a car and came that way.

MR. ANDERSON. Gentlemen, will you yield?

Mr. VAN DEERLIN. Sure.

Mr. ANDERSON. That would seem like a good place to stop and rent a car. That's an ideal place to stay. I think that shows pretty good judgment on the part of that man.

Mr. VAN DEERLIN. I could understand that, Mr. Anderson's feeling that Long Beach is always a good stopover point. Naturally, it's a view that I won't dispute before Mr. Anderson's own committee.

However, it did seem to me—and I agree that for other reasons perhaps—it demonstrated a depth of feeling on Mr. Gibby's part that the conditions that he described, 16 months earlier, had indeed become so serious that he as an airline passenger was unwilling to submit to the process of bringing in planes at Lindbergh Field.

Flight 182, which had come from Sacramento, started from an airport which has the so-called extended—what do you call it? The extended service area, the TGA is it called? Stopping over briefly in Los Angeles. It had this protection when it arrived at Lindbergh Field, which is twice as busy as the Sacramento Airport.

The CHAIRMAN. Sacramento does not have a TCA.

Mr. VAN DEERLIN. It does not? Excuse me, Mr. Chairman.

Mr. ANDERSON. Los Angeles does.

Mr. VAN DEERLIN. One objection that Mr. Gibby raised was that airports like Portland, where he was then working, and I believe Phoenix, had protections which were not available here at Lindbergh Field. I can only tell you that the attention that has been given to these and other objections from the ranks of air controllers all across the country, who in response to publicity accorded by the local newspapers and carried elsewhere as copyrighted material, prompted a series of calls from air controllers across the Nation—they are questions that are very powerfully on the minds of San Diegans wondering just how safe is this field.

Yes; it has gone 50 years and 1 month without a commercial fatality, but here we are with the worst air collision on record having occurred in our midst and, apparently, ample advanced warning to those in authority that it could occur.

Now, Mr. Gibby is not by chance a groaner or troublemaker. Very modestly he submitted documents showing that he has been singled out for citation for important service as an air controller. He is present in the room today, Mr. Chairman. This is perhaps not an occasion on which you would wish to put him on as a witness. He is one who has the courage of his convictions. He's willing to sacrifice in the support of those convictions. He feels deeply that the men on the firing line, the air controllers who man the towers around the country, have not been heard from sufficiently. He has prepared a statement, of which I have a copy and which I would surely like to make available to the committee; and I can't tell you how strongly this community feels the necessity for followup on these and other shortcomings which have been pointed out in recent weeks in the wake of this historic tragedy. I thank you very much for scheduling me.

The CHAIRMAN. Thank you very much, Congressman Van Deerlin. The committee has recently been made aware of Mr. Gibby's charges, and we will look into them. However, today we're not here to examine fault in the PSA crash. We have not permitted a number of individuals to testify concerning that, we are hearing only from organizations

today. This is done in light of the fact that the NTSB has the responsibility to investigate the accident and we did not want to get into the middle of that investigation. I'm sure that the NTSB will review Mr. Gibby's claims in the investigation that they conduct.

You referred to the air traffic controllers. We have invited the air traffic controllers' organization to testify, and they will be appearing later this afternoon.

If you would like to leave the statement with us, we'd be glad to accept it; but I would not want to make it a part of the public record, because we do not want to get into fault-finding as to who bears the responsibility for this crash and thus jeopardize the NTSB investigatory process.

Mr. ANDERSON. Would the chairman yield on that?

The CHAIRMAN. Certainly.

Mr. ANDERSON. This morning, Congressman Van Deerlin, I asked the Administrator of the FAA whether any unsafe condition reports have been filed relative to uncontrolled aircraft in the vicinity of Lindbergh approaches and what was the nature of the report and what if any, response did the FAA make. He indicated they had several reports like this, but the one that became apparent was the one written by Mr. Gibby. Administrator Bond agreed to submit a complete report of this report for the record, and I suppose that again would be after the NTSB has made their investigation so it wouldn't be in any way jeopardizing the NTSB investigation this coming month.

Mr. VAN DEERLIN. Yes. In response, Mr. Anderson, I would cite the wording of a form 2800, which I assume to be a followup to the form 1800. It's called "reminder memo." "Avoid errors—put it in writing." Well, here is a man who in his effort to avoid errors put it in writing and nothing happened. Thank you very much.

The CHAIRMAN. Thank you, sir.

Mr. Walter Jensen, vice president of operations and engineering, Air Transport Association.

STATEMENT OF WALTER JENSEN, VICE PRESIDENT, OPERATIONS AND ENGINEERING, AIR TRANSPORT ASSOCIATION

Mr. JENSEN. I am Walter A. Jensen, vice president—operations and engineering of the Air Transport Association of America. Our association represents nearly all of the scheduled interstate airlines of the United States. Pacific Southwest Airlines is not a member of the ATA.

On behalf of our member airlines, I want to express our sympathy to the families of those who lost their lives in the accident on September 25. Safety is, of course, the paramount concern of all of us who are involved in aviation. Our objective must always be the unattainable goal of zero accidents.

I wish it were possible for me to come to San Diego and be able to say just what happened on September 25, why it happened, and what should be done to insure that it never happens again.

Some basic facts are known but many of the important details are still being investigated and analyzed by the National Transportation Safety Board. The NTSB is noted for its thorough and professional investigations of aircraft accidents. But this painstaking work takes time and their findings won't be available for some months. Until

the NTSB findings are made known, we believe it would be premature and unwise to speculate as to what happened to cause this particular collision.

It has been our experience that most accidents are the result of the simultaneous occurrence of a number of factors, no one of which would have caused the accident. For each single factor known to be capable of producing an accident, some measure has already been adopted to prevent the accident. Airline flying would never have become many more times safer than automobile travel if it weren't for the multitude of redundant systems, fail-safe systems, backup procedures, checks and double checks that are commonplace in the airline industry. Unfortunately, accidents do sometimes occur and it is usually a combination of rare events that cause them. When this happens, finding ways to prevent recurrence is usually complex. But however complex the problems, we must be unrelenting in our search for answers.

Despite the absence of NTSB findings, I believe there are several subjects which can be usefully addressed today and the ATA appreciates the invitation to appear here.

We have reviewed the record of midair collisions involving U.S. airlines within the 50 States. A copy of that record is attached. So far as we have been able to determine, there have been no previous collisions between a U.S. airline aircraft on a scheduled flight and another aircraft making practice instrument approaches. That is prior to, of course, the San Diego accident. Since practice instrument approaches have been conducted in both airline and nonairline aircraft at numerous airports for many years, it is clear that such approaches can be conducted safely. This is true even when the practice ILS approaches are opposite to the direction of landing traffic. I don't suppose anyone would argue against having more ILS installations both at nonmajor airports for training and at major airports to reduce opposite direction traffic. But I don't see the need to ban training approaches.

One other comment on the record of collisions is in order. The collisions involving U.S. airlines have not occurred where one might expect; with only one or possibly two exceptions they have not occurred where the air traffic density was highest. Two possible explanations are: one, air traffic control procedures and equipment for the prevention of collisions tend to focus on the high density areas and two, it is human nature for pilots to be extra vigilant when flying in areas where they know there is more traffic.

The term "general aviation" is very handy and widely used when referring to that broad category of aviation remaining when you remove the scheduled airlines and the military. In speaking of general aviation one must be aware that it includes big jet airplanes, small propeller airplanes, highly instrumented business and corporate airplanes, pleasure flying, nonairline commercial flying, expensively equipped airplanes owned by individuals or corporations, and airplanes with limited equipment owned by one or more individuals.

Keeping this in mind, it is usually inappropriate to make sweeping assertions about doing this or that with general aviation as a class. For example, it has been suggested by some that general aviation should be barred from some airports. It is true that the capacity of some airports is insufficient to accommodate all of the airline and

general aviation flying seeking to use these airports. We think the best way to solve our common problem and eliminate the delays, fuel waste and passenger inconvenience which result from this is by finding mutually acceptable solutions through cooperative efforts. By working together, the representatives of the airlines, general aviation, the FAA, airport operators, and, in certain cases, the military should be able to address the growing need for airport capacity and develop a reasonable plan for meeting this need consistent, always, with safety requirements.

We believe that some general aviation pilots are being forced to use major airports when they would prefer to operate elsewhere but cannot do so because suitable facilities are lacking. This problem is exacerbated by the fact that each year a number of general aviation airports throughout the Nation are turned into housing complexes and shopping malls. One of the first productive actions of a cooperative effort could be to find a way to protect the continued existence of needed airports as well as a determining where additional airports are needed to relieve major airports.

The airlines have long advocated that airline flights be provided the added protection of positive control to the extent that it is practical to do so. We have endorsed area positive control at the higher altitudes and believe that it is working. We have endorsed terminal control areas for the major terminal areas and believe that the 21 TCA's currently in effect have provided added safety. We are also asking the FAA to take action so as to remove the gap between the tops of the TCA's and the base of area positive control. And the Administrator addresses that this morning and said he was preparing to do so.

Although the FAA's terminal radar service for VFR aircraft stages 1, 2, and 3 as it's called aren't strictly providing positive control and are voluntary on the part of the pilots availing themselves of this service, we believe they are also providing added safety margin.

While continuing to advocate these protective FAA ATC services, the airlines fully realize the great importance of constant vigilance on the part of all pilots. The airlines have recurrent programs which repeatedly stress the need for their pilots to always be alert for other aircraft. And before I'm asked, that is a matter of training of how to do it, not just stressing that it is important.

The airlines, working through the ATA, were instrumental in initiating the search for a practical airborne collision avoidance system, CAS, over two decades ago. An enormous number of airline manhours and over \$2 million of airline money has been devoted to this effort which was first thought to be a relative simple technical problem.

Mr. Frank White of the ATA staff has been involved since the beginning of 1955 and he is one of the few recognized experts in this field. He has just written a paper for delivery next month at the assembly of the Radio Technical Commission for Aeronautics. An advance copy of this paper is provided for the information of your committees. In it he traces the history of the CAS developmental effort which turned out to be much more difficult than was first envisioned. First we found that a self-contained CAS was beyond the state of the art. That is, one that relies on equipment only in the one airplane was beyond the state of the art and still is. Various tech-

niques for use in cooperative systems were then evaluated. Threat logic had to be developed. At one point success seemed so near that airlines actually placed orders for equipment, but problems arose which forced the manufacturer to cancel the orders. One of the consistent concerns was that the equipment required to prevent collisions with general aviation planes would be too complex and too costly for widespread use by general aviation planes. Thus the proposal to utilize the radar beacon equipment already installed in many general aviation planes had great appeal. That proposal which has evolved into what is now known as the beacon collision avoidance system, BCAS, is not the mainstream of the FAA's CAS developmental effort.

Simultaneously, the FAA is developing the discrete address beacon system, DABS, and the automatic traffic advisory and resolution service, ATARS. The FAA is also investigating the possibility of what they call full BCAS. Incidentally, I would insert here that you asked earlier the cost of a BCAS, and somewhere at variance with the answer given, the answer I've been given is the cost of a single, active-only BCAS—that's the first effort that the FAA is addressing—that a single unit would cost in the neighborhood of \$20,000. Therefore, in a dual installation in airline aircraft that would be \$40,000 for the equipment. Then, if you add the installation cost and spares, it's estimated to be around \$50,000. Again I emphasize, for the active BCAS only. We have no information whatsoever as to what a so-called full BCAS that the FAA talks about would cost. It's too far, it's too embryonic at this stage to put a cost on it.

We believe that the FAA is correct in moving toward active BCAS, DABS, and ATARS. Much more needs to be known about full BCAS before we can comment on its possible utility. The whole CAS effort has moved much more slowly than any of us would have liked. Some apparently feel that it has been inordinately delayed. We believe the FAA has been unfairly criticized in view of the highly complex nature of the problem.

Looking to the future, we would urge the FAA to acquire the factual information necessary to insure sound decisions on BCAS, DABS, and ATARS as quickly as is technically possible. Then, but not before then, decisions on how to proceed should be made and implemented. The airlines pledge their continued participation and support for such an expedited effort.

In summary:

First, nothing can ever displace safety as the No. 1 consideration in aviation. With regard to collision avoidance, the airlines will continue to devote their energy and resources to achieving their objective of zero collisions.

Second, the FAA's CAS effort should be expedited so that prompt, but not premature, conclusions can be reached and implemented.

Third, we believe in a cooperative approach to problems related to airport capacity.

Fourth, additional airport facilities to accommodate airlines and general aviation should be provided. Congressional help may be needed.

This concludes my statement, Mr. Chairman.

