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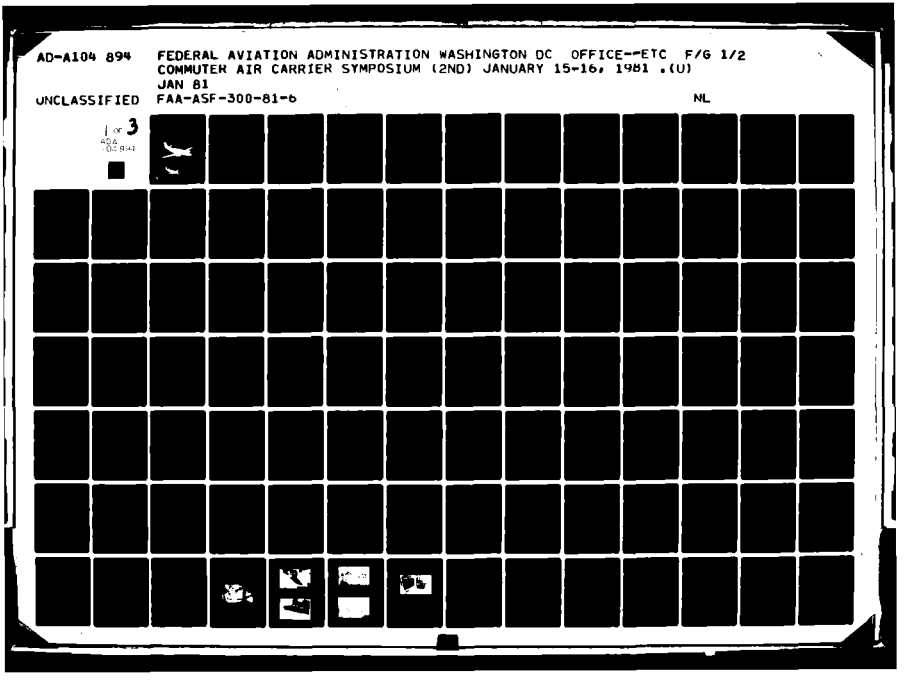

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Second Commuter Air Carrier Symposium

January 15–16, 1981

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WELCOME AND CONFERENCE OVERVIEW

Dr. Bill Wilkins
Associate Administrator for Policy and International Aviation
Federal Aviation Administration

Good morning. Please let me offer my apologies to start with. It is, as you've probably noticed, snowing out there, and as you get outside the Beltway, it is snowing even more. It was a bit of a hassle getting here this morning.

I am Bill Wilkins, Associate Administrator for Policy and International Aviation of the Federal Aviation Administration (FAA). It is my pleasure to welcome you to the Second FAA Commuter Airline Symposium.

The purpose of this symposium is for the commuter industry, the FAA and the public to have a chance to discuss areas of mutual concern, to review implementation of policy and procedures and to provide a vehicle for consideration of user views.

I am delighted that we have many familiar faces here, and delighted to see a great many new participants as well. As you can see from the program which you picked up as you registered, this year's symposium will focus a great deal on the future and the growth of the commuter industry.

We are fortunate to have on today's program five FAA Regional Directors who will share with you their perspective on commuter issues in their areas and address the unique geographical problems concerning commuter operations.

Following their presentations, you and the rest of us will have an opportunity to address questions to them and to make comments to them. Immediately following the talk by our luncheon speaker, Mr. Aaron Gellman, are five members of the Commuter Airline Association who will be discussing their operational priorities for the 1980s.

There will be two working sessions this afternoon consisting of panels. The first will cover simulation, fitness and safety analysis. The second working session is on airports and airways. During the airports discussion, there will be a short film on the Microwave Landing System - the MLS - the new approach system, and a brief statement by me on the Microwave Landing System Transition Plan.

We hope that you'll be able to join us this evening for the reception, and that you will have a chance to take a close look at the displays furnished by aircraft and engine manufacturers and by the avionics industries. I would like to, by the way, thank the exhibitors for helping make this symposium a success.

The third working session, tomorrow morning, is on human factors. This is the topic of increasing interest, and may well generate a great many questions and discussion.

Happily, we have with us or will have with us many of the experts in this field, and they will be able to give us not only the benefit of their own personal knowledge but will also be able to discuss the outcome of the human factors workshop held last November at the Transportation Systems Center in Cambridge, Massachusetts.

The conference wrap-up is scheduled for shortly before noon tomorrow, and weather permitting, you can be on your way back to your businesses and families in time for the weekend. All registrants will be mailed a copy of the proceedings as soon as they can be produced and put in the mail to you.

Again, on behalf of my organization within FAA and FAA itself, I want to thank you for coming. It is now my privilege to introduce to you the opening speaker of the conference -- the man for whom I have worked now at the FAA for some time with a great deal of pleasure, a man who has lots of style and as lots of people in the aviation industry have learned, lots of guts -- Langhorne Bond.

LOOKING AT THE FUTURE FOR COMMUTER SERVICE

Honorable Langhorne Bond
Administrator
Federal Aviation Administration

Thank you, Professor Wilkins. Ladies and gentlemen. I think the use of the word, "symposium" to describe this gathering is most appropriate. Webster defines "symposium" as a banquet, followed by a drinking party and singing.

Not because the FAA leadership will change, but rather because of the excellent safety record that the commuter industry has posted last year, celebrating is in order.

Those of us who are observers of the Washington scene, and again I am taking off from my text, have noticed words of praise from the Chairman of the National Transportation Safety Board. That is an event of unprecedented dimension, even praise for the FAA, and I know it came hard.

Seriously, the safety record that you folks have posted in 1980 -- 2.48 accidents per 100,000 hours -- indicates definitely that commuters are coming of age in the flight safety area.

Total accidents dropped from 57 to 36, and fatal accidents showed an even more impressive decline, from 13 falling all the way down to six. Of course, adding to this achievement is the fact that commuter airline operations and passenger traffic steadily increased during the year.

We at the FAA look for this improvement trend to continue. As you may recall, right after our meetings last year, we undertook a detailed review of facilities that were needed at commuter airports. It was based on your comments that approach and landing aids at many of the airports served by commuters were inadequate and, therefore, a major contributor to commuter accidents.

So we assessed facility needs at a total of 1,090 commuter and local air carrier-served airports, including 260 in Alaska. Based on this study, a comprehensive program for commuter airport facility improvements was developed which includes the establishment of instrument landing systems, terminal VORs, nondirectional beacons, visual approach slope indicators, runway end identification lights and similar types of facilities. When fully implemented, this package will total almost $160 million -- over $79 million in capital investment and about $79 million in airport development grants.

The facilities portion of the program will get underway next fiscal year. It has been approved within the FAA, and is in the process of implementation. We would also like to start the airport development grant portion of the program as soon as possible.

As you know, Congress has not completed work on the needed airport and airway development legislation; so initiation of the grant-related part of the program is tied to approval of the pending legislation. So I believe that you will have a vested interest in seeing to it that the new Congress acts expeditiously on the proposed legislation. But the F&E portion, the NAVAID portion is not stopped by the lack of an ADAP Act; and that is on track.

I am sure that most of you will agree that the standards on which this program is based represent a fair and reasonable approach to providing "essential service" to commuter airline-served communities, as this concept is expressed in the Airline Deregulation Act of 1978. At non-Alaskan, small community airports, we based the need for commercial levels of service availability on a threshold of 2,500 annual commercial passenger enplanements, or about seven enplanements per day. This parallels the minimum threshold for a "commercial service airport" used in both the Administration's proposal and the Senate and House versions of the airport and airway development legislation that was considered but not, as you well know, finally enacted by the 96th Congress. For Alaskan airports we used an even less stringent criteria in recognition of the unique air transportation role in that state.

So, in total, the commuter airport program will provide for facility improvements at 127 locations. Of these, 88 involve the establishment or upgrading of precision landing systems, while the rest include the introduction of terminal VORs, distance measuring equipment, nondirectional beacons, visual approach slope indicators, runway end identification lights, and other facilities.

The program will cover five years -- Fiscal Year 1982 through 1986 -- with facility funding of $5 million and airport grant funding of $5 million in the first year. Once implemented, we estimate that over 94 percent of all passengers enplaned by commuter airlines will be landing with the benefit of precision landing systems. On top of this, we will also consider establishing nonprecision approaches at all -- repeat "all" -- remaining locations with between five and seven daily enplanements.

Some questions remain as to whether those airports receiving precision landing systems are to get conventional ILS systems or a new Microwave Landing System, once that becomes commercially available. Although I cannot lay out specific criteria just yet, I can tell you that final determinations will be made on a case-by-case basis in keeping with our plans for systemwide transition to MLS. The final decisions will be made once public comments are in on both the MLS transition plan and the companion cost-benefit analysis. Incidentally, the 90-day comment period on the MLS transition plan ends February 10, less than a month from now. So I encourage those who haven't already done so to submit their views to us before that time. But, whether an airport gets ILS or MLS, one thing is certain -- FAA is committed to providing more precision landing systems at commuter-served airports.

I have also good news to report on FAA's proposed security rule for commuters. I have just signed the final rule, and I think that most operators will find that they can live with it easily. You will remember that the original proposal would have required full security programs for all airplanes with more than 19 passenger seats. That would have included screening of passengers and their carry-on luggage. The presence of a law enforcement officer during the boarding process would also have been required. In short, a clone of the full scale air carrier program.

The final rule will require limited security programs for airplanes with 31 to 60 seats and a full security program for those with more than 60 seats. Passenger screening and the law enforcement presence will be required as part of a security program for airplanes with 31 to 60 passengers only when FAA identifies a security threat, or passengers will have uncontrolled access to sterile areas when they deplane at their destinations. They will be required at all times for the larger planes. There is, in short, flexibility built into our proposal, and we intend to implement this flexible portion of our program within reason.

Essentially, there were two reasons why we scaled down our original proposal. One was that the increased security threat to the commuter industry that was expected to result from implementation of the Airline Deregulation Act has obviously not materialized. Only one attempt to hijack a commuter plane has occurred since deregulation was implemented, and it was unsuccessful.

The second major reason was the cost of the proposed regulation. It clearly would have imposed a terrible economic burden on many operators. These costs have been reduced significantly in the final rule.

For example, the proposed rule could have resulted in an estimated maximum annual operating cost of $8.8 million and a maximum capital investment of $5.3 million for commuter operators and $360,000 for airport operators. By contrast, the maximum annual operating cost for the final rule will not exceed $3.15 million, and there will be no capital investment required at all. In other words, we have cut total costs by almost 80 percent.

Let me take a minute to report on the status of another regulatory proposal of interest to this audience. That is the proposed rule to require certification of commuter airports. Action on that proposal is being deferred -- repeat, is "being deferred" -- because further analysis and review of the comments indicate that our authority to issue a rule is not clear and should not proceed until the statutory basis for such a rule is clarified. By letter to the Chairpeople of the various Committees of the Congress with responsibility for passage, I hope, of the ADAP Act, we have suggested that this matter be considered during the hearings in 1981 on the ADAP program and that the statutory basis for our issuance of rules on this matter be addressed and clarified at that time. Until that happens we will not issue any certification rules for airports.

Another area in which you have expressed interest is our aircraft loan guarantee program. As you know, that purpose was renewed as a part of the Airline Deregulation Act primarily to extend it to commuter carriers. Congress wanted to make it easier for your industry to purchase additional aircraft and, in most cases, larger and more costly aircraft. From the program that was renewed in Fiscal Year 1979, some $300 million in budget authority has been set aside exclusively for commuter carriers. An additional $100 million has been proposed for Fiscal Year 1982 which would bring the overall total to $400 million. Although not all of this authority has been used, a respectable amount has. It emphasizes the importance that FAA and Congress attach to participation by the commuter industry in the aircraft loan guarantee program.

For your information, in Fiscal Year 1980, the program assisted 13 commuter carriers in acquiring 28 aircraft, valued at nearly $40 million. So far, in Fiscal Year 1981, we have executed guarantees on three more commuter loans for three aircraft valued at approximately $4 million. There are 12 other commuter applications in various stages of completion, totaling $55 million. They will add 35 more aircraft to the commuter fleet.

So far it has been a very active program, and I expect it will become increasingly so during the decade. The aircraft purchased under the aircraft loan guarantee program have varied, generally, from small, twin engine Cessnas to the larger F-27's and Dash-7 DeHavilland aircraft. The average value has been about $1.4 million per aircraft. I might add that about a half-dozen other commuter carriers are now working out applications, and I expect that by the end of this fiscal year, commuter loans guaranteed could exceed $125 million, and cover some 100 aircraft.

A final subject that I need to mention is that last month we abandoned our efforts to establish separate airworthiness standards for commuter airline aircraft. We are convinced that such a regulation would produce neither improved economic nor safety benefits.

Theoretically, our FAR Part 24 proposal would have allowed manufacturers to build medium-sized aircraft for the commuter industry without having to meet the expensive standards required for large FAR Part 25 transports. Well, the theory was great, but the reality was something less. The projected cost benefits to the industry just did not stand up under hard analysis. What we plan to do now is to revise FAR Part 25, the regulation for large category aircraft, to provide a special tailoring of that standard for commuter aircraft of the particular size that you operate. We think it will prove a better and more acceptable approach, and I might add, again departing from my text here, that the original motivation for the issuance of FAk Part 24 was a fear on my part and the part of the FAA reflected in what was then, I think, a consensus in the industry that the development of new aircraft under FAR Part 25 would not occur.

That judgment was wrong, happily wrong, and the whole new generation of aircraft that will be built to Part 25, including the Dash-8, the SAAB, the Swearingen aircraft, the new Brasilia, DeHavilland's Dash-8, you mentioned them all, all are being built to the full standard of FAR Part 25, and in essence, I think probably because of the immediate market demand for aircraft and the familiarity with the only existing standard. So obviously we are not going to issue a technical standard that is less than one that is already being built to, so I think that what the government has done, for a change, is do something smart, and not a bad idea.

In closing, I want to say how pleased I am to see the commuter industry doing so well from an economic as well as a safety viewpoint. Yours is just about the only segment of air transportation showing an increase in traffic and revenues. It is a bright spot in the aviation industry, and I expect that it will brighten still more. I believe that we will see a tripling of commuter traffic during this decade.

During the next two days you will be hearing from a lot of experts, government and industry, who are here to tell you, to help you make it happen.

Thank you very much for your attention, and I wish you very well.

FORGING A SOLID FOUNDATION FOR GROWTH

Duane Ekedahl
President
Commuter Airline Association of America

It is a pleasure to be here. I understand that the word "symposium" is, indeed, an appropriate word for this meeting. I gather there was a bit of a party last night that the commuters weren't invited to as a going away banquet for the Administrator.

I expect that we missed a biggie. We could have billed this meeting as a sort of going away banquet for the Administration, and we'd have had a wonderful turnout of commuters. I don't know -- maybe it is too early in the morning to attempt to be facetious.

I also noticed that we got our security rule. I think we got it two days ago, and I am not sure whether the Van Arsdales were going to be here this year, and decided we better get that rule signed so that we can talk about something else this year besides security. I don't know.

The security rule -- we really haven't had a chance to study it -- and there are some questions about the stand-by discretionary authority and the like that we want to look at very carefully, but it certainly does appear that the FAA, in this case, has taken into account the costs of a rule, the economic consequences with respect to the commuters and in that light, attempted to devise a security plan that would apply throughout the system.

It does appear that this is a rule that we can live with. Also, of course, we're very pleased to learn of the new plan to expedite the installation of ILS at the commuter airports. You will recall a year ago that this was one of the subjects that we discussed, and in some detail, at this session.

Any plan which would add some $160 million to this worthwhile cause, that could upgrade some 88 airports apparently to full or partial ILS, and bring the total number of commuters carried under this protection now to 44 percent of commuter passengers, has got to be a very, very significant development for us.

I think we also recognize that parts of these fundings are in the ADAP bill, are going to be passed by Congress; and that becomes a real challenge for us to get that passed, particularly in light of the change of Administrations, where spending monies of any kind is going to come under some real scrutiny.

I particularly want to comment here this morning and thank the Administrator for his kind remarks with respect to the safety record of the commuters in 1980. I think we, too, take some satisfaction in the fact that the fatalities in this segment of aviation in this past year were some 60 percent less than the prior year.

I think this confirms what we said here a year ago, under some pressure at that time, and that was that the new FAR Part 135, which was being implemented at that time, would, indeed, lead to even higher levels of safety for the commuter sector of aviation, and that, indeed, FAR Part 135 has met its purpose. That purpose, as mandated by Congress, was that there shall be an equivalent level of safety throughout all segments of scheduled commercial aviation in this country.

I think the record this year, on the other hand, also confirms a view we expressed a year ago. That is that it is bad practice to make quick and easy comparisons of the safety, relative safety, of different segments of aviation without taking the time to qualify those statements and explain the differences that occur in those segments, as was occurring a year ago in the rhetoric that existed at that time.

This serves no useful purpose. Much the way we all benefit this year from the safety record throughout aviation, suggestions that one segment is more safe or less safe than another, that does damage to the entire system -- confidence in that system. So we, indeed, are proud of the record accomplished this year, and we think this, indeed, is a basis for solid growth of the commuter segment of the industry in the 1980s. Looking at numbers can be confusing, and one of the most confusing things at this time is the basic question which occurs all the time for us -- what is a commuter air carrier?

The Civil Aeronautics Board, because of their computer systems has spit out those commuters who have 401 certificates, although they're now moving to change that which excused all comparisons with the past. The FAA in its operating rules has three basic kinds of categories which we have not been comfortable with -- air carrier, commuter and air taxis, and general aviation. Clearly, commuters are part of the scheduled air carrier systems in the country, and with all due respect to air carriers, I think that they would prefer, if there is a difference between the air taxi operation and the commuter operation, to separate those out.

One very straightforward way to define this ever-changing and evolving group of carriers is really what the statutory definition is -- any carrier operating predominantly aircraft of 60 passengers or less or cargo payload capacity of 18,000 pounds or less. This is a very clear-cut definition and serves a useful purpose because it does define, these days, the short-haul segment of the industry. It is the break point usually between turbo-prop and jet aircraft.

It works very well, so with the CAB moving to eliminate the 401 certificates as defining which was the clearer definition some years back as defining the break point, we think it is important that FAA and other groups that report data look to a definition that will be consistent throughout the system, the MTS, ADAP, now all have a different data base for evaluating commuter performance. Of course, this is important to us when it comes to allocation of ADAP monies and examination of safety records and the like.

The CAAA Board of Directors, at a recent meeting, identified what it considers to be the key issue facing commuters and the growth expected in this industry in the 1980s, and it is an issue that I am sure all of you have been concerned about at one time or another. That is the question of assured access at the increasingly congested hub airports of this country. I think you know why this is important to commuters. Seven out of ten commuter passengers are interline passengers. Commuters, for the most part, are in the business of bringing people in from the regional areas and connecting them at the hubs for the long-haul segment of their journey.

The FAA has been a strong proponent of assured commuter access at airports. It has been very good for us. The Administration's ADAP Bill had language very specific on this point.

We oppose defederalization of these airports. We oppose airport defederalization out of concern simply that commuters will be left out of the local negotiations, and be left out in the cold. We think the term, defederalization is an appealing term.

These days there isn't anyone that really can't be opposed to defederalization of just about anything, I suppose. You know, defederalization -- even if you love big government, the word defederalization is something you can favor -- defederalize something. But there are many ramifications in defederalizing these new large airports as has been proposed in some legislation. We think it is very important that this be very, very carefully analyzed before we go down the road of eliminating these large airports that are now self-sustaining from the federal system.

We think there has to be a federal presence at these airports if we're going to have a balanced national system. Commuters look at any plan to auction off to the highest bidder access at these airports, and it scares us to death. We recognize that we are not in a position to match the economic clout of the major carriers. It seems to us that any plan along these lines would be very disruptive to established markets, to these small companies making the up-front investment necessary to achieve service levels. To do this in light of the fact that any capricious bid could wipe out your access to an airport, and therefore, wipe out that entire market. This is not being afraid of competition. If competition or competing means rolling up your sleeves and working harder to preserve your market that is one thing, but you can hardly

protect yourself from an irresponsible and irrational bid that summarily takes that market away, if we're talking about a bid system as access to these airports.

Now it is easy to describe what is wrong with a plan, but how about something that works; and we recognize that this is a very complex subject, and we are hoping to be prepared to address this in the months ahead with the other segments of aviation in a way that will lead to a resolution of these problems.

Another area where access is impacted is the question of meeting the capital needs at these airports. A recent FAA document, which perhaps you have not seen, "National Aviation System Development and Capital Needs," is a very sobering document. It essentially says that most of the problems are caused by a lack of money. Many of these airport problems are a lack of money problems, that we are not making the investment today needed for future growth. And in any business, obviously, in any operation, there is investment today for growth tomorrow; but not only are we not making that investment, but we're not making the investment to upgrade and keep current the existing equipment at these airports, according to this document. If this is the case, and we're not today making the investment necessary for improved productivity of the systems tomorrow, it is a serious matter. We would think that an industry that has demonstrated that it is capable of making this investment, through a tax on its services -- a ticket tax, that these funds ought to be used for this purpose, and not stashed away in a trust fund or used to balance other areas of the federal budget. This, too, is going to be a difficult argument to sell, with the change of Administrations, where the emphasis is clearly going to be on achieving a balanced budget. I think the aviation community has its work cut out for it in the upcoming session.

Clearly, the passage of an ADAP bill has got to be one of the top priorities in that session. Let me mention one more thing that also impacts on our future growth and is an area where many of you have been involved. That is the need for more aircraft in the commuter segment if they are to keep pace with deregulation. We think that the certification of new aircraft expeditiously is going to be very important in the mid-1980s, when many of the new aircraft that now appear to be on the drawing board will be hitting the marketplace at that time. I think we are very hopeful that the new lead region concept will lead to quick certification, thorough certification of the aircraft at that time. This is going to be an important factor for commuter development in the decade ahead.

The other thing I would like to comment on with respect to FAA activity is the aircraft loan guarantee program which Langhorne mentioned this morning. That, too, is a very integral and important part of our expectations for growth in the years ahead.

Last year, here, I commented that one of the ironies of deregulation was that the commuters, the unregulated segment of the industry, was becoming more regulated. This year there seems to be almost a double

irony. We're not only getting some more regulation, which we might have expected, but we're also losing some of our good regulations, and specifically I refer to the plan at the Civil Aeronautics Board to examine elimination of joint fares. Joint fares which assure the mandatory equal treatment throughout the system for connecting passengers, and passengers from the small communities, are a very important element in the growth of commuters in the past few years. This, coupled with increasing economic regulation, reporting requirements to denied boarding rules, fitness rules, and so on, all of which I am not saying we didn't expect, but coupled now with the loss of good regulation, there seems to be almost a double irony.

Now I don't want to be talking about people who are just adamantly opposed to all regulation. I think on the other hand that the past two years have shown something very, very clear. That is that the economics of short-haul air transportation are clearly different from the economics of long-haul transportation. Rising fuel costs, coupled with the freedoms of deregulation have led the major carriers having to move their equipment to markets better suited for that equipment where they're economically suited while the turbo-prop aircraft and other aircraft better suited for the short-haul are, indeed, a more efficient use of our resources to use that aircraft on a short-haul market. But the question does exist -- can the short-haul air transportation continue to be provided without the federal subsidy which the commuters don't want and the public doesn't want? There isn't anyone who wants that.

It is going to take enlightened public policy to allow this to happen. If we view these commuter carriers as now in the big league, as now having to be treated like the big guy, and regulated like the big guy, we're making a terrible mistake. If we don't understand those differences and allow these companies to grow and be healthy and to supply this service without subsidy, it is most unfortunate.

We have got to be smarter than that. We've got to see those differences and allow for them, and we've got to be smarter than that. We've got to see those differences and allow for them. I do think that FAR Part 135 is an example of that type of enlightened regulation that allows for those differences.

Let me simply close here in saying that I think we have to acknowledge one of the toughest jobs in Washington is Administrator of the FAA, and the jobs that are conducted by the people throughout the system. I wonder how many of them have heard from the same people they were hearing from a year ago criticizing the safety record of the industry, what a good job they've done this year. I doubt that very many of you have heard that. I think we recognize that, and I would like to say that from our viewpoint we think that the present leadership in the FAA has certainly been willing to listen to our point of view. We've had sharp disagreements, and will continue to have those disagreements; but our staff and others in our industry, and I can speak for our staff, I suppose, have never attempted to reach the senior officials at the FAA,

telephone Langhorne or any of the other people there without their taking our calls on the spot or returning them within a matter of minutes. We haven't been denied access to -- we might be denied access to some airports -- but never denied access to their offices, and there is an openness and willingness to hear our views that I think it is not self-serving or inappropriate at this time, with many of these people leaving the Administration, to cite that and to cite our appreciation for it.

I do think the FAA was quick to recognize -- its leadership and the regional directors throughout the system, quick to recognize during the course of their tenure -- that one of the significant changes in the industry was the emergence of the commuter into a new role.

We're very optimistic about the future. I think one of the keys to that is going to be the continued dialogue at the local level, at the regional level. Perhaps one of the best things to come out of this conference a year ago was the spurring on of that activity, and the development of these regional meetings during the past year. We thank you for that, and we look forward to continued effort in that area, because we know we share the same goals -- goals of delivering the highest service in air transportation throughout the system coupled with the highest possible levels of safety. That is why we're here today, and I thank you for coming and for your interest, and we look forward to a very good session here over the next day and a half.

Thank you very much.

REGIONAL PERSPECTIVES ON COMMUTER ISSUES

Murray Smith
Director, Eastern Region
Federal Aviation Administration

Good morning to all of you. My name is Murray Smith, and I am the Director of the Eastern Region in New York, and I am joining with four of my colleagues here this morning to discuss some issues that affect you and the FAA at the regional and local levels, and the subject of our discussion, of course, is the Regional Perspective on Commuter Issues.

The format for the panel discussion is simple and designed to give us maximum use of the brief time that we have allotted. I will introduce each director individually, giving the specific topic or topics that he will discuss.

Each director will have approximately 15 minutes to present his Regional Perspective. Because of the wide-ranging list of subjects that we must cover and because all of them, I trust, will be of interest to you, I suggest that we make our presentations first.

We will then throw open the panel and respond to any questions you may have. We would also welcome any of your comments at the conclusion of our presentation, either addressed to us or addressed to the group in its entirety.

It has been a year now since our last nationwide conference held at Reston. During that year a number of worthwhile things have occurred. They are worth mentioning briefly before we get into our program. For one thing we have now all had time to digest the new FAR Part 135 and apply it to the practical world of commuter and air taxi operations. The new regulation has proved, we believe, to be beneficial to both the commuter airlines and to the FAA and hence, to the flying public that relies on the commuter industry. For another, as a result of recommendations made at the Reston Symposium, all regions have held a number of general meetings as well as meetings with the individual airlines. There have also been special meetings at the district office level, the local inspector level and with teams of inspectors. The meetings have been productive, they have been characterized by straight talk, free give-and-take and no holds barred. What is particularly interesting is that while there are some variations in the results of these meetings due to geography, prevailing weather and local issues, the basic concerns expressed at all the regional meetings were quite similar in nature.

There has been considerable discussion on the "strict enforcement" policy toward regulation compliance and enforcement. Yes, compliance and enforcement are a major responsibility of the FAA regions in the field office. Make no mistake about that. But we feel that this policy should be and is viewed by the good operator as necessary and healthy for the

industry. The marginal or short-cut operators should be concerned because FAA will not tolerate marginal practices resulting in violations of regulations. We do see our job, however, not just as the overseer of regulation compliance, but as a source of information and experience that can be of help to commuter operators and we intend to work with you and help whenever we can.

In the comparatively short period since our Reston meeting, we already see signs of improvement. Not only has service to the public increased substantially, but significant gains in safety have been recorded as Mr. Bond mentioned earlier this morning.

Nineteen eighty, indeed, has been a very good year for the airlines and the FAA. The low number of fatalities in air transportation demonstrates that our goal of zero fatalities may someday be achieved. We can do it if we work together. If I sound enthusiastic about it, I am. I see 1980 safety achievement having occurred during an intensive growth year for your segment of the industry -- the commuter segment. I think we can take pride in the fact that our efforts, yours and the FAA's, have resulted in improved track records. You have acquired new and more complex aircraft during this period such as the DeHavilland, DHC-7, the Fokker F-28, Short's SB-330's and the Embaer. Just recently commuter operations were begun in the Eastern Region, with the Aerospatiale Dolphine Turbine Helicopters. These aircraft already have joined the already active turbine commuter fleet of Beech 99s, Nords, Swearingen and other sophisticated piston-powered aircraft.

The introduction of newer aircrafts into the commuter fleet have had a dramatic result. For example, one carrier in my region had six operations into a major hub with their small aircraft. They now operate three turbo-jet flights into the same hub carrying more people. They were able to obtain gate space with one of the major airlines, where their passengers are now able to transfer to and continue on domestic trunk carriers. Additionally, they have used the personnel of this major carrier for passenger handling, ticketing, aircraft servicing and loading. Because of better scheduling and aircraft utilization they use their small aircraft for serving passengers from the various smaller community airports and feeding them into their jet aircraft at a central point.

This has resulted in a passenger increase of two and a half times their pre-jet era. For example, in December of 1979 their passenger load was 7,607. In December of 1980 it exceeded 22,000. I am talking about Empire Airlines of Utica. Our mutual efforts in strengthening regulatory requirements and using more sophisticated aircraft have helped to promote a more efficient and attractive, active commuter system. I consider it to be a tribute to your skills and determination that it was achieved along with a reduction in the actual rates. There are clear signs that the commuter industry has "grown up" while responding to a more demanding passenger clientele and more stringent operational maintenance and equipment requirements.

Our symposium today is intended to continue the process we started two years ago, and to enable us all to work together to achieve an even better record. We in the FAA recognize the need for informality, for frank and open discussions and for mutual feedback.

I would like to add that when we get to the question and answer period, if the panel members cannot respond adequately to your questions, we will be calling on possibly some of our Washington counterparts that are here with us today.

I want to spend a few minutes now telling you about the first of the subjects we have planned for this panel discussion. It concerns improvements in air traffic control, while to some degree it is presently limited to a bi-regional perspective, it has much broader implications. My subject matter is the Northeast Corridor Study. Exactly one year ago in January of 1979, the Eastern and New England Regions set up a joint task force to study air traffic control in the Northeast Corridor in the United States. This Corridor from Boston to Washington represents probably the most complex air traffic operations within a relatively small airspace in the world. Bob Whittington, Director of the New England Region and I appointed a team from both regional offices, from the Boston and New York Air Route Traffic Control Centers, and from the New York Common IFR Room. This study group was composed of eight full-time FAA members and 37 part-time participants from the airlines, the aviation industry and the FAA. Several of the commuters in this room participated in that study.

The group's first task was to gather and review all complaints submitted by the users of the system and by FAA's facilities in the Corridor. The committee identified and validated 37 problems and classified them into eight different categories: altitude restriction, system flexibility, terminal area complexity, center boundaries, flow management and delay reporting, equipment, controller user awareness, and noise abatement.

The committee concluded in a report issued just a month ago that the present route structure in the Northeast Corridor is basically sound, however, it was determined that procedural improvements could be made, which would result in improved air traffic control services, greater flexibility in the system and substantial fuel savings.

With these goals in mind, the group focused its efforts on modifying en route air traffic control and terminal procedures. The new procedures will allow aircraft to climb to higher altitudes sooner and to fly at higher altitudes longer. They also eliminate circuitous routes where possible. They provide for more flexibility during periods of light traffic and when arrival and departure demands are not balanced. Some facility sector airspace boundaries will be vertically adjusted.

Improvements are to be made in the delay reporting and tower en route procedures. Route changes will eliminate some bottlenecks and some speed restrictions will be modified. When the recommendations are implemented,

the modified procedures will solve most of the problems uncovered by the study team. Some of the modified procedures are already in effect. The bulk of them will be carried out by the end of this year, and we expect that all of them will be in place by the end of next year.

Our colleagues in Washington were kind enough to run the modified procedure through the computer for us. They determined that the modifications will result in aviation fuel savings of more than four million gallons annually for aircraft operating in this corridor. With the current high cost of aviation fuel and going higher, I am sure that you'll all agree that substantial savings is most welcome.

Let me give you an example of just one of the problems tackled by the committee and how it was resolved. During the study period, the committee received a number of complaints that altitude restrictions on Philadelphia arrival and departure traffic were inefficient, particularly in terms of lost time and fuel use. The problem was caused by New York and Washington area traffic overflying the Philadelphia control area. This procedure forced Philadelphia arrivals and departures to be restricted below the New York - Washington flow. Since the traffic between New York and Washington is extremely heavy, rerouting around the Philadelphia area would impose time delays and fuel penalties on a large segment of the industry. The committee investigated various methods of improving the restrictions imposed on Philadelphia traffic without adversely effecting the New York to Washington traffic. It became apparent that the most logical solution was to raise the ceiling and the Philadelphia approach control to allow more fuel-efficient climbs and descents. This would increase the Philadelphia delegated airspace from 7,000 to 10,000 feet.

The committee concluded that some of the direct benefits that would be realized by raising the ceiling of the Philadelphia approach control area would be: One -- keeping arrival traffic at higher, more fuel-efficient altitudes longer; two -- clearing departure traffic to higher altitudes, thus, lessening the probability of leveling off before further climb clearances are issued in the en route structure; three -- providing more vertical airspace within the terminal area for exchange of traffic between Philadelphia and Maguire Air Force Base at a higher, more fuel-efficient altitude; and four -- establishing tower en route procedures that will more likely satisfy the needs of the commuter carriers and general aviation, while not interfering with the other major airport traffic. This increase in Philadelphia airspace will be done in concert with an additional TCA operating position in the Philadelphia IFR Room, which was installed in June of 1980. This should be good news for those of you who fly into or over the Philadelphia area.

Another very important result of the study, along with my meetings with commuters operating into Philadelphia, was the establishment of better lines of communications between the commuter airline operations personnel and the FAA at the facility level. We encouraged this level of communications as a means of resolving grass roots issues. Both Bob Whittington and I are pleased with the results of the Northeast Corridor Study. In fact, I am now enlarging the study to cover the entire Eastern Region.

Recently I appointed a committee for the special task of analyzing air traffic procedures in the Washington metropolitan area. Members of this committee include representatives from the Washington National, Baltimore, Dulles and Andrews Airport Traffic Control Towers and from the Washington Air Route Traffic Control Center.

Our preliminary judgment or the four preliminary judgments of the committee are: One -- three arrival and two departure routes for Baltimore can be adjusted to establish better descent profiles; two -- altitude assignments for the major arrival routes for Dulles can be modified to establish better descent profiles; three -- airspace adjustments for the Washington, Baltimore and Dulles terminals can be made to improve aircraft handling between these facilities and reduce the need for coordination; four -- a fuel conservation and awareness and collective operational problem can be improved through the sharing of ideas and the expansion of communication. I think you will be happy to hear that there are conversations going on now in Washington with a view of making these studies nationwide.

I am encouraging all of you to get involved in these studies as they come to light in your respective areas of operation. It is absolutely vital that we know your concerns and problems when we look at the management of airspace. You are a major user and we want to know where your problems are.

Incidentally, copies of our Northeast Corridor Study are available if any of you would like one. We have already sent them directly to the commuter airlines who took part in the study and to those airlines who we think would be the most affected by it. Should any of you want a copy, please feel free to write or call me, and I will be happy to send you a copy.

I would like to mention one more brief item directly relating to air traffic control improvements. On January 10, 1981, five days ago, we cut over from the Common IFR Room at Kennedy to our new New York Terminal Radar Approach Control Facility (TRACON) at Garden City, New York. On that date the Common IFR Room, which has served us well for 12 years, was closed down, and all personnel were transferred to the new facility. We're very pound of our new TRACON. It took us over four years to establish it. It contains the latest state-of-the-arts in equipment, and was designed to accommodate the foreseeable growth in air traffic in the New York metropolitan area.

If any of you happen to be in the metropolitan area and can spare the time, I would be happy to arrange a guided tour and briefing of the new TRACON facility for you. As a matter of fact, we welcome your visits to all of our facilities. I am sure that other regional directors will join me in this invitation. Visit our towers and other facilities. Get an idea of what we do and how we do it. Ask questions. Share your knowledge and experience with us. We are joined together in a common cause and the more we get to understand each other, the better we can all serve that cause.

Earlier I discussed the interrelationship that had developed between the FAA and the commuter industry for the benefit of safety to the flying public. The many meetings we held between FAA regions and commuters were by no means characterized by peace and tranquility. I am sure you will all agree that they opened up lines of communication. They resulted in a mutual respect for the problems we had and the mutual desires to solve them.

In the Eastern Region my staff and I met at six different locations with all of our commuter operators. We flew to Allentown, Albany, Washington, D.C., Pittsburgh, Philadelphia and Long Island. Bob Whittington and I also hosted a two-day commuter seminar in Atlantic City last September. Like the others, it proved to be extremely informative and productive, certainly to the FAA.

Earlier last year we had completed the certification process under the new FAR Part 135. I formed four regional teams to inspect all 33 commuter air carriers in the Eastern Region. The teams were made up of personnel from aeronautical quality assurance field offices and various district offices. The teams were set up so that inspectors from the certificating district office did not inspect our own carriers. This gave us an independent assessment of each carrier. It also permitted us to broaden the experience of our inspectors with a goal of uniform and consistent application of regulation enforcement at all district offices.

As planned, all inspections were completed by July of 1980. Problems in various degrees of importance were identified and immediately corrected, and immediately corrective action was taken. In more serious matters, violations were processed. I would like to add that of the 33 carriers inspected, only eight carriers were subject to violation, and at the present time all 33 commuter carriers in our region are in full compliance with the regulation.

In the Eastern Region I also established a top level commuter task force. It's main purpose is to keep the two-way communications line going, to find out what you need, and what will help you provide safer and more dependable transportation to the public and the communities you serve. The task force worked with our Washington counterparts to prepare a commuter airport program for developing proposals for additional commuter airport facilities -- Mr. Bond has signed that, and he talked about it in his brief remarks.

In summary, I would like to reemphasize that although we undoubtedly have the best air traffic control system in the world, we can and must do better in terms of efficiency and effectiveness. We will continue to refine air traffic control procedures consistent with the highest safety standards. Thank you very much.

REGIONAL PERSPECTIVES ON COMMUTER ISSUES

Louis J. Cardinali
Director, Southern Region
Federal Aviation Administration

Good morning. It is a pleasure to be with you today and to participate in this symposium.

First, I would like to discuss the background which led to a special evaluation of every commuter airline in the Southern Region and cover the results of these evaluations. Then I would like to briefly cover meetings held with industry officials and the feedback resulting from these meetings. Then, finally, I would like to discuss the agency's F&E and ADAP programs for the commuter airports.

Subsequent to the loss of several commuter aircraft to accidents (three of which were in the Southern Region), we found that the transition to the new FAR Part 135 had not been as smooth as anticipated and deficiencies existed in both the operations and maintenance areas. This was determined after evaluations of three operators which had suffered aircraft losses, and revealed that these operators were not in full compliance with the new regulation.

Compounding the seriousness of this situation was the impact of deregulation, which resulted in major travel-line carriers abandoning service to many small metropolitan areas. Commuter air carriers were hard pressed to locate aircraft, provide pilots, and expand maintenance facilities to accommodate the public demand for additional transportation capacity. FAA District Offices did not have the necessary manpower to provide advice, regulatory interpretation, and flight crew check rides to the multitude of operators which appeared to fill the gap.

From October 1979 through September 1980, we placed five teams on the road to evaluate commuter operations and, at the same time, review the recertification under new FAR Part 135. These teams visited all 47 Southern Region commuters during this period and found the operators varied widely in size, complexity and operation. Some operated under the provisions of both FAR Part 121 and Part 135, which further complicated the evaluation methods.

The results of these evaluations indicated that immediate action was necessary to correct some existing deficiencies. It was found that the highest frequency of noncompliance was in the area of manuals. There were 155 separate discrepancies, including improper revision and distribution, incorrect information, insufficient guidance on company procedures, procedures not being followed, manuals not current and many others. Unfortunately, most of these manuals had received a stamp of approval from the certificate holding office and we accept part of this responsibility.

The next highest frequency was in recordkeeping with errors accounting for 80 findings. These errors were primarily found in the required pilot records, weight and balance, forms, and retention of accurate load manifests. Insufficient or nonexistent training of approved check airmen accounted for 24 findings, and errors in approved training programs resulted in 24 findings.

As the direct result of significant safety findings and in conjunction with the certificate-holding office, five companies voluntarily ceased operation for a total of 24 days, 67 aircraft were removed from service, and 74 pilots were grounded until their proficiency was reevaluated. Depending on the severity of the noncompliance, the operator's attitude, the effectiveness of the corrective action, and other factors involved, enforcement action was administered accordingly.

At this point, I would like to point out that the majority of the companies which ceased operation, removed aircraft from service, and grounded pilots, did so voluntarily. This aspect of the program was particularly commendable and indicates recognition on the part of the operators of significant safety deficiencies and the need to provide the paying passenger with the best quality transportation possible. We appreciate the cooperation shown.

Several reinspections have shown that the evaluations were effective in improving regulatory compliance and the overall safety posture of commuters.

Improvement in commuter airline safety during the past year has been dramatic in the eight southeastern states. In 1979, there were ten commuter airline accidents with 25 fatalities. In 1980, the number of accidents dropped to six with only one fatality. This represents a 40 percent reduction in the number of accidents and a 400 percent reduction in the fatalities. These accomplishments are even more significant because while accidents and fatalities have gone down, operations among the 46 commuters based in this region have risen sharply.

Again, much of this improvement has resulted from the professional approach by the operators to provide the best possible service and protect themselves from the severe liability which results from an accident.

I have summarized the approach to solving one issue in the commuter industry -- that of overall nonstandard certification. Once this became evident, we immediately communicated directly with the chiefs of all district offices emphasizing the need for more standardization and attention to detail. We also published advisories directed to FAA inspectors and industry personnel, indicating areas where improvement in certification is necessary. Subsequent observations confirm that this program has improved the standardization required to maintain consistency in application of the rules.