[The attachments referred to follow:]

ATTACHMENT 1

MID-AIR COLLISIONS INVOLVING AIRLINES IN 50 STATES

[Revised Oct. 19, 1978]

Year (Number): Date	Airline: Types of aircraft	Location	Fatalities (1st plane/2d plane/other/total)		
1938 (0)					
1939 (0)					
1940 (0)					
1941 (0)					
1942 (2):					
Oct. 23, 1942	AAL DC-3—Army B-34	Palm Springs, Calif.	12/	0/	0/ 12
Nov. 4, 1942	TWA DC-3—Army C-53	Kansas City, Mo.	0/	0/	0/ 0
1943 (0)					
1944 (1): Dec. 24, 1944	AAL DC-3—Taylorcraft	Saline, Mich.	0/	0/	0/ 0
1945 (2):					
July 12, 1945	EAL DC-3—Army A-26	Florence, S.C.	0/	1/	0/ 1
Sept. 26, 1945	TWA DC-3—Boeing A-75	Chicago, Ill.	0/	2/	0/ 2
1946 (1): Dec. 19, 1946	EAL DC-4—Universal Airlines DC-3	Aberdeen, Md.	0/	0/	0/ 0
1947 (1): Apr. 22, 1947	DAL DC-3—Private BT-13	Columbus, Ga.	8/	1/	0/ 9
1948 (0)					
1949 (4):					
Jan. 30, 1949	PAA 749—Cessna	Port Washington N.Y.	0/	2/	0/ 2
July 30, 1949	EAL DC-3—Navy F6F	Chesterfield, N.J.	15/	1/	0/ 16
Aug. 7, 1949	CAP DC-3—Cessna	Milwaukee, Wis.	0/	1/	0/ 1
Nov. 1, 1949	EAL DC-4—Bolivian P-38	Washington, D.C.	55/	0/	0/ 55
1950 (0)					
1951 (3):					
Nov. 9, 1951	WAL DC-3—Fairchild PT-23	Eugene, Oreg.	0/	0/	0/ 0
Nov. 17, 1951	California-Eastern DC-4—Overseas National DC-4	Oakland, Calif.	0/	3/	0/ 3
Nov. 27, 1951	EAL DC-3—Piper L-4J	Ocala, Fla.	0/	1/	0/ 1
1952 (3):					
June 28, 1952	AAL DC-6—Swift	Dallas, Tex.	0/	2/	0/ 2
Oct. 17, 1952	California Air Charter DC-3—Lockheed 12-A	Milpdale, Calif.	0/	0/	0/ 0
Dec. 15, 1952	LCA DC-3—Cessna	Richmond, Ind.	0/	1/	0/ 1
1953 (1): Aug. 26, 1953	AAL CV-240—UAL CV-340	Michigan City, Ind.	0/	0/	0/ 0
1954 (1): June 27, 1954	AAL CV-240—Navy SNB	Columbus, Ohio	0/	2/	0/ 2
1955 (3):					
Jan. 12, 1955	TWA M-202—DC-3	Cincinnati, Ohio	13/	2/	0/ 15
July 12, 1955	TWA DC-3—Cessna 140-A	Kansas City, Kans.	0/	2/	0/ 2
Aug. 29, 1955	CAL DC-3—Piper PA-22	Hobbs, N. Mex.	0/	0/	0/ 0
1956 (2):					
June 30, 1956	UAL DC-7—TWA 1049	Grand Canyon, Colo.	58/	70/	0/128
Sept. 9, 1956	CAL DC-3—Cessna 170-B	Bartlesville, Okla.	0/	0/	0/ 0
1957 (1): Apr. 10, 1957	AAXICO C-46—Air Force B-25	Tinker AFB, Okla.	0/	0/	0/ 0
1958 (2):					
Apr. 21, 1958	UAL DC-7—Air Force F-100F	Las Vegas, Nev.	47/	2/	0/ 49
May 20, 1958	CAP Viscount—Air Guard T-33	Brunswick, Md.	11/	1/	0/ 12
1959 (0)					
1960 (5):					
Apr. 20, 1960	PIA F-27—Cessna 310	Hickory, N.C.	0/	4/	0/ 4
Oct. 1, 1960	EAL M-404—Beech	Orlando, Fla.	0/	1/	0/ 1
Oct. 4, 1960	Capitol C-46—Cessna	Sacramento, Calif.	0/	2/	0/ 2
Nov. 17, 1960	UAL DC-6—Bonanza	Denver, Colo.	0/	0/	0/ 0
Dec. 16, 1960	UAL DC-8—TWA L-1049	New York, N.Y.	84/	44/	6/134
1961 (0)					
1962 (0)					
1963 (0)					
1964 (0)					
1965 (2):					
Sept. 10, 1965	CN DC-3—Cessna 150	Louisville, Ky.	0/	1/	0/ 1
Dec. 4, 1965	TW 707—EAL 1049-C	Danbury, Conn.	0/	4/	0/ 4
1966 (1): June 16, 1966	Zantop C-46—Piper PA-23	Columbia City, Ind.	2/	1/	0/ 3
1967 (2):					
Mar. 9, 1967	TW DC-9—Beech Baron	Urbana, Ohio	25/	1/	0/ 26
July 19, 1967	PI B-727—Cessna 310	Asheville, N.C.	79/	3/	0/ 82
1968 (3):					
Mar. 28, 1968	OZ DC-9—Cessna 150	St. Louis, Mo.	0/	2/	0/ 2
June 12, 1968	UA 707—Cessna 377	Denver, Colo.	0/	0/	0/ 0
Aug. 4, 1968	NC CV-580—Cessna 150	Milwaukee, Wis.	0/	3/	0/ 3
1969 (3):					
Feb. 9, 1969	TT DC-9—Piper Cherokee	Harlingen, Tex.	0/	0/	0/ 0
Aug. 3, 1969	AA 707—Cessna 172	Fort Worth, Tex.	0/	1/	0/ 1
Sept. 9, 1969	AL DC-9—Cherokee	Indianapolis, Ind.	82/	1/	0/ 83
1970 (0)					

See footnotes at end of table.

ATTACHMENT 1—Continued

MID-AIR COLLISIONS INVOLVING AIRLINES IN 50 STATES

[Revised Oct. 19, 1978]

Year (Number): Date	Airline: Types of aircraft	Location	Fatalities (1st plane/2d plane/other/total)
1971 (4):			
Jan. 9, 1971	AA 707—Cessna 150	Edison, N.J.	0/ 2/ 0/ 2
June 6, 1971	Air West DC-9—Marine F-4	Duarte, Calif.	49/ 1/ 0/ 50
Aug. 4, 1971	CAL 707—Cessna 150	Compton, Calif.	0/ 0/ 0/ 0
Dec. 4, 1971	EAL DC-9—Cessna 206	Raleigh, N.C.	0/ 2/ 0/ 2
1972 (2):			
June 29, 1972	NOR—CV-580, ZW—DHC-6	Near Appleton, Wis.	5/ 8/ 0/ 13
Dec. 20, 1972	NOR DC-9—DAL CV-880	Chicago, Ill.	110/ 0/ 0/ 110
1973 (0)			
1974 (0)			
1975 (0)			
1976 (0)			
1977 (1): Mar. 27, 1977	PAA 747—KLM 747	Tenerife, Canary Islands	² 327/246/ 0/573
1978 (1): Sept. 25, 1978	PSA 727—Cessna 172	San Diego	135/ 2/ 7/144

¹ On ground.² On ground outside United States.

ATTACHMENT 2

RADIO TECHNICAL COMMISSION FOR AERONAUTICS, 1978 ANNUAL ASSEMBLY MEETING—WHERE DOES AIRCRAFT SEPARATION ASSURANCE (OR CAS) NOW STAND? AN HISTORICAL PERSPECTIVE AND PROJECTION

(By Frank C. White, Director, Information Systems and Avionics, Air Transport Association of America)

Beginning in 1955, over twenty years ago, the airline industry, working through ATA, began its search for an airborne Collision Avoidance System (herein called CAS). It was done with full recognition that doing so might create concern in the minds of those who depended on the airlines for transportation. A joint meeting of RTCA and the Institute of Radio Engineers was selected as the forum for laying out the problem and the need for a solution.¹ Nothing much happened until about eight months later when two airline aircraft collided over the Grand Canyon. This incident generated renewed interest and numerous "solutions" were offered. In July 1956 ATA sponsored a symposium in Washington, bringing together experts, engineers and inventors, to compare airline requirements against the then current state-of-the-art.

As a result of the symposium, Collins Radio in September 1956, submitted the first formal proposal to the airlines. It was for a non-cooperative Pilot Warning Indicator (PWI) System which they believed could later be developed into a Collision Avoidance System (CAS).² Two million dollars worth of airline orders were placed with Collins within 60 days. In the development work that followed, Collins Radio discovered that normal aircraft accelerations in flight would prevent their airborne doppler radar from making reliable collision predictions, or could create erroneous predictions in a significant percentage of cases. This eliminated the CAS feature of the Collins proposal. Collins withdrew its proposal³ and resumed its analytical work, which continues to this day.

Often after something is invented, everyone observes that the obvious was invented; such was the case when Dr. Morrel invented what he termed Tau. Tau is the measurement of range to the intruding aircraft divided by the range rate which gives time to collision assuming that the altitude of both aircraft is known.

The invention of the Tau concept⁴ by Dr. J. Smilie Morrel of Bendix Radio in the mid-1950's and his paper which provided the first accurate description of the fundamental physics of the airborne collision avoidance problem⁵ even today remain two basic references for filtering out poor ideas/solutions that do not address the problem to be solved.

Footnotes at end of attachment 2.

In 1960 a collision between two fighter aircraft being tested by their manufacturer, McDonnell Aircraft Corporation, sparked an all-out effort by McDonnell to develop a CAS for use in their flight test area. This was the birth of the CAS now identified as "Time Frequency" System. By the time its development was completed in the mid-1960's, the McDonnell Douglas Time-Frequency CAS met and solved most of the nagging problems of an airborne CAS. It used one-way ranging (requires extremely accurate time source), direct doppler measurement of range rate, a unique "time slot" for each aircraft to make its transmission, an exceptionally simple and readily identified pulse format for communicating aircraft altitude, bi-phase modulation of the carrier providing ample communication capability, and many other features that were quite advanced for its time.

By 1962 FAA became active in CAS System development and formed its Collision Prevention Advisory Group (COPAG). FAA sponsored a COPAG organized industry-wide symposium on the state of CAS investigations, and received widespread support and interest from all segments of aviation. At the symposium Bendix Radio described a CAS based on the Tau concept, using one-way ranging and employing the ground-bounce technique. Collins Radio outlined a method for testing by computer simulation the features of any proposed CAS. The Collins contribution was important since it offered for the first time a quick, minimum cost method for choosing the most promising techniques from among a wide variety of theoretical concepts. In the Fall of 1963 FAA contracted with Collins to study CAS techniques by simulation and by mid-1965 a (draft) Collins report was available. Collins then stated that the Time-Frequency System was the most promising, that it should work quite well for the enroute situation, but would have some limitations in the terminal area—where aircraft are most likely to be maneuvering in flight.

At an ATA meeting in mid-1965 Collins reported on its studies and McDonnell showed the Time-Frequency CAS equipment it was prepared to use in their flight test operations beginning later that year. Operations Executives of the airlines were sufficiently impressed by the McDonnell system to encourage its continued development, and resolved that the interaction between the Time-Frequency CAS and the Air Traffic Control System should be carefully analyzed since this seemed to be an area where the system appeared most vulnerable. At that point a CAS Technical Working Group was formed by the ATA to expedite CAS System development and to prepare a technical description of the system that would meet airline requirements. By late 1967 ATA Report, ANTC No. 117, was issued.⁶

At that time, ATA asked FAA to use the CAS System description (specifically ANTC 117):

(a) To test by real time operational simulation the interaction of CAS and ATC to determine if operation of the CAS would adversely affect air traffic control.

(b) As a starting point for developing a National Standard for airborne Collision Avoidance Systems, including both civil and military aircraft.

(c) To begin efforts that would be needed to secure international standardization on a single, internationally accepted system for airborne CAS.

On December 14, 1967, as a result of progress made by the ATA CAS Technical Working Group, the Board of Directors of ATA approved a cost plus fixed fee contract with Martin-Marietta Company to evaluate prototype airborne CAS Systems to meet the ANTC 117 requirement. \$1.85 million of airline money and about an equal amount of manufacturers money was expended to provide for flight evaluation of Time-Frequency CAS hardware built by Bendix Avionics, McDonnell Douglas and a Sierra Research-Wilcox Electric team. During the Fall of 1969 the ATA sponsored and funded CAS flight test program accumulated 317.2 hours of flight during the Martin-Marietta flight test program. The final report⁷ to ATA concluded as follows:

(a) Time-Frequency CAS was effective in:

(i) Detecting the presence of an intruder.

(ii) Evaluating the collision hazard.

(iii) Selecting the appropriate mutually cooperative evasive maneuvers that achieve safe vertical separation before reaching the potential collision point.

(b) Satisfactory CAS performance was achieved by all manufacturers' equipment; intermixing did not influence accuracy.

(c) The Time-Frequency CAS technique was effective in implementing aircraft-aircraft interchange of accurate range, range rate and altitude data.

(d) The combined system tolerances displayed the CAS climb/dive commands within five seconds of the desired value 90 percent of the time and within ten seconds 100 percent of the time.

Footnotes at end of attachment 2.

(e) Signal multipath and externally generated interference did not prevent the satisfactory accomplishment of CAS data interchange in all the test conditions.

The ATA Board of Directors, in June 1970, noted with satisfaction the successful completion of the airline CAS flight test program and approved an ATA program which had as its objective, "obtaining FAA support for selecting Time Reference CAS as the U.S. National Standard and achieve its early implementation."

By July 1970 an Aeronautical Radio AEEC Characteristic, ARINC 587, for Time-Frequency CAS was approved and published. By June 1971, McDonnell Douglas began flight evaluation of its pre-production ARINC 587 airline CAS equipment, and airlines began making plans (in some airlines complete plans) for ARINC 587 airborne CAS provisions. On June 22, 1971, Piedmont Airlines and McDonnell Douglas Corporation announced that Piedmont Airlines had ordered the ARINC 587 CAS equipment to protect its fleet against midair collisions.^{8,9}

On July 12, 1971, Senate Bill S-2264 was introduced by Mr. Moss: "To amend section 601 of the Federal Aviation Act of 1958 to require the installation of Collision Avoidance and Pilot Warning Indicator Systems on certain aircraft and for other purposes."

On September 30, 1971 and again on October 12, 1971, the ATA forwarded to the FAA the ATA (Board of Directors) approved airline-recommended program for orderly introduction of CAS into routine flight operations. The key action items requested of FAA were to issue a Draft Advisory Circular stating affirmative views on the following important issues:

1. Endorse the Time-Frequency CAS as the best choice for all U.S. air-space users, and state the intent to work toward the development of a U.S. National Standard for both domestic and subsequent international application through ICAO, beginning with the 7th ANC.
2. Expedite and publish FAA NAFEC real time simulation effort and indicate if CAS could be used in the ATC environment and any expected limitations on its use (beyond those specified by ANTC 117).
3. State minimum operational requirements for CAS equipment in the ATC environment, particularly any changes to those specified by ANTC 117.
4. State the assumptions used by FAA as to method employed to initiate and propagate CAS master time.
5. State FAA intent with regard to an advance Notice of Proposed Rule Making which would require all users of certain airspace to be CAS-equipped by (approximately) 1978.
6. Advise the airlines of the procedure to be followed to obtain approval for operational use of CAS.

If I stopped at this point in recounting the history of airborne CAS development, you might expect that by now, seven years later, Time-Frequency CAS would be implemented in all airline aircraft and widely implemented in many other aircraft. We all know that this is far from what has happened. Without trying to point the finger at any organization or agency, I introduced my discussion of what happened in late 1969 and the early 1970's in airborne CAS by saying that "all hell broke loose." Several manufacturers, who by then recognized that CAS was going to be a potentially b-i-g market, turned their inventors loose and began to deluge the Congress, FAA and DOD with "better" airborne CAS Systems.

Two proposals for airborne CAS Systems that surfaced at that time were selected by FAA for further development. They were the RCA SECANT (System for the Separation and Control of Aircraft Using Nonsynchronous Techniques) invented by RCA's Jack Breckman, and the Minneapolis Honeywell AVOIDS (Avionic Observation of Intruder Danger Systems). Two Breckman/RCA papers¹⁰ and¹¹ were particularly devastating since Mr. Breckman claimed the Time-Frequency Collision Avoidance System "will not work—it will not prevent mid-air collisions, but will cause them." ATA testified before the Senate Commerce Subcommittee on Aviation in June 1971 on behalf of the Time-Frequency System, and in June 1971 petitioned the FCC (RM-1801) to allow regular licensing of Time-Frequency airborne CAS.

In early August 1971, the House Committee on Government Operations, Government Activities Subcommittee, held a hearing on Aircraft Collision Avoidance Systems. ATA, Bendix, McDonnell-Douglas and Wilcox Electric all testified that the Time-Frequency System had been fully developed, flight tested and was ready to be implemented providing the government would declare it the selected U.S. system. Minneapolis-Honeywell (Mr. Ronald E. Ericson) testified jointly with Mr. Follen and stated that, "FAA should look at other systems than Time-Frequency." RCA testified on behalf of its SECANT system proposal. FAA

testified in favor of a more thorough investigation of the various systems that were being proposed.

The debate was carried to the Senate Aviation Subcommittee hearings in the Fall of 1971 at which time most of those organizations and agencies testified in favor of making CAS mandatory; however, the SECANT, AVOIDS, and Time-Frequency System proponents each testified on behalf of their own concept. The FAA Deputy Administrator testified that there was insufficient information available at the time to permit selection of a specific CAS for national implementation.

By January 1972, FAA announced an "overall investigation of airborne CAS with responsibilities assigned to its Office of Systems Engineering Management." An interdepartmental Group on Collision Avoidance involving FAA, DOD and NASA was formed to promote interagency cooperation on collision avoidance and encourage joint ventures among those agencies.

In July 1972, FAA transferred funds to the Navy which, at its NADC Johnsville, let a contract with RCA to purchase RCA SECANT equipment for test and evaluation. FAA signed a contract with McDonnell Douglas in October 1972 to determine the number of Time-Frequency ground stations that would be required to provide for coverage of the U.S. In November 1972, FAA signed an interagency agreement with Navy NADC Johnsville for the procurement and flight test of the Minneapolis-Honeywell AVOIDS equipment. In late January 1973, NADC had contracted with Minneapolis-Honeywell for the purchase of the AVOIDS equipment.

United States documentation, in 1972¹² to the Seventh ICAO Air Navigation Conference, described the Time-Frequency, SECANT and AVOIDS CAS Systems, and indicated the availability of information on the FAA NAFEC first-phase evaluation of ATC/CAS System interaction in terminal areas.¹³ These studies were conducted using real time simulation.

Since the relating of airborne Collision Avoidance System development that is provided herein is chronological, it is important at this time for me to digress from reporting airborne system development to note that in early 1973 a milestone was passed when FAA began evaluation of "conflict alert" at its Jacksonville Air Route Traffic Control Center. Conflict alert provides high altitude sector ATC controllers with computer-generated advance warning of potential imminent conflicts. That was the first automated backup of the separation which is expected to be provided by human controllers. Conflict alert uses the ATC Radar Beacon System data and a programming improvement to the NAS Stage A ARTCC computer. An FAA report (EM 73-7 March 1973) outlined the FAA E&D Program plans for ground-based separation assurance. Thus, it was at that time that improvement was first offered in the direction of using the automated ground ATC System as a means of detecting pilot or controller errors which would reduce separation standards below those desired.

Returning to airborne CAS System development, by November 1973 the FAA NAFEC had published its report¹³ which investigated the impact on the Air Traffic Control System of the threat logic set forth by ATA Paper ANTC 117. The "landing mode" version of the ANTC 117 threat logic was evaluated.

At the RTCA Fall Assembly, Congressman Barry Goldwater, Jr.¹⁴ criticized FAA for its apparent opposition to an independent airborne CAS. In February 1974, FAA recommended^{15 16} to the Senate that it not take steps to make airborne CAS Systems mandatory, and indicated that by no sooner than 1975 it would decide on National Standards for airborne CAS Systems. The General Accounting Office (GAO) in November 1974^{17 18} stated that FAA was placing too much emphasis on ground control whereas virtually all recent midair collisions (other than airline and high-performance aircraft) have occurred when air traffic control had only one or neither aircraft under control. The GAO report urged FAA to expedite its evaluation program of airborne Collision Avoidance Systems.

In mid-1974, a progress report was made¹⁹ on the Minneapolis-Honeywell AVOIDS System which had been delivered to NADC for flight evaluation. By late 1975, Minneapolis-Honeywell announced its AVOIDS airborne CAS was "ready for use,"²⁰ and RCA announced it was dropping its SECANT airborne CAS System.²¹

In early 1975, FAA's Office of Systems Engineering Management requested Mitre to begin development of an airborne CAS using the ATRCBS beacon as the cooperative element. Mitre began flight tests of the system, called BCAS (Beacon-based CAS) in mid-1975 and by October 1975 rather encouraging results were obtained.^{22 23} The BCAS system was initially proposed in 1970 by G. Litchford.²⁶

Footnotes at end of attachment 2.

The attractiveness of the BCAS concept was that it would create an expenditure only for aircraft which desired to protect itself from all other aircraft that are altitude transponder equipped. To be successful BCAS must not impact ATCRBS performance, and it must perform adequately in spite of the fact that replies from many aircraft will be received simultaneously, causing synchronous garble. The Mitre BCAS concept was quite clever, it called for an interrogation rate of only two per second. The Mitre analysis,²³ (Section 4) indicates that even with substantial implementation of BCAS it would have a very small impact on the use of ATCRBS for ATC purposes.

Because the Mitre BCAS uses an omnidirectional antenna for transmitting the Mode C interrogations and receiving the replies, aircraft within 1.6 nautical miles of each other will have their replies overlapped. The Mitre analysis showed that by 1985 in the Los Angeles basin there would regularly be 3-4 targets overlapping with a possibility of as many as 40 overlapping targets. To reduce the number of overlaps, Mitre developed the "whisper/shout" technique. Whisper/shout uses the fact that the receiver sensitivity of different transponders varies as does the antenna patterns. BCAS interrogations are transmitted at various power levels followed by a set of suppression pluses (P_1 and P_2) at the same power level which suppresses the transponders that have just replied so that a new interrogation at a higher power level will elicit replies from another group. The process is repeated, dividing the aircraft into multiple reply groups. Testing has shown that the whisper/shout technique is effective in dividing the responses into about four groups.

Thus far we have traced the development of three airborne Collision Avoidance Systems that require special, dedicated, cooperative airborne equipment installations to make them function. These are the McDonnell-Douglas Time Frequency System (which was endorsed and further developed by the ATA and its CAS Technical Working Group working in conjunction with a number of manufacturers), the RCA SECANT System and the Minneapolis-Honeywell AVOIDS System. One other matter remains to be reported regarding these systems—that of the approximate cost to the users for implementing these three versions of A/CAS. These costs have been developed in various ways as reported by ARINC Research²⁴ and FAA.²⁵ The ACAS avionics equipment life cycle costs (which include electronics, installation, non-recurring costs and maintenance costs) vary from \$633 million to \$862 million, depending on which of the three systems might be selected. FAA announced at its Consultative Planning Conference on Aircraft Separation Assurance,²⁵ that the best of the three systems (in my view, primarily a cost-oriented decision) was the Minneapolis-Honeywell. FAA also stated at that Conference that since the Minneapolis-Honeywell System would require mandatory installation of cooperating equipment in all aircraft at a cost of \$719 million, it was by no means as attractive as BCAS. Recall again, the attractiveness of BCAS is that it would utilize as the cooperating airborne system the more than 100,000 ATCRBS transponders already installed in civil aircraft, including the more than 35,000 with Mode C altitude reporting, which is necessary to make BCAS function properly.

A so-called passive form of BCAS also has received considerable attention and development effort. Beginning in the early to mid-1970's, its inventor has described,²⁶ and others have analyzed,²⁷ various forms of an airborne Collision Avoidance System which allow the determination of an intruder's location by listening on the two radar beacon frequencies of 1030 and 1090 MHz. This passive BCAS approach requires a change to the standard ATCRBS interrogation sequence in order to communicate the azimuth of the interrogator to the passive BCAS-equipped aircraft. Presently the concept calls for such azimuth marks at the eight points of the compass. The passive BCAS must identify and track the PRF of each interrogator and each responding transponder replying to its interrogation. This form of passive BCAS must also measure the time of arrival of each interrogator signal and the differential time of arrival (time intruder's reply was received and the time at which the BCAS-equipped aircraft would have heard the interrogation that elicited the reply). Passive BCAS must also compute differential azimuth—which is the angle measured at the radar site from BCAS-equipped aircraft to the intruder. With two optimally located interrogator sites it is theoretically possible to gather sufficient information to make passive BCAS function; however, experimental versions of the concept developed by the contractor generally have required more than two ground sites. When such ground sites are not present, the passive BCAS must become active, interrogate other aircraft, and must accept and solve the same problems of any other active BCAS. Passive BCAS computes intruder position using the data just identified plus decoding of altitude and identity. Thereafter, some threat detection logic, such as Tau, would be employed and an avoiding maneuver command generated when appropriate.

Passive and active BCAS, both of which depend only on the present altitude reporting ATRCBS transponder, have absolutely no way of assuring that the escape (avoiding) maneuvers are complementary unless some air-to-air communication link is added. With passive or active BCAS, the ATRCBS altitude reporting equipped aircraft is sensed—if it is deemed to be a threat, a collision avoidance maneuver is displayed to the pilot. It would then become incumbent on the BCAS-equipped aircraft to avoid the other aircraft. It is obvious that this may not be either practicable or feasible in some or perhaps many instances; for example, in those instances when the BCAS-equipped aircraft does not have the capability of out-maneuvering the ATRCBS equipped aircraft, which may be already maneuvering. If both aircraft are similarly equipped with BCAS, both will be calculating an escape maneuver. It then becomes a key element in system design to ensure that these avoiding maneuvers are complementary rather than conflicting, e.g. one climb, one dive is complementary; both climb is conflicting.

To provide the proper coordination to assure complementary maneuvers, an air-to-air data link is necessary. Since this coordination occurs after a threat has been detected and the time available to provide safe separation is very short (typically 25 to 40 seconds), the integrity of the air-to-air link is extremely important. There are a number of ways of providing the air-to-air link. Attempts have been made to use the ATRCBS signal format and several of the currently unused bits of the ATRCBS reply (e.g. "X" bits of the Mode A and C replies). These proposals, and others, short of using an addressed link such as DABS, have been studied and reported on by FAA.²⁸ Since two messages must get through, the address and the intent, the probability of successful communications for traffic densities approaching today's busy airports is low, and the probability of making an error by receiving the correct address and a false message is substantial—greater than 10 percent of the time. Flight tests reported by MIT's Lincoln Laboratory show that a DABS format air-to-air link performs adequately.³⁴

For the reasons already set forth, it has been the airline view for well over a year that for any BCAS to be successful it must include both active interrogation and DABS capability. As of this date, most airlines believe that need for or desirability of adding any form of passive capability to BCAS remains an item that requires further development and study to permit agreed, well-informed decisions to be made.

An Airlines Electronics Engineering Committee (AEEC) sponsored Seminar on Beacon Based Separation Assurance was held as a part of the AEEC Meeting in Munich, Germany on September 3, 1976. Seven excellent papers were presented at that Seminar.²⁹ A review of those papers should convince even the most skeptical that a lot was known about active BCAS and its related DABS air-to-air link at that time over two years ago.