In the Southern Region, meetings were held with operators in San Juan, Puerto Rico, in March last year, and in Miami and Atlanta during April. The purpose of the meetings was to obtain feedback from commuters relating to the problems experienced in implementing and complying with FAR Part 135. Good response was obtained and several operators made brief presentations during the meetings. I would like to summarize a few of the issues raised and cover what action has been taken to solve these issues.

Many operators expressed their dissatisfaction with the need for FAA inspectors to conduct the majority of their pilot check rides. This issue was partially solved with the expiration of Notice 8000.198 which transmitted this requirement. We believe in the use of company check airmen to perform this function so long as they demand appropriate standards. If the operator maintains adequate standards then we are willing to let them continue to evaluate their pilots.

Issues have been raised over the requirement to weigh passengers and baggage on small aircraft. Accidents have resulted and many errors have been discovered in the loading of small aircraft. We feel this requirement is valid but will certainly discuss and forward to Headquarters an alternative which can be shown to provide an equivalent level of safety.

Another issue frequently raised is the requirement for commuter pilots to hold an Airline Transport Pilot Certificate. Initially, this rule of 135.243 was applied to all operators when it was applicable to only passenger-carrying operations. We feel this issue is resolved to the extent necessary to meet regulatory compliance.

The Administrator of the FAA directed early in 1980 that a program be developed which would help the commuter airlines operate more safely, more dependably, and at the same time provide better service to the communities and the traveler. Our approach in the Southern Region is consistent with this thesis. Inspector education, closer surveillance of operators and follow-up evaluations will improve overall safety in operations and maintenance. Concurrently, we are studying airport and navigational facilities used by commuters.

In reviewing over 830 airports, the need for additional facilities turned out to be less than initially thought. For example, the study showed that 158 airports had no commuter enplanements and out of the 674 airports that did have one or more annual commuter enplanement, 425 of these airports already have an ILS or one programmed. This leaves 249 airports which have one or more annual commuter enplanements and the agency is presently finalizing a program involving some 127 of these airports.

Out of the national total of 127 commuter airports identified to need some type of facility, 13 percent or 17 airports are located in the Southern Region. Five of these airports can be instrumented without any additional ADAP projects. Two airports were identified to need REIL's

only and these are minor projects which can be accomplished immediately with minimal effort and no sponsor action. The remaining ten airports will need an ADAP project before they can be instrumented.

The Five Year (1982-1986) Facilities and Equipment Plan has included some $79.3 million for the installation of needed facilities at the 127 commuter airports. The cost for airport development is estimated to be approximately $79.2 million over the five year (1982-1986) period. The 15 locations in the Southern Region which have been identified to need an ILS are included in the F&E five year plan for $12.9 million. Airport development needed for these airports is estimated at $16.7 million.

Environmental problems are known to exist at two locations in the Southern Region and when the environmental assessment is done for all the airports, there could be more locations with environmental problems. The agency is currently involved in a law suit brought by one of the small communities surrounding the Fort Lauderdale Executive Airport challenging our Finding of No Significant Impact (FONSI) from the installation of a glide slope and middle marker with a MALSR for runway 8. This could be a landmark case since the agency has always considered the installation of an ILS as enhancing safety and most environmental assessments resulted in a Finding of No Significant Impact (FONSI). The environmental requirement for airport development is continuing to slow needed airport projects due to the long lead time required to complete an Environmental Impact Statement (EIS).

In the recently expired ADAP legislation there was special commuter discretionary money available ($15 million annually) which is part of the air carrier funds which goes only to those airports identified as commuter airports. The airports getting commuter funds, however, are by no means the majority of airports served by commuter airlines. Over the past five years (FY-76 through 80), the agency has funded 254 projects at 238 commuter locations at a cost of $116.0 million. The Southern Region totals for the same period have been 32 projects at 28 commuter locations at a cost of $11.7 million.

In summary, the Southern Region will continue to monitor closely commuter airlines and will work closely with the industry in every way possible to assist them in achieving and maintaining the highest possible degree of safety.

Thank you.

REGIONAL PERSPECTIVES ON COMMUTER ISSUES

Arthur Varnado
Director, Rocky Mountain Region
Federal Aviation Administration

I think if I were able to package up this phenomena we are experiencing this morning, I could probably make a dollar or two when I went back to Denver. We have had a situation out there where we have had two snowballs this winter, neither of which has exceeded two inches. It is giving us somewhat of a problem, and I am sure we're going to pay for that this summer.

Good morning. I am pleased to have been invited to participate in this symposium. First, and it seems to me that no presentation is complete without at least some amount of statistics, let me at least gee-whiz you initially, and we'll get on with the presentation. I would like to mention a few facts that will characterize both the economic and the aviation activities in the Rocky Mountain Region so as to place some better perspective, the role of the commuter, air taxi industry in our part of the country.

The Rocky Mountain Region with about 2.5 percent of the nation's population has about 16 percent of the nation's airspace. We have about 7.5 percent of the nation's commuter airlines and about 9 percent of this country's air taxi and helicopter operators. Also with the operating certificates of United, Frontier and Aspen Airlines, we are responsible to the safety and operations of about 20 percent of the nation's scheduled air carrier fleets. We do our job with about five percent of the total FAA work force.

Aviation growth has followed a pace of the relatively large population and economic growth that most of our six states have experienced during the last decade. The driving forces behind this economic growth initially started with a strong attraction of the natural living environment, the recreation tourist industry and more recently the accelerating trend of energy resource development.

Airline deregulation and sharpened competition between the two modes of air and surface transportation due to the rising fuel costs are two other factors affecting aviation activities. As auto fuel prices rise, air travel seems to gain a competitive advantage because of the consequent savings in both cost and time to the traveler. In this respect, distances between communities in the Rocky Mountain Region are relatively long when compared to national averages. For example, the scheduled air service trip lengths in the region are about 60 percent longer than the national average. This means both a cost advantage to the typical commuter airline and certainly a time advantage to the traveler using air service instead of his car. On the other hand, competitive market forces are distorted if the commuter airlines cannot obtain an equitable share of fuel.

The Civil Aeronautics Board and the Department of Energy are coordinating to ensure that adequate fuel is available to guarantee a level of essential service, but there is no such protection for a host of commuter and air taxi operators upon whom we are relying to provide the only air transportation to many other smaller towns and communities.

As you know, the FAA has no authority to regulate fuel availability for any form of air transport. We can only monitor fuel supply and price conditions and then formally coordinate with the Department of Energy. Perhaps we ought to plan, however, ahead to cope with the day when fuel supply distortions might become more critical than they are. Perhaps we ought to plan ahead to cope with the day when fuel supply dislocation might, indeed, become more critical than it has in the past.

Airline deregulation is another factor that has obviously affected air service patterns in the Rocky Mountain Region. Unfortunately, we don't have enough of the right kinds of statistics to be able to sort out clearly the effects of airline deregulation from the effects of our roller coaster national economy, accelerating fuel costs and the pronounced effects of energy development impacts. However, we have looked at some statistics from a recently published CAB report on changes in scheduled airline service. We found no signs that the region, as a whole, or the individual states suffered from the effects of deregulation. In fact, all states experienced a net gain on available scheduled air service passenger seats since deregulation. The picture was a little murky when looking at individual communities, because some small towns lost scheduled air service or passenger seats. However, we could not find a single community listed as a CAB route certificated or essential air service point that actually lost scheduled air service completely.

Now I would like to get on with the main theme of my presentation, and that is that of the tremendous impacts that energy resource development is likely to have on aviation activities in the Rocky Mountain Region.

Domestically speaking, the Rocky Mountain Region has about half of the nation's energy resource reserves in the form of coal, uranium and oil. It has all of the high grade oil shale deposits that are lying in wait to replace both the declining oil reserves of this country and the risky sources of foreign oil reserves. I should mention that the government owns about one-third of the land in which these energy resources reside. The rate of development of these energy resources is closely keyed to federal decisions on one -- the import of foreign oil, two -- promotion of synthetic fuel industry, and three -- the stringency of environmental regulations. I suspect that the rate of government decisions on these matters will, in turn, strongly depend on what happens in the mid-east during the coming months and years.

What extent of energy development growth are we talking about? If you look at the state-wide statistics, there is certainly noticeable upward trends in both population and an annual energy production, particularly in Wyoming. Denver is gaining fame as the new energy capital of the nation. Several years ago, the state of Colorado was the net consumer of energy, that is its citizens used more energy than was produced in the state. However, statewide growth statistics are deceiving when it comes to the actual energy development impacts in specific communities. When you look at many communities located near energy developments in the states of this region, including Colorado, we are seeing population increases that doubled, tripled or even quadrupled within the last year or two. These communities, and we've identified about 300 of them, are experiencing extreme growing pains and are scrambling for the means to provide necessary community services, including transportation. This is the real world as we see it now.

What does this energy development growth mean for aviation and especially for the commuter and air taxi service? During the past two years, air taxi and commuter operations have grown about twice as fast as air carrier operations. Moreover, in terms of passenger enplanements, commuter service has grown almost five times faster than air carrier, but air taxi enplanements grew about seven times faster than air carrier enplanements. Energy development and deregulation are apparently the main reasons for the phenomenal growth, but as I said earlier, we do not have the data to be able to sort out how much credit is due to either of these two reasons.

To gain better insight into future aviation needs and problems in connection with energy development impacts, we are working very closely with our regional counterparts in the Department of Energy. We are also working with state transportation and aeronautical directors and their representatives who are closely attuned to the planning -- attuned to and planning for the need of energy impacted communities in their respective states.

We are and want to get involved for two reasons. First, we are asked to advise in planning studies on a specific role that aviation can play from an intermodal viewpoint and state and local transportation networks. Second, we need to be on the ground floor of state and local transportation development plans so that we can orient FAA's planning and program effort to accomplish what we are saying can be done.

In a further effort to get ahead of the game, we have just completed a study which attempts to estimate needed near-term airport improvements for known energy impacted communities in the Rocky Mountain Region. The analysis in this report presented some interesting conclusions, and I will share just a few of them with you.

One, many of these airports need near-term improvements, not necessarily to accommodate the greater volume of air traffic, but to handle heavier and higher performance jet and turbo-prop aircraft.

Two, many corporate types of jets are already using airports that were not designed to accommodate them. The essential airport improvements, therefore, seem to be in runway extensions to allow this kind of traffic. Three, funds even to match Federal aid for airport improvements rank low in the community list of priorities because of the need for expanding such basic services as schools, hospitals, sewer and water systems, fire and police departments, etc. Some states are considering the use of mineral severance tax to help provide these needs. Fourth, some communities may undergo a relatively short-term expansion if the energy project's lifetime is short, thus, large capital investments for airports may be hard to justify in some cases. Last, estimates of total airport investment costs to support communities with known energy projects range anywhere from $70 to $130 million. Accelerated energy development in the region would be a different ball game entirely.

What does all this mean for the future of commuter and air taxi service? Much of the existing energy development activity in the Rocky Mountain Region is in areas of very small settlements. Therefore, the scale of aviation needs are still relatively small. But many of these fast-growing communities are evolving into economic units that are and will be ideally suited for air taxi and commuter service. Even now we are receiving anywhere from 15 to 20 new air taxi applications each month. In addition, those now in operation are fast expanding their services and acquiring more sophisticated equipment.

In one of our districts, helicopter operations have doubled within the year. The business jet fleet is also rapidly expanding. Another trend that we have noticed is that since many of these communities do not have sufficient demand to establish frequent and convenient commuter service, air taxi and business jet turbo-prop are the popular means of air transport, particularly with energy project personnel.

What are some of the problems and concerns of air transportation in this rush into this region's energy age? I will briefly touch on two of them. One problem is that the present airport facility improvements to be made -- even if and when they do -- the time associated with local planning and government funding cycles are a formidable barrier that prevents us from keeping pace with the rapid expansion of such needs. A corollary to this problem is that these communities are hard pressed to come up with matching funds.

Air traffic management is another concern that frequently arises in connection with commuter air taxi operations. Fortunately, we in the Rocky Mountain Region are blessed with a surplus of unused airspace, except for the metropolitan area like Denver, so we haven't encountered problems with direct routings of such flights.

In summary, we in the Rocky Mountain Region expect energy resource development, even at its presently cautious pace, to spawn tremendous demands and opportunities for air taxi and commuter air service growth during the next twenty years.

The economic environment is ripe, and we will do our utmost to foster the growth of this essential public service in our region by helping to plan for and provide the needed airport and navigation improvements, and the air traffic services necessary to make this transportation system both safe and efficient.

We, you and I, the FAA and air taxi/commuter management, must diligently work together on all fronts to ensure that aircraft/passenger safety records do not falter, but steadily improve in the fact of rapid expansion, not just in the Rocky Mountain Region, but in all regions.

Both the public and the Congress are watching closely to see that we do. Thank you very much.

REGIONAL PERSPECTIVES ON COMMUTER ISSUES

Wayne Barlow
Director, Great Lakes Region
Federal Aviation Administration

Good morning. We in the Great Lakes Region have a high interest in your industry. We do have some unique conditions in that region that we think have great bearing on how your industry and the FAA must provide a very needed and vital service.

We do have some unique demographic, unique economic and unique climatic conditions in the six-state Great Lakes Region which present some unique operating problems for each of you. We too, were concerned with your industry as a whole a year ago, and we too, had a series of meetings throughout the region to try to sit down and have face-to-face contact with each of you so that we could have a better appreciation for each of our positions. We think those meetings were very fruitful. They were for the FAA certainly, because we came away with a much greater appreciation of the problems that you confront every day.

Following the meetings we had with the industry, we went around and sat down with each state director in the six states of the Great Lakes Region and asked for their comments with respect to what they needed to do for your industry and what roles the state and local governments must assume along with the FAA to ensure that we do have a viable system. In each of these meetings the one thing that seemed to be a common thread of concern was that of "weather", the lack thereof or the timeliness of it when it was presented, and the completeness of the weather.

I thought today, as long as I had this forum, that I would try to briefly summarize for you what we as the FAA are trying to do with the weather issue, and what we in the Great Lakes Region are doing locally which will have a direct impact on those of you who operate in that six-state region.

This has been brought home in sharp detail for us in the FAA as a result of a recent metro-liner crash in Nebraska that was weather-related, and we have, of course, gone back to the drawing board as we always do after a fatal crash and tried to determine what we could have done better. We did find a number of areas where we could make improvements and those improvements have been made, and we are convinced now that we are doing a better job of weather dissemination from our air route traffic control centers.

We in the FAA have, in various stages of development, a number of improvements in the aviation weather gathering and dissemination systems which we believe will increase the safety and operating efficiency of the

national airspace system. These long range programs which should be implemented in the late 1980-1990 time frame are primarily concerned with: (1) the enhancement of selected national airspace system weather equipment and procedures; (2) the improvement in aviation weather radar systems; and (3) the automation of weather observation equipment and procedures.

In our engineering development complex within the FAA, we have in draft form an aviation weather program plan which has identified the following goals:

> Have a national system using a combination of telephone, radio, television, automation and data link that provides immediate pre-flight aviation weather information to the pilot when requested; to provide interference-free communication between pilots and the en route flight advisory service positions at our flight service station; to receive upper air information and pilot reports automatically from airborne aircraft; to provide hazardous weather information to the specialists and controllers at their duty positions; to provide an automated weather system without the numeric and graphic weather data needed to produce aviation weather forecasts to the meteorologists in the FAA Headquarters' central flow complex and at each of our en route center weather service units.
>
> To have an aviation weather data interchange system between the meteorologist and the en route center weather service unit in the flight service and terminal facilities within the center's area of responsibility as well as between service unit responsibilities and the adjoining centers.
>
> Provide automated aviation weather observing and reporting systems at air navigation facilities at airports without weather observing services.
>
> To reduce the human involvement in weather observing and reporting consistent with aviation safety, and to relieve the en route controllers of the duty of passing information weather to the pilot -- we hope to be able to data-link that in the future.

Through the enhancement of equipment and procedures at all of our air traffic control facilities, more timely onsite meteorology support will be provided to the users of the system by increasing our capability to collect and rapidly process and transmit significant weather information throughout the system.

Improvements and new development efforts are planned for weather radar systems which will provide increased weather detection accuracy, particularly in the area of hazardous weather detection by both type and location, thus offering a more effective advisory service to pilots.

By automating weather observation system equipment and activities, more frequent real time weather information will be obtained and disseminated automatically. This will increase the amount of pertinent information available to satisfy your requirements.

These specific areas towards which our primary work effort was directed include the following. The center weather radar service units at each of our 20 en route centers will be the focal point for real time collection, monitoring, interpretation and dissemination of weather information. The central weather service unit, when commissioned at the Los Angeles Center in 1980, completed a joint FAA National Weather Service program to provide aviation weather information at all 20 centers. These units staffed by meteorologists will keep controllers advised of weather changes, particularly those that pose a hazard to aviation.

The central flow control weather service unit located at FAA Headquarters will make recommendations for the planning of flow control activities which will improve routing and reduce delays associated with adverse weather conditions.

A data link system which will be used to transmit and receive in-flight weather data will be developed for use with appropriately equipped aircraft. This will be accomplished automatically through the discrete address beacon system which is presently under development at the FAA Technical Center in Atlantic City.

Normal radar procedures will be used to transmit weather data to aircraft without the data link capability. In the area of weather radar, a national network of doppler weather radars is under development which will ultimately provide radar data to the national airspace system.

Then we have a unit developed for a family of modular automatic and semi-automatic observing systems which will be developed and installed at selected field sites. These systems currently under development will be capable of observing, processing, and disseminating measurements of the following weather data: sky conditions and ceiling; visibility; weather and obstructions to visions such as smoke, fog and haze; sea level pressure; temperature; dew point; wind directions, speed and gusts; altimeter settings; runway visibility; and runway visual range.

Each installation will observe only those elements which are required for that location. The FAA and the National Weather Service will jointly determine which specific elements will be required. However, wind speed and direction, barometric pressure censors, a processor and a dissemination mode will be the minimum components of every system.

All of these programs will, of course, be dependent upon funding availability. I think you heard that this morning. Our long-term plan for capital development and expenditure in the FAA has very distinctly addressed its problem with weather systems.

Currently, a program is being developed for the installation of a wind altimeter voice equipment system, commonly known as WAVE. These systems will provide automatic recording and dissemination of wind and altimeter data, and will broadcast data when selected, on selected frequencies to the pilot. We plan to install a number of these systems at selected airports beginning in 1983. Once the WAVE system has been enhanced with ceiling and visibility equipment as modular add-ons, it will be approved as an acceptable weather reporting system for FAR Part 135 operations, and should be eligible for federal funding.

Incidentally, we're engineering the design of our modular equipment to be compatible with commercially available systems that are now on the market. Our short-range actions, and here I'm speaking specifically on those in the Great Lakes Region, include a number of recommendations which we've made as a result of our meetings with the commuter operators and the state directors.

As I mentioned earlier, weather was a primary topic of concern at all these meetings, and rightfully so. The specific issue most frequently discussed was supplemental aviation weather reporting stations or SWRS as we use the acronym. The concerns most commonly voiced about SWRS were the difficulty and expense involved in establishing and certifying the system, the continued expense of manning and maintaining the station, and the very real concerns about the legal liability which might be incurred in providing weather information to flights other than those of the operator. Based on these and other concerns which were raised in these meetings, we have made a number of recommendations to FAA Headquarters and asked for their evaluation. I would like to just summarize our proposals.

We recommend an evaluation of requirements for the SWRS with a specific emphasis on simplifying the criteria for establishing and maintaining the station.

We recommend that consideration be given to permit operators of properly equipped aircraft to take advantage of advances in electronics and instruments. Credit for an operable radar altimeter would be allowed toward lower weather minima where it can be shown that the procedure is safe.

We recommend that the FAA and the National Weather Service seek to develop the means and procedures by which the operators of a SWRS might be provided some insulation from legal liability as a result of providing information to other operators and pilots.

These and other recommendations which came from our conferences have been, as I said, forwarded to Washington Headquarters for their consideration and are currently under review.

We have asked the state of Indiana, and they have agreed, to take a lead in looking at some new and innovative ways wherein the state might join with the Federal Government in looking at a method of licensing observers through appropriate state statutes which would enable a given location a degree of flexibility that is not presently in the system.

We recognize the economics of trying to get good weather at some of the locations you're serving. This is becoming a greater concern in the Great Lakes Region as some of our major carriers are pulling out of a number of locations due to the continually changing economic situation we're confronted with.

Many of you know, I am sure, that Republic Airlines continues to talk about moving in and out of a variety of markets, particularly in the northern tier. At some of these markets, Republic Airlines is the only source of weather information at given airports.

If you plan to go in and take up that market segment, then we have to work together diligently to provide some reasonable and cost-effective weather information.

So we hope and look forward in the coming year to continuing to work with your industry. We hope that those of us in the Great Lakes Region have been (as we told you last year) firm, fair and consistent in our application of rules and regulations.

We hope we've been timely. We stress that your industry has been, for the last year, our number one priority. We look forward this year to having it again as our number one priority. We're anxious that you're successful and that you're economically viable, and we too, along with you, take pride in the fact that we have, in fact, become a safe industry.

Thank you very much.

REGIONAL PERSPECTIVES ON COMMUTER ISSUES

Robert L. Faith
Director, Alaskan Region
Federal Aviation Administration

Good morning ladies and gentlemen. I consider it a privilege to be here in this snow-bound Washington. I spent 13 years here, and as usual, a little bit of snow and traffic comes to a standstill. I would like for you to come up to Alaska and see how we drive. Maybe you'd better not, because almost all of our cars are dented and everything else. They drive like maniacs.

One of the other things, as far as some misunderstanding, I would like to dispel here this morning is that we call Anchorage, Alaska, part of the banana belt, because it has been warmer there than it has been here. However, I would like to hasten to point out that about seven or eight weeks ago, we had about a four-week stint of where it was ten below, twenty below and thirty below. Luckily there wasn't any wind along with these low temperatures.

At the outset I would like to strike a positive note and point out that although there are difficulties and problems galore, there have been some very significant accomplishments in the aviation industry in Alaska.

The fact that government and industry are engaged in communicating -- exchanging ideas and views -- as they are in this symposium, in itself reflects a most positive and worthwhile accomplishment. Since this can be a highly effective forum for erasing misunderstanding -- speaking of misunderstanding and communication -- I am reminded of the controller who informed the fledgling pilot that you've got traffic at 12:00. "No problem" the pilot came back. He said, "I'll be on the ground at 11:30." That is only one of the kinds of misunderstandings that we in the FAA are eager to erase. Wherever there is a misunderstanding or whatever misunderstanding there is about aviation in Alaska, in the time available, I am going to do my best to erase as much of it as I can.

There is one thing, however, about which there are not misunderstandings -- the vastness of Alaska -- a state even larger, Alaskans hasten to add, than Texas. Understandably, Alaskans take pride in being residents of the largest state, a state so large that it sometimes boggles even their minds.

Alaska is one-fifth the size of the continental United States, 550 times the size of Rhode Island, and twice the size of Texas. If you were to superimpose a map of Alaska on the map of the lower 48, you would find that Alaska's territory extends from coast to coast. Alaska's 586,000 square miles span four time zones.

With a state that vast and with a population of no more than half a million, you might conclude that aviation is a dominant form of transportation, and you would be right. Alaska has been referred to as the "flyingest state" in America.

The state has more than 10,000 pilots and more than 7,000 registered aircraft -- that is one pilot for every 50 Alaskans, more than six times the national average. The state has more than 700 airports and the 700 does not include literally hundreds of bush strips and landing places not shown on aviation charts.

With only about 3,000 miles of hard-surfaced roads in the state, and by the way some of the lower 48 counties boast more than that, about 70 percent of Alaska's communities are served only by aviation, and that is where the 220 air taxi commuter operators in Alaska are doing such an excellent job in providing essential transportation.

In that regard, it was my pleasure to get to know one of the giants in the Alaska aviation and almost a legendary air pioneer in the state who, with others, laid the foundation for modern aviation in Alaska. This was the late Bob Reeves. Only a short while before his death, the FAA paid tribute to Bob by dedicating one of our conference rooms in the Alaska Region Headquarters to him, and we were very, very happy to have him present for this dedication.

It was Bob Reeves who once called the tower at Adac Island in the Aleutians and asked the controllers to turn on the landing lights. The controllers advised him not to land because of the weather being so bad they couldn't even see the ladders that ran up the side of the tower. "Hell" Reeves snapped back. "Turn on those lights so I can see where to taxi. I am already on the ground." Many of you can probably also say something similar to that.

I think we can pay tribute to Alaska pioneers like Bob Reeves, the Weems and others less known who developed aviation at a time when there were few NAVAIDS, rudimentary reporting and postage stamp airports.

Alaska's weather has been demonstrated to be among the world's worst -- freezing rains, blizzards, white-outs, bone-chilling fuel congealing temperatures that often plunge to 70 below, and that is not adding the wind chill factor. We have all of these and plenty of it. If any of you would like to have some, we'll figure out some way to send it down to you. Many of the conveniences the commuter/air taxi operator in the lower 48 takes for granted are absent from the Alaskan scene.

Once you leave the major centers of Anchorage, Fairbanks and Juneau, you're pretty much on your own. An emergency landing can be the beginning of a serious ordeal. You may find yourself several hundred miles from the source of spare parts and the responsibility that must be undertaken for the passengers, especially in severe winters, is enormous.

The air taxi pilot must be a jack of all trades. He must keep a sharp eye out for the passengers boarding and deplaning, and I must say that we have had in about the last two and a half weeks, three people get off an air taxi airplane and walk right through the propeller. It is a shame. Two of the people survived. One lady lost an arm, and the other fellow got 18 stitches down the side of his face. The other was a total fatality. The pilot must load and unload cargo, and be concerned also for the security hazardous material. His job is a lot tougher than most other parts of the country.

Then there is the matter of the cost of doing business. Air taxi operators in Alaska today are waging a discouraging and debilitating struggle to stay afloat in the face of the oppressively high cost of doing business that keeps getting higher. The top dollar Alaska operators must pay for labor, fuel, spare parts, maintenance and other business necessities, which very often leaves very little in the till for the operator himself. I am sure that maybe some of you can say the same thing. The problem of high cost of operation is not unique, of course, to Alaska, but nowhere in the country is it manifested so acutely and so painfully.

The three major concentrations of population in Anchorage, Juneau and Fairbanks represent more than 60 percent of the population in the state. Except for these areas, Alaska consists of the vast outback dotted with tiny communities. Most of them are mere villages hundreds of miles from the nearest habitation, and most of these planes are totally dependent on aviation for their sustenance. In many of these far-flung settlements, a major airport improvement might be a shed alongside of a gravel runway to give shelter to someone waiting for the next mail plane or waiting to take a plane to one of the three big cities.

Alaska's aviation industry faces the same problems and has basically the same needs as elsewhere with some difference and degree perhaps. The need for skilled pilots and mechanics, the need for personnel equipped to wrestle with management problems, financial matters and the like are always of concern and not only in Alaska.

One pressing need is providing fast, accurate weather data to pilots from points throughout the state. This is an area in which we, the weather service, and the state of Alaska have concentrated our efforts for several years. I must admit, however, that we are a long way from where we would like to be and there are still segments of the Alaska map which remain blank so far as up-to-date weather observations are concerned.

Though the Alaska weather observation network is expanding gradually, we contend with a discouraging high rate of turnover among our observers in remote locations. Too often after installing the required equipment

and training the observers, they bow out and we are left without the data so vital to the aviation operators in that area. In one instance, we trained an entire village to give the observation. This village consisted of about 35 people, but when the fishing or hunting season rolled around, there wasn't a single observer available to us.

That is the Alaska way of life, by the way. There are no easy solutions; however, those of us working closely on the problem in Alaska on both the state and Federal level would like to see the highest possible priority given to the development of automatic weather reporting units that are still in the research and development stage. Meanwhile, the FAA is expanding its network of conventional weather reporting localities at a rate of at least six a year, and the state is also assisting in this program.

On the matter of accidents, I am sure you will agree that there is no easy solution to that pervasive problem. No matter where we happen to be situated, you and I must struggle with the problem. We can all be sure of one thing. Continuing high level rates of accidents will perpetuate the spiral in insurance rates. This alone can deal a heavy blow to the aviation industry whether it be in Alaska or elsewhere.

The matter of the skyrocketing aviation insurance, I am sure, is a problem elsewhere, but it is especially critical to the Alaska operators. In this connection, we need to be more mindful that the insurance companies should not be cast in the role of villains. Despite the high rates carriers must pay for insurance, the companies are, by and large, losing money in claims resulting from operations in Alaska. There can only be one answer -- a significant cut in accidents.

As a matter of fact, I met with the representatives of Lloyds' of London here about a month and a half ago, and there is a remote possibility that they will pull out of the insurance business in Alaska and that will be a devastating blow to us.

In a recent study the National Transportation Safety Board attributed the high rate of accidents -- air taxi accidents in Alaska -- to among other things, to what NTSB called the "bush pilot syndrome." This is an attitude on the part of the air taxi operators, pilots and passengers in Alaska that ranges from casual acceptance of risks to a willingness to take unwarranted risks. Reference to such a syndrome may strike a cord elsewhere. Beyond the so-called syndrome, however, lies an array of underlying accident causes. Other aspects of the human factor, the machines, the need for better weather reporting, improved airports, and NAVAIDS and the like, all are part of this equation.

The FAA, the state of Alaska and the aviation industry are deeply concerned and heavily involved in the never-ending quest to reduce air accidents. The state of Alaska, for example, has planned outlays of more than $51 million which will go to provide a system of improved runways, weather reporting, additional field lighting, new navigational aids and improvements in the weather reporting system. This is supplemental to the very substantial FAA improvement program.

FAA Flight Standards personnel are continuing their ongoing safety clinic program that brings safety into day-to-day contact with pilots throughout the state in an effort to forge better safety records. I can tell you that we are making good progress in that particular program, and we will keep it up.

Through ADAP, FAA is committed to a continuing program of airport development and improvement throughout Alaska, a program that along with others so far has brought Alaskan airports more than $245 million in improvements.

Most gratifying is the smooth-working partnership composed of State and Federal Governments and private industry that has developed in Alaska. I am sure that this partnership is working to the mutual benefit of all. We can see that this kind of cooperative partnership is a major key to the solution of some of the problems we have been discussing, not only in Alaska, but throughout the United States as a whole.

I hope in the brief time I've had, I've been able to give you a better understanding of Alaska and Alaskan aviation and the problems we face. Again, I commend each and every one of you for your presence at this symposium. There are a few problems that people can solve if they only work together and talk things over. By working together and talking together in the good spirit I have witnessed in Alaska and I see here at this symposium, we can meet the challenge of the 1980s. Thank you.

COMMENTS AND QUESTIONS

John Van Arsdale - I would like to comment with respect to the report that was given following the September seminar in Atlantic City and the discussion of the minimum vectoring altitude problem, which is paragraph 1284 in the FAA Handbook. The report said that the paragraph as presently written is causing problems at all airports, not just those on the Eastern seaboard. Paragraph 1284 makes VFR departures in the New York Terminal Control Area almost impossible.

The Eastern Region has been trying to get some relief from Washington to help solve the delays resulting in paragraph 1284 in the New York area. The Eastern Region has not been successful in getting a waiver to accommodate the special conditions in the New York area. I thought maybe you could comment on that.

Murray Smith - Sure, I would be glad to. What actually happened was that there was a procedural change made and the minimum vectoring altitude in effect raised the minimum altitude above the normal VFR route structure. Yes, you stated that accurately from our Atlantic City conference.

We have received from Washington the clearance to change that. As a matter of fact, there is a briefing underway to change that. As a matter of fact, there is a briefing underway today, the 15th, at LaGuardia to start talking to the users about that.

What we will do is video map the area -- the one you referred to around LaGuardia -- and it will permit us to use lower altitudes going into LaGuardia. Hopefully by the 15th of February that will be implemented. We will have arrangements with the various users that will be coming into LaGuardia so that the routes will be understood collectively. And, as I say, hopefully by the 15th of February, we'll have that resolved. We're certainly aware of the problem.

John Van Arsdale - Would the same thing be true in Boston, for instance?

Murray Smith - I can't speak specifically for Boston, but the waiver is, as far as I know, nationwide. I don't know about the timing for Boston but I think Bob Whittington -- I don't believe he is here right now -- but I will have to get back to you on that. I really don't know if it applies to Boston. All I can speak to is the Eastern Region. Is there anyone here that has an answer to that so far as air traffic? We'll follow up with you on that.

Usto Schulz (Golden Gate Airlines) - Some years back, I was discussing that airport problem with Bob in Alaska and Bob said, "I like to take off uphill, because then I'm already climbing."

One of the questions, Murray, that you talked about with regard to Empire dumping their passengers into major airlines' terminals, we have that same problem. As I understand the new 108 that was announced this morning -- and I would like to look at it a little closer, but it still requires an LEO at some of the low density places and I think perhaps at least in my view, it is flawed because I don't understand what enplaning passengers have to do with where you depart from. In other words, we screen them, etc., but why do we have to have an LEO?

Jack Hunter (Air Carrier Security-FAA Washington Headquarters) - The regulation provides several alternatives for the airplane operator who desires to discharge passengers into a sterile area, and I won't presume to take a long time with the group.

It is a fairly complicated issue, but basically there are three alternatives available to the airplane operator who has that desire to deplane people into a sterile area. First, it can arrange an agreement with the accepting carrier responsible for the sterile area -- United Airlines of Chicago, Eastern Airlines at Washington National. That agreement can be that a representative of the carrier responsible for the sterile area will agree to escort the deplaning passengers into, through and out of the sterile area. Another arrangement or possibility, an alternative possibly under the regulation, is an agreement between that discharging carrier and the receiving carrier for the receiving carrier to screen the passengers upon deplanement prior to entry into the sterile area. Then the gentleman stated the third alternative correctly. It would, in fact, be whether that airplane operator desires to discharge into a sterile area. It then would be required to screen under the regulation as a third alternative and, in fact, the airport operator, pursuant to the Federal Aviation Act, would be required to provide a law enforcement officer to support that screening process.

Let me give you a very quick, short bureaucratic answer to why we feel it necessary in all cases where there is a screening process for a law enforcement officer to be present. Number one, philosophically, we just feel that the system is not complete without the deterrent value of that armed uniformed law enforcement officer as part of the process. But, perhaps more importantly and from an operational standpoint, screening processes tend to generate incidents, problems, finding firearms, other more severe problems, and without that law enforcement officer present at the screening point or wherever screening is performed, FAA is not satisfied that we have the effective system in place. Beyond that, please contact us at FAA Headquarters in Civil Aviation Security and we'll be more than happy to spend whatever time is necessary.

Attendee - This is a question directed to Mr. Barlow. I was wondering if the FAA has given any consideration to phasing out slots at O'Hare, and if not, do you have any thoughts on this?

Wayne Barlow - The FAA gives a lot of thought to O'Hare, continuously. Right now we're involved in a reassessment of the slot process, as you well know, and we discussed it to some degree yesterday. The planning folks, the lawyers and others who are interested in this are now relooking at this slot question.

We frankly, at O'Hare, from a very pragmatic operational perspective, don't know what we would do if we got into that environment right now. As you know, in working in and out of O'Hare, that -- and I would relate back to earlier in the year when we had some difficulty with the controllers at O'Hare -- everything there must work at peak of efficiency in order for us to begin to meet the demands on that system.

If we start right now dealing with that slot problem before we do it nationwide and have a consistent rational plan, we would have great dislocation at O'Hare. So basically the answer is "Yes, we worry about it but no, we're not going to do anything with it immediately." Certainly not to O'Hare in a vacuum. It would be done with all slotted airports.

LUNCHEON REMARKS

Aaron J. Gellman
President
Gellman Research Associates

It is always a pleasure to be introduced by the likes of Walter Luffsey. This is the first time that has ever happened. I enjoyed it immensely. The only thing he didn't mention that we share is both being pilots, pilot here, pilot there, I suppose -- the real kinds of pilots. I also like that marvelous euphemism, "takes the stand." I don't feel like I am giving evidence, although I would be happy to deal with any issues at the end if anybody wants to raise any.

When Walter asked me -- Walter mentioned I came off vacation. I must say that I woke up this morning, looked out the window from my apartment in Washington and saw the snow. I felt, for the first time in my life, like a living reincarnation of a series of cartoons that some of you, not too many of you, are old enough to remember. The cartoonist named Abner Dean, used to I think publish in the New Yorker, had an unending series of cartoons called "What Am I Doing Here?". Some of you remember that. Well, I felt that way this morning for the first time in my life, but to tell the truth, very glad to be here with you. It will make St. Croix even more attractive tomorrow for the two days I have remaining which is my short vacation.

When Walter asked me to join you today, I set down first on a piece of paper 21 issues that I think are timely and hot topics that we might discuss. Rest easy, there is no way that we can even begin to approach 21 in the time we have available, so I have not entirely arbitrarily, I admit, limited it to five points I would like to make. As I say, we can delve even further into these if you like or extend into some of the others at the end, if you wish.

The first point I would like to make is related to mobility preservation in the United States. One of the great tragedies, I am afraid, that is going to be recorded for this era in our history relates to the fact, and I assert it as a fact, that neither economist nor political scientist nor any others competent to make such judgments have, in fact, attempted to undertake the analysis necessary to determine what role ubiquitous mobility has had in the history and development and growth of this country of ours.

I hypothesize, and I challenge anyone to support or knock down that hypothesis, I would welcome either case, either as it may turn out, but I would hypothesize in the absence of any proof to the contrary, that one of the very important elements in America's well-being, past, present and

future relates to the mobility that this country has enjoyed and had damn well better continue to enjoy if we are, in fact, to continue in secular terms, the "upward trend" of the United States in terms of real income, in terms of income distribution and all those good things.

If my hypothesis of the importance of mobility and its ubiquity throughout our history is even remotely correct, I suggest to you that we are seeing the government take, over the last seven or eight years particularly and prospectively in the future, we're seeing our government and even some private interests take decisions -- policy decisions, investment decisions -- which as an indirection or byproduct of the decision at least, are undermining the mobility of this country.

You think about it. In the name of energy conservation, we're committing a lot of things that I am not sure, even at high energy costs and even with the need for energy conservation, I said I am not sure some of these policies, at least, that they don't do more harm than good.

Now it is my view, after a lot of thinking about it and some work in the field of commuter aviation -- both policy and economic, finance, technology -- that the commuter airlines are essential, if nothing are gap-fillers, and I don't mean to denegrate you in any way by saying that.

Mobility preservation in the United States may well be recorded to have been maintained in the 80s and beyond for some time to be maintained in an especially important way by the existing growth and development of commuter airlines, a name which doesn't do you any justice if I am right about that. In any case, you are in fact, preserving mobility in an era where mobility for many of our people, passengers and freight shippers, many of our people would lack the mobility necessary for them to play their role to the hilt in improving the economic well-being of this country, both in the short and the long term.

I say that the role of commuter airlines is that sort of role -- potentially if not actually already, especially with what we call regulatory reform. I do not call it deregulation because a piece of legislation that thick is hardly deregulation. It must be regulatory reform at most.

The second point I would like to raise relates to what we call "market access." The element of market access, which has acquired your attention over a considerable period of time and I suggest will acquire increasing amounts of your attention, is that which is commonly referred to as "slots and gates." I am also a professor at the University of Pennsylvania's Wharton School, and I started a lecture recently by using the term "slots and gates." Some of the students thought I was talking about a public interest law firm. I assure you that I am not.

Slots and gates is a problem that is with you and is going to stay with you. I am not sure that the solution to one problem is the solution to all problems where slots and gates are concerned. In fact, the slots

and gates problem is crucial to market access or the solution to that problem is crucial to your maintaining, expanding and even, in some cases, acquiring market access. You have probably heard a lot about this or will at the late afternoon session today which I hope to attend if I can. But there are other forms of market access that need to be mentioned as well. Many, if not all of these, have been brought to your attention before, but I cannot forbear remarking on them myself.

One has to do with the print media. You're doing better in the OAG type of market access, but not well enough in my judgment. More important, you -- above all the elements in the airline industry -- ought to realize that the print media as the means of distributing information to the marketplace, the print media's days are numbered. There is something beyond print. There is a good movie title. We can only suggest what it may be. It may be something reasonably mundane in the era of electronics, CRT kinds of things, but there are things beyond print which I would strongly urge the commuter airlines to be in the forefront of exploiting because that is the way to get a jump into the marketplace when the time comes for that technology to help you expand your access to the market.

Also, with regard to market access, I think the whole area of intertwining, particularly with other noncommuter airlines, is of crucial importance as you certainly well know. The airlines that are not fortunate enough to be designated commuter must be kept aware of the importance to themselves, and their own self-interest, enlightened self-interest. They must be made aware at all times of how important it is that they market your product along with theirs where the mutual ends and the interests and profits are served.

In this regard or connected to this, I would like to point out that the current CAB travel agency proceedings are of extreme importance to the commuter airline industry and being involved in those proceedings on the side of the ATC and IATA jointly, I must say that I have not been overwhelmed by the extent to which the commuter airlines have paid attention to what is happening.

The travel agency network in the United States represents an important market access medium for you as well as for everyone else in the travel business, and I am not sure that this has been fully recognized.

God knows you are all busy people and that includes not just the carriers, and I am not just talking to the carriers. I understand there are some manufacturers, I see some people I know -- both aircraft and engines, and so forth. For all of you who have a stake, who are stake-holders in the commuter airline future, it is very important to recognize what this proceeding means, potentially in terms of market accessibility. I might add parenthetically that one would have thought the Small Business Administration of the United States -- given the fact that virtually all travel agencies and a large portion of the commuter airlines themselves, if not the manufacturers that support them -- are

small businesses by legal definition. The SBA hasn't done a damn thing in this proceeding and that, in large measure, is because neither the terminal agency people nor the commuter airline people have pushed them to do anything about it -- to take the proper interest in this proceeding.

The third point I would like to get into relates to, yes, I am sorry to bore you with it -- regulation. I am going to say some things about regulation that may be different from what you've heard. Except for the initial remark I want to make which is related to economic regulation, I am not going to say anything about conventional economics regulation except for this one.

I think that if you have not thought about it this way before, you may find it interesting and also a warm feeling may come over all of you as a result of thinking about it -- namely that if regulatory reform in the airline business works, if what Congress has designed and put in place in terms of legislation after seeing the demise of the CAB in '84 -- if all that regulatory reform works in the airline field, no single group will have been responsible for making it work anymore and perhaps not even as much as the commuter airline community.