The problems of the passive BCAS that were generated by its need for several ground sites and the synchronous garble problems of the active BCAS, particularly in high-density areas, led to the development of a single site (SSBCAS). It is designed to provide protection to the BCAS-equipped aircraft in the presence of only one ground site. The single site BCAS requires the installation of a modified DABS transponder at each ground-based surveillance sensor. The transponder communicates with the BCAS aircraft which is equipped to use the SSBCAS. The merit of SSBCAS is that it would permit single site operation beginning with ATRCBS transponders and continuing through full implementation of DABS. Please read Reference³⁰ for a detailed description of this concept.

In late 1977 FAA set up a BCAS design team led by Dr. Edward Koenke of OSEM to:

- (a) Formulate and document a BCAS concept that would work in all airspace and all traffic environments.
- (b) Provide some level of protection for a wide variety of users.
- (c) Minimize interference with the ground/ATC surveillance and Air Traffic Control Systems.
- (d) Develop an engineering requirement which defines the performance specifications for the BCAS concept.
- (e) Provide a realistic work statement to fully support the concept and the engineering requirement.

The FAA report that documents the first three items has recently been made available and is in several parts, the Executive Summary (Part I)³¹ and the Concept Description (Part II).³² The third volume of the concept description provides the thirteen appendices and is now being printed.

The FAA BCAS design team concluded that to obtain acceptable performance of the aircraft separation assurance function in all airspace, done totally in an airborne unit, is a very complex task. A directional antenna is required in the aircraft. A family of solutions is required including active, single, and multiple site passive. The envisioned system is expected to provide measurement accuracies that are at least the equivalent to (in many cases better than) those provided by the FAA's Automated Traffic Advisory and Resolution Service (ATARS) System—based on the capability of ATARS at a 50 nautical mile range. This multi-function solution has been appropriately called FULL BCAS. The FAA BCAS design team^{31 32} recommends that its BCAS be interfaced with the ATC System, even beginning with the ATCRBS environment. This would provide some control of the BCAS by the ground-based ATC System in the era before ATARS is provided by FAA. The analysis by the FAA BCAS design teams shows³¹ (Table 1) that FULL BCAS would have prevented 13 of the 15 midair collisions involving air carrier aircraft in the 1964-1972 time period. The two that the FAA BCAS design team estimates would not have been prevented are those that occurred over Mt. Carmel, New York and at Harlingen, Texas. The omni-directional active BCAS, FAA estimated, would have been effective for about 60% of the same collisions (9 of the 15). The FAA report also states that active BCAS performance becomes worse as traffic levels increase. For example, by 1995 it could only have been expected to prevent about 40 percent of the collisions.

One of the most important aspects of any separation assurance system, whether ground-derived, such as the FAA ATARS, or airborne, such as ACAS or the many versions of BCAS, is the threat logic. After a Collision Avoidance System gathers the data on appropriate aircraft it processes the data to determine if certain separation criteria are about to be violated. This processing takes place sufficiently in advance of the time of predicted nearest approach such that an avoiding maneuver can be displayed, the pilot will react, and the aircraft will maneuver in time to provide the desired separation. The most extensively developed, evaluated, and described airborne CAS threat logic is that of ATA Report ANTC 117.⁶

A computer simulation of the ANTC threat logic was undertaken³³ by McDonnell-Douglas in March of 1970. A total of 13,167 two-aircraft collision encounters were simulated using computer modeling. The report shows that for all level flight encounters, turning and non-turning, as well as climbing and diving encounters with rates up to 5000 FPM per aircraft, the separation provided by the ANTC 117 threat logic was satisfactory. Simulated pilot actions, control initiation, and execution of the maneuvers in normal and worst case flight operations were all simulated. These various conditions were loaded into the computer; the computer than "flew" the aircraft, modeled the communication, performed the evaluation as specified for the CAS equipment, modeled pilot action and reaction, and controlled the escape maneuvers of the aircraft. Appropriate print-outs provide a record of the final separation of the aircraft. Work to improve the ANTC 117 threat logic began in early 1975 and has been reported in a number of papers^{35 36 37 38} in work accomplished by the Institute for Defense Analysis and Mitre (METREK Division). The present work by Mitre on improving the threat logic includes uses of ARTS data tapes which provide track data on aircraft operating at typical low-, medium- and high-density areas. Mitre uses these data tapes to exercise its threat logic and determine how many alerts and maneuver commands would be generated by various versions of the threat logic. For example, recent Mitre data³⁹ shows that varying the Tau value between 25 seconds and 40 seconds changes the average number of alarms (pairs of aircraft) from about 5 per hour to 15 per hour at Washington National Airport with today's traffic—an average of 47 tracks per scan and 13 percent of the traffic VFR. Obviously much work remains to be accomplished.

Significant work on the interaction of the ANTC 117 threat logic with the ATC System has been accomplished by FAA NAFEC using its dynamic, real time simulation, and fast time computer simulation. This program, under the guidance of Gordon Jolitz, began in 1970 and has been reported in several papers.^{40 41 42 43 44} One of the most important findings in these papers is that "Observation of and conversation with the controller team leads to the convincing conclusion that they, the controllers, made subtle adjustments to the techniques used in handling the arrival flow when the CAS was present in some or all of the flights."

It was also reported that under existing ATC procedures for the control of traffic during IFR conditions, virtually no ATC/CAS interaction would be found under conditions similar to those simulated by the FAA NAFEC real time simulation. What I conclude from such reports by a most competent and qualified FAA

researcher is that we must continue to refine and evaluate by all possible means, including real time dynamic simulation as well as fast time computer simulation, any necessary improvements to the BCAS threat logic so that acceptable logic that will have a minimum reaction with the ATC System can be developed in time for its use in an acceptable BCAS.

SUMMARY

Having traced the development of airborne Collision Avoidance Systems from a gleam in the airlines' eye in the mid-1950's to a complex system which is still being developed, it is my view that it is safe to say that airborne CAS has a good future. We must continually bear in mind that airborne CAS is a backup for a backup to the ATC System. The automated ground environment is the first level backup to the humans, both pilots and controllers. Currently this is provided at most altitudes by conflict alert in both enroute ATC Centers and most terminal areas equipped with ARTS III Systems. Later the DABS will provide the ability to add ATARS, which will both detect and resolve conflicts. To the degree that may be necessary, a BCAS is intended to backup that automated ground environment when it might fail or in areas of the airspace where the automated environment does not exist—in fact may never exist.

Since I have been involved in the development of airborne collision avoidance from its inception, perhaps I am in the worst position to judge fairly whether it will ever see use. On the other hand, having followed each turn in the road, and in fact plowed a few of the roads toward progress myself, I have a good sense of where we are and how far we are from a suitable solution. The very recent, most unfortunate, accident at San Diego should only serve to spur all of us to seek an early solution to the "backup to the backup" problem—which obviously has to be solved.

In my discussion today I have tried to cover those instances and events I believe to be significant. In such an involved subject I have undoubtedly missed some, but please forgive me—it was unintentional.

I am always thankful for RTCA as a forum to present problems, discuss alternative solutions, and put the agreed solutions on paper. Frankly, I think the day is close at hand when RTCA will begin to write its Minimum Operational Performance Standard (MOPS) for a suitable BCAS. May the Dear Lord give us the wisdom to accomplish the task both promptly and correctly.

FOOTNOTES

¹ White, Frank C.—Is an Airborne System for Collision Avoidance Operationally and Technically Feasible? RTCA Paper 127-57/AS-183, Joint IRE/RTCA Symposium, Los Angeles, May 7-9, 1957 IRE Trans., ANE Vol. 4, No. 2, June 1957.

² Collins Radio Company—Airborne Proximity Indicator PI-101: Descriptive Specification CDS-311, September 28, 1956.

³ American Aviation Daily—Collins Drops Current PWI/CAS, Cancels Airline Orders, Vol. 106, No. 6, p. 41, Jan. 9, 1957.

⁴ Morrel, J. S.—The Use of Self-contained Range and Azimuth Measuring Apparatus to Detect Collision Courses—ION Journal; Vol. 11, No. 3, July 1958.

⁵ Morrel, J. S.—Fundamental Physics of the Aircraft Collision Problem, Bendix Aviation Corp., Technical Memorandum 465-1016-39, June 1, 1956.

⁶ Air Transport Association of America, Air Navigation/Traffic Control Division (ANTC) Report No. 117, Revision 2, September 29, 1967, (Att. 3 to Summary Report, Tenth Meeting ATA CAS Technical Working Group).

⁷ Martin-Marietta—Baltimore Division Final Report: Flight Test and Evaluation of Airborne Collision Avoidance System, Vol. 1, April 1970.

⁸ McDonnell-Douglas—Press Release 71-103 dated June 22, 1971.

⁹ Washington Evening Star—Piedmont is First to Sign for Safety System for Pilots (Charles Yarbrough), June 22, 1971.

¹⁰ Breckman, Jack—Avoiding Mid-Air Collisions: A Catechism of Truth or Consequences, Paper before the student chapter of IEEE at Lehigh University, October 16, 1969 by RCA Engineer, 40p.

¹¹ Breckman, Jack—To See Or Not To See, Testimony before the National Transportation Safety Board's Hearing on Mid-Air Collisions in Washington, D.C., November 6, 1969, 7p.

¹² Federal Aviation Administration, Interagency Group on International Aviation, Seventh (ICAO) Air Navigation Conference—Draft Advance Documentation (Summary Papers) for Agenda Item 7 (Systems for Collision Avoidance) for the Meeting in Montreal, 5-29 April, 1972, ICAO 72/1.135, March 20, 1972.

¹³ Jolitz, G.—Air Traffic Control/Collision Avoidance System Interface Simulation-Phase II, FAA, National Aviation Facilities Experimental Center, Project No. 052-241-050, Report RD73-140 (NA-73-400), November 1973, 193 p., AD 771 185, N74-12361.

¹⁴ Goldwater, B. M., Jr.—Criticism of FAA Handling of Collision Avoidance Systems, In: Upgrading the ATC System; Proceedings of the Annual Meeting, Washington, D.C., Radio Technical Commission for Aeronautics, 1973, 6 p.

¹⁵ Klass, Philip J.—Anti-Collision Systems Report Readied, Aviation Week & Space Technology, Vol. 100, No. 6, p. 38-41, February 11, 1974.

¹⁶ Electronics—FAA's Decision on Airborne CAS Delayed Till 1975, Vol. 47, No. 3, p. 59, February 7, 1974.