That is a hell of a thing to say. It is really important and it puts you in a position where you are pivotal to success. We can only really be characterized as an experiment in deregulation or regulatory change. If you do not work out well as commuter airlines, so called regulatory reform is not very likely to work out well enough to satisfy a critical mass of political opinion in this country -- that is to keep regulatory reform going, not just in the airline business, but across the spectrum of the American economy.

I think you ought to understand -- now some of you who are in love with regulation, prisoners do fall in love with their chains -- some of you who may be in love with regulation can start lying down on the job now and sabotage it, but I don't think you'll do that.

Now the other remarks about regulation are simply these. There is other regulation that you need to pay attention to. Obviously, CAB regulation -- CAB economic regulation and obviously FAA safety regulation. I am sure you've heard as much as you need to hear, certainly last year's conference on safety regulation.

I want to open a whole new door -- I suspect -- and that is what we call those who have studied regulation, "nonindustry specific regulation." The classic example for present purposes would be antitrust type regulation.

Not only are the CAB economic regulatory functions in significant degree to be transferred to the antitrusters, justice principally, it looks like it is going to be the winner or loser, depending on how you look at it -- but there is a body of antitrust interest at the

Federal Trade Commission, and I think before very long the Department of Transportation at the Secretary's level is going to have to be made aware of what deregulation in the airline -- sorry, regulatory reform -- really needs in terms of re-regulatory. That is why it is reform.

Just think about antitrust regulation. If you had antitrust regulation applied to the airline business today to the full extent of its capabilities, which will be the case after 1984, you would not have suffered nearly as much in terms of market access to the print media as you have. I could go and spend quite a little time about antitrust application to your business, but let me just say that there are many ways in which the antitrust laws of this country can be very helpful to the commuter airline industry and to commuter airlines individually. It behooves you to begin, in my judgment, to start knowing substantially more about that kind of regulation than I think you do know now, sort of begin forgetting about CAB type economic regulation and start adding to your knowledge of this nonindustry specific type regulation. I think it will be very important for you to do that.

The fourth area that I would like to cover briefly relates to management and entrepreneurship. I don't think any of you deliberately, or if you thought about it, would come to the conclusion that this is the kind of business -- commuter airline business or air frames for commuters or engines for commuters -- that doesn't need management in any particular quality.

It doesn't need what we call entrepreneurship. The innovation spirit -- the spirit to innovate, to form new enterprises and go charging forward. There is no special business protected from competition by the CAB, all kinds of things like that. Well, not so. You need this business or industry -- the commuter airline industry has seen a very high level of enterpreneurship.

I am sure many commuter airlines would not be in the air. Indeed, some of the air frames we use and see, if not love, would not be in the air either, but for some pretty dedicated work by individuals who we call entrepreneurs. So we need quality management and we need a high level quantitatively and a high level qualitatively of entrepreneurship in every conceivable aspect of commuter aviation, carriers and their suppliers too. When I say their suppliers too, I want to make it clear or say "perfectly clear" -- I have a feeling that expression may be coming back across the land. I want to make it clear that when I say suppliers, I mean the FAA in one of its most important roles as it serves you.

The FAA is to be viewed in some respects as a supplier to you. They supply you with the environment in which you operate successfully or don't -- ATC and so forth, slots and gates perhaps even. If you think about the situation with regard to suppliers, both private sector and public sector -- airframe and engine on the one hand, for example, and all the parts, tires and avionics, and so forth on one hand and the government, the FAA in this case, on the other hand -- you begin to see

that the commuter airline industry as a whole is going to suffer weak links in terms of management and in terms of entrepreneurship in any of these supplier areas that are critical.

It is hard to imagine and it is sad that I bite the hand that fed me -- not bad, too -- but indeed, we have forgotten about entrepreneurship, forgotten about it in public sector enterprise.

You are among a fairly substantial body of people who damn well better use your influence to improve the level of management in all suppliers including the FAA and to introduce, in terms of the government yet again -- you used to have a high level of risk taking -- intelligent risk bearing entrepreneurship.

You want to do away with the whole motion. You want to cause it to do away with the motion of NIH not invented here. You want to hear the area of navigation story -- the DECCA Navigation Story? Want to hear the whole story? I will tell it to you -- no, it would take too long. But as you know, it was clearly an NIH problem.

The technology people in the government didn't invent the original area of navigation system at work - DECCA System - but literally took steps in preventing it from coming into these shores as a certificatable operational system for over a decade. That is all in the book as Damon Runyan used to say, "You could look it up." So you need to recognize the critical need not only in your own businesses as carriers or airframe or engine suppliers, but you need to recognize the critical nature of entrepreneurship and management and suppliers to you.

There needs to be intelligent risk-bearing all along the line. It is not a crime to fail. One of the great dangers to public sector risk-bearing on an intelligent basis is none other than that marvelous Senator that Wisconsin keeps giving us -- Mr. Proxmire and his Golden Fleeces. That is outrage. Nobody dares even to think of failing in the government lest he be golden fleeced. Although on a day like this, it may not be so bad. I bet it's warm.

In any event, we've got to rise above that kind of pettiness and introduce into the FAA, as in the private sector, a willingness to take intelligent risks to try and do the same, even if they fail. There also needs to be in the management and entrepreneurship sense area a lot of nontechnological innovation by carriers particularly, or fancy let's say -- more imaginative pricing.

I am sure for some carriers on some routes it is already called for. Pricing is as innovative as technology in marketplaces. You need to know this and understand and remember it. Actually, one thing we've learned about the history of the airline business, and you can see it through the eyes of students very clearly -- MBA type students like those I see mostly, they have come to realize, and I know the airline used to be the great glamorous thing to go into -- nothing held a candle to being in the

airline business. Well, now it is looked at as an ordinary type management job for the most part, not totally. It has become much more mundane. In fact, it still has a lot of its excitement and interest, no doubt, but managing in the airline business requires some high-level but very ordinary type of management as well as some reaching out, entrepreneurship and innovation and imagination.

With regard to one specific area of management and entrepreneurship, I would like to overreach. I will admit it myself and make one comment. I've been appalled, and this is the only remark I think I'll make about safety -- I have been appalled and a careful reader of accident investigation reports. I have been that way all my adult life, but I have become even more of a careful reader since I've served on this Commission that was set up on airworthiness certification by the National Research Council.

I've been appalled at the extent to which a lot of the commuter airline accidents have had as a contributing factor training problems and currency problems and inadequacy of experience problems. I think it is high time, if nothing has been done already and it may well be that I don't know about, there ought to be a concerted effort to look to the frontiers of technological possibility where training and education is concerned.

I comment to you that if you have not looked, you may want very much to look at some of the more advanced automated learning concepts and technologies that are being used in other fields including, indeed, sometimes the aviation field.

The one thing that I have the most experience with in a number of different dimensions relates to the Control Data Plato System, which has proven to me things that could be done that I never dreamed could have been done in my lifetime in a sufficient time, in a relatively cost-effective way.

The last point before sort of a summation relates to technology. We've talked a bit about technology as we talk about management and entrepreneurship, but I want to talk about it quite specifically and directly. You know that if you live with the technology of this business, particularly the principal input -- the principal capital input, the principal input is people. Never forget that. I'll never forget it, and you'll never forget it, I am sure.

But the principal capital input to this business is the aircraft and engines. That is where your biggest bucks are invested for the carriers, and it has the mirror-image implications for the suppliers of those pieces of hardware. The technology embodied in these aircraft and airframes has been extremely much influenced, greatly influenced by the economic regulation that has affected and influenced this industry.

I don't know if you're aware of it, but one of the first two studies ever done explicitly to explore the relationship between economic regulations, CAB regulation on the one hand and technological change on the other, one of those two was done on small commuter aircraft. It was done in 1971 or 1972. I know, because we did both of them.

It was a study of the development of aircraft from the time FAR Part 298 was put in until the time FAR Part 298 was changed, and about a year after that. Fred Smith of Federal Express used that study which was done for the National Science Foundation, and therefore, in the public domain. Fred Smith used that very tellingly to get himself unshackled from FAR Part 298 constraints on aircraft size, as some of you may know. It was very handy for us because we were being pilloried to supply copies to all kinds of people. The National Science Foundation was out of them, and the Government Printing Office sold out of them or whoever sells the darn things were pursuaded to introduce it three separate times, I recall in the testimony on the Hill, so the Government printed it. You just got copies of the hearing -- a cheap way of doing it, but we were a small company -- you couldn't afford to xerox them even. If any event, keep that in mind. I didn't ask him to do it, it just happened.

In any event, handy helpful hints for fledgling consultants -- we don't need any more, thank you. I am an economist and I believe in competition developing. It is like a religion for any economist to believe in competition, in anybody's business but his own, and don't forget that.

But economic regulation has proved, has greatly influenced technological change and innovation. If you doubt it, look at how things got stopped at the 12,499 Gross Weight, and you got the Twin Otter and all these airplanes that march right up to the threshold like the Swearingen Metro. Go talk to the airframe manufacturers that we have. We have in great quantity, written many times about this kind of frame. But remember economic regulations are on the wane. At least it is on the change, so this influence of economic regulations -- CAB style regulations on technological change in this business -- is greatly reduced if not eliminated.

Now the suppliers -- the airframe and engine boys -- have a tough problem. They really have a tough problem. They've got to get out there and make their product development decisions just like normal people. They don't have these nice thresholds of "Yes, that is regulated this way, no it isn't regulated that way like 12499 was and 30 passengers became, and so forth."

This is a very important point for the commuter airlines to understand as well as the aircraft and engine manufacturers who, I am sure, already understand it full well. What it means is that the commuter airline people must be willing and able and even volunteer to communicate with the airframe and engine people more than they ever have because the constraints on design are market constraints, not regulatory constraints in the future.

I might add parenthetically that it is a great tragedy that the effect of economic regulation was used, in my private judgment, as much as it was as an excuse for the engine manufacturers not going ahead with their larger engines of PT-7 and its counterparts at Garret as soon as they did, or sooner than they did. They should have gone ahead, in my judgment, sooner, and we advised one of them to that effect.

I don't want to embarrass anybody, but the point is the excuse now is the regulatory thing is unclear -- it is clear enough now that you make decisions on technology and body and aircraft and airframes on the basis of market expectations and not regulatory expectations.

We're not guessing the regulatory thresholds any more because in 1984 they're gone. In 1984 technological development is already yesterday. I am also agreeing with regard to technology to notice. I am sure you all have noted, most particularly the airframe and engine people, that the United States' position in the aggregate is not all the best.

I salute my sometimes -- some of the people I have met and certainly their products and the Shorts people, you are a gainer, DeHavilland is a gainer and Bandeirante is a gainer, nonetheless it is not good for the United States.

I do not think it is necessarily bad for the commuter airline industry, but I do not think it is particularly becoming or good for the United States to see its position in this very substantial market undermined in such a way.

I wish all the luck in the world to DeHavilland and Bandeiranti or Embraer and to Shorts and anybody else. I wish them all the luck in the world. Nothing against them. I think it would be nice to have a little more American competition, however.

I saw a real billboard in St. Croix. One of the commuter airlines down there -- Carlas, just getting a Short, and they said -- great billboard -- "We welcome you into our Shorts" or something like that. You should see it. It is terrific. That is entrepreneurship.

The last comment I would like to make about technology is this. We want to be aware, be careful of FAA imposed regulation on technological change, because that is what a lot of it turns out to be in the name of safety. It may be pro-safety but it may also have side affects that are pretty important and need to be traded off. Indeed, the FAA is doing that not only well, but better than any other agency I know in the government. That is very good for everybody concerned, including the people.

The regulation, however, there is much regulation present, possible in the future and expected that could shut the U.S. market out from the rest of the world market. It could make distinctions between the U.S. market and markets outside the U.S.

Let me give you just one example. One of the non-U.S. producers of airframes told us recently that if certain FAA regulations on safety were put in that relate to certification, they would make a command decision and in fact, they'd already taken the decision, if certain regulations went in that they would build an airframe that would fly. They were confident everywhere else in the world but even not in the United States, that they could afford to bypass the U.S. market and serve the rest of the world. The rest of the world would no longer go lock-step in adopting FAA certification requirements for such aircraft. I don't know if they were calling my bluff or trying to get me to send a message. I don't know what they were saying, but I think they said it with such conviction that I had to believe them, and I do believe them.

I think it is important -- those of you who are carriers, among others -- to be aware that if that were to happen, the U.S. were to become an enclave of a market, you would pay a lot more for airplanes for two reasons. One, the economic scale of manufacturers of aircraft and engines is enormous as you well, I am sure, know; and two, there would be a smaller market so even prices would be higher and I think effectively the used aircraft markets would also be very much attractive for the turnover role that used aircraft realization permit.

To conclude I would just like to take a quick and very often fantasy-look at the future. Look at the future of commuter airline business -- I think it is terrific. For several reasons, over and above any you may have heard that I suggest make this so. You may have heard of all of these, and I would be interested to know, but I think you have some very interesting developments that play right into your hands.

Not everything is good. The fuel situation is one of the things that isn't. I won't talk about that. But what I call divergent MV's -- what do I mean by that -- Mass Ton Velocity. I stayed at MIT long enough in the economic area to learn what MV is -- it is momentum. Mass Ton Velocity.

Would the highways be very safe? You've got divergent MV's, small flow of vehicles, competing with trucks that if they don't appear larger and faster, or if they aren't and appear to be — in any case the MV's are diverging. Incompetent analysis -- I think it is competent because I believe it. That is how you define competence - right -- suggest that we're already in the area of 5,000 marginal increased deaths because of divergent MV's in 1978.

I think the study went to 1979, as contrasted wth a normalized figure for the early 1970s. That seems reasonable to me, and I think the public is going to become aware. Whether the highways are going to get a 55 mile speed limit enforced or not or relieved or not affected, it will go up faster if Reagan lives up to that promise and raises the speed limit. The divergent MV's on the highways is a very serious problem for this country, and it is going to dawn on us at some point and is going to play right in your hands. I think that is good.

Secondly, I think we're going to have a sharpened appreciation for the value of time, particularly for the type of people who are likely to be commuter airline customers -- the value of time calculations we are seeing done by companies implicitly in most cases now, but even explicitly, by clients of ours who never thought in those terms historically before. Now I admit to you that a lot of the times, what are they doing? They're setting the stage to buy a business aircraft.

There are excuses and reasons in this world, and I have never been able to figure out which is which in a lot of business aircraft decisionmaking. It isn't necessary for me to do so at this point. I think it never becomes that serious because to survive, I have to decide which are decisions and which are reasons. The fact of the matter is that the value of time is becoming calculated much more by good managers than ever before the case.

I have a friend of mine who left the airline industry recently -- some of you know who so I won't mention his name -- to go with a consulting firm that specializes in just that kind of calculation, and they're doing famously. Big story in the Wall Street Journal about a little firm the other day. Terrific, impressive story -- that they do value of time calculations increasingly for industries to help them decide the logistic decisions they should make with regard to people not freight. And that plays into our hands, too.

Social change -- a lot of very important social change, and I don't really believe in my heart of hearts that the Commission for the 1980s that Carter set up which appears already to be in trouble like most of what he's done, that the Commission on social change or whatever they call it for the 1980s talks about the South getting big at the expense of the North. Well, I doubt it will be that dramatic, but I do think there are a lot of out-migrations to certain parts of the country, and I think it is going to be very helpful to you too.

I want to go through this very quickly to leave some time for discussion if you like. Another thing is I believe -- particularly of those interested in the commuter airline industry welfare will do something about it -- it is possible to start getting air travel of the sort we're talking about, particularly with a piece of commuter transportation in it -- to get that "in the budget."

One of the really serious problems that the small aircraft manufacturers in my judgment face in this country and the FBOs face in this country is that they didn't take the opportunity when the chance was there to get particularly young people to put flying in their budget. They did nothing, nothing, and now they're really reaping the whirlwind because the starts and retentions are so low. Well, you can get commuter airline transportation in the budget for a lot more people than you may think. It takes some clever doing, but it is do-able and it is not very difficult in my judgment to start moving in that path. It has a

long-term payoff I admit, some investment in the electoral process. Maybe, I don't know, some adjunct marketing programs, but that it is important to get in the budget the kind of travel you produce.

I do not believe that substitutes for communication are going to arise that reduce, in the foreseeable future, the kind of transportation of people and goods that the commuter airlines engage in. There is a big hullabaloo about communications substitute for transportation. I have just seen three ways of this analysis which, in various contexts myself, have had much of an effect. I don't expect to see it in this century in any significant degree, certainly where the kind of services you provide are involved. Only on the very highest density type route can the cost of communications of the sort that would avoid travel can the investment be made.

I think business aircraft is major competition for you, and since we are often involved in business aircraft decisions, I am not saying anything negative to them. God knows, I hereby stipulate those present and not, but I do think that business aircraft are competitors to commuter airline business, which you probably know. I think that this is a very serious form of competition that sure as hell has been ignored by the large airlines all these years -- just ignored it, haven't paid much attention to it at all. I don't think you can afford that to the extent that you are giving a short shrift. I think there is an important possible trend.

I am not forecasting anything in saying this, but certainly there is a rumble in the new Administration's transition team and already people who are going to take office say, that one of the ways to show the people how much they love them -- though they are of the business-side of the community -- one of the things that is very likely to come about in the Reagan Administration is a clamp down on the deductability of other than perhaps first-class air travel. This would put a real crimp in the use of business aircraft. I know that this is a very serious potential threat to the business aviation field, but what is bad for them in this case could be very good for commuters.

A look in the future certainly has a revisitation of cost allocation, absolutely guaranteed to be a right projection. You should be absolutely sure, in my judgment, to understand the ins and outs of cost allocation, because this time the fire is hot and this time you want to be -- you may not be so lucky as to get the kind of economic analysis that there was last time, so it never got up on the Hill.

Some of it was pretty weak, and thank God for the colleagues in the profession that work with me. I mean colleagues in the economic profession didn't get embarrassed by some pretty bad work. This time I suspect your opponent, opponents of aviation, general or private aviation, commuter aviation, airline aviation, may be better organized.

Finally, in the future I see and I think it is of extreme importance and it is a great opportunity, it is not a threat, it is an opportunity for you, not a threat to you, and that is I believe Mr. Keagan when he says, because he's said it so many times, and if a guy says something enough you begin to believe it, (I hate to say who said that -- you already know) that government this time is going to be much more sentitive to the "governed" than it has been during our lifetime. We're all the governed. I really believe they want to hear from us. They want to hear your special interests, particularly if you can make your special interests take on the coloration of the general interest which the commuter airline industry can do because of all of the good things that you are providing and certainly will be providing this country like mobility, preservation, where I started.

I think it is critical to take advantage of a government that says it wants to listen to the voice of the governed. I am sure you won't be silent. Make sure that you go even further than you think is prudent in expending resources to let this government, particularly in its early stages, know what you feel, what you want, what you expect and what you think is good for you and the country altogether and simultaneously.

Thank you very much.

OPERATIONAL PRIORITIES FOR THE 1980s

Alan Stephen
Vice President
Commuter Airline Association of America

Good afternoon. It is my pleasure to serve as moderator of this panel. We've got some important things to say, in particular to our friends the Regional Directors who can take back the feeling of the commuter airline industry and some of the concerns we have for the future.

One thing I would like to do is offer, on behalf of our industry, a speedy recovery to Mr. Cardinali.

This afternoon we have four individuals who represent as much diversity in our industry as, I think, we could provide. Each has a different perspective -- management, operations, maintenance, and airport airways need. Each individual is from a different portion of the country. We have east, mid-west, and far-west represented here. They represent airlines that operate some 60 or so airplanes and have carried about two million people this year, which is a good percentage of our activity.

They're also representative of, I think, a very important principal that I would like to emphasize. It is that at this table we have people that are FAR Part 135 operators and FAR Part 121. We have individuals that serve as domestic air carriers, and I do mean 401 certificated domestic air carriers, and those that operated under supplemental rules, and those who operate a wide diversity of turbine equipment. The important thing is this. Their common principles are airlines, and I think as we go down the road in the decade of the 1980s, one of the most important principles we have to remember is to get the name "Air Taxi" out of the definition of a commuter airline.

Most recently I saw a report from FAA which identified facility needs. This report was issued by the Administrator not three weeks ago, and the forecast of the air carriers and the forecast of general aviation, a forecast of air taxi activity -- these commuter airlines.

That is not a true statement of what we are as industry. We're airlines, and whether we operate under FAR Part 135 or 121 or both, scheduled airline activity takes a very different priority in terms of its problems and its immediacy of providing services to the public. I think we've gone a long way towards understanding that this past year, because I see that the response to the FAA, and in particular, that which we've learned together under the new FAR Part 135, we have, I think, a very successful relationship working in the field today.

One of the things I would like to set in motion is that really we are now in a different phase of deregulatory process as industry and government than we were last year at this time. We must shift our focus from a basic review of the adequacy of the regulation. After all, we've looked at maintenance standards, equipment and pilot qualifications and operating rules and certification of our airports for safety. We've looked at the airworthiness of our airplanes. We've looked at the need for airline security. You can go right down the line. We've looked at every major regulation that affects this industry, and we have set policy or moved forward with regulatory process, and we've done that pretty well.

So it is now time to perhaps realize that the rules have been upgraded and implemented, basically, and that we have also, through the regional audits, looked at virtually every commuter airline the past year. We have a pretty good idea that, to a large extent, this industry is in compliance with these regulations and will continue to be in compliance.

I think it is time to remember that we have a mission to carry out and that is service to the public. It is time to recognize that we're going to go out and do that mission and do it very well, be productive and meet the challenges ahead, which are managing for growth.

I just want to say one point about what Duane Ekedahl said this morning about airline safety -- the record of this industry. We looked at it very carefully last year and when you've been through 14 days of Congressional hearings and have been asked every question in the world, you get to the point where you try to understand what the record is. We've had a continuously improved safety record. Even last year when we were faced with public remarks about inadequacy of our safety record, it turned out that the rate of accidents, the accident rate for this industry in 1979, even with all the accidents we had, actually showed an improvement over 1978. In fact, it was the best year we have had in terms of the accident rate and the ensuing five-year period. Of course, in 1980 we've had a dramatic improvement and are committed to that improvement. But it is a very transitory thing, and I think we ought to remember that.

One accident could make the difference between a good year and a bad year, and I know, myself and my colleagues in the airline industry and the operating maintenance of it, the pilot side is very much committed to continuing the trends and working with FAA to do a better job.

I think if I were to set forth perhaps kind of a series of recommendations it would be that we have some needs defined in the regulations, and I don't mean going about changing regulations as much as we have some technical issues to resolve. We saw it fall with the minimum equipment list, and we have a problem, an anomaly between the airworthiness and operating regulations that have to do with light airplane ice certification of perhaps how we can better approach the use of simulation in training devices in FAR Part 135 weather information.

There is a number of areas in which we have some important, technical problems to overcome, and these are issues that we're going to work with you on, and we're going to be hopefully innovative in our areas. The second area is restoring a balance. One of the things that we have been highly critical of, and I think it is an important principle, is that the way this system works is when government and industry talk to each other.

You've got to keep a balance in that communications link between surveillance and enforcement. Frankly, my personal opinion is that enforcement is a failure on the part of surveillance. You don't have to enforce if your job as surveillance has been successful. You've caused the problem and you've corrected it. You need the enforcement only as a club to prevent the knowing abuse of operators, and if you lean on enforcement as your main regulatory technique, you're missing out on the important thing which is to catch the problem before it actually happens.

Also with that is -- we've talked a lot about it in the past year -- standardization. There has been, I think, a pretty great improvement in standardization of your policies from region to region to GADO to GADO. We still have some problems, and frankly, the advice we have to more and more give our members is that if somebody comes forward from the FAA and says "We think you should do it this way" and it doesn't make sense, and we know it doesn't make sense, we have to go back and tell the FAA increasingly, "Put it in writing." We find at times when the local inspector doesn't know official policy that he'll tend to be very restrictive or arbitrary with the resultant negative impact on an operation.

So not being contrary, we're going to ask you increasingly to look at your policies and make sure that when you tell an operator that the policy that the Federal Government does this or this is the way the rule is interpreted, that, in fact, is the way the rule is being interpreted on a nationwide basis.

I think all of you experienced in the past years -- I know on the airline side and I am sure regional people have experienced -- that we do have some problems occasionally of over-reaction to what regulation means.

I think that the other thing we certainly have from an industry side is that we're changing very dramatically. There is no question of that. The regulations were part of it, but so many airlines are moving up from system to light turbo-prop to heavy turbo-prop or moving in from FAk Part 135 to 121 and may go actually full domestic rules. That brings with it a lot of need for assistance and that is one thing I would say that we can really commend FAA on. You have been able to help us understand what the regulations mean. We can implement them and in a timely and economic manner. This is an area where we would want to continue to work and it is part of this balance that we need to have between industry and government.

The next few minutes I'll invite the four panelists to speak on each of the issues. The first is J. Dawson Ransome who is President of Ransome Airlines, based in Philadelphia. Mr. Ransome has been very concerned about management and productivity as a president of an airline, and his message, I think, is very important because it gives an idea of what we're going to have to do if we're going to be profitable and that is ultimately the key to whether or not we're going to provide economic air service.

Dawson recently gave a speech before the National Aviation Club and we feel did a good job, so we invited Dawson to provide that speech today.

PANEL - OPERATIONAL PRIORITIES FOR THE 1980s

J. Dawson Ransome
President
Ransome Airlines

Being a great believer in optimizing communications, I am really delighted to have this opportunity to be here today. I think one of the greatest benefits that we derive from meetings of this sort is to maintain the highest degree of communication between our industry and the government who regulates us.

I think we've come a long way, incidentally, since our meeting of last year, and I will try to expand on that. For those of you who might have heard me at the Aviation Club, I apologize. The speech is precisely the same. I also apologize for the occasional reference to our own company, as it was designed for that particular occasion.

Today I would like to provide you with an overview of our industry. I'll review our gross to date and look at the opportunities and challenges as we view them for the future of our industry.

Although deregulation has been credited with a substantial increase in phenominal growth of the commuter airlines in the United States, the facts are that commuters who generally operate a high frequency of service with properly sized and fuel efficient aircraft have provided the type of short-haul service the air traveler wants and is using in increasing numbers.

In the 1960s the trunks and some of the local service carriers increased substantially their productivity with the introduction of the first generation jet. At that time, however, fuel was only about 9¢ a gallon. Those great new highly productive aircraft were commonly seen on routes of 100 miles or less.

During the past 20 years, however, fuel has escalated ten fold or more, while most airlines' human productivity has declined substantially, therefore, the combination of higher operating costs and lowerhuman productivity have combined to render these highly productive new aircraft no longer economically viable on the short-haul routes that the typical commuter airline operates during the day. Although deregulation is credited with the growth and success of our industry's rising fuel cost, reduced human productivity and increased costs of labor for the trunks and locals as well as deregulation have all contributed to the expanded growth potential of our industry.

In my opinion, the aforementioned all have rendered even the latest state-of-the-art jet transports not economically viable on short-haul stage lengths. The modern jet aircraft is a magnificent tool when placed

in the proper environment. The high cost of operation, inadequate return on investment and lower yields inherent in operating the modern jet airplane at lower altitudes and short hauls are forcing the major airlines to carefully scrutinize their asset allocation, that is in what markets they can profitably use their aircraft.

With few exceptions, the simple fact is operating even the latest state-of-the-arts jet airlines on stage lengths of under 200 to possibly 300 miles has simply become financially unsound not only from the standpoint of cost of operation but also asset allocation.

At Ransome we're totally committed to stay in the short-haul markets. Our aircraft are designed to operate in these markets most efficiently. We are also firmly committed to operate fuel efficient, turbo-prop aircraft and not to be tempted to join the jet set.

As you might be aware, we have committed ourselves to purchase the DeHavilland Dash 7 aircraft. Its STOL and RNAV capabilities make it an ideal aircraft for our type of mission. The RNAV installed enables us to save approximately 40 miles of travel through airspace on each flight between Philadelphia and Washington, D.C., and the aircraft can land comfortably at full gross weight in 1,000 feet permitting us to use the so-called nonprecision runways at Philadelphia and Washington.

Ransome Airlines has reached agreement with the FAA and the Philadelphia International Airport Authorities to use taxiway alpha for departures, which saves us additional ground taxi time and unloads runway 27 left for higher performance aircraft, all of which save us time and increase our productivity.

By year's end we forecast that the U.S. commuter airlines will have transported more than 15.5 million passengers (up 11.3 percent over 1979) and 500 million pounds of cargo to some 850 domestic destinations. In so doing, commuter airlines will have reliably performed 2.4 million revenue flights and accounted for approximately one-third of all the U.S. scheduled air service. The 12 Allegheny commuters of which we're one will transport approximately 2.25 million passengers in 1980, operate 85 aircraft, and serve 55 communities with over 600 daily flights which represents about 20 percent of the total commuter passengers in the United States.

I think we're going to see more of this kind of concept from many of the locals and trunks. The Allegheny commuter system was born of the need to maintain service to small communities that could no longer be served economically with the proper frequency by the modern jet transport. Rather than abandon this very important operation the small commuters provide, Allegheny (now USAir) has maintained, through their commuters, more frequent service with properly-sized aircraft feeding to carefully selected hub airports thus not losing control over these very important markets.

A second benefit that we're seeing, however, nowadays is that the traveling public is using our particular service to connect between hub to hub such as Washington, Philadelphia and New York. A much greater percentage of these passengers are inner-connecting from hub to hub primarily because of the greater dependence on the hub airport of the small community. We see this as a continuing trend.

Ransome Airlines today is serving 12 cities with something just under 200 departures a day in the Northeast Corridor between Washington and Boston. We have transported nearly four million passengers since our first flight in 1967. In 1967 we transported 6,318 passengers and we project about 815,000 in 1980. I haven't seen our final figures yet, but it's something over a million in 1981. Now it has not been too long since many local service carriers were transporting something in the order of a million passengers per year -- so, we're not alone.

All of the commuters are showing substantial growth. Now what challenge does this growth present to our industry and our company? Accelerated growth in any company presents a major challenge to management. Of the many challenges our industry faces in the 1980s, our ability to manage growth and successfully transition from small to larger and more complex businesses will be our greatest.

Managing growth requires identifying where the talent in your company is, then developing, motivating and training these people to personally develop and accept greater responsiblity and make decisions consistent with and contributing to corporative objectives.

Many an airline or company has asked us what they must employ and properly allocate if they are to successfully grow. These assets in my order of priority are as follows: their human resources or people, their physical assets (that is their planes, tooling, hangars, etc.) and their financial resources or money.

Now why do we place people ahead of physical assets or money? Simply because without highly motivated and productive people, we can't successfully grow, compete and develop the financial resources required to finance our future growth.

Our country today is in the sad shape it is in because we're no longer a highly productive nation able to compete in the world marketplace. We simply must reverse this trend both as individuals and as a nation if we are to survive. I see a glimmer of hope that labor and management are waking up to this fact and working more closely together to reverse this most dangerous trend.

We at Ransome feel so strongly that this must be done, and in an effort to maintain the high personal productivity that is characterized by our people, we have developed a program to reward our people for their continued high productivity.

About two years ago we averaged the total labor cost percentage as it relates to the total sales over the past three years of our company's history. We then structured a program that would share with our employees, on a 50-50 basis, any reduction in this labor-sales ratio. Fifty percent accrued to the employees and 50 percent to the company. This year the employees of our small company in total will receive approximately $500,000 as their share of the pot for their continued high personal productivity. Personal productivity of our people is absolutely essential if we are to continue to successfully grow.

As far as opportunity for growth is concerned, there is currently more opportunity for growth in our industry than the industry can take advantage of, once again eliminating factors being people, planes and facilities, and simple money. With these assets being in limited supply we will, therefore, be more selective where we place them. Obviously, they will be placed on those routes where we will get the best return, but as I see it, not on routes or stage lengths that are competitive with the local service and trunk carriers.

The explosive growth in our industry will continue to tax our airway, approach, runway, gate and terminal facilities particularly at our hub airports. The exodus from many of our nation's small and medium communities by some larger airlines has made the smaller communities dependent on the nation's hub airports for entry into our nation's air transportation system, therefore, placing greater pressure on our air traffic control system, particularly at our hub airports.

In an effort to solve our growing airport access problems, we at Ransome Airlines are embarking on the most ambitious program in our history. It involves investment by our airline of some $40 million in new high technology aircraft and flight control systems. It is an effort on our part to find a solution to this ever-growing and serious problem or "the" ever-growing and serious problem of air traffic delays and airport access.

Just over a year, ago Ransome Airlines introduced into service the first of a number of DeHavilland Dash 7 aircraft into the Philadelphia and Washington market. I want to hasten to say I am not a salesman for DeHavilland here. I am trying to sell a concept. This remarkable aircraft coupled with a three dimensional area navigation system capable of storing 200 nonvolatile way-points, has allowed us at Ransome to utilize special area navigation route and microwave approaches for service between Philadelphia and Washington, D.C. These routes and approaches are removed from the conventional route and approach systems and are, therefore, termed noninterfering.

The Dash 7 aircraft will be equipped with airborne computer-generated, pictorial route display on the aircraft's radar screen that can be used concurrently with our weather avoidance function of the radar system. These functions will drive the auto pilot, producing an automated flight path from takeoff to landing. Ransome Airlines'

Philadelphia to Washington, D.C., Dash-7 three-dimensional area navigation, microwave landing program will, we hope, contribute to a solution of our ever-growing air traffic and congestion problems both on route, approach and landing.

At Ransome we have invested almost $500,000 per aircraft in airborne computer-generated auto flight systems. At the same time, the Administration is holding over $5 billion of user paid ADAP funds to, in my judgment or my opinion, project a lower national debt. These funds should be released and properly spent to improve our airways and airport systems. We don't need slot auctions or any other constraints. We need improved airways, landing aids, STOL, other reliever runways, and reliever airport development if we are to solve our growing airport access problems.

Artificial constraints have done more to discourage innovative solutions to our airway approach and landing problems at our nation's hub airports. Ransome Airlines, the Commuter Airline Association of America, United Airlines and many other airlines (major airlines) feel strongly that we should eliminate all slot restrictions entirely at all airports and look for a more rational, innovative solution to the problem.

The elimination of artificial constraints will do more to develop more innovative ways of solving the problem such as our 3-D RNAV and MLS program that we happen to have at Ransome and many others. The elimination of slots will, in our judgment, do more to develop our reliever and joint civil airport facilities than any other single thing we might do.

Frankly, the greatest constraint at our airports is not in the air any more. The technology is there -- it is on the ground -- so we have national constraints anyhow. I firmly believe that we should take a very serious look at eliminating slots, and I can assure you that that will do more to develop Dulles, Long Island McArthur and possible joint use of other airports and any single thing that we might do. Granted there will be some problems and some congestion, but I truly believe this to be the case. The airways users are not getting the end product for which they are deserving.

The Administration withholding these funds borders, in my judgment and these are my words, is criminal. As far as I am concerned, I would hope, the Administration would -- the future Administration I guess in this case -- through OMB, release these much-needed funds to improve our airways' facility and safety.

Our industry over the past year has been a target of NTSB and the FAA with regard to the safety issue. Some of the safety issues discussed, however, are not of our making. For example, many of the commuter airlines are forced to operate in facilities that are substandard with no radar coverage, precision approaches or high intensity lighting.

The vast majority of the commuter air carriers take the responsibility placed in their hands very seriously. However, they need the proper tools with which to work, and I believe that the words we heard from Langhorne Bond this morning as well as the work that Murray Smith has done in the Northeast Corridor are extremely encouraging and certainly when this was written, I wasn't aware of Bond's announcement. On the other hand, I have been very well aware of what Murray Smith has done in the Northeast Corridor and I would like to take this opportunity to thank and congratulate him. I talked to him a little while ago and he said we can still go further.

That is the kind of attitude that we absolutely must have. Our industry responded promptly and with vigor to the FAA and NTSB safety hearings held less than a year ago. The hearings were constructive and produced some positive results. However, and this statement I can soften up a little at this point -- we have made little or no progress in improved ATC procedures and facilities for the commuter airlines and other users. Over and above the ATC 8 precision approach problem, there are problems developing at all of our hub airports with regard to gate and ramp space.

Some new and innovative solutions to these problems are going to have to be considered such as remote parking and bussing. As the pressure builds for these facilities, the cost for gate space and ramp space will continue to rise, and as distasteful as it seems, bussing and remote parking will be the only solution that I presently see to the problem. On a longer-range basis, newer less-sophisticated and less costly facilities need to be constructed for commuter air carriers at our hub airports. We don't need gate loaders, for example, so ramp level boarding will suffice.

More combined facilities such as the one that we operate here at Washington National for all the commuters down here or the commuters serving National Airport are needed. The costs are prorated on a per passenger basis over the entire spectrum and this results in obviously less total cost, greater efficiency and a more professional operation for all carriers involved. I think we're all going to have to look at more joint use at all of our nation's airports to solve this problem.

In summary, we at Ransome look to the future with great optimism. Despite air traffic, fuel, gate, ramp and other pressing industry problems, we see great opportunity for growth in the commuter airline industry. We must guard against growing beyond our people's development and ability and their ability to accept greater responsibility. We also would hope that the regulatory impact would not proliferate to the point rendering our product noncompetitive to our customers.

Ten years ago the regulatory impact on our industry and other than safety and operational areas was relatively low. Today we find the regulatory burden substantially greater and still increasing. In the 1960s, about the mid-1960s, we witnessed a great new influx of new

carriers entering into the commuter airline arena. History will repeat itself during the 1980s. We are already witnessing many new entrances into not only the commuter area but also the certificated area.

We at Ransome and our industry, I think as a whole, welcome competition. It keeps us alert, on our toes and contributes to a more professional organization.

I am, however, reminded when I started back in 1967 and I thought I knew what I was doing and I certainly found out very quickly that I didn't, and looking at Tex Melugin over here I am reminded again today that when I came to Washington to go in, Tex said "Well, why don't you just go out to Dulles?"

We've come a long way since then, but at any rate I thought I knew what I was doing. I've been flying since I was 16 and have been in the business community a few years, but I found that the airline business is distinctly different than anything else I'd been involved in.

My pallid experience and my business exposure distinctly did not qualify me to run an airline. As a result, I lost a lot of money. I think the bottom line is still sound management practices and experience that will prevail.

Many commuter airlines of today are fathered and are still run by entrepreneurially-spirited individuals who are now faced with the challenge of transition from relatively small to much larger and more complex businesses.

I hope you have found this overview interesting, and I will be glad to answer any questions later. Thank you.

PANEL - OPERATIONAL PRIORITIES FOR THE 1980s

Edward J. Godec
Vice President - Operations
Air Wisconsin, Inc.

Good afternoon ladies and gentlemen. As we all know, the closing date for initial comments on Notice for Proposed Rulemaking 78-3B has passed, and the question of what to do about flight crew member flights and duty time limitations and rest requirements now rests with the rulemakers here in Washington. This question has lately been the subject of much comment, both written and verbal. It is a complex question involving a multitude of complex situations for which a practical answer is not only necessary but crucial.

I would like to briefly discuss this subject by trying to answer the following questions:

(1) What rules do we presently have?
(2) What do we need to properly serve the nation's travel needs?
(3) What has been proposed and how will this affect service to small communities?

Please keep in mind that I am answering for Air Wisconsin, a certificated air carrier operating DHC Dash 7s under the domestic rules of FAR Part 121 and Swearingen Metros under FAR Part 135. Also, I will limit my comments to those parts of the existing and proposed regulations that deal with rest period requirements and duty periods. It is not that I consider the other parts of the proposal unimportant, it is just that when we consider the issue of service to small communities, rest and duty limitations play the most important role.

To start with, what rules do we presently have? For a large aircraft we follow 121.471 which in essence, allows us to schedule a crew member for up to eight hours during any 24 consecutive hours. This subparagraph also requires a rest period of 16 hours if the crew member flies more than eight hours in the 24-hour period.

For our Metros, we have 135.261, subparagraph A and subparagraph B which allows scheduling of a crew member for up to ten hours of flight time and which requires ten consecutive hours of rest during the 24-hour period preceding the planned completion of the assignment. In addition, we were granted on January 28, 1971, an exemption from what was then 136 B and which is now 135.261 B. This exemption allows us to assign a flight crew member for duty during flight time when that assignment does not provide for at least ten consecutive hours of rest during the 24-hour period preceding the planned completion of the assignment, and is subject to the following conditions:

(1) No flight crew member may be assigned for duty during flight time unless the assignment provides for at least eight consecutive hours of rest during the 24-hour period preceding the planned completion of the assignment.

(2) Each flight crew member who has completed an assignment for duty during flight time that provides for less than ten consecutive hours of rest during the 24-hour period preceding the planned completion of the assignment must be given 16 consecutive hours of rest before he is assigned for further duty during flight time.

The exemption was requested to solve the problem of how to provide the community with both a late arrival and an early departure using the same overnighting crew and aircraft. This explanation leads me right into the answer to the second question which is "What do we need to properly serve the nation's travel needs?"

The Regulatory Reform Act has, among other things, allowed the trunks and regionals to decrease or eliminate service to many small communities. This service void is now being filled or will be filled by carriers such as those represented here today.

Most communities want both the late-night arrival and an early morning departure. We can provide that service by either domiciling an aircraft and crews at that airport or by overnighting an aircraft and crew out of another company's domicile. Of these two means, the first has proven to be highly impractical unless the carrier exists primarily to serve that particular community. Most generally an established carrier being asked to provide service will choose to do so by overnighting an aircraft and crew out of a company crew base.

I would like to mention at this point that we prefer to have as few crew bases as possible because of the added complexity of crew scheduling, training and check rides, and because of the cost associated with the additional supervision, duplication of facilities and personnel moves due to upgrading.

Now the second means of providing a late arrival and early departure -- that is overnighting an aircraft and crew -- requires a rule that either does not impose a minimum rest period such as 121.471 or one which demands a minimum rest period that is short enough to fit the time schedule, in our case, exemption 1252. Both of these rules have been in effect, been in use for some considerable time -- almost ten years in the case of our exemption and over 30 years for 121.471.