- ¹⁷ Aviation Daily—GAO Calls for Better System to Prevent Midair Collisions, Vol. 216, Nol 6, p. 46, November 8, 1974.
- ¹⁸ U.S. General Accounting Office, Comptroller General of the United States—Aircraft Midair Collisions: A Continuing Problem—Report to Congress, B-164497(1), October 23, 1974 36 p.
- ¹⁹ Dexter, R. G.—AVOID-I Collision Avoidance System (M), Honeywell, Inc., Contract DOT FA73-WAI-358, 1974, 185p. AD/A-002 492, N75-33019.
- ²⁰ Aviation Daily—Honeywell Says Its Collision Avoidance System Ready for Airline Use, p. 237, December 15, 1975.
- ²¹ Electronic News—RCA Drops Anti-collision System Work, Vol. 20, p. 1+, December 22, 1975.
- ²² Ebert, Paul M.—Beacon Collision Avoidance System (B-CAS), Test Plan, Mitre Corporation Contract DOT-FA70WA-2448, Project No. 052-241-100, Technical Report MTR-7092, November 1975, 38 p.
- ²³ Federal Aviation Administration Report—An Active Beacon-Based Collision Avoidance System Concept (BCAS), FAA Report FAA EM-75-7 MTR-7036.
- ²⁴ Kowalski, Stanley; Haspert, J. K. and Witt, James—Cost Analysis of Airborne Collision Avoidance System (CAS) Concepts, ARINC Research Report FAA EM76-1.
- ²⁵ Federal Aviation Administration Associate Administrator for Air Traffic and Airway Facilities—Consultative Planning Conference on Aircraft Separation Assurance: Presentations, FAA Report ATF 4-76-1 September 27, 1976, 154 p., AD-A032 354, N77-22066.
- ²⁶ Litchford, G.—Avoiding Mid-Air Collisions, IEEE Spectrum September 1975.
- ²⁷ Bagnall, James J., Jr. and Kay, Irvin W.—A Review and Analysis of the Litchford Beacon Collision Avoidance System, Institute for Defense Analysis, Contract DOT-FA74WA-3498, Report FAA-RD 77-1 (S478) October 1976, 222 p.
- ²⁸ Koenke, E. J.; Ebert, P. M.; Harman, W. H.; Spencer, N. A.; and Weinberg, A.—A Preliminary Evaluation of the ATCRBS Signal Format for the BCAS Data Link, Federal Aviation Administration, Office of Systems Engineering Management, FAA Report EM 77-9, August 31, 1977 38p.
- ²⁹ Sheftel, David J., Federal Aviation Administration—FAA Views and Plans on Separation Assurance DABS/IPC/BCAS. Drouilhet, Paul R., Massachusetts Institute of Technology, Lincoln Laboratory—DABS/IPC Development Progress. Langley, John V., National Air Traffic Services, U.K. Civil Aviation Authority—ADSEL in the United Kingdom—Plans and Progress. Pozesky, Martin T., Federal Aviation Administration—BCAS—What is Being Done, Tradeoffs Between Active and Passive, Results of Flight Tests. Fink, Harold H., Air Transport Association of America Communications Committee—Airline Industry View of BCAS. Engholm, Kenneth J., Collins Radio Group, Rockwell International—An Outline of Problems to be Solved to Achieve an Acceptable BCAS. Shear, Wayne G. Bendix Avionics Division—Avionics for BCAS. Above Presentations appearing in AEEC Letter N76-106/AXX-00, October 11, 1976.
- ³⁰ Schuchman, L. and Orr, R.—The Single-Site Collision Avoidance System (SS-CAS), Stanford Telecommunications, Inc. DOT Contract F04701-75-C-0239, FAA Report EM 77-8, September 16, 1977 149p.
- ³¹ Koenke, E. J., et al.—FAA BCAS Concept—Executive Summary, Federal Aviation Administration Office of Systems Engineering Management, FAA Report EM-78-5 I, April 1978.
- ³² Koenke, E. J., et al.—FAA BCAS Concept—Concept Description, Federal Aviation Administration Office of Systems Engineering Management, FAA Report EM-78-5 II, April 1978.
- ³³ Watson, Fred; Lazzareschi, C. R.; and Wedlake, W. E.—Evaluation of Threat Logic for the Air Transport Association Airborne Collision Avoidance Systems (ANTC 117), McDonnell Douglas Astronautics Company, Report MDC E0116, March 13, 1970.
- ³⁴ Paradis, A. R.—L-Band Air-to-Air Multipath Measurements, Massachusetts Institute of Technology, Lincoln Laboratory, Contract DOT-FA77WAI-727, FAA Report RD 77-87 (ATC-77), September 6, 1977, 100p.
- ³⁵ Bagnall, James J., Jr. and Kay, Irvin W.—Review and Analysis of Some Collision Avoidance Algorithms with Particular Reference to ANTC 117, Institute for Defense Analyses, Contract DOT-FA74WA-3498 Study S-450, FAA Report RD 75-72, June 1965 175p. AD-A021 635 N76-23233.
- ³⁶ Bagnall, James J., Jr. and Kay, Irvin W.—A Review and Analysis of the RCA Collision Avoidance System—Phase II, Institute for Defense Analyses Contract DOT-FA74WA-3498 Study S-462, FAA Report RD 75-152, October 1975 108p. AD-A012 672 N76-23244.
- ³⁷ Clark, J. and McFarland, A.—Initial Collision Avoidance Algorithms for Beacon-based Collision Avoidance System, Mitre Corporation, Contract DOT-FA69NS-162, FAA Report RD 77-163 (MTR-7532), April 1988 99p.
- ³⁸ Clark, James S.—Active Beacon Collision Avoidance System Computer Algorithms—ATCRBS Mode, Mitre Corporation, Contract DOT-FA70WA-2448 Technical Report MTR-7280, August 1976 63p.
- ³⁹ Broste, N. A. and Patterson, D. C.—Progress Report on the Performance of Active BCAS Threat Logic, Mitre/METREK Division, September 26, 1978.
- ⁴⁰ Jolitz, Gordon—Status of the ATC/CAS Simulation Program, Paper presented at the 32nd Meeting of the Collision Prevention Advisory Group (COPAG), Washington, D.C., November 19, 1968 12p.
- ⁴¹ Jolitz, Gordon—Simulation and Analysis of ATC/CAS System Design, Paper presented at the Program Review, Test and Evaluation Activities at NAFEC, May 14-15, 1970, 7p.
- ⁴² Jolitz, Gordon—ATC/CAS Interface Simulation—Exploratory Phase, FAA, National Aviation Facilities Experimental Center, Report No. RD 72-10 (NA 72-8), Project No. 052-241-03X, March 1972, 183p.
- ⁴³ Jolitz, Gordon—Air Traffic Control/Collision Avoidance System Interface Simulation—Phase II, FAA, National Aviation Facilities Experimental Center, Project No. 052-241-050, Report RD73-140 (NA-73-400), November 1973 193p., AD 771 185, N74-12361.
- ⁴⁴ Jolitz, Gordon—ATC/Airborne CAS Compatibility—An Analysis of Field-Derived Data, FAA, NAFEC, Project No. 052-241-030, Report RD 75-228 (NA 76-14) June 1976, 70p. AD-A026 070, N76-30188.

The CHAIRMAN. Thank you very much, Mr. Jensen.

Does the ATA support an increase in the number of terminal control areas and terminal radar service areas?

Mr. JENSEN. Yes, sir. We have advocated more TCA's when they were first brought into being, and we've also thought there should be what are considered group 1 TCA's, not the so-called group 2 and 3 TCA's.

The CHAIRMAN. The contention has been made that the carriers either penalize pilots for using excess fuel or reward them for saving fuel, in either case creating incentives for the pilots to use VFR approaches wherever possible. Is there any truth to that contention, as far as you know?

Mr. JENSEN. I know of no penalty ever given any pilot, airline pilot, with regard to fuel usage. Certainly—and I think it is correctly done—airline pilots are encouraged to save fuel, as airlines are encouraged to save fuel, but never at the expense of safety.

Now, in terms of taking a visual approach, what we would prefer to have, Mr. Chairman, is a system whereby you don't have to make a full instrument approach procedure when the weather is good and you don't have to go through all of that, therefore, save the fuel in doing it. But we want to have the protection of the separation service continue when that's done.

The CHAIRMAN. Has ATA examined in detail the contention that if DAVS is turned on around the United States, it would have the effect of unintentionally shutting off or interfering with the air traffic control system?

Mr. JENSEN. We have examined that system, and we don't think it's so.

The CHAIRMAN. Congressman Anderson?

Mr. ANDERSON. No questions.

The CHAIRMAN. Mr. Ertel?

Mr. ERTEL. No questions, Mr. Chairman.

The CHAIRMAN. Thank you very much, Mr. Jensen. We appreciate you being here and giving us the benefit of your association's feeling.

Next, Domenic Torchia, regional vice president of the western region of PATCO.

STATEMENT OF DOMENIC TORCHIA, REGIONAL VICE PRESIDENT, PROFESSIONAL AIR TRAFFIC CONTROLLERS ORGANIZATION; ACCOMPANIED BY NORM BELSTERLING, FACILITY PRESIDENT OF PATCO LOCAL AT LINDBERGH TOWER; AND BILL BARRY, PRESIDENT OF PATCO LOCAL AT MIRAMAR APPROACH CONTROL

Mr. TORCHIA. Good afternoon. I'm Domenic Torchia. My position was stated, to save time. I brought with me today Norm Belsterling, facility president of PATCO local at Lindbergh Tower, and Bill Barry, president of PATCO local at Miramar approach control. In the interest of brevity, I think we've heard enough prepared statements that we've had in front of us today; so I would like if it's OK with you to waive the reading of this. I believe everybody has my statement.

The CHAIRMAN. I've read your statement and I'm sure that my colleagues have. If you'd just summarize from it, that would be fine.

Mr. TORCHIA. Okay. Fine. What my main concern is right now is all the talk I've been hearing lately about increasing the responsibility of air traffic controllers, increasing positive control areas, et cetera; and then I heard the ridiculous statement from the Administrator that instead of taking an aggressive stance in response to the questions about the staffing problems in the system, which would be compounded by these additional safety measures and positive control measures, by the way of which this system could not handle anymore right now due to the shortage of air traffic controllers—that instead of saying that he would look into the fact that there is a shortage of controllers, he said he was going to look into the fact that there might be an overescalation of the actual numbers of air traffic controllers as set forth by the FAA. I think you'll find that if he did that, he'd run across, let's say, the Seattle Center, where the FAA has continually kept the number of recommended journeymen air traffic controllers at a low level; and he would probably find a figure like that in several other places, where the recommended staffing is far below even what it should be. Contrary to what he thinks, staffing levels at the Los Angeles and Oakland Centers would probably be below the figures it should be at also.

As far as staffing goes right now at the Los Angeles Air Route Traffic Control Center, which handles approximately 1,250,000 operations a year, IFR operations—that doesn't include VFR, general aviation advisories—there are authorized 351 journeyman air traffic controllers. They now have on shift work 195. Now, the FAA could pad that another 120 or so, and taking secretaries and clerks and everyone else and calling them air traffic controllers, which they would do to save face.

In Oakland center, where we have over a million IFR operations and probably another hundred thousand general aviation advisories, which is the responsibility of the air traffic controller also, is allocated by the FAA 333 GS-13 journeymen control slots. Right now the total staffing in the air traffic control division is 205. The number of controllers actually working shifts is 188. They're almost down to 50 percent.

Mr. Bond also inferred that it would be very easy to supply this committee with overtime figures for the FAA, of which several controllers work 6-day weeks. And we heard about the controller that was working local control at Lindbergh had worked 11 out of 12 days because he had to work overtime. That goes along with the increase of 19 percent, as the FAA has come out in the press in the past couple of days—the increase in 19 percent in the amount of traffic in the United States handled by the ATC system. Yet they have only requested an increase of less than 2 percent in the number of controllers, new controllers that they hire, when they went before Congress this year.

After some prodding they—I'm not sure of how this works. I should temper this a little bit. There was 350 controllers, and that was pushed very hard by PATCO. That was the top figure that we figured we could get the FAA to ask for in Congress, and I understand they got 350 new controllers. But for 350 controllers, what will actually filter into the system will probably be less than 75. The current washout rate in the State of California, the Western Region actually, which covers Arizona, Nevada, and California, at the Academy alone, which

is at the very initial state of traffic control training, was 58 percent in a class that was 2 months ago and 47 percent, I believe it was, in the last class that came out of Oklahoma City, that washed out. When they go to the facility, rest assured that probably half of what's left, which is a quarter of those that were hired, will make it through. It's a very difficult job to learn.

And when we sit back there day to day and listen to the people talk about the system that the pilots and the controllers make work, it more or less solidifies our thoughts that maybe only pilots and controllers know how the system does work. That's a statement that air traffic controllers become more and more aware of, is the idea that we talk about TCA's and their benefits and we relate that to the way that it might have prevented the aircraft accident in San Diego. Well, the terminal control area would not have prevented the accident in San Diego. Everything would have happened just the same.

The one thing we needed was Alpha-nums in the tower, and that's primarily because if the controller had time from his other duties, he might have told PSA 182, "Traffic at 12 o'clock, 1 mile, same direction"—that's what he did say. What he might have added to that is "Out of 2,100" or "out of 2,300 feet, climbing VFR." Now, if he had said that to PSA—and PSA has the finest airline pilots in the industry—the pilot would have taken maybe that extra split second maybe to scan some more. That's the only thing that could have helped. A TCA could not have helped the situation.

That's why we strongly encourage the use of the Alphanumeric system when related to the BRITE displays. They would be the only thing that might have helped in that situation.

As far as, skipping back here, rest periods—we'll skip around.

The CHAIRMAN. Wouldn't there have been a BRITE display in the tower, if that was a TCA?

Mr. TORCHIA. No. A TCA will not show Alphanumerics. A terminal control area is nothing but an upside down wedding cake or maybe some sort of geometric figure that emanates from the surface to a certain altitude that is drawn on charts, and pilots refer to geographic figures in their navigation. And they are either cleared through it or you keep them out of it if they haven't requested clearance through.

The Alphanumerics is a piece of equipment that is put in the control tower or the radar facilities, the centers, and the terminals, and one does not mandate the other. One does not necessitate having the other. The TCA and an Alphanumeric system is not related.

The CHAIRMAN. Well, that wasn't the answer we heard from the FAA.

Mr. TORCHIA. OK. The FAA might have stated if they put in a Stage 1 TCA, that they will have Alphanumerics in the tower. Is that what they stated?

The CHAIRMAN. I don't believe they specified it had to be a Stage 1.

Mr. TORCHIA. Category 1. I think it was called "Stage 1." Whatever they used.

The CHAIRMAN. The FAA did say that you would have the transponder and the decoder and from that you would be able to determine the location of the aircraft.

Mr. TORCHIA. OK. To fly a through a Category 1 TCA, you need an encoding transponder, all right? But there's nothing I've ever seen in the regulations that to fly through a Stage 1 TCA you need Alphanumerics in the control tower. I know there is an Alphanumeric system in the center, so, in other words—

The CHAIRMAN. Well, according to the FAA, they go hand in hand.

Mr. TORCHIA. Well, it just works out that way, because it is like at Chicago, San Francisco, Los Angeles. And those are the places where they've concentrated the bulk of the money, and the money is what brought the equipment. It's not the TCA that brought the equipment. It's the actual money that brought the equipment. It's what came first, the chicken or the egg? So, they had the Alphanumerics and, then, came the TCA, or vice-versa. In my facility where I worked for 5½ years, they had the TCA, then the Alphanumerics.

Mr. BARCLAY. Isn't it purposeless to require a transponder and encoding altimeter if you don't have Alphanumerics?

Mr. TORCHIA. Well, see, most of the major terminal facilities do have Alphanumeric facilities now. The towers are what don't have it. The enroute facilities, all the facilities, have the RDP-type equipment, radar data processing.

The CHAIRMAN. All right. Go ahead.

Mr. TORCHIA. The statement on rest periods, I think it speaks for itself. The FAA has completely ignored this. There were several instances that I can recall where controllers were working 6 days a week for as long as they could live with no regard to their welfare. There are five controllers right now in my region, which I'm completely at odds with the FAA over. They are psychologically disqualified by two or three physicians, which the FAA fails to recognize; and we don't want psychologically disturbed controllers working traffic. The FAA has continually overlooked the welfare of the controller, and they place little or no emphasis on the health of the controller. They allow us to work 40, 48 hours a week; and now the Administrator is talking of staffing less—

The CHAIRMAN. Now, I interpreted him to say that he would take a look at whether their projected staffing requirements were too high. I got the impression that he thought their own projections were too high due to the upgrade of the equipment that's now available, the state of the art.