Speaking for Air Wisconsin's exemption over the past ten years, it has given us the flexibility to provide good service to many communities which might not otherwise have had air service. During this period, it has caused us no problems other than those associated with meeting the required eight-hour rest period whenever weather or mechanical problems disrupted the schedule.

FAR 121.471 which we were first able to use in our overnight scheduling starting in January of last year, has enabled us to improve service to those communities where the Dash-7 replaced an overnighting Metro. We can now schedule a later arrival without disrupting the early departure because of having to provide for a fixed rest period. This is a very important part of the domestic rules. I would venture to say that the service pattern of the regional and local service carriers depends significantly on this one paragraph.

Responding to my query, a representative of a large regional carrier stated that they have 43 overnights scheduled under the privisions of FAR 121.471. In our own case, 50 percent of our Dash-7 overnights are scheduled for a late night arrival followed by an early morning departure.

In response to this rather apparent need, what have the rulemakers offered? For a two-pilot operation proposed 121.481 and 135.271, which are identical, require a rest period of at least the number of hours of duty time scheduled since the last rest period but not less than ten hours. The maximum duty period under proposed 121.483 and 135.273 would be 14 hours with scale reductions of up to four hours for landings. Compared to the present domestic rules, the proposal is unprecedented. Compared to our exemption, the proposal is a throw-back to the present FAR Part 135 rule whose overly restrictive provisions forced us to seek the exemptions in the first place.

Adoption of these proposed rules would require carriers to make drastic changes to their system of overnighting. For example, instead of one crew and aircraft providing Toledo with a late arrival and early departure, we now need two crews -- one to bring the aircraft in late and the second to already be in Toledo resting so as to be legal to take the aircraft out early.

For many communities, this requirement to stage crews would mean the end of their late-in, early-out aircraft service. The overnight aircraft would soon be on the ramp of some larger city, more capable of generating sufficient revenue or traffic to economically justify the cost of staging crews.

In the sparsely settled areas of our country, this ability to schedule an aircraft and crew late-in and early-out is crucial. It is crucial to the community which desperately needs as much well-time service as it can get, and crucial to the carriers having to provide that service at a profit.

To illustrate a common situation, I would like to use Frontier Service at Grand Forks, North Dakota, as an example. Frontier has two flights a day in and out of Grand Forks. The first one departs at 5:40 a.m. The second at 3:31 p.m. The first in arrives at 3:11 p.m. and the second at 11:57 p.m. The 3:11 p.m. inbound makes up the 3:31 p.m. outbound. The 11:57 p.m. inbound and overnighting aircraft and crew makes up the 5:40 a.m. outbound. Both of these flights connect

Grand Forks with Denver and all flights make at least one stop because Grand Forks is a city of 61,000 and is obviously not able to support nonstop 737 service to Denver.

I am certain that the city fathers of Grand Forks considered a single plane Denver service as very important to their community. If asked about it they would predictably state that an additional flight about mid-day would nicely round out the pattern.

I can also visualize the reaction to the threat of losing all or part of their present service. Frontier to Denver is the only direct westward connection Grand Forks has, and I am sure the city would be seriously hurt by the loss of this connection. Yet this probable loss to Grand Forks and similar losses to many, many other communities is what is being proposed -- proposed not so much in the name of safety, for the rulemakers themselves state in their preamble to 78-3-B that they are unable to estimate the safety benefits of these proposals, but for the sake of standardization and review -- standardization so that one set of rules will apply essentially to all carriers, and review because some of the rules have remained essentially unchanged for over 30 years.

As an old SAC pilot who was assigned to a standardization and evaluation section for over two years, "I can't speak out against the concept. However, I don't believe in the idea of standardization as an end in itself. Let there first be a logical reason to standardize."

The call for a review leaves me somewhat puzzled. These rules are all about pilot, flight and duty time limitations and rest requirements -- in other words, human, physical and mental limitations.

The rulemakers state that the regulations have remained essentially unchanged for over 30 years. I ask, has the human organism changed? Do today's pilots need more rest than those of 10, 20 or 30 years ago?

Don't we now have autopilots, pressurization, flight directors, radar, turbine engines and other modernizations or conveniences which make the job much easier and offset the stresses brought on by today's higher traffic density.

This call sounds like change for change's sake. I'm sure we're not opposed to changing the rules where they really need to be changed. The problem, I think, is in identifying where and how the changes should be made.

To that end and to broaden the stated "extensive technical expertise of agency personnel", I invite the rulemakers to actually visit and spend time with some carriers in each service category. They would gain valuable insight watching the rules being applied in the construction of aircraft schedules and in crew routing.

The new administration will probably be tight with travel money. However, I am sure that most carriers would gladly extend free positive space transportation to any agency personnel traveling for this purpose.

Downtown Washington is often described as eight square miles surrounded by reality. Those of us outside the eight-mile limit are waiting for review reality. Please accommodate us. Thank you.

PANEL - OPERATIONAL PRIORITIES FOR THE 1980s

Ronald K. Shull
Vice President - Technical Liaison
Aeromech, Inc.

Good afternoon ladies and gentlemen. Our luncheon speaker spoke about economics, and today I feel economics was the biggest change in aviation maintenance during 1980. During 1981, it is going to be even more pronounced.

In that regard, I would like to apply a few thoughts towards the regulations today. It gives me the opportunity to bounce around, and I will start off with Federal Aviation Administration Airworthiness Directives (ADs). ADs today are composed towards the legal entities involved more than the technical aspects. This, I don't feel, helps the maintenance teams with good data. A good example is the twin otter landing gear. It created more confusion than it cured. Oversights such as this create costs. A possible solution to this might be contacting the technical committees through the CAAA.

Another suggestion on the ADs to improve it would be to life limit them. Doing this would place the responsibility back on the manufacturers to correct the discrepancy. Allowing the AD to continue indefinitely places the responsibility ineptly on the mechanic or operator and creates a continuing cost impact. This, I feel, is unfair in both categories. I'm not saying that we should sacrifice the safety of ADs, but the method of creating and implementing them needs to be altered.

More common problems experienced in this area are the scheduling. Today commuters are using a flexible, progressive maintenance program that hard-time ADs are not usable with. Consider a 75-hour time schedule for phase one and 50-hour AD time. The aircraft has to be scheduled in for maintenance twice. It just doesn't work.

For the most part, that 40-hour is not always good criteria for the inspection. To prove that, I went back and checked one of the ways ADs are created and that is through the M&D reports we submit.

Aeromeck Airlines submitted 17 M&Ds on beta system failures. In querying the computer in Oklahoma City we found only three reported, and contacting our local GADO in Oklahoma City on this subject, they were very vague as to why 14 were missing. So I have come to the conclusion that some of the data that is available to the FAA to create an AD is not always correct. I think in this particular area, a change is in order.

Three other areas that I think can help us today in maintenance economics are creating a CDL list or configuration deviation list equal to 121. This would allow the operator to have, as an example, dual

transponders, and if one fails, remove it for repairs and replace it in the aircraft. Several operators are flying with spares on board, so with a CDL you can remove it.

A ferry certificate authorization -- when an item fails, ferrying the aircraft back to your home base under 135 is not allowed today and there is no real reason for it. I feel the FAA has to get a little more liberal on these two areas to help our cost today.

Fleet component time sharing -- this completes the cycle. If each operator would share the information on components, we could make them much more reliable, therefore, less ADs, possibly then less failures for the reasons of the MEL and the CDL -- all the way around, a more economical operation.

I don't feel it is a one-sided event. I think it is going to take the FAA, the operator and the manufacturer collectively working together to resolve this.

During 1980, the primary reasoning to accomplish regulation revision was safety. Nineteen-eighty-one, in my opinion, will be the year we determine the economics for those decisions. In many cases, though, more liberal viewpoints on the regulations will be necessitated for economic impact. I am convinced this can be accomplished without sacrificing maintenance quality.

With that, being as I am a poor public speaker, thank you.

ALAN STEPHEN

For 1981, the area of airworthiness is going to take a very important role with the Commuter Airline Association, and I will get into that later.

During the next month or so, we are going to be adding additional technical support to the staff with the sole responsibility of assuring a stronger communications link between the operators of aircraft and the manufacturers of the products they use. Importantly, we want to at this time and particularly the regional directors -- I have talked to Craig Beard -- we want to take a much more active and participatory role in the analysis of the need for an AD.

We are well aware of the problems with ex parte communications. We have talked this over with the Chief Counsel of the FAA and some of the others and I think we have got a very legitimate role here. In the next few months, we will be getting a hold of you and your Flight Standards people to propose that we have a legitimate role in being able to resolve the problems and being able to help you assess the need for an AD and compliance time, and perhaps the regulatory language that evolves so that we don't have to go back and make amended ADs because we find out we screwed up the first time around. I would say the area of airworthiness is going to become very important there.

Secondly, I would like to give a message. We have two very panicky retroactive airworthiness requirements imposed on our aircraft this past year -- I'm not talking about ADs because ADs are always related to a safety problem -- I'm talking about something like cabin safety amendment number eight which came out about a year ago which nobody knew how to comply with, nobody still knows how to comply on some airplanes.

The problem for us as an industry is unlike perhaps the Air Transport Association members who have internally very large engineering and maintenance staffs that can engineer fixes to some of these products. They are flying perhaps a Boeing product and Boeing is going to put a thousand engineers, if it is a critical problem, to figure out how to solve the problem and make sure the parts are available.

When you impose a cabin safety amendment on a Martin 404 or Convair 580 and a lot of other airplanes we are using and using quite safely, then you have a problem of who in the world is going to design a standard and how are we going to comply?

My message here is, and I understand the problems, but we have retroactive airworthiness requirements imposed through operating rules, this is a very serious subject and a subject that we are increasingly going to have to get some communication links going.

One of the things we are very happy with and will support 100 percent is the growing application of lead region.

Earlier in November of 1980, all foreign transport aircraft airworthiness moved to Seattle. As of today, I believe, all FAR Part 23 airworthiness certification responsibility moved to Kansas City which is the Central Region. We are going to see centralization of engines, I believe, very shortly.

The bottom line is we are going to work with you as well. We will work with the individual regions and through the lead regions, and we are going to make that concept work.

I think our last speaker has one of the more critical messages for us, and that is Usto Schultz. Usto and I share a common heritage. We both were with the FAA at one time in our career.

Usto is the Senior Vice President of Operations for Golden Gate Airlines which is located in Monterey, California, and Usto is going to be talking to the airport and airways needs of the industry.

PANEL - OPERATIONAL PRIORITIES FOR THE 1980s

Usto Schulz
Senior Vice President - Operations and Engineering
Golden Gate Airlines

Good afternoon everyone. Alan, did you have to tell that last part about the FAA history?

The first three speakers we had were so interesting I would rather sit here and talk about what they have already said, and I'm sure that will come from you folks later, but it certainly is encouraging for me to hear the kind of talking that we have just heard.

One of the things that Mr. Gellman talked about today is a book that he was involved in writing -- he and a lot of other very prominent people -- and I certainly recommend it all to you. It is called Improving Aircraft Safety. In that book, it doesn't just speak to what needs to be done at the FAA level. It talks about what we should do as operators. I certainly think there are some excellent points to be made in it. As far as I know, it is in the public domain so somebody can print it and sell it, I guess.

No review would be complete in the commuter airlines operations without discussion of our growing need for airport and airway facilities and services. Commuter airlines provide timely service that tie outlying towns and communities with their associated air transportation hubs, and 70 percent -- in our case 80 percent -- of commuter passengers today interline or connect with other air carrier flights; 90 percent of all commuter routes are less than 250 miles in length. This shorthaul feeder service has been and will continue to be the backbone of our industry.

As we heard Mr. Ransom say, "he doesn't intend to branch out into the jet-age operation." That, to me, is the essential part of what is beginning to transpire under deregulation, and for Mr. Gellman, I'm sorry I have used that two or three times in here and will try to get it changed later.

In fact, one of the things that I think needs to be considered, and I think Alan has already alluded to it, is that the very character of commuter airlines has changed from the predominantly briefcase type transportation that existed a few years ago to one in which we are an integrated part of the national and international transportation system.

What is changing dramatically, however, are the operational and economic consequences related to such hub spoke patterns. Industry provides one-third -- that is, our industry -- provides one-third of all U.S. scheduled air transportation, some 2.4 million flights annually

while operating from eight of the ten air carrier airports. Nearly half of these eight airports out of ten must rely exclusively on commuters for their only scheduled air transportation. Therefore, airport and airway development is for commuter airlines a subject that raises a broad operational issue of capacity, safety and reliability at the airports we serve.

During the next few minutes I want to share what I believe must be the FAA priorities in assuring a rational, national aviation system, heavily impacted by deregulation.

We are pleased that FAA has today announced a program to improve the approach facilities at 127 airports serving the people in the less dense areas. This $160 million program is an excellent move to make air transportation systems a real service to all citizens. Beyond the fundamental small community airport safety and reliability, capacity at transportation hubs must be addressed. Slot allocation, as you have heard earlier today from our airline colleagues, is certainly no solution, in our opinion.

Frankly, deregulation will fail if shorthaul airline access and capacity needs remain constrained while the level of replacement services continue to grow.

A lot has been said recently about defederalization. If defederalization means red tape, bureaucratic foot-dragging associated with the federal design standards and limitations on funding are removed, the outcome can be positive. On the other hand, if defederalization means we can have arbitrary lock-out schemes such as exist at Orange County, California, then the public will not be served. We have been unable to gain access to Orange County because local ordinances preclude any increase in "the total noise generated at the airport." That means even with our quieter Dash-7 as compared to the 737 that operates there, we are not allowed to enter Orange County, and that is a local regulation.

In another situation, the local Los Angeles Airport Authority which has an approved FAA operations manual will not allow our small aircraft to mix at our United Airlines gate. This effectively precludes us from operating the metroliners in Los Angeles, because we simply can't afford two different locations at the same airport to serve the people that we want to serve. The situation, I think you can readily see, would be chaotic.

I am sure that given an opportunity, my fellow businessmen here could cite similar kinds of problems, and the ones at National have already been talked about a great deal. Thus, the definition of defederalization must be carefully forged. I can't over-emphasize that.

Now for 1981, the Commuter Airline Association has an ambitious and comprehensive set of objectives for airport and airway development, and that is for the purpose of meeting the shorthaul needs. These objectives include: One, reenactment of airport/airway legislation. Last year we

identified ADAP as the number one CAAA priority. The inability of the aviation community, the administration and each House of Congress to come together has resulted in a twofold failure -- not only do we have no airport/airways program today, but passenger ticket taxes that amount to about $1 billion annually, are now being diverted from the aviation trust fund to the U.S. general revenue account, and of course, it is used to offset deficit spending in other areas.

I was active as an advisor on the Reagan Transition Team as it relates to transportation. Every group, including a passenger advocate group, with whom we had an interview took a positive stand in favor of new legislation and the associated tax. On the other hand, they were equally adamant that the trust fund be used for airport/airway improvement and that it not be used for operations.

The CAAA seeks to assure that the post-1980 airport/airway legislation treats all commercial service airports the same from the standpoint of funding mechanisms, while assuring that adequate levels of authorization are also specified to meet the high priority safety and capacity needs of small community airports.

Number two, with the announcement today, of course, we would like to move expeditiously to implement that program and with the input from CAAA, develop a comprehensive plan with priorities directed to achieve a balance that meets the safety and operating needs of the growing and significant element of aviation.

Three and finally, improve terminal access. Commuter airlines provide important feeder service into our nation's major air traffic hubs. Under deregulation and mandated replacement service, commuter airlines must link surrounding communities with their associated hub airports.

Where the departing jet air carrier might provide two flights per day, commuter replacement levels can be five or more flights per day. We believe it is possible to add much needed air traffic access by developing reliever approach procedures and runways, not to mention satellite airports for general aviation use.

There is little reason to cue the jet and the commuter aircraft together. The lower approach speeds, greater maneuverability and shorter landing distance of aircraft generally used by commuter airlines offer greater flexibility in the utilization of congested terminal airspace and ground site facilities.

Development of stub runways and other alternative landing sites such as has recently been done by Ransome, can also provide much needed future capacity with no deterioration in safety.

We are working with air traffic control locally for greater use of existing runway service, but it may well be that part of the fund -- I'm talking now about the dedicated fund -- should be used for the

development of an aircraft movement system that goes beyond separation of traffic. I use the term "aircraft movement system" for semantic significance. I use the term to signify we want fuel economy designed into the system along with increased capacity, safety and reliability.

We know the $5.5 billion in the fund today is being tapped for $590 million in operating money and $2 billion is committed for paying grants now in various stages of construction. Significantly, the uncommitted $3.6 billion at the end of FY 1980 will decline to $3.2 billion in 1981, and this is without any consideration for the losses due to inflation.

In summary, we believe the new act should provide for a new flow of money and the money should be used only for the purposes that improve the total system; that care should be used in defederalization, avoiding chaotic local operating rules; that ILS and other landing aid programs must move ahead expeditiously; and that we recast our capacity thinking into "can do" posture rather than "can't do."

Thank you.

ALAN STEPHEN

Usto identified, I think, our plan at CAAA. It has been directed by the board and government relations committee that ADAP is the number one priority.

I am proud to report that we, along with eight other organizations -- airline, general aviation, manufacturers, state aviation officials -- have come together very effectively and I think within the next couple of weeks, we will be able to come before Congress with a unified industry position to do the types of work that Usto has just identified.

I think in closing -- and I think we are running late -- I think we will forego questions so we can move on because I know there are some other important presentations.

I would like to provide perhaps something of a personal note. It is something that bothers me, and I know it bothers a number of my colleagues because we have talked about it, and I think it is an underlying way that CAAA views the FAA and that is we believe in public confidence in FAA.

I am very discouraged to see the increasing choice of some organizations, some individuals, to go to the news media or perhaps go to Congress when they are unsuccessful in resolving a technical issue. We are technical people. We will propose technical answers to you. We hope you will use our advice. If you don't, we are going to come back and keep working with you to try to get the solutions we need, but the more we go to the news media and the more we go to Congress, we create -- as in the age 60 rule, as I think some people know, which tried to be lifted and Congress in its infinite wisdom came up with the age 61-and-a-half rule -- that kind of solution we don't need.

We don't need lack of public confidence, because if the public doesn't have confidence that aviation is safe, then we will be increasingly subjected to the political decisions which will not be rationally nor technologically based.

So you can count on us. Our friends at FAA here, you can count on the commuter airline industry to be vigorous in our opposition to policies we don't like, but we will support you and make it all happen and make 1981 the safest year ever.

Thank you very much.

WORKING SESSION I

Kenneth S. Hunt
Director, Office of Flight Operations
Federal Aviation Administration

Since we are running a few minutes behind here, I'll get started. I am Ken Hunt from the Office of Flight Operations, Federal Aviation Administration, and it's a real pleasure to be the moderator of this panel today.

If you will notice, our subjects are a little diverse. This started out as three separate panels, and in an effort to consolidate some of this and make it a little more palatable and not have you sit so long, we consolidated and our panel ended up with three very interesting subjects to be discussed, but they are in ways very diverse.

It is a real pleasure for me to be associated with this panel that is going to deal today with simulation, and we've got an expert from industry who is involved in training and simulation to talk to us, and we also have one of our people.

To start with, I would like to introduce Mr. Al Gleske, Vice President of Governmental Affairs, Flight Safety International. He will talk to us on his thoughts and views toward flight simulation. Al is more than qualified to speak on this important subject and his background includes positions in Congressional relations, aviation affairs for the FAA in the Office of the Secretary of Transportation, and as a special assistant for research and development in the Office of the Secretary of the Air Force.

He has in excess of 3,600 hours of flight time, which has principally been in jet aircraft, both executive and transport and also military aircraft. Al holds a masters of science degree in aerospace engineering from the University of Maryland and is a registered professional engineer.

So at this time I would like to turn it over to Al and let him give us his thoughts on simulation.

WORKING SESSION I - SIMULATION

Elmer G. (Al) Gleske
Vice President of Governmental Affairs
Flight Safety International

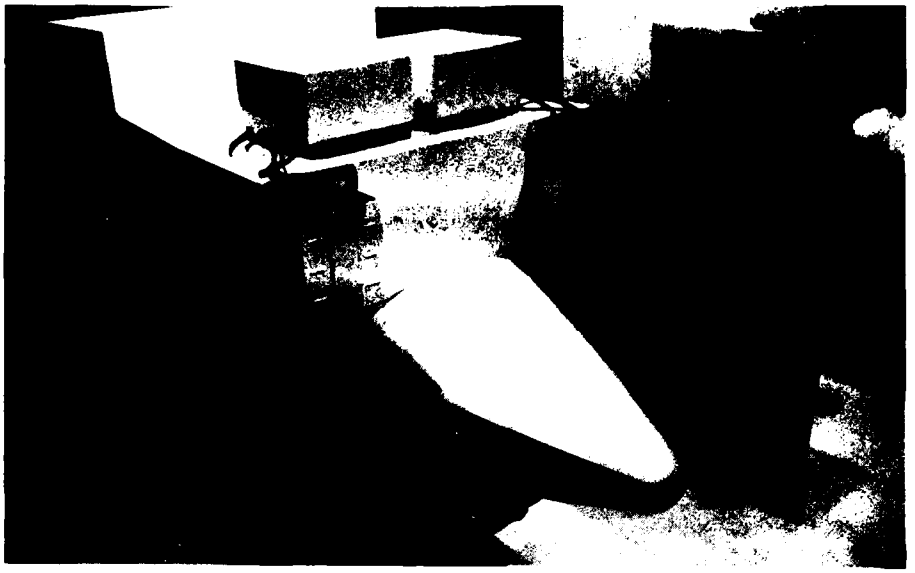
Our luncheon speaker, Mr. Gellman, referred to the need for advanced technology and training in the commuter area, and with that as a point of departure, I would like to talk about one facet of the use of advance technology that could apply to the commuter field.

Before we talk about what flight simulation can do for you, it is very important to define what we mean by "simulator." it is a generic term taht is often used to include a full mission simulator, a pert task trainer, procedures trainer, or a training device. this happens to be a view of a training device.

The remainder of my remarks, however, are going to pertain to a full mission simulator. A full mission simulator is a device that permits the flight crew on the aircraft to simulate all the tasks or the majority of the tasks connected with any flight.

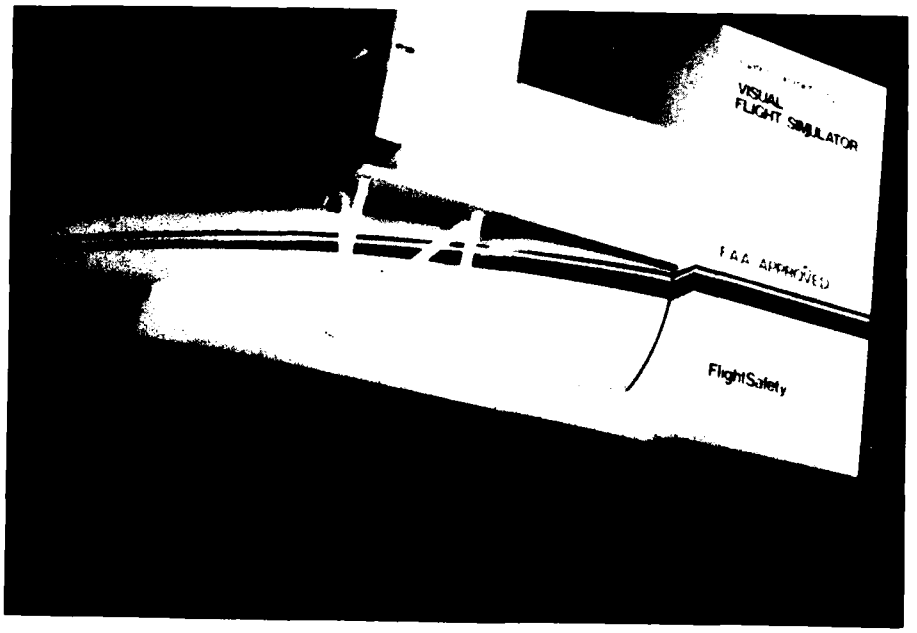
A full mission simulator may include but not be limited to a visual system, motion system, a means for introducing environmental stimuli. It is a fully dynamic system.

Shown here is the King-Air 200 in the foreground and the military C-12 full mission simulator in the background, and on the forward portion of the picture you can see the computer generated image equipment.

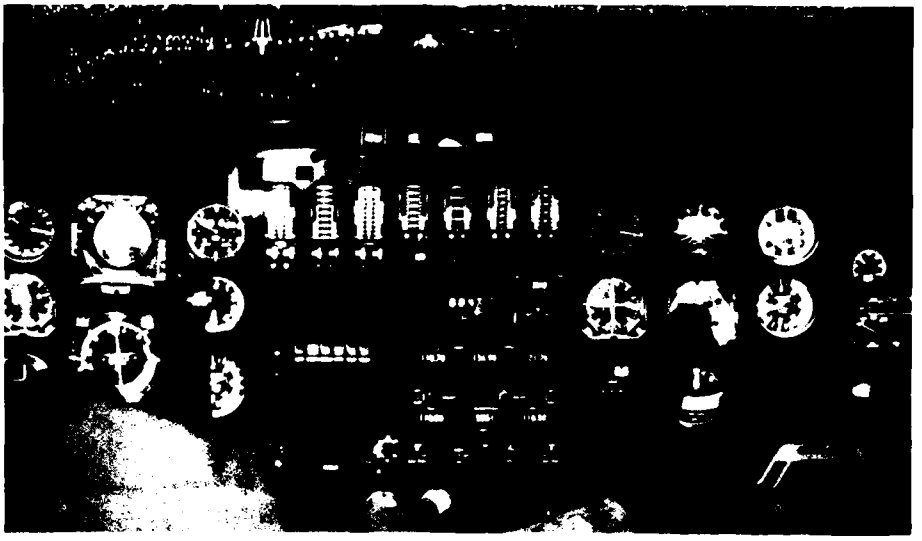


The key to today's state-of-the-art technolology and full mission simulation are digital computers. Through them and through the software, the flight handling characteristics of many aircraft can be programmed. The cabinets in this view happen to show the housing for the computers.

You can see here the motion system that is used to introduce turbulence and motion cues to the crews

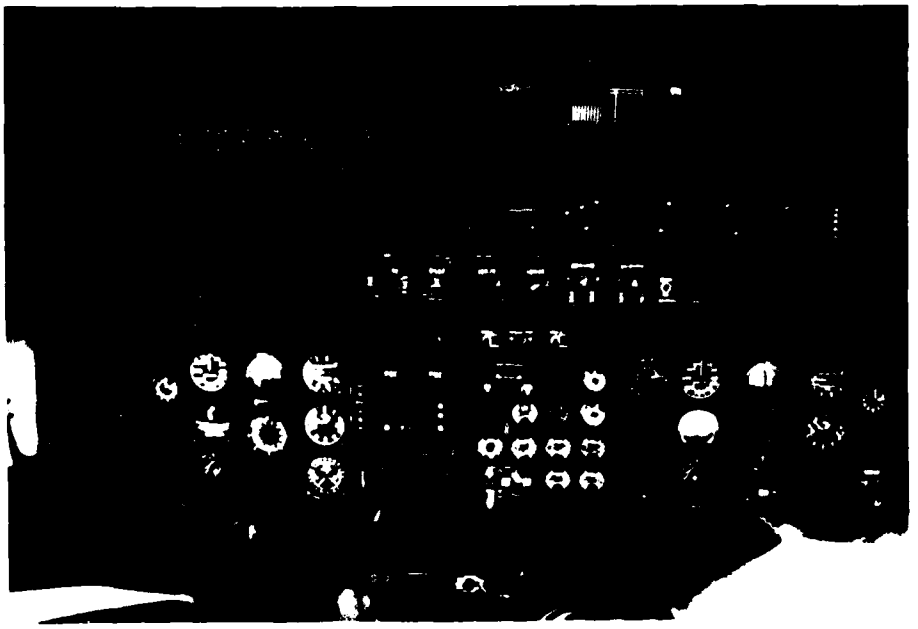


An example of a computer generated visual scene is shown here where the crews are flying an approach into runway 04 at LaGuardia.



It is possible to program any airport around the country or in the world, for that matter, to simulate an airport, and some unusual locations can be programmed using the computer generated image visual system.

The pilots here are flying a Bell 222 six-degree motion simulator and are flying an approach to the Peter Smith Hospital in Fort Worth. It is a twelve-story building with a regulation helipad that is about 150 feet above the ground.



The key to any training program or particularly any simulator training program is the instructor. This shows the instructor's console. The panel to the right -- at the top of the panel to the right -- the instructor can create abnormal situations and introduce emergency situations or whatever. The red fuzzy stuff on the lower panel there are navigational aids that can be used to set up navigational aids anywhere around the country. You can also change the visibility, the base of the clouds, the height of the undercast -- a point here about realism. When a pilot breaks out of an undercast, for example, there are ragged clouds as in the real world so that's not a synthetic situation that he has been exposed to.

Continuing on down on the lower part of the panel, it is possible for him to change the temperature and pressure to coincide with any particular airport and the runway direction and velocity.

On the left panel you see a standard plotter for reporting the ground track. This is, I guess, the $64 question. NTSB statistics show that a high percentage of aircraft accidents occur in a training situation, and not only that, FAA encourages the use of approved simulators for training and check rides. For example, you can do 135 checks or the ATP check, or for that matter, a pilot can maintain his six-month category two currency in a full-mission simulator.

Today some commuter operators are growing so large that if they were to use simulator training, it could be possible for them to replace the equivalent of an aircraft that is used for training.

Probably the fastest growing item in your budget today is the cost of fuel, and it will probably continue to be so in the future. Through the use of simulation, you can increase your competitive edge.

I mentioned earlier how important it is for the simulator instructor to control the environment. For example, a crew can take off out of Miami and a few moments later begin an approach into a high altitude airport such as Denver. Normally an aircraft isn't loaded to its max gross weight in a training flight. You can do so on a simulator. Not only that, he won't be exposed to an out of limits condition for the center of gravity. He can do this safely in a simulator so that if he should encounter this situation at some point during a flight later on in his career, he hopefully would recognize it.

Performance of some aircraft degrades considerably when you turn on the anti-icing equipment. He would have an opportunity to examine range and takeoff and landing performance.

FAA provides a standard windshear profile that includes the Eastern 66 crash that can be used to program into most simulators, and the idea here is not to teach a pilot to fly through windshear, but to teach him what the characteristics are and to avoid that.

I discussed the restrictions to the visibility. On runway conditions, it is possible for him to induce icing conditions or wet runway conditions.

The idea of any operator, I'm sure, is not to train his pilots, and by avoiding putting his equipment out of the active schedule for training, he obviously is going to get a better return on his investment. The last line there, I don't think, needs any additional explanation.

It is a fact that some insurance companies do offer preferred rates if an operator conducts his training in a simulator. There are a number of management benefits that can accrue through the use of flight simulation. We have heard a couple of times today the reference to the slots in the noise complaints out at National, and I can mention the Santa Monica case or Monterey to talk about noise pollution. Also it would be another example of where an operator might consider himself as being a good neighbor.

With respect to standardization, often times -- I guess most of the time -- when training is conducted in an aircraft, the instructor pilot either occupies the captain's seat or the first officer's seat.

Through simulation training you can start with the crew concept from day one -- that is, the captain in the left seat and the first officer in the right seat, and we are all concerned about our professional image.

In summary, the best safety device in any aircraft is a well trained pilot. Thank you.

WORKING SESSION I - SIMULATION

Edgar C. Fell
Program Manager
National Simulator Evaluation Team
Federal Aviation Administration

I appreciate this opportunity to be with you today to briefly discuss the aircraft simulation program and the recently established national simulator evaluation team. The FAA is committed to realism in simulation through high fidelity, aerodynamic programming requirements for simulator approval.

Advisory Circular 121-14C, which was issued on August 29, 1980, sets forth stringent requirements for simulator approval. The procedures and criteria established in this Advisory Circular are applicable to FAR Part 121 certificate holders and other operators who are authorized by exemption to use an approved simulator for type-rating checks as permitted in Appendix A of FAR Part 61. However, you should keep in mind that simulators used in FAR Part 135 operations also require FAA approval. Therefore, Advisory Circular 121-14C is also applicable to FAR Part 135 operators.

The FAA is aware of the life cycle, procurement and maintenance costs of a device that meets our simulator approval criteria. Until such time as the economics become more favorable, a single commuter airline would probably not justify such an investment.

We are convinced, however, that cost effective, meaningful flight training is one of the most important considerations for reducing airplane accidents in the commuter industry. The best vehicle for providing such training is a simulator capable of meeting our requirements.

The FAA encourages the commuter airline industry and the organizations which represent the industry to explore all possible avenues toward increased utilization of the simulator and pilot training programs. Collective utilization of simulators operated by an independent regional training center might be one possible means of providing the advantages of a simulator without the high procurement costs. Simulator manufacturers should be made aware of the commuter airline training needs and be responsive to those needs.

As mentioned before, the cost of sophisticated simulation is a consideration, but perhaps the cost of a simulator which represents an airplane used in the commuter market might be considerably less than the cost of a simulator representing a large turbo-jet airplane.

However, cost considerations aside, we are all pragmatic enough to realize that widespread use of simulators in the commuter airline industry will not happen overnight. In the mean time, to provide some

relief from the cost of training pilots in the actual aircraft, the training device remains a viable alternative in most instances. The extent of approval of such devices would depend on the operator, the sophistication of the device itself, and the training program involved.

Now to clear up any misunderstandings regarding the approval of simulators or training devices used in FAR Part 121 or FAR Part 135 operations, keep in mind that the FAA will approve a device for a particular operator's training program on an individual basis. All simulators will be evaluated by the national simulator evaluation team in accordance with the procedures outlined in Advisory Circular 121-14C. Training devices will continue to be evaluated at the local district office level with technical support from the national simulator evaluation team as needed.

I would like to close my remarks with a few words about the national simulator evaluation team. This team was formed to provide the FAA with a nucleus of individuals especially trained to conduct standardized simulator evaluations on a nationwide basis. The team consists of a staff of three Washington and nine specialists in the field who are responsible for evaluating all simulators requiring FAA approval.

After four weeks of intensive training with various simulator manufacturers and air carriers, the team officially began operations on January 1st. All the field specialists are experienced aviation safety inspectors with a wide range of aircraft qualifications. One specialist is domiciled in each FAA Region within the Continental United States.

One of the primary functions of the team is to provide technical assistance on matters concerning aircraft simulation. If you have questions regarding simulator approvals, your local FAA District Offices should be glad to supply you with the name and telephone number of the specialist in your region.

I have kept my remarks very brief this afternoon for a specific purpose. I have been to these things before and usually this subject is quite controversial in some people's minds and I want to give everyone an opportunity to ask questions. I will be here the rest of the afternoon and into this evening and look forward to some lively discussions with you. Thank you very much.

WORKING SESSION I - FITNESS

Charles Hutcheson
Air Safety Investigator
Federal Aviation Administration

Good afternoon. I am suppose to talk about fitness. Several people today stopped me and said "What are you going to talk about -- pilot calisthenics and jogging and things like that?" That's not really it.

I thought I would very briefly explain what fitness is, how the FAA interfaces with the CAB in making operator fitness determinations, and additionally, I would like to mention a couple of other areas in which the Board and the FAA coordinate very closely concerning various operators.

Passage of the Airline Deregulation Act of 1978 substantially lessened the economic barriers to entry into the air transportation field. This Act charges the responsibility for determining whether air carriers are fit, willing and able to the CAB, and this determination also includes the ability to do so safely. Since the FAA is charged with ensuring that all carriers perform their services at the highest possible degree and level of safety, the CAB and the FAA work closely together in coordinating these activities.

In making its fitness determination, the CAB relies largely upon the FAA for an evaluation and recommendation on the safety aspects of a proposed service. To effectively coordinate these areas of mutual interest and responsibility, the CAB and the FAA have established a working group and have entered into an agreement which is entitled "The Interagency Memorandum of Cooperation Regarding Safety Matters Between The Civil Aeronautics Board and the Federal Aviation Administration." Under this agreement and when requested by the CAB, the FAA provides a safety and compliance evaluation within 28 days. However, in cases involving essential air service under Section 419 of the ACT, the responses are returned in 15 days.

In each case the CAB sends a written request to our air transportation division indicating the type of authority being sought and requesting that we provide a written safety and compliance evaluation. In establishing the FAA's response to CAB inquiries, the FAA takes the basic position that any applicant currently holding an operating certificate and operating specifications is conducting those operations at the required level of safety. However, we must rely on the certificate hold region to review an applicant's accident, incident and enforcement action history and to advise us if there is any reason that the FAA should recommend unfavorable action.

In all our responses to the Board, we include as a standard paragraph the suggestion that any authority awarded should be conditioned upon an FAA finding that, number one: the applicant meets the qualifications of the Federal Aviation Regulations applicable to the type of operation permitted by the Board's authority; number two, that it is able to comply with the operating requirements applicable to that operation; and number three, that it has been issued an appropriate FAA operating certificate and/or operation specifications which authorizes the operation. I believe this highlights the FAA's role in the CAB fitness findings.

As I mentioned earlier, there are two other areas in which we maintain a very close liaison. These have to do with financial position and with essential air service. The first one, financial position, occurs when a CAB audit report shows that an operator appears to be in a weak financial position. The FAA's Air Transportation Division is then notified. We, in turn, notify the appropriate regional office so that that office can consider the need for increased surveillance. I don't mean to say that it is automatically done, but they just consider it to see if additional surveillance is necessary. The second area is essential air service. Each month the CAB sends the FAA an updated listing of all commuters upon whom they are relying to provide essential air service.

The FAA or our office in turn informs the Board right away at any time we have reason to believe that an operator's ability to provide the essential air service authorized might be in jeopardy.

In summary, then: (1) Fitness is a determination that must be made by the Board as mandated by the Deregulation Act of 1978. (2) The FAA provides a written safety and compliance evaluation upon request from the Board. (3) Finally, I think probably most important, the FAA's basic position is that any operator currently certificated and holding operations specifications is operating at the required level of safety.

Thank you very much.

MR. HUNT: Thank you, Charlie.

Our next subject has been brought up in a way by Ron Shull in his presentation, and I had a nice, typed introduction to our next speaker but as I walked up to the podium, he handed me his own and asked me to read it. So I'll read his introduction.

Bob Wiseman, our next speaker, is from the DOT Transportation Systems Center in Cambridge, Massachusetts. He is the project manager on the Center's program to support the FAA, and particularly Aviation Standards, in the design of a modern nationwide aviation safety analysis system.

Bob has a bachelors degree in electrical engineering. He also has a masters in aeronautical engineering from MIT. He is eminently qualified in this area and in the last part of his statement, Bob points out that his wife has a masters in social work so he may be able to handle any emotional as well as technical issues you may raise.

With that, I will turn it over to Bob.

WORKING SESSION I - SAFETY ANALYSIS

Mr. Robert Wiseman
Project Engineer
Transportation Systems Center

MR. WISEMAN: My wife deals with private therapy for individuals. As an engineer, my patient is a system, and the people in the FAA and the TSC who work with me in doing this job tend to look at my job as technical therapy.

About 15 months ago, when I was asked by Jack Harrison to work on this Aviation Safety Analysis system, he said, "I've got a patient for you." My first impression of this patient when he later came into my office looked like Figure 1.

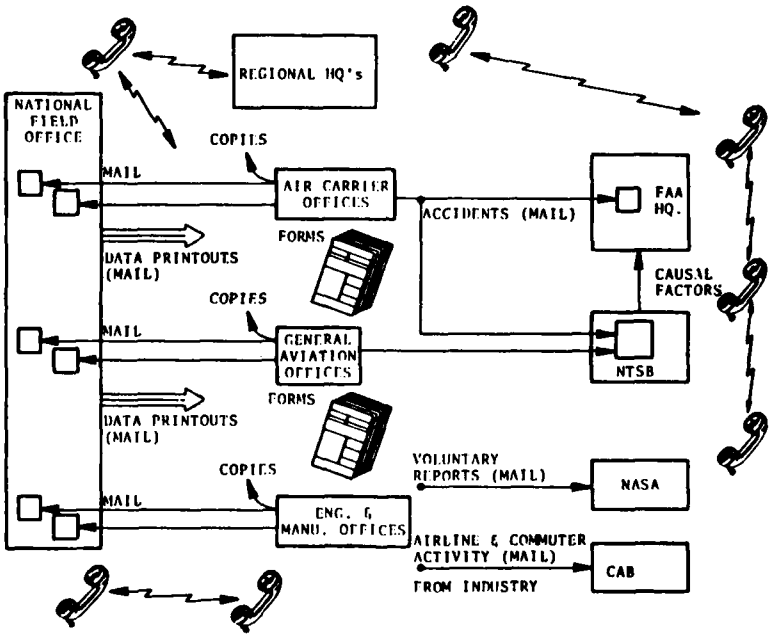


FIGURE 1. PRESENT SAFETY DATA EXCHANGES

As this patient sat down, I asked him why he was here and what was his problem. He said, "Well, to begin with, I'm feeling somewhat uncoordinated and outdated. I am trying to serve about 4,000 users in aviation standards, not to mention the entire aviation community. However, I feel that I'm not really doing my job well because I don't have the modern equipment that everybody else seems to have. More importantly, I feel that I should be going into analysis."

That last is a pun, but when I think of what the Aviation Standards people have to do in the future to modernize the system, I feel that the methods of analyzing aviation safety information must change.

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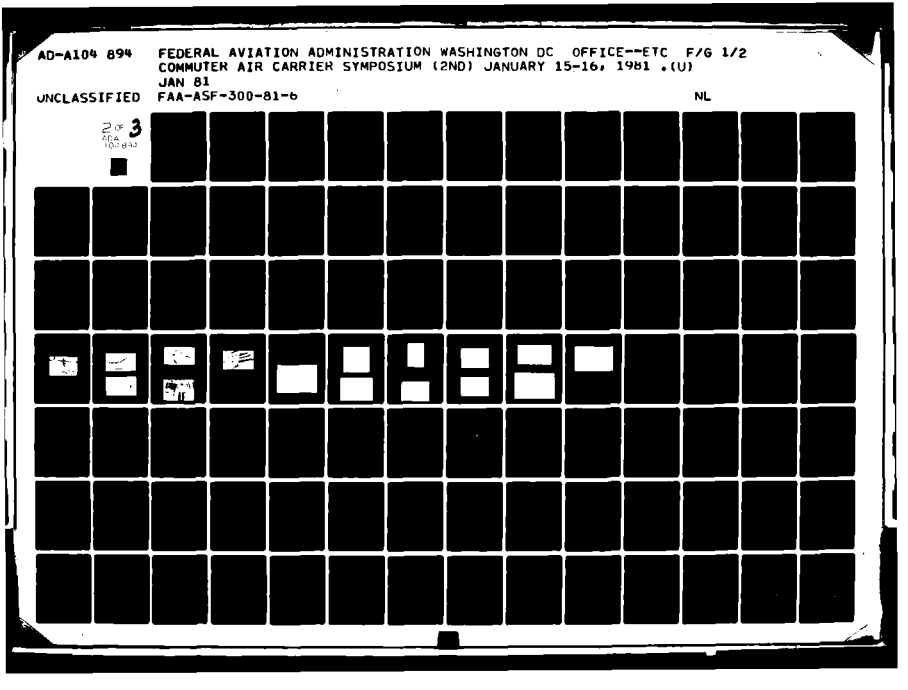


After this initial meeting with the patient, I had a consultation with another technical therapist, the eminent Associate Administrator for Aviation Standards, Walt Luffsey, and asked, "What do you want me to do with this guy?" Walt said, "Let's try and establish some goals for your patient in the therapy over the next two years."

"First of all," he said, "You have to get out to the field and meet the users and find out what their needs are." This we have done and we will begin to report on the results this month. I will give you some more information on that later in my talk.

Walt also maintained that people in the field are suffering under a major paperwork overload. Technical people, who are supposed to be out in the field doing technical work, are filling out some 1.5 million forms a year. Moreover, most of those forms sit in local district offices and never get disseminated or analyzed at other offices or national levels.

Figure 2 shows some of the ground rules that Walt had set for us. He said, "Why don't you work with this patient and come up with a design and a plan for his improvement, namely a modern system implementation by 1982?"

DESIGN	● IDENTIFY SPECIALIST NEEDS
	● INCORPORATE USER-ORIENTED MODERN EQUIPMENT
	● DATA BASE ORGANIZATION/MANAGEMENT
	● ENHANCED ANALYSIS TOOLS
	● INCREASED INFORMATION EXCHANGE
IMPLEMENTATION PLAN	● IDENTIFY NEAR TERM & LONG-RANGE PRODUCTS
	● DEMONSTRATE BUILDING-BLOCK OPERATION IN REGIONS
	● VERIFY INCREASED INSPECTIONS
	● ESTIMATE SAFETY BENEFITS
	● CONFIRM USER ACCEPTANCE

FIGURE 2. OBJECTIVE: DESIGN AND PLAN THE IMPLEMENTATION OF AN IMPROVED NATIONWIDE SYSTEM

Soon after, I had a separate session with the patient's parents, the aviation industry. They said (as shown in Figure 3), "We've heard this story before. He says he wants to improve. He goes to therapy and he comes back and says, 'I've improved," but all he turns up with is another study."

REPORT OF WORKSHOP ON AVIATION SAFETY INFORMATION SYSTEMS (NOV. 15-16, 1979):

1. FAA SHOULD EXAMINE THE INFORMATION IT NOW COLLECTS:
   - WHAT IS USEFUL & HOW IS IT BEING USED?
   - WHAT IS NOT USED & HOW CAN IT BE ELIMINATED?
2. IDENTIFY NEEDS AND USES FOR NEW DATA
3. MAKE A LONG-TERM COMMITMENT TO REAL END-PRODUCTS
4. FOCUS ON FLIGHT OPERATIONS, PARTICULARLY FOR GENERAL AVIATION (i.e., HUMAN FACTORS)
5. HAVE THE QUALIFIED LOCAL SPECIALISTS DO THE SAFETY ANALYSIS

FIGURE 3. INDUSTRY USER COMMENTS

Continuing the treatment, we had a meeting in Cambridge in November of 1979, including both the industry and the FAA, and another with the FAA separately. In both meetings, one message came across -- no more studies. If you are going to do something about this system, you had better make some decisions and get equipment out to the field in a hurry.

Moreover, the industry said, "Look, before you say that this patient is in a good emotional state, please let us know what data you need from us; that is, straighten out your own house first. After accomplishing that, then come to us with a firm definition of the types of automatic connections you need with our data systems." The industry reservations were for privacy and other obvious reasons, as I'm sure you all know.

I got back to the patient and said, "What do you want to look like? I mean, what kind of goals would you have for yourself as a system?" He answered,

"I really want to act younger and be more vigorous, as indicated in Figure 4. I want to be able to have such things as direct data entry at the district office level where the inspectors, who have a first-hand knowledge of the data, can assure its accuracy, rather than mailing forms in to a remote data entry facility like Oklahoma City."

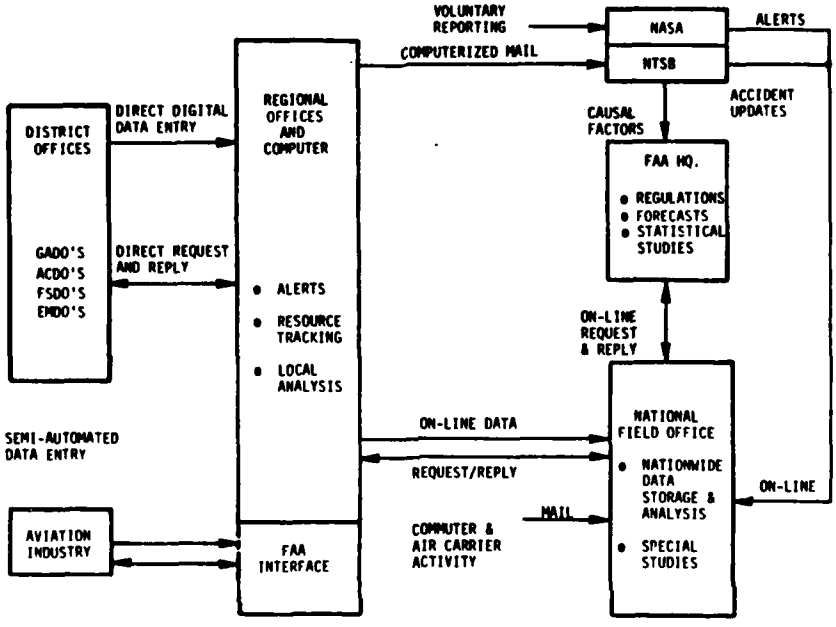


FIGURE 4. ALTERNATIVE SYSTEM CONCEPT

"Moreover," he continued, "I need to be able to do what the Southern Region is starting to do in pilot tests; that is, to test the use of modern word processing and data entry equipment in district offices. Such equipment provides inspectors with the capability of taking an audio cassette out to the field during inspections. Instead of filling out forms, they dictate onto the audio cassette. Later, they can transmit the recording over a phone line to a central Dictaphone data entry point at the district office where it can be entered and forwarded automatically to the regional headquarters and the national data base."

I told him that what we envisioned for him in this long-term therapy, (and I hope it's not too long-term), was an improved system where most of the data that is currently collected could be entered directly at the district office. It could then be transmitted to the regional office which would first extract some data for its own needs and send along the complete data package to a

national facility where the data would be stored for use in other, broader analyses. For example, if the field inspectors wanted to do a simple type of analysis relating the performance of individual flight instructors to students, their request might be processed by the regional office. For more complicated analyses, the regional office might inform them that the data processing would be performed at the national facility, possibly in an overnight batch mode.

Please notice that there are a number of interfaces in Figure 4, some of which we still have to work out. For example, it includes the aviation industry (you people and how we can serve you), and the NASA Aviation Safety Reporting System. The interfaces also include a lot of the data exchanges that might by a part of a nationwide safety analysis system. But this system must start from an improvement in the FAA's Aviation Standards operation.

In the early therapy sessions, I also asked the patient what his preliminary goals were. I said, "What else do you want besides the capability for single-entry of data at its source?" At this point, he gave me the longer list of early goals shown in Figure 5. He said that, "Automatic screening (checking for errors at the district office) is important at this point." He mentioned that a careful interpretation of the safety data was important at the field level. For example, prompt and proper interpretation of Service Difficulty Reports were a major concern of one of his parents, the air carrier segment.

He also mentioned that he needed an electronic mail function so that people wouldn't get information they don't need and, conversely, quickly get information they do need.

- SINGLE ENTRY OF DATA AT SOURCE
- AUTOMATIC SCREENING FOR DATA ERRORS AT POINT-OF-ENTRY
- ELECTRONIC MAIL FUNCTION
- MINIMUM TRAINING REQUIREMENT FOR SYSTEM OPERATION
- COST REDUCTION FOR DATA COLLECTION (FAA AND INDUSTRY)
- SYSTEM ADAPTABILITY TO FUTURE FAA NEEDS
- AUTOMATIC FLAGGING: PROBLEMS AND ADVERSE TRENDS
- RAPID DATA COMMUNICATION RATE AMONG ALL AVIATION STANDARDS OFFICES
- SYSTEM INTERFACING WITH INDUSTRY, GOVERNMENT AND INTERNATIONAL DATA BASES

FIGURE 5. AVIATION SAFETY ANALYSIS SYSTEM: PRELIMINARY GOALS

The system also has to adapt to future FAA needs. That's a tough one, and I will try to show you how we will remain flexible in the design so that as the needs of Aviation Standards and the aviation community change, the system can remain flexible and adapt to these changes.

The long-term plan is shown in Figure 6. We have already had, as I mentioned before, our FAA industry workshop. We are about to complete our user needs evaluation. I'm going to take a minute and tell you how that evaluation was conducted. There were extensive interviews, first with the Eastern Region, then a larger coverage of the Southern Region, along with some interviews out

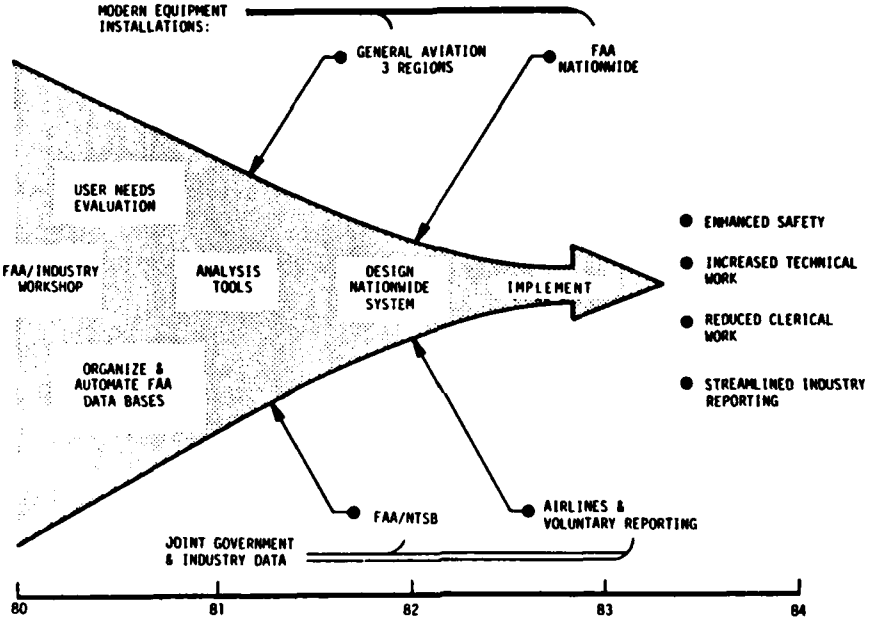


FIGURE 6. FAA AVIATION SAFETY ANALYSIS PROGRAM

in the Northwest Region. This work was performed by Arthur D. Little and involved designing a questionnaire containing ninety-three different sets of user needs. The needs covered such categories as general, administrative, maintenance, analysis, and inspection.

Then in early December, with the help of the FAA and the regional people, we sent out the questionnaire package with the following requests: For each of these needs would you please rate its importance to aviation safety and in terms of work efficiency; would you please tell us how much time you might save if this need were implemented; and tell us how often and how quickly you need it.

We got our responses back from 50 different offices. The last ones were in around the 5th of this month, and I can assure you that even for the newly emerging lead region needs (which we are beginning to investigate), the primary need in terms of aviation safety and work efficiency is to get a regular interpretation and tracing of FARs. The field people identified a need for quality, consistency and quantity in SDR reporting. They also expressed a need for current and traceable airworthiness directives. I will be glad to discuss the field responses in detail with you later, if you wish.

Now, when you go out to see a field inspector and ask what he would like in a future, automated system, what might happen (and did happen often enough) is that the inspectors cannot look ahead well enough to be able to envision how a new system would operate since they have been working a long time with the present manual system.

So, in order to get their opinions on the requirements for a future system, TSC developed, on our Dec-10 computer, a real-time simulation (I'm going to use the term "simulation" advisedly). The simulation will be ready in two months and will enable the field people to explore an on-line capability that might exist in three or four years. The simulation is called UNSAS, and has the features shown in Figure 7. What you can ask this system, for example, are things like: I have a mechanical problem, could you please show me whether that problem has a certain number of SDRs for any given aircraft-make model and whether that make-model has a corresponding number of accidents related to that SDR, by ATA code. You can also ask it if there have been ADs associated with the same problem.

DEVELOPED TO:

- **TEST "USER FRIENDLY" INTERACTIVE SOFTWARE**
- **TEST THE QUALITY OF DATA IN EXISTING DATABASES**
- **STUDY PARAMETERS USEFUL IN LINKING EXISTING DATABASES**
- **SIMULATE NEW DATA ANALYSIS TOOLS AND TEST THEIR EFFECTIVENESS IN MEETING USER NEEDS**
- **DISCOVER UNSTATED USER NEEDS DURING FIELD TESTS**
- **BUILD CAPABILITY TO PREDICT UNSAFE CONDITIONS**

FIGURE 7. PURPOSES OF USER NEEDS SAFETY ANALYSIS SIMULATION (UNSAS)

The simulation will, in fact, lead you, without a user's guide, through a set of linkages among existing data bases so that you can relate the information from a variety of sources of safety data.

I invite you to look, later on, at a printout of this system. You will find that, for example, if you were using the FAA's Accident/Incident Data System (AIDS) and you needed full text accident backup, you would have an opportunity to search more detailed NTSB accident records.

You might even ask the question: For a given aircraft, by N number, would you please tell me whether there are a significant number of SDRs, and at least one accident for the same aircraft.

I call UNSAS a simulation because we have not used complete multi-year data bases. For example, SDR files now have 130,000 records, all of which are not needed to assess future possible uses of this system. So, we deliberately limited our data to 1977 SDRs and 1977 NTSB accident reports. We also restricted operator types to commuters and air taxis, figuring that they were a suitable middle ground between air carriers and the general aviation community. Linkages between these and other data bases on UNSAS now afford the opportunity to explore advanced and more elaborate needs for both air carriers and general aviation.

Getting back to the patient, there was a lot of family history to go through. By that, I mean, in the beginning, we did not know what forms that are filled out by Aviation Standards really related to aviation safety. We also needed more information flows showing the processing and routing of the forms.

We are building up a data dictionary and directory system on our Dec-10 computer which, within one year, will be able to trace a regulation or an advisory circular entirely through the whole system. As shown in Figure 8, the computerized tracing identifies the function the regulation applies to, who it applies to, what forms are being filled out, the data elements on these forms, where they are entered in data bases, the corresponding data elements files, and, finally, the reports resulting from the data that this whole system is generating.

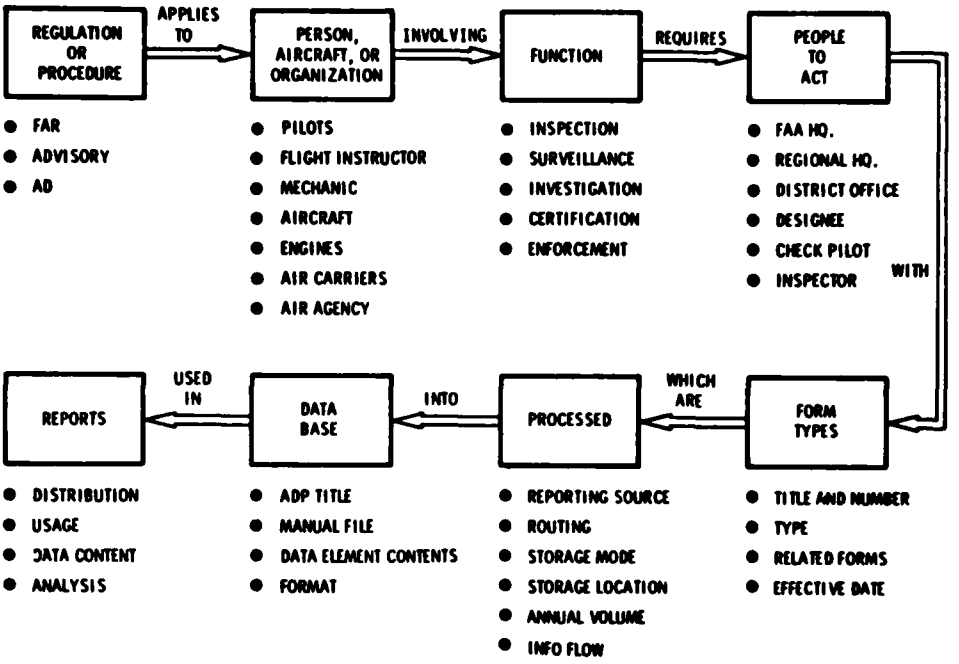


FIGURE 8. DATA DICTIONARY/DIRECTORY

In June of this year, except for the regulations and reports, the data dictionary will be fully operational. We now have over ninety safety-related forms fully characterized. The forms have been tied to the information flows from the initial action on the forms to their final destination, whether it is in a manual file or computer record.

The information flows are now specified in a report which contains over sixty diagrams like that shown in Figure 9. The heavy lines, are for our system designers, to indicate mailings, so that as direct computer data entry and access are postulated, they can alter those flows and know how the system is affected.

The data dictionary, we believe, will eventually be a way to trace, for the first time, the cost of regulatory changes through the federal system to the government and, hopefully, the cost to industry, as well.

Given that the patient will soon have directly entered data that he never had before, how do we begin to put him into an analysis framework? An initial step in this direction is shown in Figure 10.

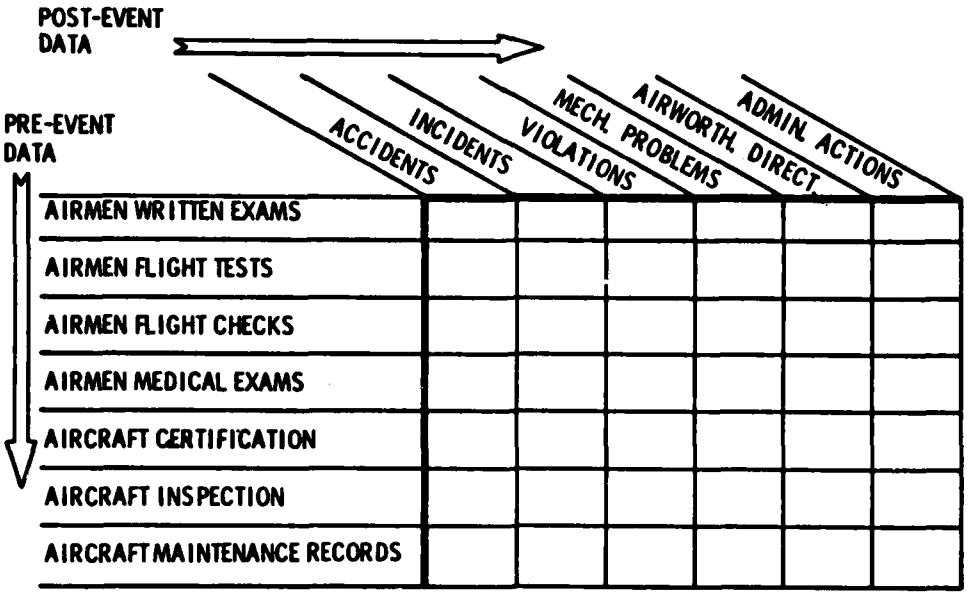


FIGURE 9. AIRCRAFT AIRWORTHINESS INSPECTION

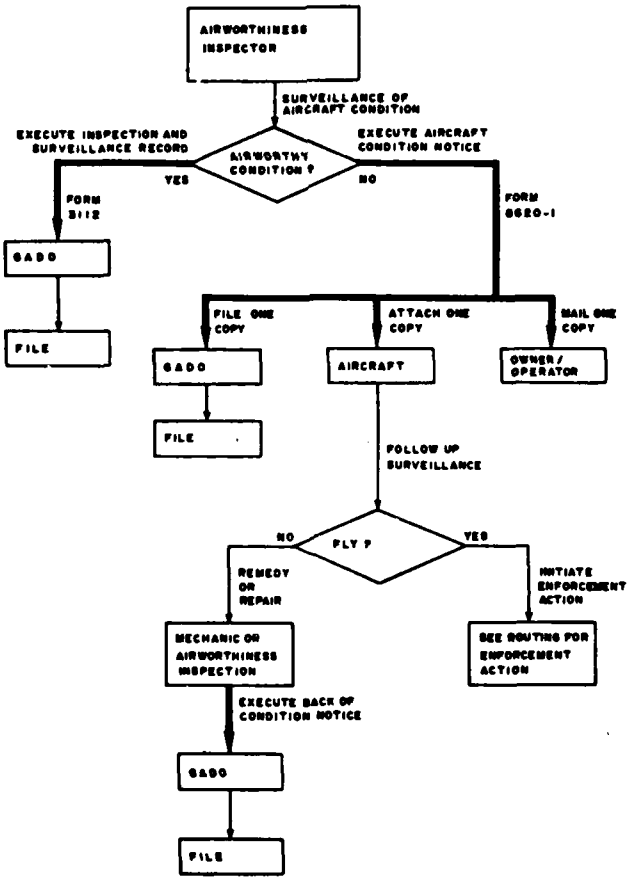


FIGURE 10. SAFETY ANALYSIS, CORRELATIONS FOR GENERAL AVIATION

Until recently there were very few linkages between data bases which might show correlations between sources of safety information. Our UNSAS simulation is a method to explore these correlations in real-time with the users. In the meantime, the FAA at Oklahoma City has done much work in this area. Linkages are being established between aviation accidents and incidents; they are now being explored between SDR information and accidents, violations and airmen records, and between pre and post-crash medical factors in accidents.

The FAA and this system patient have grown to the point where the Southern Region pilot experiments with modern equipment, and the modernization of the data bases, will allow aviation safety data to be established in an analysis framework.

In this analysis framework, safety questions for various phases of flight might be answered from data that is already collected on flight checks. Data that presently sits in a file cabinet at the local district office may become a part of a nationwide computer record which relates this information to accidents or incidents. In another example, the scores on written exams for a particular phase of flight, e.g., landings, can provide some clues on accident causes. At the very least, the analysis framework can provide a snapshot of the current system and as future data is entered on computer records, the FAA can make a more efficient allocation of its resources.

That is one-half of the analysis picture. The other half is to use this very same matrix with a computer system monitor of all the data bases. The monitor would track the kinds of questions that are being asked of the data, who asks them, what are the kinds of problems for which answers are needed, and how often is this data asked for.

The monitor can also provide a way of partitioning the many data bases thus providing rapid access to data that is needed quickly or often. It will also identify less urgent batch processing of data and even the elimination of certain data collection that is not used by people in the field.

This then, is the framework in which we at TSC are conducting the system design. We hope to have a design and an implementation plan ready, with the help of a lot of people in the FAA, by the end of this September. This work should set the stage for aviation safety analyses with modern equipment for many years to come.

Thank you very much.

QUESTIONS AND ANSWERS

C. O. Miller - I was impressed with that first slide that you showed from flight safety there that showed the C-12 simulator and another one that was adapted to, I presume it was a Beech 8200 or something like that.

My question is that obviously there must have been some development money provided by the military to put that together. You don't think so? Let me ask the other question that I'm leading up to then. Do the existing FAA requirements for analysis of aerodynamic data, either on paper or in flight tests, provide sufficient information with which you can develop that kind of a simulator and if so, what is the requirement?

Al Gleske - I'm not technically qualified to answer your question. I can tell you the procedure that we went through with the 200 and with the C-12 and that was basically collecting the data, stability derivatives, aerodynamic data, and programming it into the simulator, putting that into a functional test guide that is made available to FAA. They, on the basis of that functional test guide, then examined the simulator and determined whether it will be approved or not.

Ed Fell probably can answer part of your question. As far as the requirements from FAA, the simulator has to be presented to them and then they decide whether or not it is good enough, after the hardware is there.

Ed Fell - That was a good job Al. Thanks a lot.

The FAA requirements for aircraft simulator certification are very explicitly detailed in Advisory Circular 121-14C. The requirements for aircraft flight test data versus other predicted data or simulator data are also pretty well defined, and it also depends on the level of approval of the simulator that you are seeking.

You can have, for instance, five levels of simulator approval -- nonvisual simulator; visual simulator; a phase one simulator which is approved for the landing and takeoff maneuvers for recency of experience, night landing and proficiency checks; a phase two simulator which is approved for all training and certification of flight crew members for transition and upgrade to captain, depending on their level of experience; and phase three which we're not there yet but hopefully will be there in the next several years, which is all training and certification done in an aircraft simulator of the type that the individual is seeking a type rating in.

If you want to get with me later, I will sure show you the advisory circular and explain it to you in more detail.

Ken Hunt - Thank you Ed.

J. Dawson Ransome - I would like to ask I guess Ed or Al or a combination thereof, to what degree could we find receptiveness to procedure trainers as an interim step to going into full simulation? One of the benefits I see from that is that we would have documentation as far as proficiency, particularly in the hold and approach mode and things of that nature. I think it's something that we ought to look at very seriously and I wonder how receptive you all might be to that approach as an interim step. I agree there is no way that any single carrier can afford the simulator, for example, for a Dash-7 right now.

Ed Fell - I guess I'll have to take that one. About a year ago, we came out with a notice to our field inspectors for Part 135 operators in which we extended the training device approval procedures above and beyond that which is allowed in Part 121. A Part 135 operator right now can do quite a bit more training and even some certification maneuvers in a training device which a Part 121 carrier can't do.

I know some of you in this room, if not the majority, are operating under Part 121 training situations. Now I will address my remarks to you people in that we will entertain any viable program submitted to us for extended credits in a device which you think is capable but let me make it clear to you that we expect to see a very detailed specification, written specification, of the exact training device you have in mind, not a proposal but a firm commitment specifying what device you plan on purchasing, how you plan on implementing that into your training program when you purchase it, and then when you have gone that far we will sit down with you and work with you as to what might be available to you for credits in that area.

There has to be a commitment there on your part as an industry before we can really step in, because as I said in my remarks, we approve these devices for individual operators. We don't approve the device to be used by ABC and XYZ airlines both.

If XYZ airline buys the training device, we approve it for that operator. If ABC wants to contract with XYZ, then we will look at the device for the other persons and he may not get the credit that you may get. The door is open, but as of yet I have not received any proposals which were detailed enough to give us an idea as to how to proceed.

Al Gleske - I would like to add one thing to that. If it is determined that there is some need or requirement that can be filled with a procedures trainer, I think there are probably a number of companies around that would be glad to respond, but again the purpose it would serve is something that say the manufacturer or the operator would agree on, and hopefully be able to sell that to the FAA.

Jack Richardson - I have a question for Ed. I know there is considerable, in the major airlines, generation of use of simulators by flight schools such as Boeing's flight training school out on the west coast and I think Bell has one down at Fort Worth. Are there any provisions in FAA for commuter airlines to utilize a flight school

provided by the airplane manufacturer or a consortium of manufacturer or a simulator manufacturer which would permit individual commuter airlines to do some of their training at a central location and get credit for it in relation to flight time?

Ed Fell - I'm sure Al is glad to hear that remark. In my remarks I think I tried to make it clear that yes, definitely, the training center approach is a very viable approach. There would be some minor technicalities to work out as far as approval of the simulator for the various airlines which would use it, but that's not insurmountable and we encourage that.

We know what the cost of a simulator is today. Although, I might add, I think there are some firms that are right now researching the area of supplying lower cost simulators with the same type of technology they use in the larger ones. In the meantime, yes, the training center approach is a very viable approach and we encourage it.

Al Gleske - I would like to talk to you about a company that offers that type of service.

Elizabeth Landers - You mentioned the very detailed data. Why then was evaluation of training devices left up to the district offices rather than also being considered by the national team, and is there any plan in the future for the national team to take over the training device?

Ed Fell - Thank you Beth. To answer your first question, understand that I was asking for detailed specifications to me or the team for extended approval of an idea that you might have or want to have to go beyond what is approved now -- what we allow now for training devices. That's what I'm after.

The district office, in the meantime, is responsible for approval of the training device for your airline if it is within our present guidelines and what we can allow.

Secondly, it is rather difficult at this time for me to answer the second proviso in your question. We are just now off and running and I am right now very involved in training these people on an individual basis to get them qualified to check out so that they can go out on their own. We certainly want to explore that area, but it will be a considerable time, say further on down in this calendar year before we can make a final determination of that.

The answer to your question is yes, I would like to encompass training devices. Right now it is a very difficult thing for us to do at the present time, but we are looking at that area.

Ken Hunt - I would like to thank the panel. I guess at this time we are going to have to cut it off. Al and Ed and I will be around here -- the whole panel will be around here. If you've got any questions, later on we will be glad to talk to you about it. Thank you very much.

WORKING SESSION II

John MacKinnon
Office of Aviation Safety
Federal Aviation Administration

I am in the Office of Aviation Safety. I am going to try to fill in for Jack Harrison, and the program as it is listed is changed a little bit because of some commitments by some of our people at FAA.

Our first speaker will be Keith Potts who is in Air Traffic Service. He is the Chief of the Air Traffic Rules Division. He has been in the air traffic control business for 24 years, and I am sure he will be able to enlighten you or help you and answer questions at the end of the session.

We will also have, following Mr. Potts, Roger Brubaker and Keith will introduce Roger to you. Harvey Safeer will follow and Harvey will talk about airports and introduce an MLS film that we have this afternoon. Following the MLS film, Dr. Wilkins will address MLS and the transition plan. With that I would like to have Keith come up and do his thing for us. Thank you so much.

WORKING SESSION II - AIRWAYS

Keith Potts
Chief, Air Traffic Rules Division
Air Traffic Service
Federal Aviation Administration

I guess according to your program it is obvious I am not Ray Van Vuren for those of you who know Ray. Ray is the Director of our Air Traffic Service and events overtook him today. He wasn't able to attend. He asked me to express his regret.

Representing Air Traffic, we've been asked to talk very briefly about two subjects -- area navigation, RNAV and our efforts to identify and minimize air traffic delays. I will very briefly give you a little bit of history and what we are planning in the way of RNAV. Then I will ask Roger Brubaker to talk about delays. Roger is the Chief of our Systems Command Center here in Washington. He just found out late yesterday afternoon when he was in Chicago that he had to be here today, so we got him off an airplane early this morning. I hope he's awake there. I think he'll stay awake. With that, in the interest of time, I had a speech I am not going to give you -- I will just give you some off the top of my head -- history about RNAV and what we're planning to do.

As most of you know, the first RNAV airways were established back in 1970. Initially we installed or established 166 routes. Generally these routes were lined to coincide with the then-established flows of traffic, and to avoid standard instrument approach procedure areas and jet penetration procedures as they passed by the various airports and military bases. Also, they were designed to avoid special use airspace. Additionally they did not consider the more subtle preferential and arrival routes and procedures that are established between our en route facilities and our terminal facilities, and of course, that would be center to center as well as to the entire tower to tower.

As a result of all this, they were kind of cumbersome, and it didn't work too well. After a short period of interest these routes were not used very much, so in 1977, we announced a new agency policy and among other things the policy said that we would eliminate the routes that were not required.

We would give more consideration to random route use of the RNAV and the inertial navigation equipment that was coming in and already in. We eliminated about 93 of the 166 routes. There are still 75 remaining. They are in the high altitude structure. They are not in the low altitude structure, and in accordance with our policy to establish routes in the low altitude structure, we said we would do that on a case-by-case basis for individual users where the end product doesn't have a substantial adverse affect on the other users -- doesn't disrupt the system.

In accordance with that policy we have established some 38 routes for high altitude in addition to those that still remain in the chartered system. We have established two routes for one of your commuter users between Philadelphia and Washington. We have established nine RNAV helicopter routes in the Northeast Corridor between Washington, D. C. and the Boston area.

As I said, again, it is our policy that we will establish those where we can. In addition to what I've already said, we have a test program underway that we started last June. The test program has the cooperation of several users.

Basically it is some direct routes that we establish between 35 paired cities in the domestic route structure. We have asked the crews to evaluate the availability of the route, the reclearances or the reroutings, if any, and also the weather conditions that were applicable at the time. At the same time we're having our facilities fill out questionnaires on how it is working. We hope to complete this test some time within the next couple of months. We hope to learn something meaningful that we can expand the use of the low altitude direct route system.

What that test is doing now is actually allowing the participants to file from their departure point to an arrival fix at the destination airport, rather than to the airport. We are proposing to put out a planning chart in the very near future, and it is in the planning stages right now, where we can just simply portray way points which would allow you to file to the destination airport and then hook these -- to the destination fix, excuse me, and they will be hooked up with the arrival procedures at that airport. That should allow us some greater flexibility and should work better. We are testing that now and that looks pretty good. It looks pretty hopeful.

Among some other things we're doing, we have a program to educate our controllers as to RNAV capabilities and to show them that the direct route system really is feasible and to get them to use it.

There are some problems in the very low altitude structure where we cross terminal boundaries with regard to flows and, of course, the instrument approach procedure areas where we do not have radar coverage so we can vector to finals.

What I am saying there is that when you pass by an airport on a direct route, if you go through the procedure turn area, obviously we've got to have some kind of separation, and if we don't have radar coverage there, chances are that is not going to work out too well, so we are trying to educate our controllers in that area. We're using a booklet that was put out by one of the groups called "RNAV and the Controller" in our training program in several of our facilities.

In addition to that we have issued a STAR Order -- a Standard Arrival Route Order -- guess I shouldn't use so many acronyms here. I am a typical AT type. I can't talk without my hands in my pocket and without using acronyms.

Our Standard Arrival Route order does provide for the publication of coordinates at the start of the fix and at the way points along the way of the basic STAR. We also have a Standard Instrument Departure order (SID order) which provides for the publication of the same way points that hook up with the Standard Instrument Departures -- gets you out into the en route environment and then on your merry way.

Along with that program, we have started in the airport facilities directories including the geographic position of the airports as well as rotating information. We have put some of this on the low altitude en route charts and in the near future we plan to expand that.

In addition to that we have established way points at some 33 ILS outer marker points at the compass locater sites or at the outer marker sites for terminal evaluation which will allow the kNAV equipped aircraft to identify the final approach fix with his RNAV as well as his other instrumentation.

As far as the RNAV avionics standards go, that is out of my area but the current standard is the RTCA, the Radio Technological organization, they're advisors of 137. The reason I mention that is that to establish a published RNAV route, it has to be within radar coverage or flight checked in order to guarantee signal receptions so that we have assurance that the aircraft is going to go where we all think it is going to go. Most aircraft that are using the RNAV systems in the en route environment on a random basis between their airports are finding that it is pretty satisfactory according to the reports we get. Somebody might want to take exception to that, and we'd be glad to talk to you.

Overall, we think it is working pretty good. Basically again and very briefly, our policy is that we will probably not have a formalized RNAV route structure per se. We, in fact, are considering canceling the high altitude en route charts because of lack of use. They cost us about $140,000 a year and that is a drop in the bucket in some budgets. To me that is quite a bit of money and replace it with the way point chart I talked about and go for the random routes rather than the established airway system.

Again, we'll do it for individual users. If you have a need for an RNAV route, you should submit your RNAV route to your regional office. They will evaluate it and forward it on up to my shop and we will be responsible for working with the Flight Operations people -- I didn't call them "Flights Standards," I almost did -- in getting the approval for you and where it can be approved, as I said, without substantial impact on the rest of the users. We're going to do that.

Without my formal speech there, I guess that is all I have to say. With that I will introduce Roger Brubaker. He is the Chief of our Systems Command Center here in Washington and he can tell you all about delays. Thank you very much.

WORKING SESSION II - AIRWAYS

Roger Brubaker
Chief, Systems Command Center
Air Traffic Service
Federal Aviation Administration

Relative to flow control and delay management, I am going to give you a little overview of our operation and try to tell you what our role in life is, explain a little bit of what resources we have available to us, and where we're going in the near-term future.

First of all, our flow control facility is located in our headquarter's building here in Washington, D. C. We're supported in that effort by a 9020 computer in Jacksonville, Florida. It is the same computer, by the way, that all 20 en route centers have at their disposal, but this one is dedicated strictly to us. Additionally, we have five National Service meteorologists on duty 24 hours a day here in Washington.

Very basically, our job is to reroute traffic around impacted areas, whether it be weather or whatever other constraint it may be, approve inner facility flow control restrictions to assist impacted facilities. Most importantly and probably the biggest role we have in the business today is to manage excess demand versus capacity.

We have had, since the inception of a central flow control facility, varying degrees of success since 1970 and have utilized several different programs. To be very basic, our success depends almost exclusively on our ability to predict and measure the demand versus the capacity at any given airport. We deal almost strictly with what we call 17 pacing airports in this system, and those are the airports that historically have generated and created most of the delay problems.

Basically how we function is that at the start of each day, we will receive a national weather briefing from our meteorologist who is in communication with each local meterologist at each of the 20 air traffic control centers. We receive very early in the morning the national weather pattern. We also receive at each of the airports the runway configuration and any constraints that may exist. Therefore, we know what the capacity at each airport is.

At those areas where we do detect any constraints in this system, whether it be reduced capacity or weather or whatever the case may be, we continually monitor the demand that is going to be generated for that airport.

In our computer in Jacksonville, we have stored the OAG which is very basic static data. We also have the international OAG. We can use that to generate a predicted demand over a longer range period of time. We also interface with our computer with all of the 20 air traffic control centers who feed us flight plan information, cancellations, etc.

The biggest weakness that we have in our ability to predict a day, of course, there are some things lacking, and that is the VFRs, the charters, the military, extra sections and the like. Therefore, we have to do some interpolation of historic data on how much or what percentage of those kinds of unknowns actually affect the total operation of any given airport. When we make these determinations the computer will, based on the demand and the capacity that we tell the computer exists, tell us what delays are going to be incurred for any given hour or even for any given 15-minute period of time.

Basically, we do not get involved in any local traffic problems that are generated within a particular terminal area or between a single terminal and a single center area. We generally don't get involved until traffic problems are created between two or more centers, and then our role is to get actively involved -- to try to manage that demand to minimize delays.

As the time -- the impacted time -- period approaches, all of our predictions with flight plan information are recalculated and massaged because as you know, ETE's that are filed by each flight differ considerably from what is contained in the airline guide. So as the time approaches and we get closer to a given hour, our accuracy and predictions improve considerably.

In the past and up until now generally we have tried to manage demand when delays reach an hour or more and are expected to last for more than two hours. It is hard to get involved in a program where delays are not going to last for more than two hours, because by the time we take any action to do anything about the traffic, the demand perhaps has been reduced and the traffic congestion -- the problems are cleared up.

Generally, we're in business when the delays are predicted to last for more than a two-hour period, and basically today with our various programs such as quota flow and FAD, we determine the stack-hold time that we want to absorb in a particular area and then the delay that exceeds the stack-hold time.

We find that delay of the aircraft on the ground -- it is a lot better, we feel, taking the delay on the ground than it is to be sitting up there spinning and wasting all that good fuel.

Our plans right now and what he have in the mill, as I said earlier, we do have several programs that we use. They are different. Each has its advantages and each has its disadvantages. We're in the process right now of taking all of our programs and combining them into a single delay management program, taking the best features of each to simplify the program to the en route centers, the terminals, the airline dispatchers or whoever may be involved, and also to a great degree, eliminate conflicting terminology.

We're coming up later this year -- we're already in draft form with our program for a single delay management program. Additionally, our goal for 1981, by the end of this year, is to have a program in place where, as I said before, where delays that exceed two hours or a longer period of time -- we don't want anybody holding in the system for longer than a 30-minute period of time.

That is basically what our operation is. Thank you.

WORKING SESSION II - AIRPORTS

Harvey B. Safeer
Director, Office of Aviation Policy and Plans
Federal Aviation Administration

Given that we're operating under time constraints, I am going to limit my remarks to just a limited number of areas. This morning Langhorne described the commuter airport program and the hopes we have for improving and increasing the quality and quantity of facilities available to operators of commuter aircraft as well as some overflow into the operators of larger aircraft.

Now an axiom in economics is that every silver lining has to have a cloud. There is a cloud associated with this program. Basically FAA does not build airports. FAA does not build airport improvements, and it is going to be the job now of the commuter airlines, the FAA and the regions and the business interests and other interests who want the improved service to get the airport sponsors to be willing to sponsor the improvements that have been identified as being needed, and to somehow come up with their share of the money.

Now I talk about their share of the money. The second part of the problem is to get the Congress to approve an airport development bill that will provide adequate funding so that the Federal Government can continue to provide its share of the money.

The second element of this is the airway facility. Now we have, indeed, budgeted for airway facility installation, but that is only one part of the project. It's hard to talk about the trust fund without raising emotions, when I start using the trust funds for things other than hardware, concrete and other forms of capital investment.

One has to realize that facilities don't just plant themselves. You just can't walk around and expect the facility to go in. You need labor. You need labor to install facilities. You need labor to check facilities, and you need labor to maintain facilities.

The FAA has proposed and has supported and will continue to do so, that the operations and maintenance part of the FAA's budget come out of the trust fund. It is very easy to picture a scenario wherein we have sufficient monies to put into facilities, but because of the budgetary process, the way in which manpower ceilings are established, the way in which dollars are allocated, we don't have the people that are required to install, maintain and check the facilities.

I think that if you think through the whole reason for the airport and airway trust fund, if you go back to the initial legislation, the discussion that centered around that legislation during the 70s and was subsequently repeated in 1975, that the concept of not only putting in capital investments, but operating and maintaining the system, using the

trust fund, not in toto, but in part, did not have its genesis last year or the year before. It goes back a long time in the history of the agency and the history of the attempts to set up a trust fund to develop airports and provide facilities engineering and provide research and development.