Mr. TORCHIA. All right.

The CHAIRMAN. That was the impression that I got. Maybe I was wrong.

Mr. TORCHIA. We appreciate all the money that the Congress and the Senate of the United States have given to the air traffic controller for this upgraded, automated equipment; but I want you to know that the equipment has not alleviated the workload of the air traffic controller. It just has redirected it from oral communication between facilities to manual communications between facilities. In other words, it still makes it necessary if you're flying across the country say in "United 53," to roll the ball around, make a handoff, to enter it and wait for you to accept it, and transfer it. "United 53," and they'd say, "Go ahead." I'd say what I had to say, give my initials and read-off. The time is about the same. It's just redirected.

The CHAIRMAN. You're saying that this upgrading of equipment has not relieved your load at all?

Mr. TORCHIA. I don't think it has. I don't think it has.

The CHAIRMAN. That isn't what I have heard from all the controllers that I talked to, and that has been a substantial number.

Mr. TORCHIA. It has made it easier in the sense now there's no delay. Now, that handoff on United 53 might have come a lot easier with the RDP than it did with the oral handoff, and that's the only thing, rather than wait for a controller. I don't have to call him and stay on the landline. I can say it on the radios. But as far as time goes, if everything is working smoothly, there was no more effort, just redirected the amount of energy that the controller has to put into whatever he does to another source.

The CHAIRMAN. In your judgment, would any of these issues that you've raised, that you're undermanned, that you don't have the proper rest periods, and don't have the proper equipment—would any of these have any effect on this incident in San Diego, as you see it?

Mr. TORCHIA. Well, I'd have to—I really would rather not respond to that.

Mr. ANDERSON. I thought he did. I thought he said if they had more time, the air controller would have added the little line or two that he didn't have time to give.

Mr. TORCHIA. No; if he had the added equipment.

Mr. ANDERSON. That was equipment; that wasn't time?

Mr. TORCHIA. That was equipment; that is correct.

The CHAIRMAN. If the FAA is being negligent in its regard for the safety of the system by understaffing, I wonder if you'd provide for us the exact figures on what centers are understaffed and to what extent they are understaffed?

Mr. TORCHIA. All right.

The CHAIRMAN. That would be very helpful to us for the record rather than try to do that now.

Mr. TORCHIA. I'll forward it to your office. Through the entire country; is that correct?

Mr. CHAIRMAN. If you can do that. I think that would be helpful, because I was disturbed by your statement that traffic is going to increase an alarming 19 percent.

Mr. TORCHIA. It has.

The CHAIRMAN. And that while traffic will increase 19 percent, controllers would increase less than 2 percent. You indicated that would place the safety of the system in a rather dubious state. Now, I don't know what the correct mix is, but I would certainly think—and I'm sure you would agree with me—that it isn't a 1-to-1 ratio. In other words, you wouldn't need a 1 percent increase in controllers for every 1 percent increase in traffic.

Mr. TORCHIA. I realize that.

The CHAIRMAN. Is there any accepted formula on what the proper relationship ought to be?

Mr. TORCHIA. No; I had thought about that too, and I really couldn't give you an answer, even after thinking about it. I'd guess roughly 5 percent. The traffic has increased 19 percent this year. That's a fact that comes directly from the FAA, and I don't think it would be disputed by anyone. And it's also a fact that they hired

an increase of 2 percent above attrition of controllers this year that were allocated. Whether they've hired those people or not, I don't know. That was the allocation this year.

What we're going to get out of that 350 is, most likely, probably 100.

Mr. ERTEL. Of that 19 percent, is that 19 percent overall or is that 19 percent air carrier traffic?

Mr. TORCHIA. That 19 percent is overall.

Mr. ERTEL. Are you sure?

Mr. TORCHIA. I'm not positive about that, but that's the figure I read.

Mr. ERTEL. It didn't define it? It most likely would be air carrier, if they were concentrating on those reduced fares.

The CHAIRMAN. You made another statement in your prepared testimony that pilots and controllers are responsible for the safety of the system and no credit is due the FAA for its foresight. It seems to me it's FAA foresight that has brought us ARTS III, the conflict alert, the TCA's, the basic air traffic procedures, as well as many other air traffic procedures that have given the controllers and the pilots the modern tools to keep up with the jet speeds and the increase in air travel. Wouldn't you agree?

Mr. TORCHIA. It's usually because of pressures applied to the FAA. It's not because of their aggressive attitude.

The CHAIRMAN. I see. You feel the FAA is responding instead of going out on their own initiative?

Mr. TORCHIA. It's somewhat like this accident and the need for the TCA in San Diego—I'll just jump off on this real quick—that I've heard some rumblings about, you know, the TCA would not have avoided this in San Diego. And I even stated that myself. However, just drawing from my past knowledge, when I worked originally at the bay approach and we did not have a TCA, that I went in the office and counted the number of near misses for the year of 1972 that were on this chart with red pins, which indicated air carrier reported near misses with other air carriers or general aviation. It was 80. The next year, I believe in 1973, when they had the TCA implemented, stage 1 TCA, there were three red pins on there. The TCA is definitely necessary in certain areas around here. They're not that restrictive to general aviation.

The air traffic controllers, a strong majority of them, work very well with general aviation pilots. I believe that their cries they are so restrictive are really not warranted. I think the facts will bear out that the TCA's are necessary in other areas.

The CHAIRMAN. Didn't the controllers oppose the TCA's when they were first under consideration?

Mr. TORCHIA. So did I.

The CHAIRMAN. I must say I was a little disturbed by PATCO's concern for the safety of the system this summer when its members were conducting work slowdowns at major terminals and stacking up airplanes. Some pilots were writing to me personally about the unsafe conditions.

Now, how can controllers extend their work hours, which you claim are dangerously long, because they seek free familiarization rides to Europe whether or not they handle international traffic?

Mr. TORCHIA. I believe that the system becomes safer as you do go by the book. We are required to go by the book, if that's what you're referring to. As far as any concerted action, Senator, I really am not aware of that, I believe maybe that was the fatigue that I recommended or suggested here rolling in and maybe controllers were feeling that.

The CHAIRMAN. I'm sorry that the reporter cannot put your smile and my smile in the record with that remark.

Mr. TORCHIA. Thank you. Can I loosen my tie now?

The CHAIRMAN. Finally, I want to clarify on one important point here; and I asked you something about this earlier. You're not suggesting that the PSA accident here was due to understaffing or lengthy work hours or insufficient rest periods, are you?

Mr. TORCHIA. That is the intangible thing on this. There is definite—I won't hide from this thing. There's definite news coverage by the media of the work period that was allocated to the PSA controller. There was news coverage about the time the air traffic controller had, but that's intangible. You can't say whether that was a factor involved. I just know when you're flying a plane and more so when you're controlling airplanes, you need adequate rest; and it's tough to do. It's tough to do when you only have 8 hours between the shifts to unwind, drive home, beat the wife and kids, and get a couple hours of sleep.

The CHAIRMAN. If you do uncover anything along this line that you think should be called to the NTSB's attention, we would certainly want it available to the Board in their investigation of this accident.

Before turning you over to Congressman Anderson, I just want to compliment you people, because I know that you do a very important job and a very difficult one. I for one helped provide a number of additional controllers more than the FAA requested within the past few years. I appreciate the fine job you do when I myself am flying as a pilot.

Mr. TORCHIA. Thank you very much. And I appreciate you mentioning that.

The CHAIRMAN. Congressman?

Mr. ANDERSON. Thank you, Senator.

We're here today to find out about what we can do to avoid mid-air collisions, and in your testimony I had the impression when you were talking about various grievances like the overtime and the staffing shortage and the number of employees, number of air traffic controllers washed out at the different schools, different times going to school, and the rest periods—I thought you were leading up to the fact that this was a possible cause of the San Diego collision. And yet when it boils down to it, you said, no, this was an intangible, it could be, it might be, but really when pinned down, it was the equipment. I guess the ARTS III you felt should have been or had it been at the Lindbergh Tower, the additional information would have gotten out to the pilot and we might have avoided the collision. Is that basically what you're saying?

Mr. TORCHIA. That's what I said. What I'm making my comments for is I'm trying to plan ahead. This one may not have been controller fatigue. Like I said, the overtime hours are long.

Mr. ANDERSON. In other words, this one wasn't the result of any of the staffing shortage, the overtime, or the rest periods; but a future

one might be the result of fatigue or something and that's why you brought it in this time in relation to the collision avoidance systems?

Mr. TORCHIA. That's correct.

Mr. ANDERSON. That's all.

Mr. TORCHIA. I would like to make a statement here before I lose track of what I was saying. We do appreciate the modernized computer equipment. As I said, I don't find any real benefit from it as far as the controller workload goes or controller responsibility, but I do find it definitely an assistance to air safety. And any of that equipment we can get, we certainly appreciate.

The CHAIRMAN. Mr. Ertel?

Mr. ERTEL. Thank you, Mr. Chairman. I'm just curious about a couple of things you said.

You indicated that the controller might have added the plane was out of what—whatever altitude it was and climbing?

Mr. TORCHIA. Yes.

Mr. ERTEL. Meaning the Cessna. Didn't that controller have that information?

Mr. TORCHIA. No; he did not.

Mr. ERTEL. Well, he was controlling him on an ARTS III system?

Mr. TORCHIA. No; the traffic controller in the tower that issued the final traffic information to PSA does not have that info. He was in Lindbergh Tower, OK?

Mr. ERTEL. That's right. The tower did not have that information; you're correct.

One other question.

The CHAIRMAN. If you would yield for a moment. The controller who was controlling the Cessna did have the ARTS III system.

Mr. ERTEL. But he could not communicate with the PSA, the communications system that he could not communicate through—

The CHAIRMAN. I think that's correct, isn't it?

Mr. TORCHIA. No. It's the controller in the tower who was talking to PSA. He did not have the altitude readout equipment. The controller at Miramar RATCC did have the altitude equipment, but to him the separation criteria had already been established and in that particular instance it was visual separation.

Mr. ERTEL. The controller controlling PSA did not have the altitude equipment?

Mr. TORCHIA. The controller talking to PSA.

Mr. ERTEL. The controller talking to the Cessna had it; is that correct?

Mr. TORCHIA. Yes.

Mr. ERTEL. And the controller controlling the Cessna did not have communications with PSA—

Mr. TORCHIA. That's correct.

Mr. ERTEL [continuing]. Because he was on another frequency? I guess we're back to where we started, square one.

You said the controller in this particular instance worked 11 out of the 12 previous days. Did he work 8-hour days?

Mr. TORCHIA. Yes, he did. I don't know if he worked overtime days. Did he?

There was one 10-hour day and—possibly one 10-hour day in there and ten 8-hour days.

Mr. ERTEL. That only means that he worked 1 extra day?

Mr. TORCHIA. That means he worked 1 day of overtime, had 1 day of rest, and worked 1 day of 8-hours duration.

Mr. ERTEL. That overtime is something he had to do——

Mr. TORCHIA. That is correct, sir.

Mr. ERTEL. Does the FAA require that or is it by contract——

Mr. TORCHIA. No; you must work overtime. The only time you can get out of it is in the contractual agreement, if you find a suitable replacement with the same equal qualifications as you and he's willing to accept your overtime, you can trade with him your day of overtime.

Mr. ERTEL. This is a matter of your contract?

Mr. TORCHIA. That is correct. And I don't know many that would like to work overtime.

Mr. ERTEL. Pardon?

Mr. TORCHIA. And I don't know many that would like to work overtime. So, you don't find the replacements.

Mr. ERTEL. But that is a matter of bargaining that?

Mr. TORCHIA. That's better than shooting horses, I guess.

Mr. ERTEL. But that is a matter of a bargain that is struck with PATCO?

Mr. TORCHIA. That is correct.

Mr. ERTEL. That is something that you can bargain in the collective bargaining?

Mr. TORCHIA. That is correct, but we have to work overtime.

Mr. ERTEL. According to your contract?

Mr. TORCHIA. No; that is according to the FAA.

Mr. ERTEL. That is regulations not a part of the collective bargaining?

Mr. TORCHIA. No, sir. The only way we can get out of mandatory overtime, the only way, is we can trade to someone of similar qualifications; otherwise, we have to work.

Mr. ERTEL. What are your rest periods? I'm just curious.

Mr. TORCHIA. Rest periods in centers are fairly good. I'm sure that the FAA will play a numbers game with this one also. And having worked for 5½ years in a center also, I know that they just show I probably worked an average of 5 hours a day; but what they would not show the committee was that was 5 hours actively engaged in separation of aircraft and possibly 2 hours in briefing or upgrade training or things like that.

Mr. ERTEL. Well, by contract or by regulations, are you allowed your rest periods?

Mr. TORCHIA. It could be interpreted as that, but in some facilities that don't have adequate staffing, which is the majority of them, the contract is applied this way: Every 2 hours the controller must be relieved from a busy position——

Mr. ERTEL. For how long?

Mr. TORCHIA. It doesn't say. See, that's what I'm going to get to, Congressman. He can be taken off this position after 2 hours, if he brings it to the attention of the supervisor; but that doesn't mean that they don't unplug from there and go over and take another position without a break.

Mr. ERTEL. So, he is relieved from his position and goes to another immediately?

Mr. TORCHIA. That is correct.

Mr. ERTEL. Do you get a coffee break?