The second part of the program that I deal with -- the loan guarantee program -- is doing well as we expected, given the economic conditions that prevail today, high interest rates, a recession and a fall-off in total demand although the commuter segment has been maintaining its growth. But I postulate that the time will come when many of the carriers will find themselves looking for new equipment, and they will come to the loan guarantee program for support.

The loan guarantee program expires in October 1983. If you expect to see that program continue, it is not too soon now to start talking about the shape, the form and size of that program that you would like to see carried on beyond October of 1983.

The third issue that was touched upon by a number of speakers is airport access and slot allocation. I would like to make it clear that the FAA has never proposed to go ahead and do slot allocation. The FAA has issued through the Department, a Notice of Proposed Rulemaking that suggests that there are three ways of doing it. One is a slot allocation by an administrative procedure. The second is a continuation of the current way of allocating slots at those airports that have them through the slot committees. And a third way is a method of auctioning off slots and using some kind of market mechanism to establish the allocation. What has been missed is the fact that in all these cases we have talked about separate markets for operators of small aircraft and operators of large aircraft.

I know it flies in the face of those who strongly believe in letting the marketplace make all the decisions, but we felt that we had some responsibility to make some decisions in how we thought we might propose the system to be handled.

One of the decisions we clearly made through all of the allocation schemes that we asked for comments on was a differentiation in the marketplace or the allocation or the scheduling committees between the operators of large aircraft who obviously can dominate and the operators of small aircraft. So I don't think it is a valid criticism that we have been forcing or we're suggesting that the commuters go up against the big carriers. Now I would like to censor your thoughts on if there is going to be a slot allocation; and if you don't like the three methods that are in the NPRM, give us a forth, a fifth and a sixth.

There is no decision that has been made. We have a new Administration coming in, and I am sure they will want to reexamine the whole issue. Also, the comment period was extended; the comments now are not due until January 26.

The public hearing was rescheduled to February 12 and 13, and if you don't like what you heard and you don't like what you read, you have yet another comment period to reclama which will not close until February 25. So this is still in the domain of public discussions, and as Alan has said, one thing that we are doing is talking to each other. The only way we're going to arrive at a solution that can work is if we all get our cards on the table, find out what points we agree on, where we disagree, and then resolve those disagreements. So this is not a closed issue. It is still wide open.

Finally, the airport and airway trust fund. I have been following the activities of the accent group. This is the combination of the alphabet groups, and as I have said to the other associations when I've addressed them, I implore you to quickly resolve your differences; and if you can't resolve your differences, at least go to the Congress with that part of the program that you can agree on so that they have something they can work with, that the industry can live with and then battle it out on the margins where you truly do disagree. Now the reports I've gotten back are that the differences are narrowing, and I am as optimistic as Alan is. I think you will see a resolution shortly, and that we can have a program that will satisfy your needs as users of the system and our needs as providers of services that you use.

I guess the final point is that it is good to keep having dialogues and it is productive to have dialogues, but it is equally valid that people of good will can disagree. My office is involved in many of these issues, working with the commuter industry, and I think it has been a healthy dialogue.

I think as time goes by we'll find the areas of disagreement are growing fewer and fewer; but in order to know that we disagree, we have to talk. In order to evaluate each other's positions, we have to have information. So once again, I thank you. I think this has been a very productive year. It started last year in an atmosphere of hostility and animosity. Somebody said this year it is almost like a love fest, and in order to get me to the fest, I am going to now pass the podium on to Dr. Bill Wilkins who will be showing you a film on MLS and discussing the MLS transition program. Thank you all.

MICROWAVE LANDING SYSTEM - TRANSITION PLAN

Dr. Bill Wilkins
Associate Administrator for Policy and International Aviation
Federal Aviation Administration

In the interest of time, I want to move directly into the film. It is about a 20-minute film which has been put together to remind you of what MLS is, how it operates and what kinds of gains may be forthcoming for us.

I'll come back then and talk briefly about the transition process, and introduce to you some of the FAA'ers who are here who are keys in the MLS program. If we're ready to run the film, let's do that now. (Film shown)

Last week a team of FAA people held public hearings on the MLS transition plan, literally coast-to-coast. We started on Monday in Los Angeles, went to Denver where we had a hearing on Wednesday and then Chicago on Friday, then Tuesday of this week had one here.

I should say that the commuter interests were represented very well in those hearings. There was testimony from a commuter operator in Los Angeles, again in Denver, and here in Washington. In addition, Alan Stephen represented your association here in Washington, D. C.

Some of the key members of the MLS team at FAA are in the audience. I'll probably miss some of them by trying to call their names, but I am going to call some of them and let them stand up so you can see them.

Siegbert Poritsky -- Sieg stand up would you please, sir. Sieg is in the Engineering and Development area. Jack Edwards -- Jack is really the man who is running the MLS program. Marv Olson is also here -- Marv is heading the transition effort. And Seymour Horowitz, who is an economist who has done some of the work on the cost-benefit analysis of MLS.

I am going to sound very bureaucratic. During the time I've been at FAA, one of the things I have learned is that there is always lots of paper in this oganization, most of it pretty well done. There are three volumes that you should become aware of because the transition -- which is at stake right now -- the agency is trying to decide how it should proceed with transitioning from ILS to MLS.

Ten possible ways to do that have been analyzed and are presented in what is called the Draft Transition Plan. It is an orange book like this. Marv stand up again. Marv, over here, is the man you should see to give your name and address to if you would like to receive some or all of these documents.

Comments may be filed with the agency until February 10 on which of the transition strategies you think ought to be followed and why. The strategies vary from some that would emphasize the equipage in general

aviation aircraft early in the program to others that would have air carrier equipage first to others who would have network equipage, and then still others that would speed up the time.

There are some other documents also available. The red one like this is a summary of the transition plan itself, and is a very valuable document which includes the address to which your comments could be addressed by February 10. Then there is a cost benefit study. It comes in two volumes and it indicates that there is a substantial net benefit from the aviation community from transitioning from ILS to MLS. That, in turn, has an executive summary available for it. So really there is a package of five different kinds of documents that are available for you if you would just leave your name and address with Marv, if you would like them. We certainly do encourage you to file your comments on how you would like to see the transition to MLS take place.

We emphasize that that is what is at stake now -- the transition -- what is happening is that the agency is seeking public comment on how the transition ought to be made. It is interesting to note that the economic analysis of the transition plans, themselves, the ten strategies, yielded less than ten percent difference in the net benefit to be obtained among the strategies. From the highest to the lowest, the benefit or difference is less than ten percent. That is within the range of estimating errors, but that says to the FAA that the transition strategy can be selected almost entirely upon operational consideration, and in terms of operational consideration your comments are keyed -- your views, your reasons, your thinking about how the transition should take place are both welcome and will be analyzed carefully and will be weighed into the final decision. The people, the experts on MLS are here, and would be pleased to answer questions you might have about the program.

Before I close let me say that this is my second commuter conference as Associate Administrator for Policy and International Aviation and very likely to be my last since I, like Langhorne, am one of those people here and won't be here next week, at least not in this same capacity. It has been a pleasure to work with your association, your people, and it has also been a pleasure for me to work with the FAA people who helped put on this conference.

There is a young woman you ought to meet because she has been the key in putting this conference together this year. Marva Booker would you stand and let these people meet you. She is the lady who did the arranging.

QUESTIONS AND ANSWERS

Steve Smith (Commuter Airline Association) - Harvey, this is a baited question to you. In the NPRM that was issued by the FAA concerning the various alternatives in allocating slots at National Airport -- which may be the selected method at the other four airports and possible additional airports if the demand occurs at those airports -- has the FAA evaluated the need for slots at those four airports or the possibility of adjusting the number of slots to reflect the increased capabilities in the system and the investment the FAA has made, for instance, in the New York area, the break-up of the common IFR room into the various airport controls based on forecast growth.

Harvey Safeer - Let me give you a two-part answer to your loaded question. The FAA is in the process now of looking at the slot allocation of the high density rule with respect to: (1) whether or not it is serving the purpose for which it is intended, (2) whether the numbers that have been established are still the correct numbers, and (3) whether there might be a problem that needs addressing or needs solving at other airports.

The second part of the answer pertains specifically to National Airport. If you recall, the Secretary and the Administrator's statement with respect to a policy at National Airport talked in terms of setting a cap on the passenger through-put of that airport in order to better balance the travel between the three area airports that serve this area -- National, Dulles and Baltimore-Washington International. It was decided that once a cap had been set, it is impractical to go out and shoot the 17th billion and first passenger that tries to come into that airport. Therefore, it was determined to use the mechanism of the high-density rule to control the passenger flow by controlling the number of operations. So the answer to your question, with respect to National Airport, one has to not only look at the high density rule and the way it is presently constituted, but also look at the reasons for the slot allocation and the total number of slots and the way they've been divided among the three classes of users and the purposes behind them.

John MacKinnon - Are there any other questions at this time? Well, we want to thank you and we want to thank the speakers that we had today for an excellent program, and we'll be looking forward to seeing you all at 8:30 tomorrow morning. The subject area will be human factors, and as I mentioned earlier, the reception is in the next room and we'll see you all there. Thank you so much.

HUMAN FACTORS OVERVIEW

Mr. Walter Luffsey
Associate Administrator for Aviation Standards
Federal Aviation Administration

Good morning. Let me make a human factors observation. Eight-thirty start times on Friday mornings are bad, especially for human factors.

I would like to add my welcome to you to the Second FAA/Commuter Airline Symposium. My specific interest here, although I was very interested in all of yesterday, is specifically the human factors subject today. It certainly is a pleasure for me to be here and I certainly appreciate the attendance and the interest shown.

This morning we are going to address human factors safety issues. I think it is apparent to all of us -- human factors is of high interest.

FAA and other government and industry reports indicate that perhaps human factors is the last unexplored frontier -- this remains to be seen. But what is clear at this time is that the study of human error and the ways to eliminate it should prove valuable, due to methods of improving aviation safety.

Aviation human factors, as a program, is the study of human elements in the entire system and addresses all aspects of human behavior in the design, maintenance, and operation of man-machine systems.

In our view, we must meet the broadest coverage of inputs to identify the human factor safety issues -- we are as concerned as to what are the right questions to be asked as we are the answers at this time.

In an effort to obtain the views of the world aviation community, we have scheduled a series of workshops and symposiums to address the human factors safety issues. The first workshop was held at the Transportation Systems Center in Cambridge, Massachusetts, on November 24-25, 1980. Four panels participated in this workshop and represented the Government, ALPA, AIA, and ATA. This morning we are looking for a dialogue with the commuter industry. In March, we will meet again at the Transportation Systems Center with additional pilot groups, controllers and those interested in helicopters. In May, we will hold a workshop at the Civil Aeromedical Institute in Oklahoma City to discuss medical, behavioral and toxicological problems. In addition, we are planning a workshop at the FAA Technical Center in July to exchange views on ATC interface problems.

We have recognized the need for more hard statistical data on day-to-day working conditions in the cockpit. We are issuing a supplemental Notice of Proposed Rule Making to allow the FAA Administrator free access to flight data recorder and cockpit voice recorder tapes. This data will be used only for human factors research and will not be used as a basis for enforcement action.

Our goal in this session is to establish a common perspective on human factors problems, and to identify the issues that, when resolved through our common efforts, can lead to the greatest improvements in safety. You were invited here to assist in mapping a Government program. We need to better understand the "why" of human error, the interfaces between people and our complex system, and to mitigate problems or hazards in such interfaces in both existing and proposed future systems.

We must deal with elusive and sometimes abstract considerations and assess in an objective manner the pros and cons of a number of issues which aim at safety improvements. The Department of Transportation/ Federal Aviation Administration has recognized that human performance in the activities of men and women who operate and maintain aircraft -- the air traffic control system and navigational aids -- are of paramount importance to aviation safety. This is evidenced time and again in accident investigations which reveal that a large percentage of casual factors are attributable to human performance, or putting it less positively, to human error or lack of adequate performance.

We also recognize that a large number of reports in the aviation safety reporting system show the involvement of human error. Our conclusion that human performance enhancement deserves an elevated priority is supported by nearly every element in the aviation community. The National Aeronautics and Space Administration (NASA), the National Transportation Safety Board (NTSB), and the Department of Defense (DOD) have highlighted the importance of gains in safety that may be attained through increased understanding and better applications of present knowledge in human factors areas.

Concerned groups have called for more attention to the root causes of so-called pilot error. The simple logic is that blame provides neither the remedy nor prevention of repetition in the future. If we can find out why, we have a clue to avoidance next time through by changing methods, practices, or applications of complex systems and hardware. I believe, then, there is general concurrence that improved engine, airframe and avionics capabilities and reliability must be paralleled by comparable improvement efforts relating to the human elements in aviation.

What we see happening in the coming years is the melding together of human factors knowledge -- that already existing and that produced by new programs -- aircraft design advancements, and ATC system and aeronautical aids improvements into a technically advanced national aviation system that, in turn, achieves improved safety.

I personally call on you here and the rest of the aviation community to help with this task.

Today we have a full panel. I will not proceed with introductions with the exception of the moderator, Mr. Cliff Hay or George C. Hay, as the program says, Division Chief for the Special Programs Division where human factors activity resides in my complex.

WORKING SESSION III

George C. Hay
Chief, Special Programs Division
Office of Aviation Safety
Federal Aviation Administration

I hope all of you have heeded Walt's words very carefully. We are very serious about this. We are engaged in what we consider a very, very important project in putting together the best possible total human factors program in aviation. Walt has said to you, and let me simply underscore, that we are ready to talk, to listen, to work with all parties in the development of this program. Our doors are open at all times. We simply ask you to provide us with the opportunity to work with you in what your proposals are.

It is always a pleasure when I have the opportunity to work with a panel as I have here today. Starting out first is Neal Blake who is the Deputy Associate Administrator for Engineering and Development for the Federal Aviation Administration. Neal and I have worked and flown together for the better part of 20 years now. I think I have one anecdote that I would like to start off with. It was Neal and I that surveyed the country of Iran for the current ATC system that we were proposing at that time. I don't believe it was based upon our efforts over there that the country collapsed or that the Shah went out of power, but we did spend a considerable time going over that part of the world.

Neal is Captain on DC-9's, current at this time, and I think we have flown a good number of airplanes together in the past. What work has been going on in the FAA has been conducted through Neal Blake's office. He has several organizations under his immediate purview for R&D in research and development applications. He will cover that with you today. I can assure you Neal, like the rest of us, is open for your comments in this area.

In addition to Neal, we have John Elliott who is the project engineer on one of the newest aircraft lines coming out, newest evolutionary developments of an aircraft line coming out that affects you people -- the Beech 1900. It is an extension of the Kingair 200.

John has a bachelor's degree in aeronautics from the University of Minnesota; has been with the Beech Company for many, many years; was the project engineer on the original 23 and I believe 77; division manager at Liberal, Kansas, and for the last two years on the Beech 1900 series.

In addition to that, we have Dr. Emmett Kraus with us today. Emmett's career and experience in this particular field ranges across to both large and medium-sized aircraft. He has worked with the Douglas Company as well as with Cessna, and he is in charge of all of the

advanced design and new product work that is conducted at Cessna today. Again, this experience ranges from both the 121 aircraft through the 135. He has a Ph.D. from the University of Illinois.

Now we get to Tom Appleton. Tom is a good Scotsman who has come over to Canada and resides there now as a citizen and brings with himself an intense interest in aviation. He is a flight test pilot and was the project pilot on the RNAV and the MLS work that has been done on the de Havilland aircraft and the human factors interface involved.

So with that, what I propose is the following, subject to each of the speakers as individuals, I would like each of them to make their presentation to you. At the end of that particular time, if you have any questions, I'll act as sort of a timekeeper on this to see that we don't run over too far one way or the other. Address your questions to the speaker as he completes his presentation at that time.

With that, I thank you, and Neal, would you be good enough to start out, please?

WORKING SESSION III - HUMAN FACTORS

Mr. Neal A. Blake
Deputy Associate Administrator for Engineering and Development
Federal Aviation Administration

Thank you Cliff and good morning. The human factors area has been the subject of much study over many years and the results of these studies have had a major impact on the aircraft and the air traffic control system in operation today.

In conducting our current efforts therefore, we are not starting from scratch, but we are building on and improving the already high performance of our current system. So the focus of our current efforts is not on "knobology" or the location of displays and controls best suited to the phsyiology of the human being (although this certainly is an important area), but rather it rests on areas such as the following: the causes and types of human error and the impact of these errors on the safety, performance and productivity of aircraft in the air traffic control system operations; the definition of automation approaches that assume the continued existence of human as well as machine error, and strive to avoid both the occurrence and the consequences of such error; assessment of the proper distribution of air traffic and aircraft control and monitoring functions between automation systems and the controller and the pilot; determination of the appropriate interface between the man and the machine at each step up the ladder leading to higher levels of automation in the aircraft and in the ground system; and determination of adequate automated, semi-automated, and manual system backup capabilities to permit safe continuation of system operations under a variety of conditions of human and machine system failure.

These areas of research and development are all directed toward the need to maintain and enhance the safety of our aviation system, to achieve improved performance of the system for the participants and the flying public, to make the system more productive, and to constrain the cost of the system to the nation.

Of particular importance to this meeting is the achievement of improvements in the air traffic control system and in aircraft operations which take into full account the limits and the capabilities of the men and the women operating this system.

Our goal is to reduce the probability of human errors occurring and to minimize the consequences when the inevitable human error does occur.

Here is a little bit of background. In 1975, a special DOT task force study of the FAA safety mission recommended that FAA undertake a major safety research program to assure that future systems are designed around reasonable criteria for human error.

Concurrently, the FAA Office of Systems Engineering Management undertook a study to identify human factors problems associated with both air carrier and general aviation accidents and incidents. This FAA study entitled "Program For Optimizing Crew Performance and Minimizing Human Error in Aircraft Cockpits" which responded specifically to the DOT safety recommendation No. 10, used as input safety statistics from a variety of sources and solicited the views of the aviation community for its perception of human factors problems and potential solution.

After a great deal of internal and external discussion, several major problem areas were identified as primary candidates for expanded effort and form the basis for establishing our human factors program.

While research and development in human factors has been carried on for many years in association with specific programs, FAA determined in 1977 that a common thread existed between the programs and the problems and the central E&D umbrella management was needed to ensure a fully cohesive program which responded to the identified problems.

Such a management structure was established. Although the programs are grouped into two broad areas related to pilot and controller problems, it was recognized that there are many similarities between these two areas. Because even the term human factors is frequently misunderstood, we chose to talk about out program in terms of the intended result; namely, Aircraft Performance Enhancement and Error Reduction (or APEER) and Controller Performance Enhancement and Error Reduction (CPEER).

Today I would like to give a brief overview of some of the efforts we have underway in these two areas. I would like to stress that many of these programs represent joint efforts with NASA and with the Department of Defense. This was done deliberately to assure that the nation's best resources are applied efficiently to the problem.

Our program in the aircraft cockpit and air crew area consists of several types of activity, which include problem analysis and program definition, aviation standard support programs, evaluation of the human factors aspects of new or upgraded cockpit systems, and research into new techniques and concepts.

In the area of program analysis and program definition, we have established a number of activities designed to quantify the problems and to identify needed engineering and development activities. Some of these include the following: Pilot error analysis. Historically, pilot error is cited as a factor in approximately 60 percent of the air carrier and about 88 percent of the general aviation fatal accidents. Pilot error is also cited as a significant factor in aviation incidence. A continuing study is being made of the types and causes of human error to establish a basis for improvement of current systems in the design of new systems. We also want to define the additional information that should be included in accident reports so that in the future we will have better statistics on the probable causes of pilot error.

In addition, we hope to be able to identify techniques, procedures and systems that can make aircraft more fault tolerant. That is, to make the aircraft more forgiving so that when pilot error does occur, the consequences are not fatal.

An analytical study of cockpit information requirements. The introduction of advanced cockpit design concepts and advanced ATC system improvements will present new requirements for cockpit information processing and display. It is essential that human and aircraft system capabilities work in harmony with the evolving air traffic control system. We plan to develop a series of recommendations for efficient means of displaying and using information in the cockpit, for consolidation of information on electronic displays and for functional integration of aircraft functions. Proper integration of such new capabilities as collision avoidance advisories, wind shear information, microwave landing system flexible approach paths, cockpit displays of traffic information, flight management computers and others is essential. A similar review of information requirements is planned for the helicopter area.

Pilot workload measures. Although a great deal of work has been done on the subject of defining pilot workload measures, additional efforts are needed to develop fully acceptable, scientifically validated and widely accepted methods for measuring pilot workload. Some of the current efforts underway to deal with this problem include: Completion of a report entitled "Flight Crew Member Evaluation" covering workload measurement techniques that have contributed to successful certification programs. A joint activity with the United States Air Force to survey and categorize all existing or planned workload assessment and measurement techniques. An effort to develop and validate a set of subjective pilot workload measures that can be used to assess reliably the workload associated with current and advanced cockpits of aircraft operating in the current and future air traffic control systems.

The intended end product will be a set of pilot rating scales for total workload measurement which is widely accepted and which can be used by government and industry researchers as a common measurement standard.

As an initial activity in this program, the subjective workload rating scale developed by MIT which is based on an earlier method developed by Cooper and Harper of NASA is currently being examined and validated at the Ames Research Center using airline subject pilots. This new rating scale includes the impact of air traffic control workload as well as the workload associated with flying the aircraft.

Another approach being followed recognizes the importance of full mission system simulation in characterizing workload scientifically. FAA and NASA are working together on the development of such simulations to be used as an aid in learning more about establishment of objective pilot workload measures to augment the large body of empirical and subjective information which now exists. Full mission system simulation techniques

will also permit improved studies of the interface between the pilot and the air traffic control system, which is where a lot of the human errors originate.

Runway taxiway transgression analysis. A number of accidents and incidents have been caused by aircraft taxiing inappropriately into active runways. Our objective is to determine the factors which cause pilots to make inadvertent or unauthorized takeoffs or incursions onto active runways or taxiways. An initial assessment of past transgressions has been completed and the report is in preparation.

Assessment of pilot performance is using domestic and oceanic navigation systems. Our present program is examining the relationship between the separation standards and navigation system performance for en route operations. Human error and blunders in navigation are significant contributors to the failure of pilots to navigate within designated routes.

This program addresses the human factors problems related to the use of current VOR and area navigation systems and tries to isolate those things which may contribute to the error and the blunder problem. The program will be extended to evaluate new navigation systems including 4-D time navigation, integrated flight management systems, and problems unique to the utilization of the global positioning system. An important objective is to examine advanced navigation system concepts to establish the data base needed to define guidelines and criteria that will recognize the special needs of single pilot IFR operations and it will help to minimize pilot errors, blunders and workload.

We have underway a general aviation accident problem analysis. Eighty-eight percent of general aviation fatal accidents involve some kind of pilot error. A detailed categorization of these accidents and the identification of underlying human factors problems is clearly needed. This is being accomplished through a review of the general aviation accident and incident data bases to determine human factors problem areas and to prioritize them. The end product will be a rank ordering of problems and the definition of the program needed to resolve them. A significant part of this work will examine the relationships between weather-related accidents and current methods of instrument flight training.

We have conducted a study on the relationship of general aviation pilot judgment and training to aircraft accidents. Inappropriate judgment is suspected of being a prime cause of pilot error in many general aviation accidents. Our objective is to develop a system of experiments to assess pilot judgment in selecting appropriate actions in the varying cockpit, air traffic control and aircraft emergency conditions. We plan to examine the feasibility of preparing and providing training in the use of pilot judgment aids such as cockpit reminders, checklists and training aids and to determine if pilot judgment training can, in fact, offer any specific benefits.

In addition to these programs that we have just looked at which have application to helicopters, we also have underway or are planning a number of programs that relate specifically to the human factors problems associated with helicopters. One of these programs is designed to define the minimum acceptable handling qualities for IFR flight in helicopters. Other efforts include analysis of accident data and a survey of helicopter operators to identify potential helicopter problems and characteristics which may contribute to helicopter accidents. We are also planning experiments to determine helicopter pilot's ability to operate in restricted visibility to provide the criteria and techniques for safe, low visibility helicopter operations. These studies are expected to identify the major human factors problems affecting helicopter operations and aid in defining programs for their solution.

We will look now at aviation standards support programs. This program is designed to review current regulations and procedures related to the human factors area with a view toward identifying potential changes related to desired system improvement. The following are representative of this type of task.

Examination of transport aircraft with regard to cockpit standardization. This program is examining the current status of cockpit standardization and will seek to identify the potential problems that may relate to lack of standardization. We have conducted a survey of seven representative airlines to determine the present status of cockpit standardization between aircraft of the same type and between aircraft of different types as an aid to identifying any problems associated with nonstandardization. The product of this work entitled "Transport Aircraft Cockpit Standardization" will be information on the current status of standardization and the benefits of any additional standardization.

A program has recently been completed on the effect of pilot performance on controller altitude call outs for airport surveillance radar approaches. This program addresses the value of providing mandatory altitude call outs by controllers during ASR approaches as a factor in reducing landing accidents. The conclusion of this particular task indicated that altitude call outs did not significantly affect the performance of the pilot in executing this type of approach.

The next area relates to new and upgraded systems programs. The programs in this area represent developments initiated to respond to problems identified in field operations or through the problem analysis programs covered earlier. The following are representative of this type of activity.

Our work on the wind shear program, which is essentially complete, included a great deal of emphasis on the human factors aspects of the problem; namely, how best to determine and then to present the information to the pilot. The airborne wind shear program began with a series of manned flight simulation experiments to identify and then to refine the most effective pilot aiding concepts. Most subject pilots favored a system that displayed an air speed-ground speed comparison.

Another system that rated well in the evaluation utilized a quickened flight director logic. These results were validated in a number of simulations with airline and FAA pilots and the results have been made available to the industry.

Development and evaluation of heads-up display presentations for civil aviation aircraft has been undertaken. This program seeks to define alternative display presentations and to assess the potential benefits and also any liabilities of this type of information presentation in contributing to safer operations in air carrier aircraft during approach and landing. FAA has established a joint program with NASA to examine the potential of heads-up displays to aid the flight crew in reducing pilot workload, increasing reliability and providing redundancy of information for navigation flight path control and other flight management tasks. The performance of flight crews using the device will be assessed over a full range of operational and weather scenarios. Flight test hardware is now being installed in an FAA 727 at our test center. Our purpose is to provide enough basic data to the industry and to our own aviation standards organization to establish the capabilities, the limitations and the minimum requirements for such a system.

Another program is defining and evaluating approaches to improving aircraft alerting and warning systems in use in the current generation of air transport aircraft. Current systems are being examined to determine those factors which could contribute to pilot judgment error and incorrect remedial actions. Further, current systems may not indicate the priority order in which critical action should be taken when multiple or catastrophic failures occur.

The program has been underway for several years with participation from three major U.S. civil transport aircraft manufacturers. Our objective is to develop guidance for the functional standardization of air transport cockpit alerting systems particularly with regard to the use of automation and of new displays for alerting and warning data. We have encouraged the airframe manufacturers to work together to coordinate the development of a standardized industry alerting system concept. A major study entitled "Aircraft Alerting Systems Criteria Study" has been completed which lays out the dimensions of the problem and recently two improved alerting system concepts were designed and are being tested in simulation. We are planning to go beyond this effort to concentrate on more advanced methods of warning which take into account the changing priorities for warnings with flight phase and the need to account for problems which may be associated with highly unique occurrences, such as the physical separation of an engine from an aircraft. We have been working on research into more intelligent warning systems which can provide not only prioritized alerts and warnings but which may also be able to provide diagnostic capabilities that will offer the pilot the best alternative course of action instantly based on computer-aided analysis of the aircraft state or problem.

In the area of research investigations, this program is examining the potential of new techniques or concepts for improving system operations. Two of the current activities are the following.

Extension of the use of computer-aided analysis techniques to provide computer-aided decisionmaking capabilities for cockpit systems. Current air carrier aircraft have complex emergency failure procedures and checklists and in cases of multiple system failures the likelihood of intermingling checklist procedures is high and the consequences potentially severe. In this program we have investigated the feasibility of applying computer-aided decisionmaking to analyze complex and interacting aircraft systems so that unusual failure situations can be detected and remedial action recommended to the pilot. This work may show that computers having a knowledge data base and program reasoning ability can assist the pilot in high workload situations.

The next program is examining the use and benefits of Cockpit Displays of Traffic Information (CDTI). While the technology to provide air traffic information in the cockpit exists, the pilot's ability to use this information and the impact of such use on the air traffic control system is not fully known. Our objective is to evaluate the use of Cockpit Displays of Traffic Information for both passive monitoring, and active spacing tasks so that the advantages and disadvantages of such use can be measured in terms of system safety, capacity and efficiency in operationally realistic environments. We want to evaluate the impact of using CDTI on the pilot as well as the controller and also to look at its impact on traffic flow stability, dynamic merging and spacing, display content and format, and pilot/controller workload changes. This work is being done jointly by the FAA and NASA and is addressing general aviation use of such a system as well as air carrier. Closely related to this work are efforts to develop and evaluate optimal displays for the beacon collision avoidance system and the automatic traffic advisory and resolution service system.

Another major FAA program that involves classical human factors engineering is the crash worthiness program. Here we are developing design guidelines to minimize injury and improve the possibility of human survival when an accident does occur. A number of features can be designed into aircraft to better accommodate human factors in the crash environment if deliberate attention is given to this subject during the design of the aircraft. Human tolerance limits must be defined, potentially survivable crash scenarios described, and suitable design features identified to minimize injury and enhance survival. These include impact absorbing pole designs, seats and restraint systems, and means of egress suited for the human occupant of a crashed aircraft.

We have been talking about the pilot, the air crew and the aircraft up to this point. I would like to shift gears now and talk for a moment about the controller-related human factors activities.

Our program in this area consists of tasks dealing with problem analysis and program definition, evaluation of the human factors aspects of new or improved ATC system elements, and research in new techniques and concepts.

The problem analysis and program definition activity area contains the programs needed to quantify the problems and to identify needed engineering and development programs.

Controller performance and error analysis. Just as in the case of air crews, errors occur in the air traffic control system. Although the rate of growth of system errors has been greatly reduced through implementation of ground automation capabilities such as radar data processing and conflict alert, the total number of such errors has been rising slowly to the 1979 total of 612. A system error is defined as a operational error involving aircraft being provided air traffic control services which result in less than the applicable separation minimum occurring between two or more aircraft. The system error figures are small, less than two a day in a system which handles more than 30 million aircraft annually in centers and nearly 70 million in the towers. Also, many system errors represent very small violations of separation minimums. However, the occurrence of any error is considered important. An analysis of these errors showed that over 90 percent of the errors involved human frailities, such as inattention to duty, poor judgment, lack of coordination between controllers, failure to properly identify aircraft and poor communication skills. These findings have resulted in the establishment of controller performance improvements programs aimed at the elimination of the error causes. The introduction of advanced data processing and display technology into the air traffic control system has brought the potential of new sources of system errors in terms of controller interaction with automation. Such issues as controller boredom, inappropriate intervention into automatic control, and inability to detect and intervene in automation failure situations have led to the establishment of projects aimed at defining appropriate controller roles which are compatible with increasing levels of automation.

One of the programs we have initiated to deal with the problem of system error causes is the development of standard operating practices using groups of field controllers to establish the best techniques for generating and implementing control actions. We have under development a listening and remembering course for controllers to help improve controller communication skills and thereby to reduce the incidence of this type of prob m.

With respect to the evolving air traffic control system, a number of specific human factors problems are being addressed and these include the following: the optimum level of automation of the air traffic control process; the role of the controller in an automated air traffic control environment; the ability of the controller to perform his assigned job in an automated air traffic control environment; the optimal design of the interface between the controller and the computer in the more automated environment; the feasibility of the concept of proceeding to very high

levels of automation which some have called auto-controller which is somewhat analogous to the operation of an aircraft on auto pilot; the impact of passive and active cockpit display of traffic information functions on the controller.

Obviously, the impact of increased automation on system safety and efficiency must be demonstrated prior to implementation of any new functions. Our objective, therefore, is to characterize and measure the impact of different roles to the man and the machine in a more automated system. We are in the process of defining conceptual approaches to the higher levels of automation and will make assessments of system performance at several levels of automation with the associated man-machine interfaces.

Another program is the development of a systems effectiveness measurement process. In the area of ATC simulation technology and methodology, there is no currently accepted set of measures of system performance that can be objectively utilized to assess accurately the impact of changes to the existing system. We have underway the development of a systems effectiveness measurement system for evaluating controller and system performance to provide more objective measures of the impact of change to our system. We expect to develop an ATC experiment designers handbook which will provide objective measures to be used in assessing the likely impacts of our future automation improvements.

In the area of new and upgraded system activities, these activities relate primarily to the continued improvement of the man-machine interface and the evolution of that interface as the level of automation increases.

The first one is the electronic tabular displays for flight data. Human factor considerations formed an important part in the development of the new electronic data displays which include both the electronic tabular displays for the en route centers and the terminal equipment, TIDS, or Terminal Information Display System. These considerations span the range from degree of automation of the flow planning process to the optimization of data entry techniques in the hardware itself.

As a part of our program for the future automation system, we have under development a set of controller suite mock-ups which will show several stages in the evolution from the current to the future automated functions and associated procedures. We have established an intra-service FAA working group to establish future design requirements for the controller suite which will represent the future air traffic control computer system. Its aim is to provide design guidelines, functional descriptions and requirements for the new system.

As new functions are designed and made a part of the ATC system software, the methods for displaying data to the controller must be carefully evaluated. Examples of new software functions which will require an optimally designed man/machine interface include: en route

metering of traffic, terminal metering and spacing, conflict resolution, a variety of data link applications, and the advanced en route automation functions.

Closely associated with this program is an activity to analyze the radar controller information sources, data needs, and utilization of currently available data and to develop requirements for the future system display formats including their information content.

Investigation of the CDRI/ATC interaction loop. This program will investigate the changes in controller actions implied by various redistributions of the control function between the controller and the pilot, controller impact and workload implications of various CDTI passive and active functions and special interface hardware and software design requirements needed to achieve compatibility between the two systems.

Another area of investigation is the use and human factors benefits of the use of color in our planned view displays and electronic tabular displays.

In summary, there is much more that we need to know, particularly about the fundamental human capabilities and limitations. We need your help in defining scientifically objective measures of workload and measures of system performance. We ask for your thinking as how best to get at some of these fundamentals in a way in which practical results can be achieved. Results which we can apply with reasonable hope that gains can be made in reducing air crew and controller errors and in making the human errors survivable.

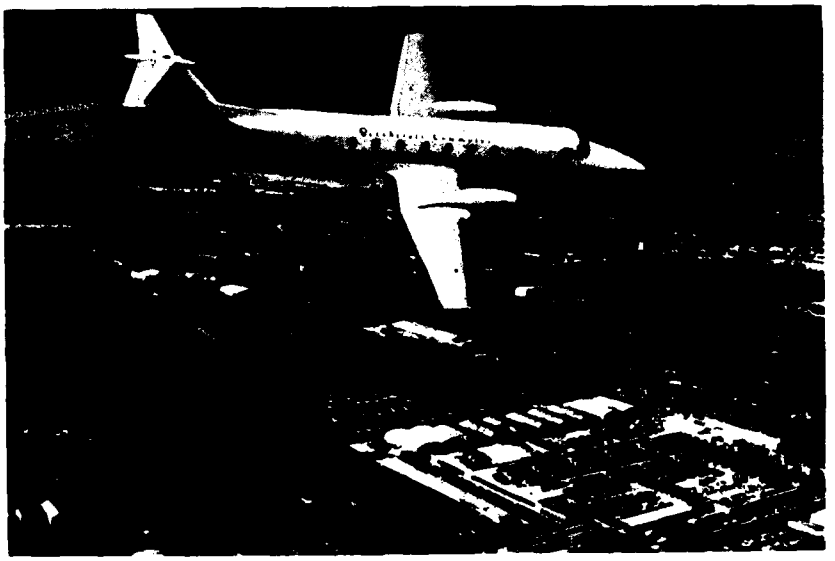
This brief program overview is intended to provide you with an indication of the types of activities which are underway or planned in our current air crew and controller performance enhancement and error reduction program. We recognize that these programs represent only a start toward the efforts needed to address the human factors problems in the present and the future systems and we encourage you to submit your inputs to help us to expand and also to focus this program. Thank you.

WORKING SESSION III - HUMAN FACTORS

John Elliott
Project Engineer - Model 1900
Beech Aircraft Corporation

Good morning ladies and gentlemen. My presentation this morning will cover some of the human factors aspects in the design of the Model 1900. If I could have the lights and ready with the slides please.

It might look like the Model 1900 is flying. This is an artist's conception. We are still a little ways away from having our first flight. A human factors effort was established in the early design phase of the Beechcraft 1900 Commuter because corporate management recognized the importance of applying good human factors design practices to the design of Beech products.



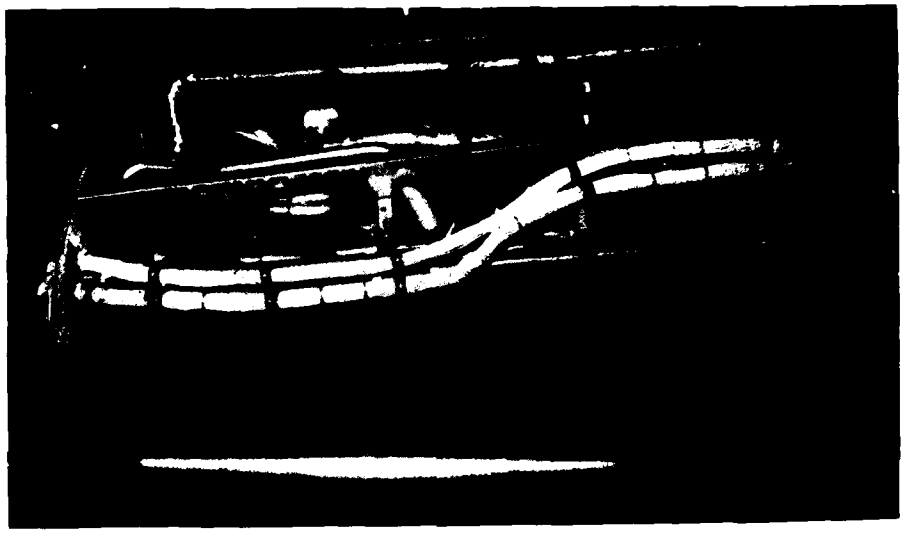
As a result of the preliminary analysis, the human factors group established three basic design goals for the Commuter 1900 design: achieve maximum human efficiency, man-machine compatibility, and to maximize occupant comfort and safety. Today's presentation will address three particular areas in the design of the Commuter 1900 in which human factors efforts have been directed. These are: aircraft maintainability, design of the cabin, and design of the crew workspace.

Design for maintainability. An overall maintainability plan was developed in the preliminary design stage of the Commuter 1900. A systems maintainability mock-up was constructed to develop and test design concepts. The equipment is designed to facilitate rapid and positive fault detection and isolation of defective components. Wherever

possible, systems have been arranged so that modular components can be removed for repair or replacement without the necessity of complex, costly and time-consuming procedures. In other maintenance savings moves, components are arranged so that necessary adjustments can be made without removal of the equipment from the aircraft.

The system's maintainability mock-up has proven to be a valuable tool in the effort to design for maintainability. Design and maintainability concepts were evaluated before finalizing the design of the structure or systems area.

Some of the maintainability factors that have evolved from the mock-up study include:



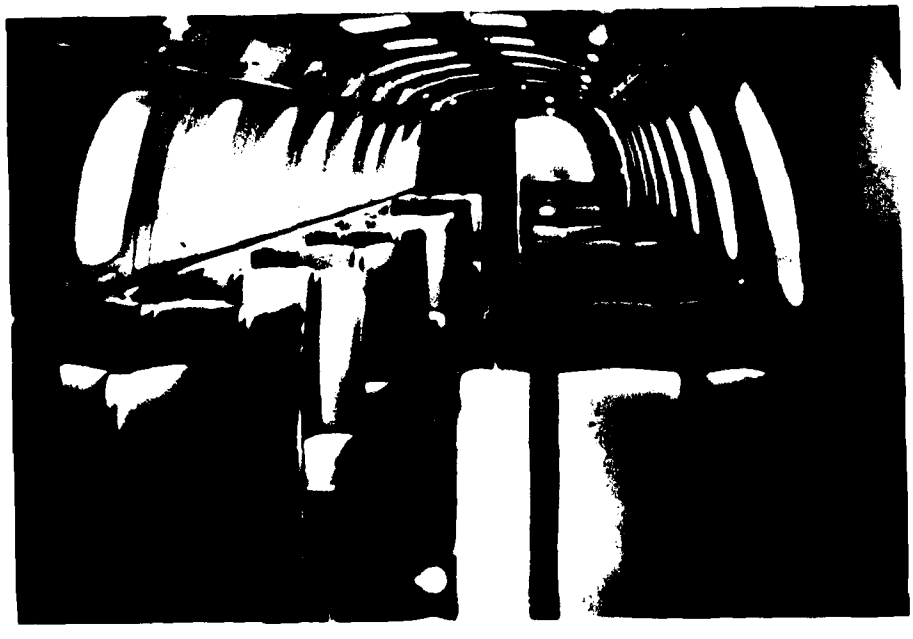
an easily removable leading edge that permits total access to the systems located in this area. These are: environmental systems, hydraulic power pack, and the battery;

a flat cabin floor with panels that are held in place with one-fourth turn fasteners and easily removed for access to systems under the floor.

The nacelle opens up to provide access to the engine and accessories and in addition, the aft portion of the engine nacelle opens up to provide unlimited access to electrical system components.

Other design concepts that will ease the maintainability of the Commuter 1900 include: front mounted avionics and instruments, a low maintenance hydraulic landing gear system, access doors and panels throughout the aircraft, external servicing of freon air conditioning and oxygen systems. As a result of the efforts in designing for maintainability, the Commuter 1900 offers a simplified, saving kind of built-in maintenance reduction that requires far fewer hours of labor and less specialized ground support equipment.

The Cabin. The primary goals in the design of the cabin area of the Commuter 1900 have been to provide a cabin that maximizes occupant comfort and safety. Cabin mock-up studies have been utilized to insure that design goals are realized.



The importance of providing an environment to enhance occupant comfort was also recognized in the design phase of the Commuter 1900. Some of the important design factors incorporated in the design of this aircraft include: a pressurized cabin, 4.8 psi, low noise environment, flat floor, pleasing psychological environment, and total temperature control.

Occupant loading/unloading studies were conducted to determine design factors such as door size, door location, aisle width and carry-on baggage storage locations.

Other human factors design considerations include: comfortable cabin seats designed to the latest FAA strength requirements, 30-inch seat pitch, two 20 x 29 inch escape hatches, and two 26 x 52 inch cabin doors.

The inclusion of human factors criteria in the design of the cabin has resulted in a cabin that provides practical and comfortable passenger accommodations with correct attention to function and style.

The Flight Deck. The Commuter 1900 provides a carefully planned cockpit with exceptional utility and comfort.

The design of the cockpit is based upon a number of scientific factors which include: human engineering analysis, pilot workload studies, analysis of flight procedures, and pilot inputs.

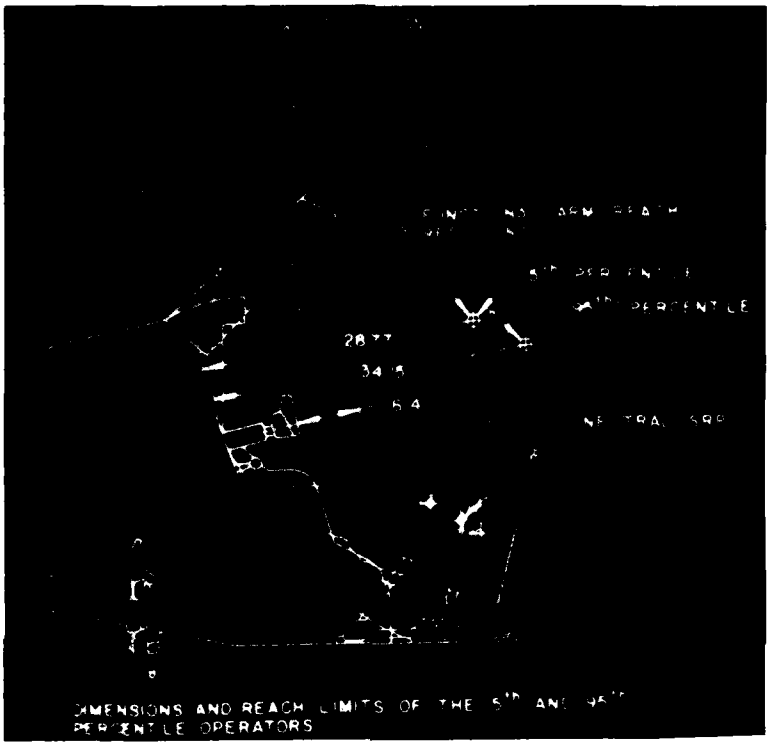
During the design and development phase, many human factors investigations and pilot opinion surveys were conducted. Considerable data was derived from Beech test pilots and other professional pilots. These data covered many aspects of flight station design including the location, arrangement and design of controls and displays, comfort and fatigue factors, visibility requirements, handling and safety criteria.

The primary design goal was to provide the best pilot workspace in the industry in this class of aircraft. To accomplish this, four of the basic design goals established in the development of the cockpit concept were: simplify the flying task, provide an efficient workspace, totally accommodate 90 percent of the pilots, and also provide a pleasing psychological environment.

A paramount objective from the outset was that the 1900 flight deck should be a well integrated and highly efficient workspace for its crew; a place where transfer of training was kept to a minimum and crew ratings could be achieved with relative ease.

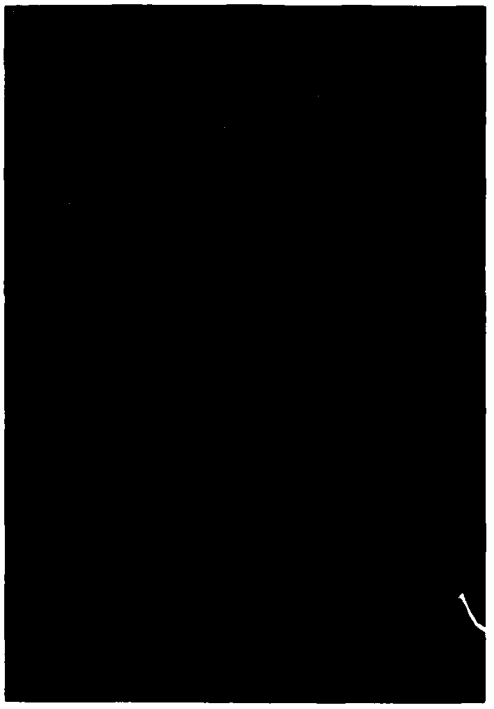
The layout of the cockpit has also been accomplished, keeping in consideration the pilot's capabilities, habits and behavioral patterns. The controls and instruments are located in functional and convenient groupings to improve pilot performance and reduce the possibility of error. The unburdening of the pilot's workload guided the selection of control locations. Key visual areas are used for primary instruments with an emphasis on providing an optimal viewing arrangement. Adherence to FAA regulations and following the guidelines of SAE recommended practice for control locations typify the cockpit arrangement.

The workspace has been designed for the total accommodation of the 5th to 95th percentile pilots. Seat adjustment places all controls within the reach envelope of the accommodated pilots. There are +3 inches of horizontal adjustment and +2.5 inches of vertical adjustment from the neutral seat reference point.



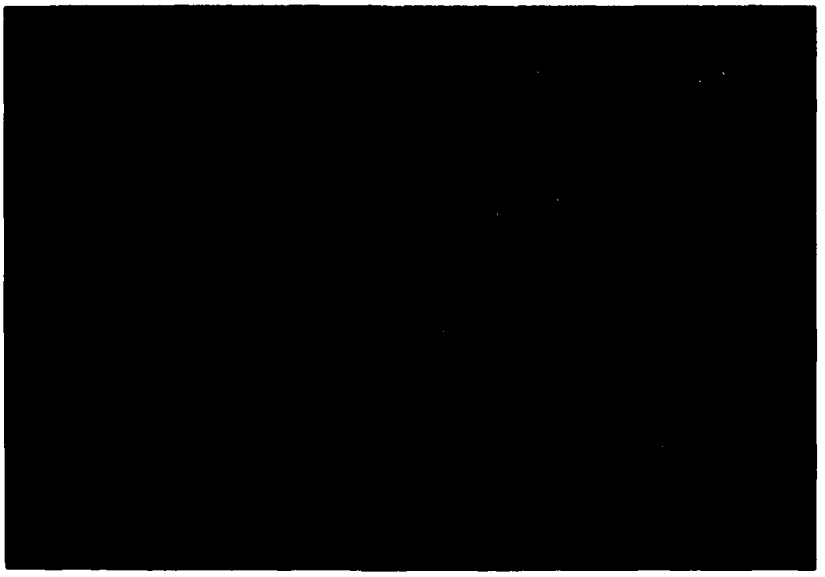
The importance of crew visibility has been stressed in the design of the Commuter 1900. Controls and displays are located to require minimum head movement and all primary items are in areas requiring only eye movement.

The exterior field of view has been maximized to provide the safest operating environment possible in this class of aircraft. Traffic monitoring and approach/landing visibility were primary design considerations.



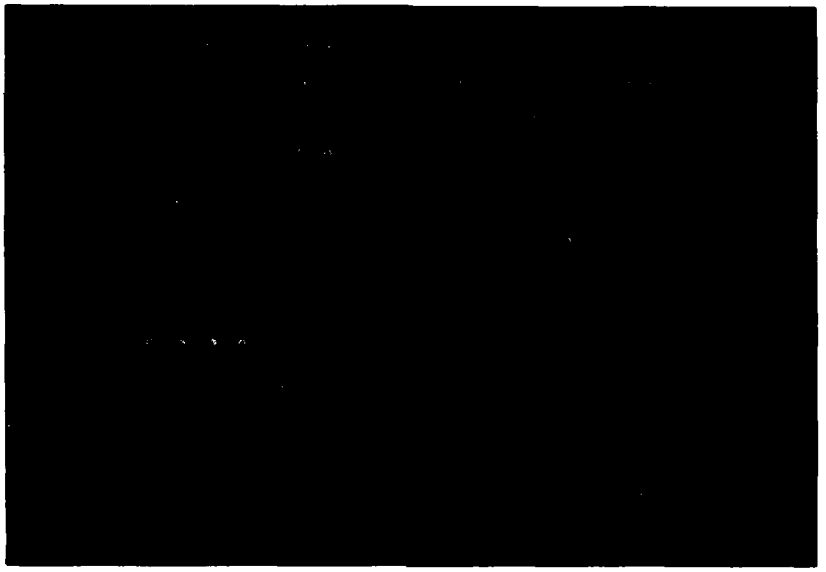
The instrument panel has been designed in accordance with Federal Air Regulations, FAR Part 25, which requires the basic "T" arrangement for the primary flight instruments. The entire panel area is arranged in functional and convenient groupings for rapid interpretation and assimilation of information by the pilots.

Other design features included in the design of the cockpit are: the edge of the flat glare shield provides a good horizontal reference in all flight modes, knobs and controls are shape coded, anti-glare coating is used on instrument cover glasses, controls have been designed to minimize inadvertent activation, displays are designed to minimize reading errors, and emergency controls are readily visible and accessible.

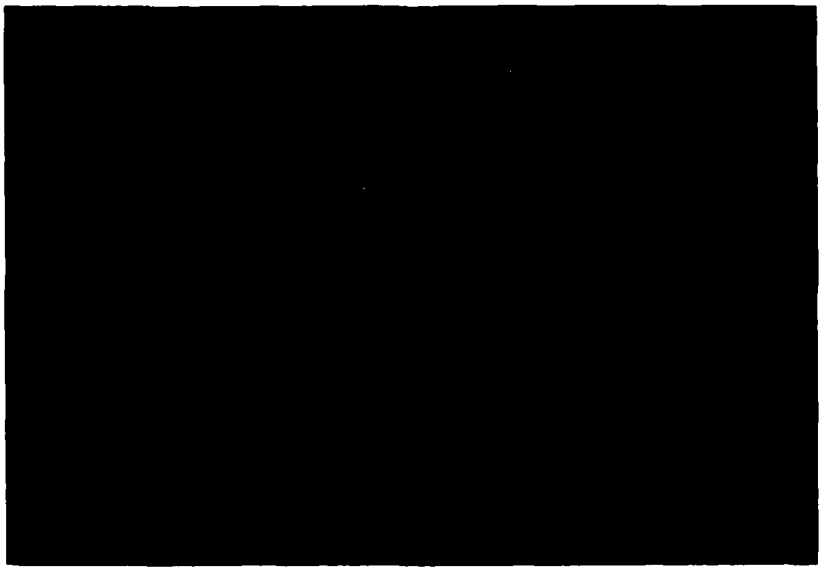


In order to minimize pilot workload and provide for optimum crew coordination, importance has been placed on systems management techniques. Automation and simplified operation are two important factors in the design of the aircraft systems.

On the subpanel, the switches are arranged by system function in a logical operational manner: engine, electrical, ice protection, exterior lights, environmental, secondary instruments, and landing gear.

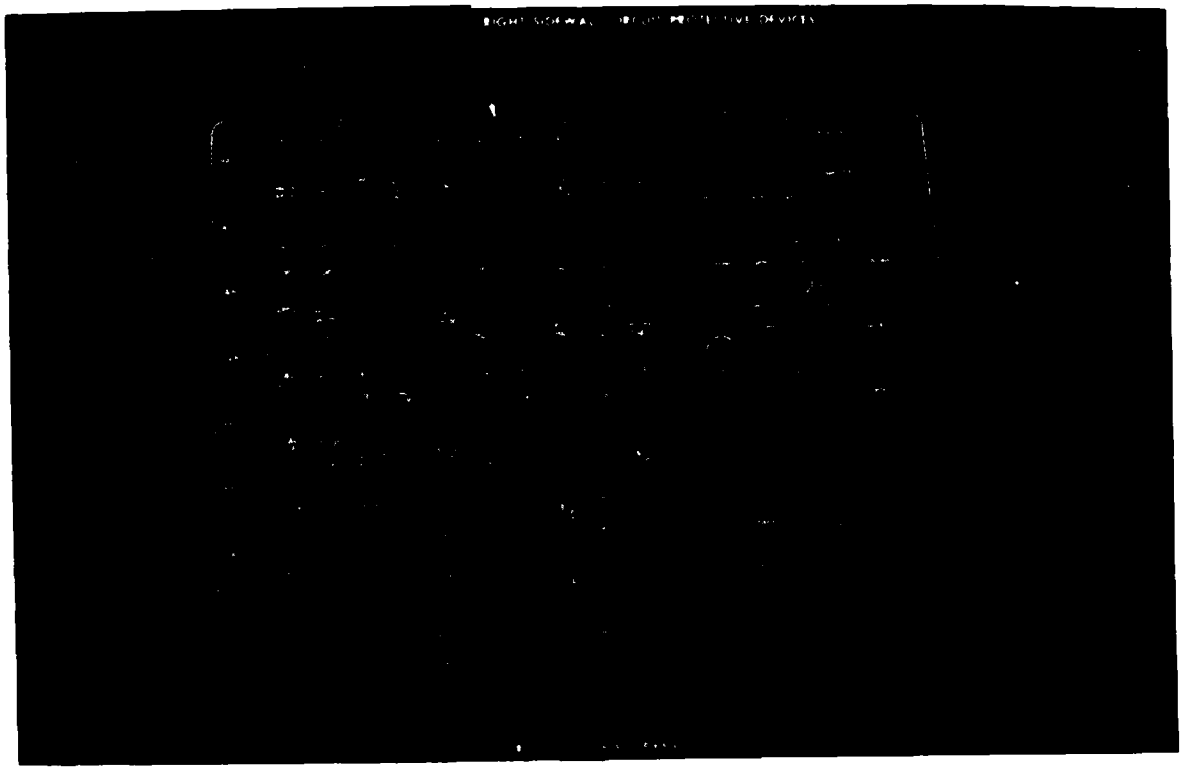


The pedestal areas contain the engine controls, flap position switch, trim controls, pressurization controls, and the autopilot controller. These controls are arranged in a logical format that relates directly to displays associated with the controls where applicable standardization has been utilized.

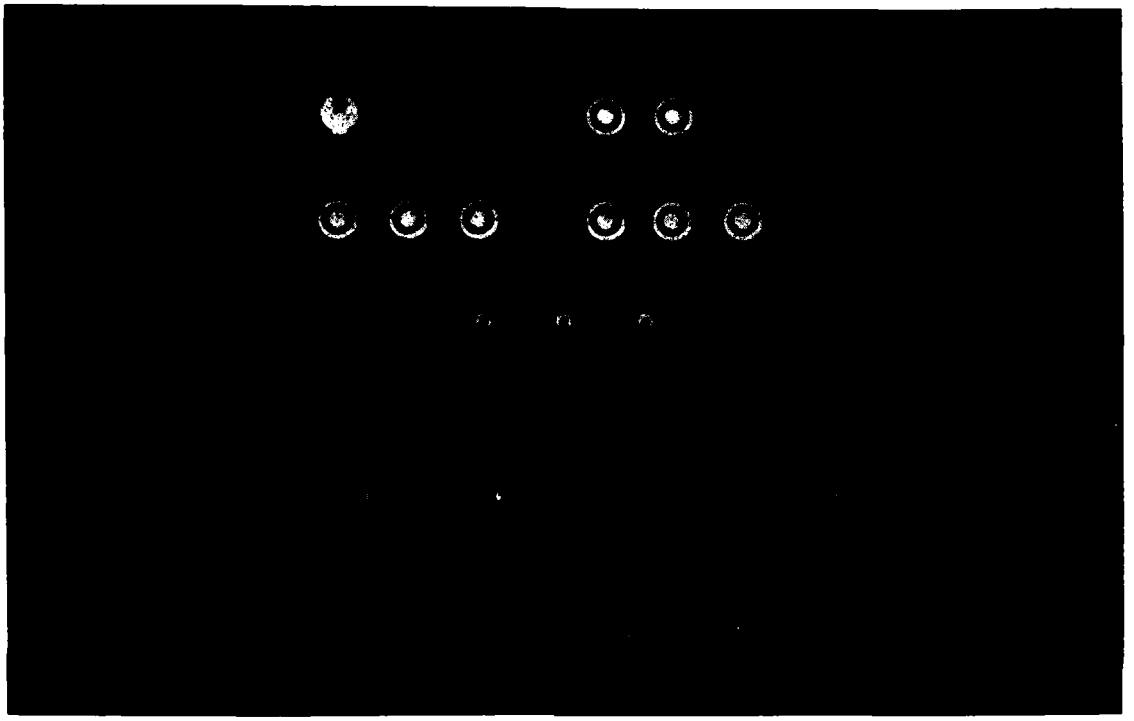


The fuel panel is located on the left-hand sidewall -- fuel system management is simplified. Tank switching is not required. Fuel quantity is monitored at all times and read directly in pounds. The crossfeed switch controlled by the pilot allows use of fuel from the opposite side of the aircraft.

A three bus electrical system in which, during normal operation the buses are automatically tied into a single loop system, is utilized in the Commuter 1900. This design concept reduces pilot workload and the possibility of pilot error in system management. The circuit breaker panel is located on the right sidewall. A bus system schematic format is utilized to simplify monitoring and management techniques.



The overhead panel is primarily used for lighting system control and electrical monitoring. The systems are internally lighted and electroluminescence edge lighted panels are used to provide balanced cockpit illumination and cockpit color combinations that accentuate the effectiveness of the cockpit lighting that have been employed.



In summary, the emphasis of following good human engineering design practices on the Commuter 1900 has resulted in a professional, business-like environment that will reduce pilot workload, reduce the chance for pilot error, ease maintainability and provide a pleasing environment.

That completes my presentation. Thank you.

WORKING SESSION III - HUMAN FACTORS

Dr. Emmett Kraus
Advanced Design Supervisor
Cessna Aircraft Corporation

I would like to review in my presentation some general design concepts in use today for incorporating the human factors information, much of which already exists in aircraft design. It is going to be a general overview with some detailed information and some of it admittedly motherhood. The work I will be discussing is based to some extent on Cessna's participation in the NASA STAT study. STAT refers to small transport aircraft technology.

One thing that I wanted to say that was particularly exciting about preparing this review is that a great many human factors considerations are in fact given substantial attention throughout the design process. It is true that we have a long distance yet to go; nevertheless, there is all the while a willingness to provide human factors considerations in design. The real need today is to train designers to first, understand human factors criteria and secondly, for them to be able to identify opportunities to apply the criteria.

The four general areas I will be discussing include passenger appeal, ground handling and ground access, cockpit workload, and maintenance and servicing access. I will be covering the first three of these in the most detail.

I think passenger appeal deserves special consideration because if the passenger's knees are buckling at the site of your airplane, there isn't much economic reason to consider the rest of these.

The passenger appeal items that we look at in a general sense in the design of the aircraft during the advanced analyses include its overall appearance, the entry stairs, entry door, cabin size, seating comfort, noise, ride quality, and of course the cabin environmental system for pressurization and air conditioning. These design items together affect the passenger appeal of the aircraft.

Overall appearance is a difficult thing for those of us immersed in the industry to really judge. The fact of the matter is a first time passenger doesn't know what he is on and probably doesn't know whether it has a high wing or a low wing. He might observe the proportions and lines and might observe by virtue of its overall height, how generally large it is -- probably doesn't know whether it is propeller or jet powered. But he will notice as he sits in his seat or as he approaches the door and looks at the details of the airplane how well they are

integrated into the overall lines and how clean the detail workmanship on the airplane is. So proportions and lines, overall height and detail integration are really the most important ones for passengers who haven't much flight experience. But for those who do fly a lot, it turns out that high wing versus low wing can make a difference to them.

Of course, in operations where sightseeing seems to be a large part of it, a high wing is a tremendous advantage. It also has an advantage for cargo operations, but that doesn't affect passenger appeal. The low wing in a sense can be said to have a cleaner look because details can be hidden under the wing. There is also less chance of upsetting passengers due to something like an oil stain or fuel dripping from a vent tube or the action of flaps and landing gear operations.

A flap operation, while it is something normal to us, might look like wing disassembly to a person not familiar with aircraft looking up at it from the bottom.

So in general, the overall comments which we have received from surveys are that on the whole, passengers feel a bit more comfortable with a low wing.

The entry stairs and entry door are also important. It is important to have even spacing and firm support. The first step should be at a reasonable height above the ground and there needs to be a firm handrail. Here the high wing has the advantage. It is easier to provide an air stair door that is firm with good spacing with a high wing airplane because the cabin is closer to the ground.

The entry door is also important. As was mentioned yesterday, the commuter airlines are graduating above the small handbag on board and doing more and more interlining to where the passengers are coming on board with a full complement of baggage. And so we have to provide width for the passenger to get on with a bag in each hand, as long as we also provide room on board for those bags.

We need to provide the height to minimize and eliminate stooping to get in the door. And we need quiet, straightforward and solid operation of the door mechanism so that passengers near the door, when it is opened and closed, aren't upset by the hollering and the ground crew working on it for several minutes.

In terms of cabin size, it is becoming essential to provide space for hanging baggage, to have aisle height and width and to provide a standup aisle and room to pass by others standing in the aisle. It is nice to have, although not essential, a flat floor. There needs to be underseat storage space, and if at all possible, a lavoratory and galley.

In the area of seating comfort, we need to watch to make sure that seat pitch is equivalent to airline standards, there is sidewalk clearance, especially where we are considering circular, small fuselages, and we need to make sure that for comfortable seating heights there is enough sidewalk clearance for the passenger's head. The seat width must be reasonable. The window location should be high enough for the passenger to be able to look straight out at the horizon. And the seat detail design which is an entire subject in itself, the seat must be comfortable and it must be safe.

I think we have talked about these in general terms; let's look at a few comparisons from the point of view of the small 19 and 30 passenger type aircraft. These are easy things to say, easy design goals, but how do you do it in a 19 passenger airplane?

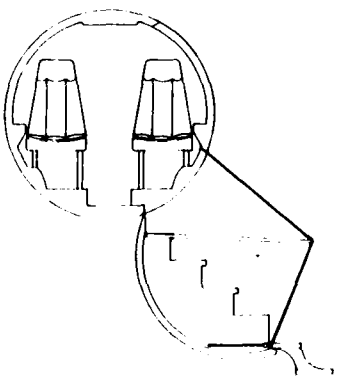
The interior shown on the left is based on the Cessna Citation fuselage which has a diameter within about two inches of the Fairchild Swearingen Metro. It has a five inch dropped aisle and the seat base is designed to allow some underseat storage. It would take a small attache case or a soft bag.

While this interior can be considered successful from the two-abreast point of view, I think it is obvious that the interior on the right would be more successful from a passenger appeal point of view. It has a full six foot aisle height and 18 inch minimum aisle width, and an 18 inch seat width. But to provide this, we go up from a 62 inch outside diameter to a 96 inch outside diameter and we pay a penalty on fuel and weight because of this.

CABIN CROSS SECTION COMPARISON

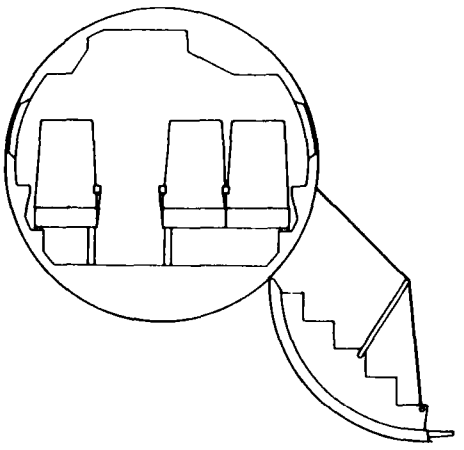
2 ABREAST SEATING

- 57 INCH AISLE HEIGHT
- 14 INCH MIN AISLE WIDTH
- 18 INCH SEAT WIDTH



3 ABREAST SEATING

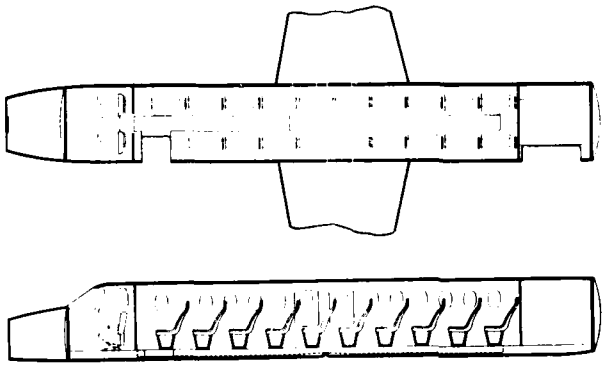
- 72 INCH MIN AISLE HEIGHT
- 18 INCH MIN AISLE WIDTH
- 18 INCH SEAT WIDTH



A little more detail on the two-abreast configuration is shown here -- an aisle height of 57 inches. We are limited because of the diameter to a 14 inch aisle width. The seat pitch of 30 inches is adequate but not generous. Under seat storage is also at least minimal. We do have in this configuration the ability to have reasonable prestored baggage in the aft compartment.

19 PASSENGER SEATING ARRANGEMENT

2 ABREAST SEATING



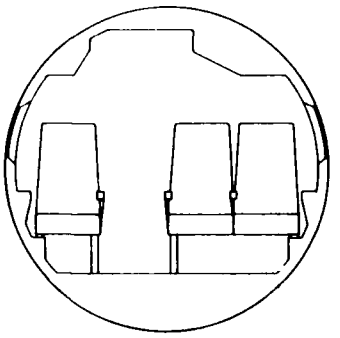
- 57 IN AISLE HEIGHT
- 14 IN MIN AISLE WIDTH
- 30 IN SEAT PITCH
- UNDER SEAT STORAGE 5 x 14 x 18 IN
- AFT BAGGAGE HOLD 5.8 CFT/PSGR

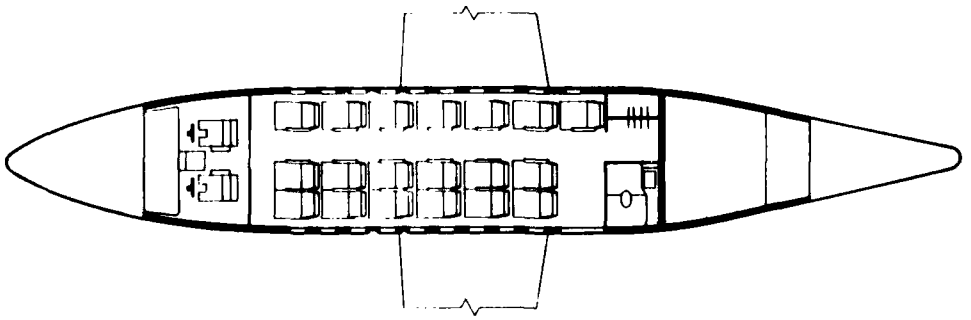
But how much better it gets when we have the standup aisle and the three-abreast configuration. We have in the back a lavoratory and we also have room for hanging baggage near the entry. The flat floor and the standup aisle also provide improved passenger convenience.

19 PASSENGER SEATING ARRANGEMENT

3 ABREAST SEATING

- 72 INCH MIN AISLE HEIGHT
- 18 INCH MIN AISLE WIDTH
- 32 INCH SEAT PITCH
- UNDER SEAT STORAGE 11 x 16 x 20 INCH
- HANGING BAGGAGE
- OVERHEAD BAGGAGE
- AFT BAGGAGE HOLD 13.2 CU FT/PSGR
- LAVATORY



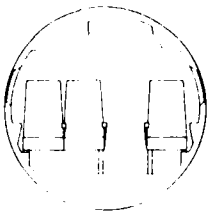


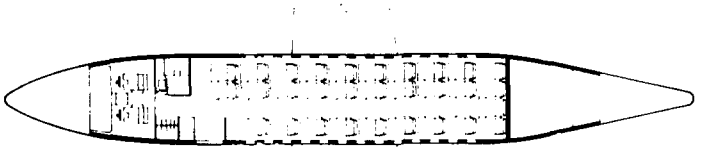
Our layout studies also included work in the 30 passenger configuration and these conveniences can be extended as necessary because we have more passengers to allow the operating costs to cover them.

30 PASSENGER SEATING ARRANGEMENT

3 ABREAST SEATING

- 72 INCH MIN AISLE HEIGHT
- 18 INCH MIN AISLE WIDTH
- 32 INCH SEAT PITCH
- UNDER SEAT STORAGE
  11 x 16 x 20 INCH
- HANGING BAGGAGE
- OVERHEAD BAGGAGE
- AFT BAGGAGE HOLD
  8.1 CU FT/PSGR
- LAVATORY





Let's look at an overall comparison of these passenger conveniences. As we look through this table, we see that the only item that is wanting relative to the DC-9-30 is aisle height and the only way to get that aisle height is to have an airplane with a fuselage with a DC-9-30 cross section. So we have to be willing to give up a little bit, but it is not essential to give it all up. It isn't. I do need to mention, however, that the DOC penalty for the three-abreast 19 passenger fuselage as compared to the two-abreast is about 13 to 15 percent. This needs to be weighed against passenger appeal to see whether that increase would be warranted by additional passengers coming to fly the airplane.

COMPARISON OF PASSENGER CONVENIENCES

AIRCRAFT	CABIN DATA					LAVATORIES	
	SEAT WIDTH (IN)	SEAT PITCH (IN)	MINIMUM AISLE WIDTH (IN)	AISLE HEIGHT (IN)	CABIN PRESS (PSI)	NUMBER	PAX/LAV
19 PASSENGER 2 ABREAST	18	30	14	57	6.0	-	--
19 PASSENGER 3 ABREAST	18	32	18	72	6.0	1	19
30 PASSENGER 3 ABREAST	18	32	18	72	6.0	1	30
DOUGLAS DC-9-30	17.5	33	19.5	80	7.45	3	31

AIRCRAFT	BAGGAGE ALLOWANCES PER PASSENGER				CLOSET SPACE	
	PRELOADED	UNDERSEAT		OVERHEAD	TOTAL LENGTH	LENGTH/PAX
	VOLUME (FT^3)	VOLUME (FT^3)	SIZE (IN)	VOLUME (FT^3)	(IN)	(IN)
19 PASSENGER 2 ABREAST	5.8	.8	5x14x18	---	--	--
19 PASSENGER 3 ABREAST	13.2	1.7	9x16x20	.91	36	1.89
30 PASSENGER 3 ABREAST	8.3	1.7	9x16x20	.95	24	.80
DOUGLAS DC-9-30	8.1	1.8	9x16x21	.98	80	.73

NOTES: 1. COCKPIT CREW PROVISIONS INCLUDE A CHART HOLDER AND A TOTAL WEIGHT ALLOWANCE OF 60 LB.
2. DOUGLAS DC-9-30 DATA BASED ON 110 PASSENGERS.

This completes the cabin comfort discussion. I would like to discuss now just a little bit about noise. There are five noise sources that affect the passengers. Engine and propeller noise is a problem we can take care of by managing our exhaust locations and by using slower turn propellers. Here the high wing airplane can have an advantage because slow turn propellers approach ten feet in diameter and we need the clearance to swing them.

Air stream noise can be minimized by detailed attention to possible leaks. The cabin air distribution system also needs detailed attention. It is very difficult to get a quiet air distribution system in a small diameter fuselage because there simply is not much room to place the ducts. Flap and gear systems can be isolated but detailed design must be appraent in order to minimize the noises and the bumps that occur during their operation.

Another area which I think is of special interest is ride quality improvement. My last commuter airline ride was along the eastern slope of the Rockies and I was given the chance to give this some attention at this point.

In our NASA study, we took a look at two levels or two approaches for improving ride quality. The first was simply to increase wing loading, which is accomplished simply by making the wing smaller. But we also have the associate goal of making the wing efficient. Nevertheless, we were able with these three airplanes that we looked at, the 19 two- and three-abreast and the 30 passenger airplanes, to increase the wing loading sufficiently to make some improvements in ride quality.

For the 19 passenger three-abreast airplane, we were able to increase the wing loading from about 51 to 68 pounds per square foot.

As is always the case in small aircraft, we were limited by fuel volume requirements to meet the design range. The larger 30 passenger airplane, while we were able to increase it from 53 to about 78 pounds per square foot, finally reached the approved speed limit which in fact is really the limit of the technology of the flaps used.

But by doing this, we were able to reduce the average vertical accelerations about ten percent. There is more that can be done, however, with active ride control systems in conjunction with higher wing loading and it was this approach that we used for our level two.

We included advanced airfoils and improved flaps to achieve the ten percent level that we got in level one. And we also included an active ride control system which involves accelerometers for vertical acceleration and pitch feedback, and separate aileron, spoiler and elevator control surfaces. The total reduction in aircraft response to gust was 70 percent.

RIDE QUALITY IMPROVEMENTS

- LEVEL 1: HIGH WING LOADING
  - -- INCLUDES ADVANCED AIRFOILS AND IMPROVED FLAPS.
  - -- WING LOADING INCREASE:

AIRCRAFT	(W/S) BASELINE	(W/S) LEVEL 1	LIMIT
19 PAX, 2 ABR	49.1 PSF	66.8 PSF	FUEL VOLUME
19 PAX, 3 ABR	51.3 PSF	68.3 PSF	FUEL VOLUME
30 PAX	53.1 PSF	77.9 PSF	APPROACH SPEED

  - -- RMS VERTICAL ACCELERATION IS REDUCED 10%.

- LEVEL 2: HIGH WING LOADING WITH ACTIVE RIDE CONTROL SYSTEM
  - -- INCLUDES ADVANCED AIRFOILS AND IMPROVED FLAPS.
  - -- RIDE CONTROL SYSTEM INCLUDES:
    - ACCELEROMETERS FOR VERTICAL ACCELERATION AND PITCH FEEDBACK
    - SEPARATE AILERON, SPOILER, AND ELEVATOR SURFACE CONTROLS
  - -- RMS ACCELERATION IS REDUCED 70% IN CRUISE.

I would like to discuss a little bit about the analysis of ride quality. It begins with the development of an atmospheric turbulence model. The fundamental quantity for this purpose is a probability distribution based upon gust velocity. Estimates of probable gust encounters are derived from data for a number of load histories of transport operations and what we used in our studies was NACA data collected on propeller aircraft from 1952 to 1959 in transport operations. We followed a format by Notess and Gregory presented in a technical report in 1963.

The data was extremely useful and it is especially useful because we can also determine the airplane response to gusts. And when we apply the airplane response to the probability of various gusts, we can then come up with the probable cabin accelerations in gusts as a function of altitude.

What we have shown here is a format following that of Holloway and Brumigen in NASA Technical Memorandum X2620 and it is based principally on simulator studies of passenger discomfort.

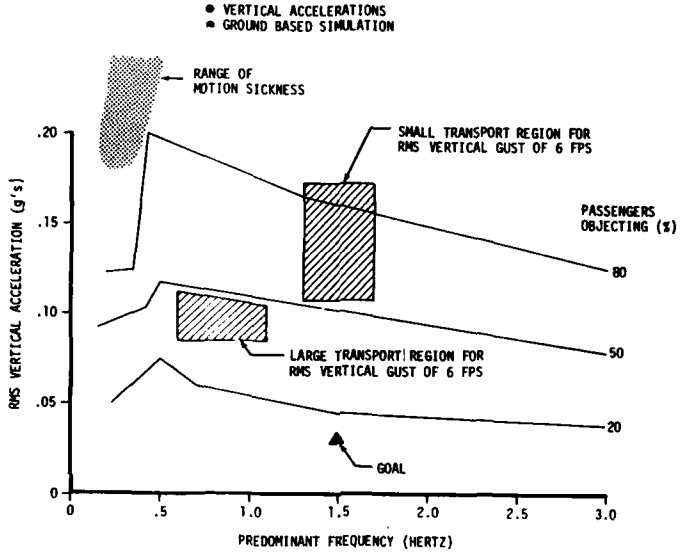
You will notice we have thresholds of passengers objecting to various vertical accelerations, shown as 20, 50 and 80 percent. The higher the vertical accelerations, the more passengers objecting.

We have superimposed on this information about the predominant response frequency of both large and small transports when encountering an RMS vertical gust of six feet per second, which is a pretty healthy gust. We have also shown the average range of motion sickness as being something somewhat out of the realm that we are discussing here for overall ride quality.

But what is interesting I think is that the small transport region tends to center around a predominant frequency of 1.5 hertz and because of that we can simplify the entire presentation as shown here in terms of passengers objecting as a function of the vertical acceleration.

Here, we have plotted on a STOL aircraft of low wing loading, the deHavilland-6, the Twin-Otter, and we have our baseline STAT airplane shown. We have shown the improvements that we can achieve with, first of all, level one higher wing loading, and secondly, level two, higher wing loading with active ride quality control.

PASSENGER DISCOMFORT MODEL

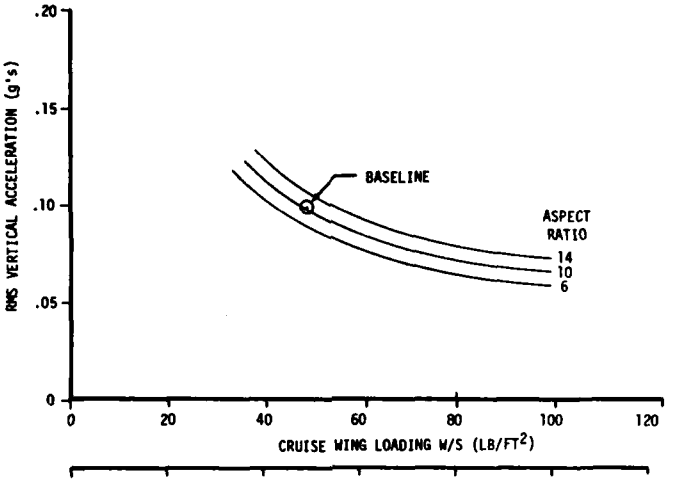


I think our next slide indicates the detail problem we have with trying to improve ride quality control with higher wing loading. As we move further and further out to higher wing loadings, we get more and more diminishing returns. There simply isn't a lot to be done there.

What I am getting at is simply that we have to look at active ride quality control if we really want to achieve the overall capabilities that we want.

RIDE QUALITY CONTROL

EFFECT OF WING LOADING

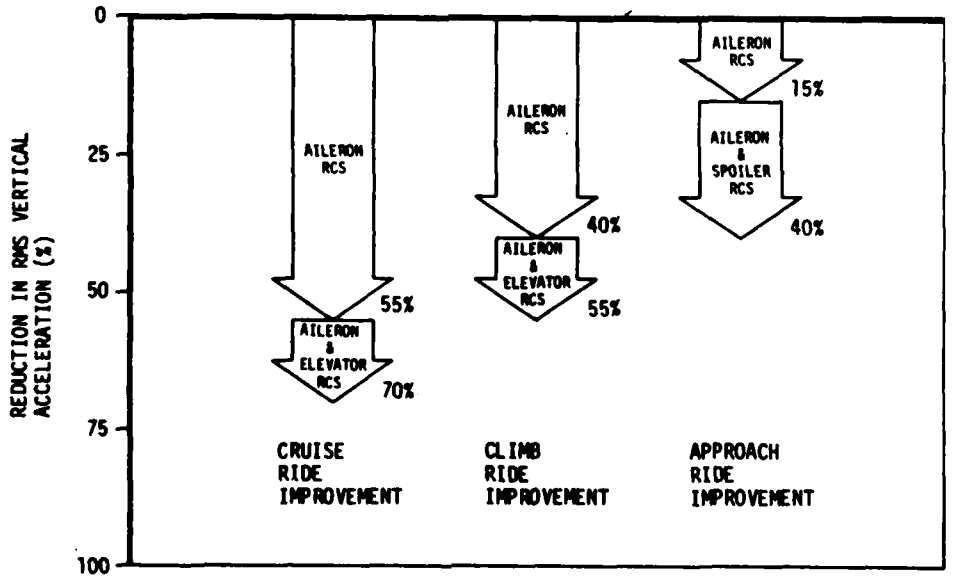


A summary of the possibilities for ride quality control is shown next, and it is shown as a result of the NASA-Boeing work on the Twin-Otter. For cruise ride improvement, if we simply use ride control systems applied to the ailerons, we can achieve a 55 percent reduction in cabin accelerations. If we include the elevator as well, this can go on to 70 percent. The maximum possible reduction we can expect for climb ride improvement is 55 percent and on approach, simply because of the flap condition, 40 percent.

So I think there is a tremendous amount of improvement we can gain here. We can actually get ride quality which exceeds the ride quality of the large transports if we incorporate active ride control systems. And this is one area I think needs continued and strong support in the future.

RIDE CONTROL SYSTEM EFFECT

NASA - BOEING DHC-6 STUDY



This completes the section on passenger appeal. We have a few other areas I would like to discuss.

One important one is ground handling and ground access. The need to make access for the various parts of the aircraft involves the gear design, whether we use a high or low wing, a conventional or a "T" tail, where we put the doors, and even where the hinges and the handles are.

In particular, high wings and tails are appropriate for cargo aircraft because you can access them easily, you can drive vans and trucks up and you don't get in the way of the aircraft hardware.

Door locations need to be away from the propellers, the wings and the tail. And door hinge and handle locations need to be designed so that the door swings out of the way and the handle can be reached and handled by the operator so that he isn't in an unusual position trying to latch the door.

I want to move on to cockpit workload. Now the initial approach that a manufacturer would take to cockpit workload is, quite frankly, FAR Part 25, Appendix D, which lists five basic workload functions that are going on in the cockpit and various factors that need to be assessed which affect those workload functions.

The way we evaluate these is through simulation and through flight test. We will use evaluation teams and will sometimes use naive subjects. So we would evaluate, for example, the accessibility and operation of controls for flight path control, the problem of collision avoidance, navigation, communications, operation and monitoring of systems. Sometimes these don't apply. But we will go through each of these and go through all of the procedures sometimes with a controlled experiment and sometimes, as I say, simply with an evaluation team.