Mr. TORCHIA. We're allowed 2 20-minute coffee breaks and a half hour for lunch. That is if staffing permits. In the facilities I worked—

Mr. ERTEL. That's 40 plus 30. That's 1 hour and 10 minutes?

Mr. TORCHIA. That's correct.

Mr. ERTEL. So, you actually work 6 hours and 50 minutes?

Mr. TORCHIA. Six hours and 50 minutes, yes. Some work less, but generally I'd say that would be a pretty good average overall.

Mr. ERTEL. Now, you also indicated that traffic will increase an "alarming 19 percent" per year.

By traffic, do you mean aircraft or do you mean by passengers, the number of people using—

Mr. TORCHIA. The article just said 19 percent. Now, that referred to traffic figures.

Mr. ERTEL. If you're saying passengers, then that means one thing. That doesn't increase an air traffic controller's work at all, because whether you have 100 passengers or 10 doesn't make a bit of difference to you.

Mr. TORCHIA. On checking on this, there were none that were below 17-percent increase in the traffic in the center. Los Angeles Center was—I believe they were at that 17-percent level.

Mr. ERTEL. Seventeen-percent increase in amount of operations controlled?

Mr. TORCHIA. Increase in amount of operations.

Mr. ERTEL. Then, I would question the 19-percent figure.

Mr. BELSTERLING. Last year at Lindbergh they averaged right around 220 air carriers a day, and this year we're averaging right around between 240 and 250. That's just air carriers. That's not speaking of general aviation.

Mr. ERTEL. Well, my computation, that would be about a 10-percent increase.

Mr. TORCHIA. That's correct.

Mr. ERTEL. Well, that makes a difference in your statement, in the analysis of your statement.

Mr. TORCHIA. I have a newspaper article at home. I'll take a look at it again.

Mr. ERTEL. I'd appreciate it if you'd clarify that and send it in. I think we'd be happy to have it. It could put a difference in the interpretation of your testimony. Thank you very much.

Mr. TORCHIA. Yes.

The CHAIRMAN. Gentlemen, thank you very much for being here. You did make one point that surprised me, and that is that your people don't want to work overtime. I have been told by some controllers in the past, that they did like overtime and the chance of making extra money. But you seemed quite firm that controllers don't want to work overtime.

Mr. TORCHIA. It's the idea that—I wasn't going to mention this, but I think we're the lowest paid professionals for the responsibility we hold. Maybe they can't support their families with what they make. I don't think it makes the system any safer though for—

The CHAIRMAN. So you will stand by the statement that controllers do not like to work overtime?

Mr. TORCHIA. I will speak first hand, from the center where I work, the third busiest in the world for radar terminal approach controls, that the supervisors were making an average of 19 calls a day to 19 people and would not get anybody to respond to overtime calls. In other words, my wife and several other controllers' wives became liars just trying to protect us from working overtime. That was the one facility I know first hand, the games that we all—

The CHAIRMAN. I'm informed that the average controller at Miramar is a GS-13 and earns approximately \$30,000 a year. Am I wrong?

Mr. TORCHIA. That's true.

The CHAIRMAN. Thank you very much, gentlemen.

[The statement follows.]

STATEMENT OF DOMENIC V. TORCHIA, REGIONAL VICE-PRESIDENT, PROFESSIONAL AIR TRAFFIC CONTROLLERS ORGANIZATION

On behalf of the Professional Air Traffic Controllers Organization (PATCO), I would like to thank Chairman Cannon and Chairman Anderson and their committees for allowing us the opportunity to testify before you today. As most of you are aware, PATCO has been actively seeking a safer Air Traffic Control System for over 10 years now. Officers such as myself, have been before committees of this stature several times in the past. We are pleased to again be provided the opportunity to respond to the concern of our legislative officials. As a representative of PATCO, I will concern myself primarily with those recommendations that would assist the Air Traffic Controller in his/her profession to make the National Air-space System a safer one. I have selected today four topics which have been vocalized several times by PATCO and its representatives. I only hope that this committee will judiciously seek relief for the Air Traffic Controller which should assist in insuring the continued safety record of the Air Traffic Control System. The categories are Staffing, Working Hours for Controllers, Equipment and Air Traffic Control Procedures.

(1) *Staffing*.—This is an age old problem of the Air Traffic Controller. I can recall staffing shortages as far back as 1969, during that time, the morale of the Air Traffic Controller hit an all time low. During that period, the main concern of Air Traffic Controllers, as it is now, was air safety. Since that time, I have not seen staffing as low as it is this very day. In the state of California, we need desperately the employment of an additional 600 to 1,000 journeyman Air Traffic Controllers. I would venture to say there is not one single Air Traffic Control facility in the State of California that has the full recommended complement of Air Traffic Controllers as set by the FAA. In the two major en route facilities in the State of California, the Oakland Center in Fremont and the Los Angeles Center in Palmdale, staffing levels are critically low. Both facilities are now staffed at approximately 60 percent of the FAA's recommended journeyman levels. Overtime is abundant, relief breaks are scarce and both of those factors combine to make for long, fatiguing hours for the Air Traffic Controller. However, each year PATCO has to go before the Congress to testify and plead for more controllers, while the FAA has always appeared reluctant to requesting an adequate number of new controllers. If we do not receive more Air Traffic Controllers in this system, within the next two years, the system will then find itself hard pressed to function due to a shortage of Air Traffic Controllers. Traffic will increase an alarming 19 percent this year, while the number of journeyman Air Traffic Controllers will only increase less than 2 percent, meaning that those that have to work the positions in these ATC facilities, will find themselves burdened with work loads that would place the safety of the system in a dubious state. The FAA will hold in front of you the safety record of the system. However, I request you go beyond the facade and analyze why the system has remained so safe throughout the years. You will find this is due to the dedication of the Professional Air Traffic Controller and the pilot. You will also most likely find that little or no credit for the safety of this system can be attributed to the foresight of the Federal Aviation Administration. If the FAA continues to linger with regards to adequate staffing in ATC facilities, the results will be a tragic deterioration of the safety of the system.

(2) *Rest Periods (working hours)*.—It has been stated in previous testimony, before similar committees of this stature, controllers in the United States do not receive adequate rest periods. Our ATC system most likely handles in a single

year, as many aircraft operations as the rest of the nations combined. But we find ourselves far behind other industrialized nations as far as recognizing the long hours that Air Traffic Controllers must work. We are one of the few countries that still mandates our controllers to work 40 hours a week. In some cases, controllers can be legally required to work up to 60 hours in a single week. The 40 hour week is much too long and lends itself to the fatigue of the Air Traffic Controller. PATCO requests this committee to look into the work week of the Air Traffic Controller with regards to that of other countries. I am sure you will find an alarming discrepancy. More so, we implore you to look into how much time is spent concentrating on aircraft crew rest and how little time is spent on controller crew rest. Keeping in mind all the time, that the flight crew is responsible for a single aircraft, the crew on the ground of Air Traffic Controllers is responsible for the entire system.

(3) *Equipment.*—This subject is quite complex and to do it justice in the short period of time allocated, would not be right. Therefore, I will briefly tell you that the installation of the new and sophisticated equipment available to the FAA at many major terminals has fallen far behind. An example is in California, there are approximately 5-6 major terminal areas that handle a great number of air carrier operations that are still without the essential tool of "brite radar." This is because of the FAA's reluctance to aggressively promote the installation of such equipment. Specifically, in Sacramento, California, the State Capitol, there are two towers that are ready to accept the "brite radar" displays. The monies have been appropriated, and the equipment has been purchased, however, this equipment is sitting in a warehouse or garage in that city at this very time. I have received word from reliable sources indicated that this equipment will not be installed until approximately two years past its original deadline. Which would put it six months to a year from this date. As I said previously, this is a very broad and deep subject. It involves radar, radios, support equipment, computer equipment, etc. To go into detail at this time, about the shortcomings of the installation of this equipment, would be virtually impossible. However, it would be a relatively easy thing to do to have this committee request that the FAA provide them a "game plan" for installation of modern and technical equipment at ATC facilities. I am sure that that information will assist this committee in understanding the plight of the Air Traffic Controller with regards to the installation of equipment available for them to use.

(4) *Procedures.*—Again this is another broad subject, unfortunately rarely understood by those outside the ATC ranks. However, I would like this joint committee to consider two recommendations. First, that the FAA completely review the airspace system and recommend either TCA's or climb and decent corridors, with similar restrictions possessed by TCA's, at airports that have a large mixture of civil air carriers jets and light general aviation/air taxi aircraft. Secondly, that this committee urge the FAA to review the regulations that allow inexperienced pilots to make practice instrument approaches at airports that handle large volumes of air carrier traffic. There are many airports available within minutes flying time from major hubs that would accommodate large quantities of general aviation practice instrument approaches. This would allow general aviation a safer place to conduct their required instrument training. I want this committee to also realize this is not a restriction against general aviation from landing and departing at major hub airports. It would be a restriction that will not allow them to make practice instrument approaches with non-experienced pilots, underneath hoods, trying to learn how to fly in this complex system.

It is PATCO's sincerest hopes that this committee will use whatever influence it has to assist us in rectifying the unsafe conditions created by the aforementioned topics. In summary, short staffing will lead to fatigue which may lead to an unsafe situation. There is a definite shortage of controllers in this system today. Also, the inconsistency of rest periods and long intervals that controllers must work on positions, also lend themselves to fatigue. Equipment—If the equipment is available, and a controller does not have it available for his use, then the consequences will be felt by all eventually. We have the technology, we have the resources, but we don't have the equipment. And finally, it is procedures, there has not been one major successful change in approximately 5 years. It is time for the FAA to start responding to the modern day system and view the use of terminal control area and climb and decent corridors. Again, on behalf of the Professional Air Traffic Controllers Organization, I would like to thank this joint committee for allowing us the opportunity to present our views.

[The following information was subsequently received for the record:]

PROFESSIONAL AIR TRAFFIC CONTROLLERS ORGANIZATION,
Oakland, Calif., November 6, 1978.

Senator HOWARD W. CANNON,
Chairman, Senate Commerce Committee,
Russell Senate Office Building,
Washington, D.C.

DEAR SENATOR CANNON: I would like to take this opportunity to thank you for allowing the Professional Air Traffic Controllers Organization to present our views before your most prestigious joint committee. I realize that there were many diverse views presented before your committee and it will probably take weeks for yourself and your aids to digest them and to respond to each of them accordingly. I am sure that you are aware that the odds of an aircraft accident occurring, particularly a mid-air collision, are astronomical. However, accidents such as the one that occurred in San Diego, make those odds of probability a grim reality to many people. We must continue to work to ensure that air safety is not dealt with by means of probability.

The reason for my writing to you is to respond to the inquiry made by the committee as to the factuality of the figures I used in my testimony. Specifically, my statement regarding a 19% increase in traffic. I obtained the 19% figure from an article I had read. The article in question, was in several newspapers, including the *Wall Street Journal*. However, time did not permit me to dig those articles out as I really wasn't sure the exact date that they were published. I did run across an interesting figure that will help to substantiate my claim, at the same time, still not justifying a total overall increase of IFR traffic by 19%. The article I refer to is in the October 30, 1978 issue of *Aviation Week and Space Technology*. In this very reliable periodical, on the aviation industry, it states "U.S. domestic and international scheduled traffic was up 20.4% in September over the year earlier period and increased 18.1% for the first nine (9) months of 1978 according to the Air Transport Association."

This combined with several other figures that I was able to obtain, at this time still awaiting written verification, indicate that maybe 19% wasn't a high enough figure. However, I do not feel that anybody can deny the fact that the number of aircraft movements in the country has increased tremendously. That workload is felt by one group of individuals more than any other group in the industry. That is the Air Traffic Controller. We can banter figures about until "the cows come home," but when the bottom line is there and it is analyzed, the Air Traffic Controllers of this country desperately need relief in numbers. That is the primary reason I have made the statement in front of your committee that the number of controllers in this country is critically low.

Therefore, I again ask you to apply whatever pressure you possible can to ensure that my brother and sister controllers in this country are not forced to work overtime and are not forced to work long hours without adequate relief breaks. For those circumstances lend themselves to the fatigue I described, which eventually will convert that "intangible ingredient" that I discussed at the hearing, into the probable cause of an aircraft accident.

In conclusion, Senator Cannon, I would like to urge you to call on PATCO, if we can be of any assistance. I will also urge you to carefully consider the statements I made in my prepared testimony before your committee. I look to you, as the governing body that has the power to assist us, the Air Traffic Controllers, in ensuring that the skies in the United States remain as safe as possible. Thank you again for what you have done to assist in ensuring air safety. I feel confident that future controllers will reflect back to October 27, 1978 and realize that your committee was instrumental in obtaining them the relief that was needed to keep our nation's skies safe.

I remain respectfully yours,

DOMENIC V. TORCHIA,
Regional Vice-President.

Data for those employees who have failed to complete the initial phase of ATC training at the FAA Academy is maintained on a calendar year basis. Accordingly, the following data reflects the attrition rate, by yearly input, starting with the implementation of pass/fail procedures in January 1976.

	Center	Terminal
Calendar year 1976:		
Enrolled.....	741	719
Failed.....	57	51
Withdraw.....	23	11
Total loss.....	(80)	(62)
Percent loss.....	10.79	8.62
Calendar year 1977:		
Enrolled.....	923	996
Failed.....	209	189
Withdraw.....	59	37
Total loss.....	(268)	(226)
Percent loss.....	29.03	22.69
Calendar year 1978:		
Enrolled.....	736	524
Failed.....	236	131
Withdraw.....	72	29
Total loss.....	(308)	(160)
Percent loss.....	41.84	30.54

The CHAIRMAN. I want to reiterate that as far as I am concerned today's witnesses have just begun an ongoing investigation for the Congress. I believe we have discovered today that there is no singular, simple, or black-box fix to the problems of avoiding future midair collisions. Rather it requires changes to existing ATC procedures and navaid criteria; it requires accelerated development and implementation of sophisticated collision avoidance systems; it requires a new commitment to increased funding for safety-related navaids and airport construction; in short, midair collisions present a problem that requires a "systems approach," and we will need the cooperation of FAA, the users, and the Congress to implement these improvements as quickly as possible.

I believe that Administrator Bond is acting in a way he sees best for the air transportation system, and I was pleased to hear of the positive actions which FAA plans. However, I believe we must continue to insist on immediate and long-term steps that can be taken both at Lindbergh Field and throughout the system.

I believe that Alfred Kahn, former Chairman of the CAB and the President's new head of the Council on Wage and Price Stability, has taught us all a valuable lesson about the bureaucracy. That is, one can cut the procedural spaghetti when it is working to the detriment of the public interest. Laws should be interpreted by the agencies to give them the ability to move swiftly to meet an obvious public need, rather than worrying about historical interpretations that tell a bureaucrat his hands are tied, while common sense is telling him something needs to be done now. I think the approach that the Board took was refreshing and correct.

I encourage FAA to consider a similar style in moving toward some of the procedural changes we have discussed today. Phasing in TCAs at all large and medium hub airports could begin immediately while a rulemaking is simultaneously conducted. Instructions could be issued tomorrow to all controllers to inform both aircraft of a conflict alert regardless of any previous traffic warnings. The NTSB recommendation to implement a TRSA, or preferably a TCA, at Lindbergh should be approved tomorrow. Training ILS should be scheduled for installation within the next year at relievers to all large and medium hub airports. The development and implementation of DABS and BCAS should be accelerated immediately. And tomorrow FAA should call Congressman Anderson and I to tell us what the funding needs are to implement such a plan, so that we can plan to work within our respective bodies toward obtaining the needed funds. I, and I'm sure Glenn, would welcome the challenge.

FAA is taking the path it feels is best in a less "reactive," more long-term approach for implementing solutions to the midair collision problem. I am simply saying that I call this one differently, and I hope the Administrator will consider my opinion before he finalizes his own.

Today, I think, has been constructive and a positive push toward a safer system. And I am making my commitment today to introduce in the Senate in January a bill dedicated to increasing safety facilities at airports throughout the country, and also aimed at the airport noise issue. These are the two major problems which face commercial air transportation today and which require immediate action.

I hope to work closely with Chairman Anderson in developing legislation which can be swiftly approved by the House and Senate.

I want to thank you gentlemen as well as all the other fine witnesses who have taken their time to be with us today.

Congressman, do you have anything?

Mr. ANDERSON. Thank you, Senator.

First I want to join with you in your very fine concluding statement and say that we endorse what you said. I too want to thank the members of the Air Traffic Controllers that are here with us.

I do have an item for inclusion in the record from the President of the Marin Air Center.

The CHAIRMAN. It will be made a part of the record.

Mr. ANDERSON. Thank you very much for inviting us here.

The CHAIRMAN. Gentlemen, thank you very much.

[Whereupon, at 4:40 p.m., the hearing was adjourned.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

STATEMENT OF HON. S. I. HAYAKAWA, U.S. SENATOR FROM CALIFORNIA

Mr. Chairman, ladies and gentlemen. I am glad to have the opportunity to participate in this hearing on airline safety and extend my thanks to Senator Cannon. I might also add that thanks to the efforts of Senator Cannon, other Members and staff of the Senate Commerce, Science, and Transportation Committee, and respective Committees in the House of Representatives, Congress passed legislation this year to deregulate the air transportation industry, and the badly needed noise legislation, to provide assistance for compliance with Federal aircraft noise standards.

Air travel has become a vital part of our lives, yet it is surprising that most of us are unaware of the problems and controversy within the industry concerning safety.

On September 25 an airplane crash occurred that was truly a national tragedy. The collision of the Pacific Southwest Airlines 727 and the Cessna 172 over this city was an alarming reminder that the impact and loss of life from present-day plane crashes are far more drastic than any we have ever experienced, despite our level of advanced technology.

In the aftermath of this destruction it has been easy to forget that commercial airline travel is more than 33 times safer than driving. The very fact that there are more than 186,000 private planes in the air and more than 13,000 commercial flights each day is testimony to safe air travel. However, the growing popularity of private aviation, together with the recent boom in commercial air travel has created congestion around many of our major airports much like rush hour traffic on our nation's highways.

I support the purpose of these hearings to study the nationwide problems of air safety. In an effort to provide the highest degree of safety at our major airports, it is of the utmost importance that all of the problems are recognized and every alternative thoroughly examined. And, as all of you know only too well, the problems are many and varied.

What we do now should not be dictated by emotional reaction that is the result of sorrow, fear, anger or frustration. I hope that the information gathered at this hearing and the results of previous studies and investigations when fully analyzed, will provide the base for the promulgation of thorough and effective regulations which will make airports and air travel safer for everyone.

Lakewood, Colo., October 3, 1978.

HON. TIMOTHY E. WIRTH,
*Member, U.S. House of Representatives,
Lakewood, Colo.*

DEAR CONGRESSMAN WIRTH: I am taking this opportunity to express my concern about a serious situation which exists and of which I hope you are equally concerned.

Throughout our nation are numerous municipal airports of the same magnitude of Stapleton International Airport. The use of these airports is shared by large commercial airlines utilizing supersonic jet aircraft, and private citizens flying small single engine, two-passenger airplanes. Thanks to regulations promulgated and enforced by the Federal Aviation Administration, Department of Transportation, aircraft and flight personnel (pilots, navigators, etc.) for commercial airlines are inspected, tested, and controlled to insure the safety of passengers.

Unfortunately the same is not true with regard to privately owned aircraft. Any person may own and fly an airplane. They are supposed to be licensed, true, but don't have to be to operate an airplane. (The same with an automobile.) To my knowledge the lack of legal control over the airworthiness of private aircraft, the capability of the pilot, including the physical and mental condition of the pilot, creates a hazardous condition when private aircraft are intermingled with large commercial aircraft within close confines.

It would certainly appear to me that something must be done to resolve this situation at our nation's large municipal airports. It seems absurd to spend so much money to ensure passenger safety on large commercial aircraft and then subject these aircraft and passengers to the uncontrolled hazardous environment of small private aircraft.

Each time I fly by commercial airlines, I am acutely aware of the number of small aircraft on the runways and in the air immediately over the airport in approach, departure and holding patterns. Why not require these small aircraft to utilize smaller, county municipal airports outside the vicinity of the large airports.

Often I have read or heard a public official state that a particular airport is too small to handle the large amount of air traffic it has. Perhaps removing the small private aircraft would also solve this problem. If new airports need to be constructed, perhaps they could be for large commercial aircraft only, or for small private aircraft only.

Whatever the solution might be, this hazardous condition does exist and I feel something needs to be done about it. I am confident millions of other commercial airline passengers throughout the world will agree.

Sincerely,

GORDON E. REYNOLDS.

MARIN AIR CENTER,
Novato, Calif., October 19, 1978.

BRIAN A. RABER,
District Assistant of Hon. Glenn M. Anderson M.C.,
Long Beach, Calif.

DEAR BRIAN: I enjoyed meeting you in Los Angeles at the Bandieri demonstration.

I am following up as promised on the collision avoidance subject. I know that Congressman Anderson is a very knowledgeable person about aviation and my comments may do some good, and that is all I can ask for.

Very quickly, a little background on myself, I guess, to qualify what I have to say. I hold an Airline Transport Pilots rating, I have been in the aviation business all of my adult life. I spent over twenty years with Pan Am in all phases of operations, although I was not a Pan Am pilot. I have had my own General Aviation (small airplanes) business for the last twelve years, and was president of a small commuter airline for 2½ years. I have had wide personal experience operating both small and large aircraft in congested traffic areas as well as intermixing the various types of traffic that makes up this industry we call air transportation.

It appears to me, from information that I have been able to gather on the PSA, San Diego accident, that this was the one that never should have happened. The weather was perfect, the pilots were experienced, the systems were being used correctly. The most sophisticated equipment in the world showed the accident about to happen. People operating that equipment were alert, doing their job. Only one very tiny flaw in the system prevented the one person who could see that accident about to happen from doing anything about it. Again Brian, remember I am going pretty much by newspaper and television reports. Those reports indicate that approach control radar not only witnessed the accident, but their collision alert system operated correctly, sounded the alert. The weak link, approach control, was unable to contact PSA 182, because they had already gone over to tower frequency. The time spent by approach control trying to reach 182 through the Lindbergh tower was critical. That thirty second delay allowed the accident to happen.

Now I know there will be thousands of solutions offered to this particular problem. I have heard of many of them already from, banning light aircraft in the skies, to absolute positive control for all airplanes. From my experience, I would have to say that while the objective is commendable, none of these systems are practical and in fact, would make the system worse, rather than better.

The fact that the ground radar system did exactly what it was supposed to do, shows me that we already have in place a system that can work. Because this radar is ground mounted, it can be considerably more sophisticated than anything that could be put on an airplane. We have tens of thousands of airplanes in the air, and only about 500 major airports. Even if an airborne alert system is practical, to put it on several hundred thousand airplanes, the vast majority of which will never operate in a high density area, then expect those owners to maintain that elaborate equipment, is just not a practical solution.

Again this accident points out that all that was lacking in our present system was an effective means of communications with the PSA pilot or the Cessna pilot for that matter, in an extreme emergency situation in which immediate action was required.

As I mentioned to you earlier Brian, I think I have a practical solution to that communication problem. All airplanes presently are capable of using an emergency frequency which is 121.5. None of us are in the habit of cruising around with 121.5 constantly turned in because we need that radio for other communication purposes. It would also be possible to blank out that radio with other transmissions that might make an emergency warning from approach control unreadable. The solution, in my view, and one that could be implemented quickly, relatively inexpensive, is simple to operate, fits within our present procedures, avoids adding another black box to an already overloaded cockpit. It allows the pilot to keep his head up looking out the windshield, rather than inside the cockpit, where he already spends too much time. I would call such a system a command frequency. I would suggest that every aircraft that flies into a high density area be required to have a single channeled emergency command receiver, equipped with proper mute relays so that if the approach controller or whatever ground radar system was monitoring this particular flight observed another San Diego or other emergency situation developing, could immediately pick up his command transmitter (red phone), broadcast the necessary warning, quote "PSA 182, turn left, climb immediately". If that transmission came out loud and clear in PSA's cockpit and in every other airplane within the area, blanking out all other transmissions so that it was the only thing that came out of the cockpit speaker, I feel quite certain that PSA would have reacted immediately and the accident would have been avoided.

Interesting point is that had this type system been available to pilots of the Pan Am 747 involved with KLM at Tenerife, there is a strong possibility that accident too, might have been avoided. With this in mind, I think serious consideration should be given to giving the pilot, at least in certain cases, the ability to get on the command frequency to avoid an imminent accident. (Perhaps air carrier pilots only)

I would put my R&D dollars into better and more ground radar and closing the missing communications link so that a collision alert on the ground can be immediately transmitted to airplanes involved in command language, directing the necessary evasive action.

As one pilot, I want less time spent with my head down in the cockpit. I want time to look out the windshield.

Like most pilots, I do not like any more ground control than necessary but I also recognize that there is need for traffic cops in the air as well as on the ground.

I also firmly believe considering the weight, size, power requirements, personnel necessary to handle an effective collision avoidance system, there is just not room for it in the airplane. The pilots already have too many things to do in the cockpit and to equip two hundred thousand airplanes to protect 500 airports, appears to be going at the problem exactly 180 degrees out of phase. Equipping 500 airports makes more sense.

Brian, this ended up being a little bit longer than I had intended it to be, but I think you will get the picture. I hope you will pass it on to Congressman Anderson. I intend to, of course, copy my own senators and representatives in my area. Congressman Anderson, because of his interest in aviation, is in a position to help solve this problem without creating another bureaucratic monster, or some highly sophisticated, very expensive equipment in the airplane that probably won't work anyway.

If I can add anything or if there is any way I can help the cause, please feel free to call me.

Best personal regards,

RICHARD T. DUSTE,
President.

P.S.—I received Congressman Anderson's kind note today. I hope to meet the Congressman one day.

RTD/db

NOVEMBER 27, 1978.

*Congressional Committee on PSA Tragedy, San Diego Naval Training Center,
San Diego, Calif.*

The most crucial question is why the jetliner was allowed to violate all rules of right of way as prescribed in Federal Air Regulations, Part 91.

Next most important is why the FAA guided the smaller plane via radar vector directly into the path of the incoming jet. Then comes the question of WHY Lindbergh tower was permitting instrument training flights to take off directly into the face of landing traffic.

Fourth is the question of why a plane closer to Lindbergh was being "handled" by radio and radar from Miramar, 10 miles away, although the more distant jet was in radio contact with Lindbergh tower on a separate frequency.

To millions of people who fly as passengers or pilots, these are life and death questions. So far, information released to the public indicates a GROSS VIOLATION of right of way rules by the PSA pilot; and overwhelming disregard for Federal Air Regulations and for life of pilots and passengers, by the Lindbergh Field tower controllers.

These comments are for the record.

GEORGE E. GOLDING,
Aviation writer, Private pilot, Air traveler.

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