COCKPIT WORKLOAD

FAR 25 APPENDIX D

- WORKLOAD FUNCTIONS
  - FLIGHT PATH CONTROL
  - COLLISION AVOIDANCE
  - NAVIGATION
  - COMMUNICATIONS
  - OPERATION AND MONITORING OF SYSTEMS
- WORKLOAD FACTORS
  - ACCESSIBILITY AND OPERATION OF CONTROLS
  - ACCESSIBILITY AND CONSPICUITY OF INDICATORS
  - NUMBER, URGENCY, AND COMPLEXITY OF OPERATING PROCEDURES
  - DEGREE AND DURATION OF CONCENTRATED EFFORT
  - EXTENT OF REQUIRED SYSTEM MONITORING
  - ACTIONS REQUIRING A CREW MEMBER TO BE AWAY FROM STATION
  - DEGREE OF SYSTEMS AUTOMATION PROVIDED TO COPE WITH MALFUNCTIONS
  - COMMUNICATIONS AND NAVIGATION
  - POSSIBILITY OF AN EMERGENCY WORKLOAD CAUSING OTHER EMERGENCIES
  - INCAPACITATION OF A CREW MEMBER

Current design areas that we are working on in an attempt to minmize cockpit workload include reduced external noise, advanced high lift systems, and direct lift control. The main advantage from cockpit workload of reducing external noise is that it eliminates noise abatement procedures which can be important in a high workload environment.

Advanced high lift systems have the advantage of a low approach speed and natural stall warning. We would try to design for general and conventional stall characteristics to eliminate the need for stick shakers and pushers and the systems associated with them and the failure modes associated with them which will add to workload when, in fact, they are intended to reduce it. And we want a flap system which has small pitch change with flap change.

These are important, but to me I think the most exciting thing here is the direct lift control. Direct lift control is important because in jet transports, roughly half the accidents are on the approach to landing. What happens is there are difficult approaches and there are disruptions to the approach. The higher workload approaches include the ILS back course, VOR, NDB and circling approaches. And disruptions to the approach inlcude wind shear, turbulence, cross wing, wind shift, two segment approach, and the landing glare.

Direct lift control provides immediate glide path authority over these disruptions. It minimizes touchdown point dispersion, it cuts it in half, and it also reduces touchdown discent rate on the average in half. Experience in this area so far includes the Lockheed L-1011, which as far as I know, is the only production airplane with direct lift control. There have been some NASA-Princeton experiments with the Beech Muskateer -- the F-8 experiments by LTV relative to carrier approaches -- F-8 experiments by NASA relative to transport approaches -- some Hansa jet experiments in Germany -- Convair 990 experiments by NASA -- 707 experiments, again NASA with Boeing -- some DC-10 experiments by Douglas.

The results of this experience with direct lift control indicate that when properly implemented, all results show significant improvements in glide path control, missed approach capability, executing the flare in touchdown, and of course, pilot workload. When properly implemented, and that is important -- properly implementing it -- no deteriorating influences are found except in stall speed.

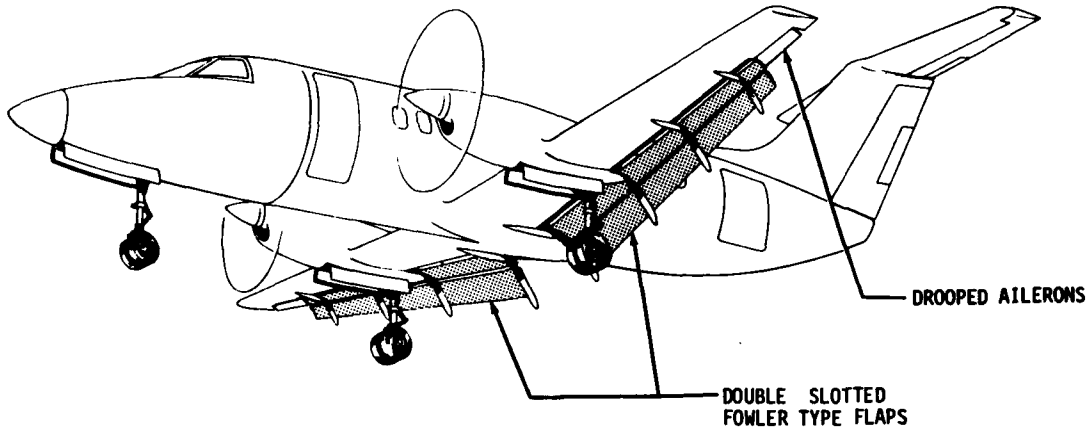
What do we mean by proper implementation? First of all, you need adequate authority -- on the order of +1/10th of a G. There needs to be integration with the throttle control, separate from the throttle but positioned to allow simultaneous operation. There needs to be an absence of pitch movement upon actuation, an absence of buffeting on actuation, and there needs to be an immediate and predictable response from the pilot action.

We believe these are achievable for some aircraft. These are not always achievable as retrofit to existing designs. It has to be largely designed into the airplane from the early conceptual stage.

In our design of the STAT 30 passenger aircraft, we incorporated direct lift control in the concept along with the advanced level two-flap system.

IMPROVED HIGH LIFT SYSTEMS

LEVEL 2



I want to make just a few remarks about maintenance and servicing access. I think it is important that latch mechanisms are easy to operate and when they are closed they stay closed. The ease of operation is important simply because if it is hard to get to something that needs servicing, it won't be serviced. Or if it has to be serviced, it will simply cost too much. The height, the reach, the work position and the forces necessary have to be assessed, not only from the point of view of what we have done historically, but also considering the fact that there are more and more female mechanics in the work force.

Tool and removal clearance have to be watched. And if at all possible, the part being worked on ought to be visible.

This completes the presentation that I have prepared for today and I think we can be very optimistic about incorporating human factors capability in tomorrow's small transports as shown here in this 19 passenger plane and also in 30 passenger aircraft. Thank you.

WORKING SESSION III - HUMAN FACTOKS

Thomas Appleton
The deHavilland Aircraft of Canada Limited

What a way to start. I have never been described as a favorite Scotsman even by my wife. Good morning ladies and gentlemen. This morning I am feeling a little bit vulnerable having heard the disadvantages of high wings, high lift devices, the advantages of two-abreast seats, three-abreast seats, and all these other things, so I think I am going to stay away from the passenger area at least for the moment.

Obviously, we are building the wrong airplane. I can only suggest, Emmett, that your last design is getting closer to the act. Now if you will just move that wing up on top, I think you will probably find something.

In a typical parochial fashion of a specialist, I took human factors in my own specialized little world to mean pilot factors. Of course, there is more to life than pilots, even in aviation. However, I would like to talk this morning about trying to keep the pilot in the loop in the cockpit and what we as a manufacturer have done in our own small way to try and improve the human factors design of our aircraft and to improve the working environment for the pilot.

One outstanding characteristic of the typical commuter aircraft operation sets it apart quite distinctly from general aviation or trunk air carrier aircraft in any consideration of human factors in the cockpit.

The short flight cycle, very high frequency type of operation typical of our aircraft imposes a significantly different time workload function type of pattern compared to other airplanes. In fact, you find that the time required for the accomplishment of each function on a flight is very much reduced.

The typical Dash-7 in fleet service in the U.S. flies approximately a 40 minute flight cycle and ten flights per day on the average, and I stress these are averages. There are peaks significantly different than that, placing these aircraft among the most fully utilized in the air transport industry.

Because our customer airlines typically serve the high density urban areas of the world with the attendant high load imposed by air traffic control at the hub airports, our flight crews are also among the busiest and hardest worked in the industry.

Attention has to be given to the specific demands of this type of operation to ensure that each individual cockpit task is simplified to the extent possible to permit maximum time for the primary task such as looking at and observing traffic, which is extremely important, needless to say.

There are other mundane practical little items that occur in the commuter world that tend to be significant to the average line crew in operation. Dash-7's with 50 seats are typically turned around in 15 or 20 minutes scheduled time and there are some carriers that actually schedule and achieve ten minute turnarounds at through station stops.

Needless to say, the pilots are unable to leave the cockpit in these instances and consequently pilot comfort ends up as being a very important part of human factors, particularly to the maintenance of a good quiet and benign cockpit environment.

Early in the design stage of the Dash-7, we offered many pilots the opportunity to assess our mock-up configuration, criticize it, and advise us where they thought we were going wrong. We soon discovered that we were getting a great range of opinions that were very hard to evaluate in terms of the pilot preferences for instrument panel view, external visibility within the constraints of FAR Part 25, etc. and we ended up putting a cockpit eye position indicator on the windshield post. Nothing very novel about it. As a matter of fact, I think you use it in your Citations. We probably stole it from you, Emmett, and I think you probably stole it from Boeing, so we don't feel too bad.

It is surprising how good this little device has become. We transferred it from the mock-up to the prototype aircraft. We got so used to it and some engineer left the drawings in accidentally and it ended up in production as well. And in service today you find that the pilots are indeed sitting at the correct eye reference position typically. We get very few comments, when I am training people, we get very, very few opinions like, "Oh, I like to sit low," or "I like to sit high" or "No, I don't like sitting where everybody else sits." This destroys the whole concept of human factors with reference to the design eye point. So we are rather pleased wth this simple device.

Again, I have to stress that aircraft such as the Dash-7 and any of the other commuters rarely get above 10,000 feet in operation. They are operating down in the very high density traffic areas of the TCAs and in a 40 minute flight cycle there is very little time to relax.

One other aspect of this time compression that we see in commuter aircraft you can refer to during takeoff and landing. An airplane, again like the Dash-7, and I hate to sound so parochial about it but one has to talk about what one knows, with a 2,200 foot takeoff field length, the takeoff roll rarely lasts more than 10, 12 or 14 seconds, something in that area, depending on the weight, temperature and so forth.

The average jet, on the other hand, takes anything up to a minute or more ground borne during the takeoff roll. Using these times, you can see that although the aircraft are operating within exactly the same FAR 25 regulations, the time required for handling an emergency, for instance an engine failure at V1, the two seconds on a jet transport are a very small percentage of the total takeoff time. Two seconds on a 14 second

takeoff become a very large percentage. For this reason, we ended up providing an engine fail warning system to assist the pilot in making his decision at V1 in the shortest time possible.

Where possible, the need for dexterity in the operation of individual controls within the aircraft must be kept to a minimum -- this goes without saying. We have tried to make the best of this by installing a fly-by-wire steering system with variable rate control. It is a very basic start to fly by wire, but we have found great advantages in terms of response characteristics and smoothness of operation to the steering and I think one is going to see much greater applications of fly-by-wire techniques in the next decade, even in smaller aircraft such as the 50 seaters and 20 seaters, 19 seaters that we are accustomed to building.

I would like to talk a little bit about avionics in the cockpit at this time. As we all know, in order to take advantage of the cost breaks that are possible in very high volume production, the majority of the commuter aircraft use equipment that is essentially designed for the general aviation and corporate market. This is good, obviously. It makes the economics of the equipment make sense and it means that we can acquire sufficient navigational aids in the aircraft to satisfy our demands.

However, it also brings with it some disadvantages. The equipment is frequently designed for appearance more than for go. One of my pet personal peeves is that some avionics manufacturers have taken to designing their instrument faces and frames to establish a particular corporate identity of marketing approach and ignoring some of the human factors aspects of good instrument design.

We in the airframe industry go to some considerable trouble to produce a harmonized integrated panel and cockpit environment and to have it intruded upon by the various logos and decorative frames around the flight instruments is distracting to say the least.

While we are on avionics, somebody has already touched on it earlier this morning, we have to talk of course about the upcoming CRT flight displays. Obviously, when the Boeing 757, 767 and airbus A-310 aircraft come into service in 1982-1983, all of them having full CRT systems, it is likely that these types of equipment are going to become the standard for comparison and there is going to be pressure on the smaller aircraft manufacturers to install CRT equipment.

Although any advantages in terms of initial costs and weight are not yet obvious for CRT equipment, these systems do seem to promise improved reliability and dispatchability. But more important to pilots, they offer greatly increased capacity for displaying critical flight information. However, the flexibility that is available in the apparently easy way that software can be changed to produce major changes in display format can in themselves pose real concerns. Software discipline and software control is one subject now that the FAA, I know, is studying very carefully.

In some cases amongst the initial instruments, initial CRT displays produced by some of the avionics manufacturers there have been a tendency to change the display formats on the CRTs purely for the sake of change. At least I believe that is partly true. At any rate, we must encourage people to resist this impulse.

Electrical mechanical displays have gone through decades of evolution and development and today they are pretty well understood. The display formats are understood. And there is some surprising degree of commonality among the various avionics manufacturers.

Any more to introduce radically new display formats will undoubtedly induce resistance to change amongst the pilot community which would be self-defeating.

While we are on avionics, we can't ignore the area of navigation, microwave landing systems which are with us and coming onto the scene very shortly, the use of which is increasing greatly in the commuter airlines today as we search for innovative ways to improve access to the hub airports. This places even new emphasis on the integration of cockpit tests in the terminal approach phase particularly.

Throughout the development of the hardware for the separate access concept for Ransome Airlines, Golden West, Hanson, others, a great deal of effort was expended by deHavilland, Jet Electrics and Sperry to ensure that the final package is an integrated system which imposes the minimum workload on the flight deck crew while keeping the pilot in the loop at all times. Area navigation systems produce very quickly increased workloads if the integration has not been very carefully worked out and the pilot displays have not been thought out and evaluated very carefully.

Incidentally, recently we have been undertaking some development work with the microwave landing systems in cooperation with the FAA as their technical center and in preparation for the first phase of the STEP program. You might be interested to know that we have been doing a couple of 7.5 degree approaches on the MLS down to very low decision heights. The workload, unsurprisingly enough, is very, very low. Direct lift control, as mentioned by Emmett, in the propeller driven aircraft today with a beta control propeller system such as we have essentially have direct lift control. You have immediate response to thrust and drag and because the wing is in slip stream, this automatically means immediate lift response as well.

I hear you talking, Emmett, it is exactly what we have experienced on the 7.5 degree approaches. The rapid response and authorities you have through the power levers reduces pilot workload to minimal levels.

The other aspect, of course, that makes it somewhat simple is that with an approach speed of 80 knots even a 7.5 degree approach only amounts to something on the order of 800 or 900 feet a minute sync rate which is equivalent to current jet aircraft sync rates today on approach.

I think we have just about covered the points that I wanted to cover in the cockpit, but I thought while I was here I would share with you one of our minor disasters in human factors engineering in the Dash-7 that you talked about earlier.

The toilet in the back of the Dash-7 is installed at the rear of the cabin and the aisle is not terribly wide -- it is adequate. We all face limitations in the commuter business no differently from others.

The door is a sliding door and if I can describe the situation to you, the door slides longitudinally along the aircraft. The first knob we designed to open this door, it was a brilliant design, was a rotating knob. It rotated clockwise. Fine. The very first paying passenger ever to use the toilet in the Dash-7 couldn't get the door open -- not a disaster. The stewardess was able to sort it out and open the door for her. Once she got in she couldn't get out, which was a little bit more serious, but again, the stewardess did look after her.

The airline customer that owned the aircraft got back to us and pointed out our shortcomings and so in our usual fashion, we came up with a very quick fix which involved a little arrow that was appliqued just to tell these people who can't tell which way a knob rotates which way it is supposed to rotate. We put it below the knob, underneath the knob. And if you had been three feet tall, it probably would have done the job .

So after some convincing and arm twisting of the engineers, we finally got them to go for a wing type of latch. That should have been the end of the story. Unfortunately, they put the wing on the bottom of the latch -- you had to push this thing back rearwards towards the aircraft at the same time as you are pushing the door back. It is a little bit hard to describe. It requires at least two hands to do the job. However, by this time, we are on about Change 15 and the economics of the situation were such that we were damn well going to have to live with what we built at this stage.

A few weeks ago, I was reviewing some of the delay reports from our operators and there was a rather dry dispatch delay report that came through from one of our overseas carriers reporting an hour and a half dispatch delay, which always gives us concern as a manufacturer. What had happened was that this latch, incidentally, because of its minor shortcomings, its design tends to get rather roughly handled. One of our passengers got into the toilet and she locked herself in and could not get out. Very unfortunate. In fact, she had to stay there for the landing. You might not believe this, but I promise you it is true. In fact, the pilot didn't believe it either. So after landing, he went to investigate. They extracted the poor passenger and out she came. He then seated himself in the toilet and he couldn't get himself out. An hour and a half later, they finally dispatched the airplane.

Thank you very much for your attention. If you have any questions, I would be pleased to address them.

QUESTIONS AND ANSWERS

Alan Stephen - This past week the Chairman of the National Transportation Safety Board went to great pains to talk about protection of the passenger in crashes and to point out we had a number of fatalities this year, both domestically and overseas, that probably shouldn't have occurred. And in all of the discussions here, we haven't had anything on that.

We are here on safety and it seems to me that I would like to hear something regarding what can be done on Part 23 and certainly Part 25 light transport seat design that can certainly be improved so we can get at the heart of the question. If we don't, I can guarantee you that Congress will.

Cliff Hay - Thank you Alan. Would you care to respond to that, please Neal?

Neal Blake - I think we agree with you completely and we do have several crashworthiness efforts underway with NASA which specifically address the questions that you raise. Some of the work that has been underway for some time and some of the conclusions that have been reached are the design of a seat model for both general aviation and now more recently use in air carrier design. Of course, the objective there is to provide energy absorbing seat designs which will provide greater survivability in the crash scenario.

We are also working with broad segments of the industry, the large transports, the smaller aircraft and helicopters to develop crash scenarios. What is the most common or perhaps the typical crash scenario for the different categories of aircraft? That work has been started and will be continued during the next several years.

Once we have that information, we will be focusing our crashworthiness efforts on providing improvements, structural improvements, cabin design improvements, seat improvements to specifically reduce the possibility of failures in those structures and to build perhaps crashworthy structures in some of the smaller aircraft to absorb the energy and keep it away from the human.

So we do have a fairly major effort in that area. We certainly agree with you -- it is most necessary, and we have been receiving excellent cooperation from the industry in starting this type of activity.

Cliff Hay - Thank you Neal. Alan, we will be delighted to meet with you or your people at any time to go into any further detail on those programs if we have them. We certainly solicit your comments on them.

Are there other comments from the floor?

C. O. Miller - There was a phrase that I haven't heard here this morning, at least the last two presentations that I caught, and that is human error. We talked in terms of workload but I didn't hear the term human error.

It is my understanding that an effective human error program and design begins with the task analysis. It is amplified by what I call a predictive operational hazard analysis -- that is before you ever fly the airplane. It continues, as Dr. Kraus indicated, by simulation or actual controlled tests in the airplane, and is completed by an effective incident reporting program or an incident analysis program.

I think it clearly applies not only to piloting but to the maintenance people. It also clearly applies not only to the airplane that may be delivered by a manufacturer, but that airplane as it is flown complete with our navigational systems and things like that. My question, therefore, is to what extent (if at all) are the general aviation manufacturers supplying commuter airplanes doing a total program as I have just defined?

Cliff Hay - Let me start down the line. Tom, you mentioned maintenance. There was a mention of it with Cessna as well as Beech. Let's just start from left to right.

Tom Appleton - I am sorry but I am not qualified to discuss maintenance of the aircraft in any great detail, at least not at this stage. I have only been in the job that happens to involve maintenance for five days so it will take me a day or so to catch up.

As far as the question regarding the task analysis of cockpit workloads is concerned in the design of the cockpit, you are absolutely correct and that is exactly the process that is gone through during the design of an aircraft. We, along with the other manufacturers who are building the new 30 to 40 seat range aircraft, are involved right now in cockpit task analysis programs, including kNAV and MLS, and these results, of course, are available to the certification authorities. I don't know if that answers your question, but I hope it does.

C. O. Miller - I would be interested to know if you do operational hazard analysis and if you have an incident feedback system to your designer?

Tom Appleton - We do do operational hazard analysis and we have incident feedback to our engineering group and the design group, yes, recognizing that we as a manufacturer, like our customers, are somewhat smaller than the Boeings and the Douglas of the world. The lines of communication are pretty short in our sort of a company which simplifies the task of getting this sort of feedback to the operator.

It is done in an organized sense but it is also done frequently in a very direct sense when the Vice President of Operations of one of our carriers will get on the phone and call the Chief Designer. So both a formal and an informal line of communication are open.

Dr. Kraus - I think that Tom pretty well covered the point of how the lines of communication work. Cessna, of course, does not have an on purpose commuter program as such and consequently might have even less formal approach than what Tom was talking about.

I think that all of the elements though, the four elements of the procedure that you are mentioning, are there in the conceptual phase of the aircraft all the way through to the operational phase and, as Tom also said, we do get reports from the field which do immediately enter engineering either through official channels or directly, as he says, from a telephone call from the operator to the Chief Engineer. And we establish a list of top ten priority items in that category which we go through in the order that we perceive as being the most critical.

John Elliott - I think too in our case the lines of communication are, because we are smaller, shorter and in general any of our points where we are looking at the human factors element and attempting to make improvements, the end result of the whole package is to minimize this human error. That is one of the end results and one of the fallouts of any of our efforts in the human factors aspects.

Tom Appleton - Just one thing I would like to add to this. The manufacturer definitely has a responsibility in this regard. We recognize it. But we hope also that the operators recognize their responsibility to report to us incidents. I can assure you that is a very real problem getting feedback from the field before an incident becomes something more serious.

C. O. Miller - Cliff, I wonder if I could take a moment to comment as I did in Boston on this particular subject because I have attended no less than three major symposia in the past few months in which the question specifically came up in terms of the item Mr. Appleton just mentioned and more specifically in regard to those systems that really have pilots becoming computer operators. I am talking about things like RNAV systems and various flight management systems.

I was somewhat dismayed to realize that there is no organized approach and the people who are installing these systems in the airplanes don't know the kind of mistakes that are being made by the flight crews. There might be an occasional report here and there, but in my opinion you are into a whole new field of human error because of certain computer-based systems in the airplane, and RNAV is a classic example. I know of one accident that I came across since I talked to you people lately in which I think this is a clear factor.

I would only plead with these manufacturers to use the techniques I outlined to try to anticipate these kinds of problems, alert the operators to them and I agree with Mr. Appleton totally -- I think the operators can't just chaulk off a wrong button being hit, they have got to ask the question why was it hit that way, under what conditions and get the information back to the manufacturer.

Cliff Hay - Very good, C. O. We will look for your written as well as your verbal comments on that as well. I do want to, in closing on this particular point, recall Neal's presentation here to start out with this morning. I believe you recall in each case hearing the emphasis on the maintenance in the system and the human factors involved in the development of that maintenance process in each area that he examined. I would simply like to ask Neal if he had any closing remarks on that at all?

Neal Blake - I think we have really been, as a government agency, looking at two things: (1) what caused the error, and (2) what can you do to keep it from occurring again, and certainly RNAV keyboards and blunders that go along with those are an object of some detailed study.

We are also looking at what can you do, given that no matter how perfect you make the avionics, the human will find a way to screw it up and what can we do to minimize the impact of that failure either in additional monitoring on the ground or in the airplane or other places. So I think it is in many cases more of a systemwide look at handling errors regardless of where they occur realizing that we will never build a perfect set of avionics.

Cliff Hay - Thank you Neal. And again, we emphasize, we recognize that we need the input from a lot of people to develop this program.

Are there any other comments from the floor or questions? With that, I personally thank you all for your cooperation and participation at this meeting At this time, I would like Walt Luffsey to say a few words in closing and then Jack Harrison, the Director of the Office of Aviation Safety. Walter, would you please?

CLIFF HAY

In a way, we saved the best for the last. That we want to thank Tom for. I would like to just review a few administrative things, if I may.

As you recall, in November we had the first workshop on human factors at TSC. A proceeding is not available of that because the record is open. However, a transcript is available of that work and in the outer lobby here at the Registration Desk for all of you who wish it. I certainly suggest it as good background reading. One point is that it is made up of two volumes. Be sure that you get both copies of those, if you wish one of them.

In closing today with my personal thanks to all of you who have participated here and those of you who have been in attendance, I want to mention that all of this material will become a part of the proceedings that are eventually released as the basis for the work that we are doing in our development of a total human factors program in aviation. All of the material provided by the participants today will be a matter of record in those proceedings when they are completed, and again will be sent to all of the registrants here today and at the future and past hearings that we have had on this.

CLOSING REMARKS

Walter Luffsey
Associate Administrator for Aviation Standards
Federal Aviation Administration

Thank you Cliff. I just want to add my personal thanks for the attention that you folks have given and admonish you if you will to devote some time and effort to giving us that input. I know there weren't many exchanges today though there were excellent presentations. I would like to receive your input. We really want to develop a program which is responsive to aviation's needs and we need all of your input to do that. So while the record is still open, and it will be for some time, and I hope we will continue interaction even after we develop a program, you give us your input and we will assure you that it will be considered in the development of the program.

I want to mention a person here. I guess Marva is not here. She was recognized yesterday. But we have what we call our "Johnny-On-The-Spot" John MacKinnon. I would like to give a nice round of applause for his work here. And one more time for our panelists. That was an excellent session. Cliff, panelists, we thank you.

We look forward to the third symposium next year and look forward to continuing interaction in human factors. We thank you.

CLOSING REMARKS

Jack Harrison
Director, Office of Aviation Safety
Federal Aviation Administration

I would like to open with my thanks to Cliff and Walt for giving me the opportunity to make a few remarks. They may have said it all.

I would like to extend, however, to the industry, to the exhibitors, the manufacturers, and the operators my personal thanks for their contributions to this proceeding. My thanks to Alan Stephen of the Commuter Airline Association of America for his efforts in developing this program. I would like to extend my extreme gratitude to the industry for their efforts over the past entire year which have produced a very commendable safety record.

In addition to the human factors record of this proceeding, we will be issuing a report of these proceedings some time within the next several months which will be received by all registrants and, of course, we will maintain copies for those who wish them in the future.

Again, my thanks to you for contributing to this very successful program. Thank you.

APPENDIX A

IMPACT OF RECENT FAA SAFETY PROGRAMS

ON

COMMUTER AIRLINE SAFETY

IMPACT OF RECENT FAA SAFETY PROGRAMS ON COMMUTER AIRLINE SAFETY

Leslie E. Eder
and
James W. Hines

December 1980

U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Office of Aviation Policy and Plans
Washington, D.C. 20591

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EXECUTIVE SUMMARY

This paper examines the recent safety record of the commuter airlines to determine the effects of FAA safety programs. 14 CFR 135 was revised in 1978 to better address the operations of commuter airlines. In addition, at about the same time, the Administrator announced a multi-faceted safety enhancement program. Included in this program was a reorganization of FAA staff to better focus on safety issues, proposed increases in the air traffic control requirements and services, and new FAA air traffic control facilities.

Analysis of the commuter airline accident rates from January 1975 through June 1980 reveals that the accident and fatal accident rates per hour and per departure had a slight downward trend over the period, while the fatality rate increased sharply, probably as a result of the use of larger capacity aircraft. The observed 1980 rates, however, decreased significantly from the historical trend, indicating an improvement in commuter safety. For 1980, rates per 100,000 flight hours were 3.3 projected versus 2.3 actual for accidents, 0.8 projected versus 0.2 actual for fatal accidents, and 5.0 projected versus 1.2 actual for fatalities.

To trace the sources of the improvements, detailed data on accident types and causes were analyzed. Data obtained from NTSB accident briefs for 1975-1978 were compared with preliminary data for 1980 (January through October 1) compiled by FAA personnel. NTSB briefs were not yet available for 1980. Both the circumstances and types of accident were investigated.

Given the nature of the recent revisions to Part 135, the incidence of certain accident factors seems more likely to be impacted by the revision than others. More stringent commuter airline pilot, maintenance, and operations personnel requirements and procedures were a major element of Part 135 revisions. The data indicate a decrease in the 1980 rate of occurrence of pilot and personnel factors, but the reduction is not great enough to establish a formal statistically significant change. The projected 1980 rate per 100,000 flight hours was 4.3 for pilot circumstance versus an observed rate of 3.8. For personnel circumstances, the projected rate was 1.1 versus 1.0 observed. There was a statistically significant decrease in the incidence of other accident factors--airframe, powerplant, systems, airports, airways facilities, weather, terrain, and miscellaneous--where the causal role of the Part 135 revisions is less obvious. The projected rate per 100,000 flight hour was 4.8 versus an observed rate of 2.2.

Types of accidents do not relate directly to the accident factors, but a grouping of the accident types that might be associated with accident factors was made to allow some comparison to the safety related programs and accident circumstances. For example, gear collapse and airframe failure accident types might be termed an "airframe" accident circumstance. Less obvious, gear retracted or undershoot/overshoot accident types might result in a "pilot" accident circumstance. In 1980, there were statistically significant decreases in the rates of occurrence of accident types which might be attributable to pilot accident circumstances influenced by Part 135 revision. Accident type rates per 100,000 departures potentially associated with pilot

accident circumstances were 0.5 before 1980 versus 0.1 in 1980 for all accidents and 0.1 before 1980 versus 0.0 in 1980 for fatal accidents. These rates are based only on the experience of commuters reporting to the CAB through June 30, 1980.

There has been an improvement in the safety record of commuter airlines during the first half of 1980. The sources of improvement may be attributable to Part 135 revisions, other concurrent FAA safety programs, and increased safety emphasis on the part of the commuter airlines themselves.

IMPACT OF RECENT FAA SAFETY PROGRAMS

ON COMMUTER AIRLINE SAFETY

1. INTRODUCTION

This paper examines the safety record of the commuter airlines to determine if recent Federal Aviation Administration (FAA) and commuter airline industry safety programs have had an impact.

The most extensive recent change in safety regulations which directly affected the operations of commuter airlines was the revisions to Title 14, Chapter I, Part 135 of the Code of Federal Regulations (14 CFR 135) which the commuter air carrier industry has been phasing in over the past year. The major goal of these revisions was to provide passengers traveling on commuter air carrier flights with a level of safety comparable to that attainable on certificated route carriers (Part 121).

A summary of commuter airline developments and the Part 135 revisions is given in the proceedings of the First Commuter Air Carrier Safety Symposium, January 16-17, 1980. Appendix A of this study also contains a list of the major changes to Part 135. Some of the implications of this major regulatory revision are that:

- About 75 percent of the revenue passenger miles flown by commuter airlines are be by aircraft having either weather radar or thunderstorm detection equipment.

- About 97 percent of the total revenue passenger miles flown by commuter airlines are in aircraft flown by a pilot in command having an air transport pilot certificate.

- Two-thirds of the commuter revenue passenger miles are in aircraft maintained to certificated air carrier (Part 121) standards.

Other changes result in upgraded crewmember training and proficiency and increased avionics and other safety related equipment.

All commuter airlines were certificated under the new rules by December 1979. However, because of time and scheduling constraints, not all requirements were actually complied with by December 1979. For instance, any new required training need not be completed until the next scheduled session for each airline. In addition, compliance dates for certain rules were extended to December 1980 under paragraph 135.10. Because of this phasing in process, the maximum impact of the rule revision probably has not been realized at this date, nor is it expected that impacts will be uniformly realized over the various accident types and factors.

Other ongoing and newly implemented FAA safety programs include:

- Establishment of Terminal Control Areas. As of December 1980, terminal control areas were established at the Nation's 23 major airports; the most recent addition was San Diego on May 15, 1980. All aircraft in terminal control areas are under positive air traffic control.

- Establishment of Terminal Radar Service Areas at additional air carrier airports. One hundred and thirty-five terminal radar service areas have been established as of December 1980 and an additional 28 candidate locations are pending. Pilots flying into these areas are offered radar guidance to keep them safely separated from other air traffic. Experience indicates that over 90 percent of the pilots elect to use this voluntary service.

- Equipment for installation of brite radar equipment at eight additional airport control towers which would permit direct radar readout of vital flight information is presently under contract. The eight airports where installation is anticipated include: Long Beach, California, Sacramento (Metro), California; San Diego (Lindbergh), California; San Jose, California; Santa Ana (Orange County), California; Orlando (McCoy), Florida; Omaha (Eppley), Nebraska; Oklahoma City (Will Rogers), Oklahoma.

In July 1979, the safety-related functions of the FAA were reorganized under the newly created Associate Administrator for Aviation Standards. Key elements of this reorganization include:

- o Expansion of the functions of the Office of Aviation Safety to include accident and incident investigation, special safety investigations and analyses, analyses of safety trends, and special safety programs.

- o Creation of a new Office of Flight Operations responsible for insuring the competency of airmen, the adequacy of flight procedures and air operations, the evaluation of in-flight facility performance for compliance with the prescribed standards, and the maintenance of the FAA's aircraft fleet.

- o Creation of a new Office of Airworthiness responsible for assuring airworthiness of civil aircraft, production certification, airworthiness certification, approval of operators' aircraft maintenance programs, airmen certification, air agency certification, and continuing airworthiness programs.

- o Reassignment of the Office of Civil Aviation Security to the Associate Administrator for Aviation Standards to assure an integrated and coordinated aviation safety and security program.

- o Reorganization and redefinition of headquarters staff functions in order to free resources for field work, including more field inspectors and engineers.

In particular, the Air Transportation Division of the Office of Flight Operations has accomplished or coordinated a number of projects and programs which have contributed to commuter air safety. A summary of a number of them follows:

(1) In December 1978, Advisory Circular 135-3B Air Taxi Operators and Commercial Operators, was issued to assist air taxi and commuter operators in complying with the requirements of the then new Part 135. Since the rewrite of the air taxi inspector's handbook was not completed at the time, this advisory circular was also used by FAA inspectors to standardize the certification process throughout all FAA regions.

(2) In April of 1979, FAA Notice 8000.176 entitled "Increased Surveillance for Operations Under Part 135" was issued. This Notice directed increased surveillance of commuter airlines certificated under the new Part 135 and prescribed additional actions to emphasize the higher level of safety that would be required under the new Part 135. This increased and intensified surveillance covered pilot proficiency checks, en route inspections, check airman designations, pilot's knowledge of weight and balance, takeoff and landing performances, cockpit procedures, and adherence to company procedures.

(3) In 1978, an abbreviated air carrier indoctrination course was established to qualify FAA inspectors in the inspection and surveillance of operators operating large transport category aircraft under the provisions of Part 121. Since the new Part 135 closely parallels Part 121, the abbreviated air carrier indoctrination course will now be conducted on a continuous basis for the purpose of imparting Part 121 and the new Part 135 regulatory philosophy to all inspectors having certification and surveillance responsibilities for Part 135 air carriers.

(4) Formulation of standardized check procedures was issued which designates specific maneuvers and procedures required for pilot competency and instrument checks, and whether a simulator or training device may be used during checking or training. This guidance was initially distributed in an agency notice, and later incorporated into the air taxi/commuter handbook, which was issued in January of 1980. This handbook implemented, in detail, FAA practices and procedures with respect to the certification and surveillance of air taxi/commuter air carriers and commercial operators under FAR Part 135.

An integral part of the FAA's continuing safety program is the continued operation and installation of new facilities in the air navigation and traffic control system. Shown in Table 1 is an inventory of facilities installed as of September 30, 1980.

TABLE 1

FAA FACILITIES

Facility Type	Commissioned as of 6/30/79	Commissioned as of 9/30/80	Change
o En Route Control and Services			
-- Air Route Traffic Control Centers	25	25	0
-- Air Route Surveillance Radar	105	112	7
-- Remote Center Air/Ground Communication Facility	483	504	21
o Terminal Control and Services			
-- Airport Traffic Control Tower	424	431	7
-- Airport Surveillance Radar	159	166	7
-- Automated Radar Terminal Service	81	108	27
o Flight Service Facilities			
-- Flight Service Stations	319	317	-2
-- Direction Finder Equipment	166	166	0
o Navigation and Landing Aids			
-- VHF Omnidirectional Range	923	925	2
-- Instrument Landing System	642	712	70

The FAA established by Order 8000.44A, May 30, 1980, the Aircraft Certification Lead Region Program. Under this program, the FAA region having the greatest expertise with a category of aircraft has been assigned aircraft certification national program responsibility according to their expertise identifiable by specific Federal Aviation Regulations--e.g., Parts 23, 25, 27, 29, 33, 35, and 36. In particular, certain engine type and production certification and airworthiness functions are transferred to the New England Region; all propeller type and production certification and airworthiness functions are established in the Great Lakes Region; and certification of certain domestic manufactured airplanes and all foreign manufactured airplanes being certificated as transport category airplanes is transferred to the Northwest Region. Also, authority to issue airworthiness directives on foreign manufactured products, excluding certain aircraft manufactured in Canada, has been transferred to the Directors of the lead regions.

Application of the lead region concept is intended to provide more standardization in certification decisions for a given category of aircraft, improve overall effectiveness of FAA aircraft certification efforts, and will permit the Washington Headquarters to be more selective in concentrating on other major issues of national significance. In addition, the program will result in more timely updating of regulations and resolutions of precedent-setting issues pertaining to type certification.

An aircraft certification national resource specialist program has also been established by Order 8000.45A, May 29, 1980, to identify FAA personnel having special technical skills to be used nationally in policy and problem

areas. The lead region and national resource specialist programs are designed to be complimentary programs directed toward upgrading the FAA's technical effectiveness.

2. ACCIDENT RATE ANALYSIS

2.1 Methodology

In order to assess the impact of the FAA safety program on commuter airline safety, the 1975 through 1979 accident rates (pre-Part 135 revision) of commuter air carriers are compared to the corresponding 1980 rates (January 1 through June 30, 1980, post-Part 135 revision). The means of comparison are trend projections whereby historical data (1975-1979) are used to compute the least-square trend lines for the accident and fatality rates. The linear trends are subsequently projected through 1980 and provide the basis for comparison of the observed 1980 rates. If the observed rate falls below the lower prediction interval limit ($R-tS_{y.x}$), then we can say with some degree of confidence that there has been a decrease. R is the projected rate, "t" is Student's t-statistic for the appropriate probability level, and $S_{y.x}$ is the standard deviation of the dependent variable about the trend line.

2.2 Analysis

Tables 2 and 3 show the commuter air carrier accident data of operators reporting to CAB for total scheduled operations and scheduled

TABLE 2

RATES OF COMMUTER AIR CARRIER ACCIDENTS IN SCHEDULED OPERATIONS
OF OPERATORS REPORTING TO CAB

Year	Accidents			Per 100,000 Flight Hours			Per 100,000 Departures			Flight Hours	Departures
	Total	Fatal	Fatalities	Total	Fatal	Fatalities	Total	Fatal	Fatalities		
1975	38	8	32	4.0	0.8	2.3	2.6	0.5	1.5	950,410	1,475,579
1976	34	10	30	3.5	1.0	3.1	2.2	0.7	2.0	966,931	1,536,130
1977	36	7	28	3.2	0.6	2.5	2.1	0.4	1.7	1,115,858	1,680,491
1978	51	12	46	4.0	0.9	3.6	2.6	0.6	2.4	1,273,000	1,954,731
1979	39	10	57	3.3	0.8	4.9	2.3	0.6	3.4	1,177,874	1,694,188
1980*	14	1	7	2.3	0.2	1.2	1.7	0.1	0.9	598,764	809,533

*1980 data are through June 30.

TABLE 3
RATES OF COMMUTER AIR CARRIER ACCIDENTS IN SCHEDULED PASSENGER OPERATIONS OF OPERATORS REPORTING TO CAB

Year	Total	Fatal	Fatalities	ACCIDENT RATES Per 100,000 Flight Hours Total	Fatal	Fatalities	Per 100,000 Departures Total	Fatal	Fatalities	Per Billion RPM's Total	Fatal	Fatalities
1975	22	2	13	2.9	0.3	1.7	1.7	0.2	1.0	30.1	2.7	17.8
1976	26	6	26	3.1	0.7	3.1	1.9	0.4	1.9	31.0	7.1	31.0
1977	23	6	27	2.6	0.7	3.1	1.5	0.4	1.8	24.4	6.4	28.6
1978	32	7	34	3.2	0.7	3.4	1.9	0.4	2.0	27.9	6.1	29.7
1979	27	8	54	2.5	0.7	4.9	1.6	0.5	3.2	21.0	6.2	41.9
1980*	11	1	7	2.0	0.2	1.3	1.4	0.1	0.9	17.2	1.6	10.9

Year	Flight Hours	Departures	RPM's
1975	746,000	1,262,000	730,000,000
1976	845,000	1,400,000	840,000,000
1977	869,000	1,498,000	943,000,000
1978	1,014,000	1,700,000	1,145,000,000
1979	1,094,000	1,694,000	1,288,000,000
1980*	550,000	809,000	639,000,000

*1980 data are through June 30.

passenger operations, respectively. Figures 1, 2, and 3 display the time series graphs of the data for the accidents, fatalities, and fatal accidents per 100,000 flight hours, respectively. As described in Section 2.1, each graph shows the time series trend line calculated from the 1975 through 1979 data, together with the projected 1980 rate and the corresponding prediction interval limit. In each case, the observed 1980 rate (January 1 through June 30) is also shown. The trend lines portray the overall movement of the time series data and indicates the direction of the rate changes over time.

Both the accident rates and fatal accident rates have a slight downward trend, while the fatality rates have a sharply increasing trend. At first it seems surprising that while the accident rates are going down, the fatality rates are going up. This is attributed to a trend toward bigger aircraft and an increase in passenger traffic, so that a single fatal accident tended to produce more fatalities. Originally, commuter carriers were limited to aircraft weighing less than 12,500 pound gross takeoff weight. During the 1970's, the CAB issued a regulation allowing commuters to operate aircraft up to 30 passengers and a 7,500 pound payload. The Airline Deregulation Act of 1978 raised the maximum permissible size of commuter aircraft to 60 passengers and a 18,000 pound payload. In addition, the number of passengers carried by commuter airlines has increased on the average by about 14 percent annually during the last decade. Piston powered, single and twin engine aircraft, seating less than 10 passengers, while accounting for 54 percent of all commuter aircraft, operated 40 percent of fleet hours and yet accounted for only 18 percent of the industry seating capacity during 1979. Turbine powered aircraft, having larger passenger capacity, while accounting for just one third of the commuter fleet, now provide nearly 75 percent of all industry seating capacity.

Figure 1. Accident Rates per 100,000 Flight Hours of Commuter Air Carriers in Scheduled Operations of Operators reporting to CAB.

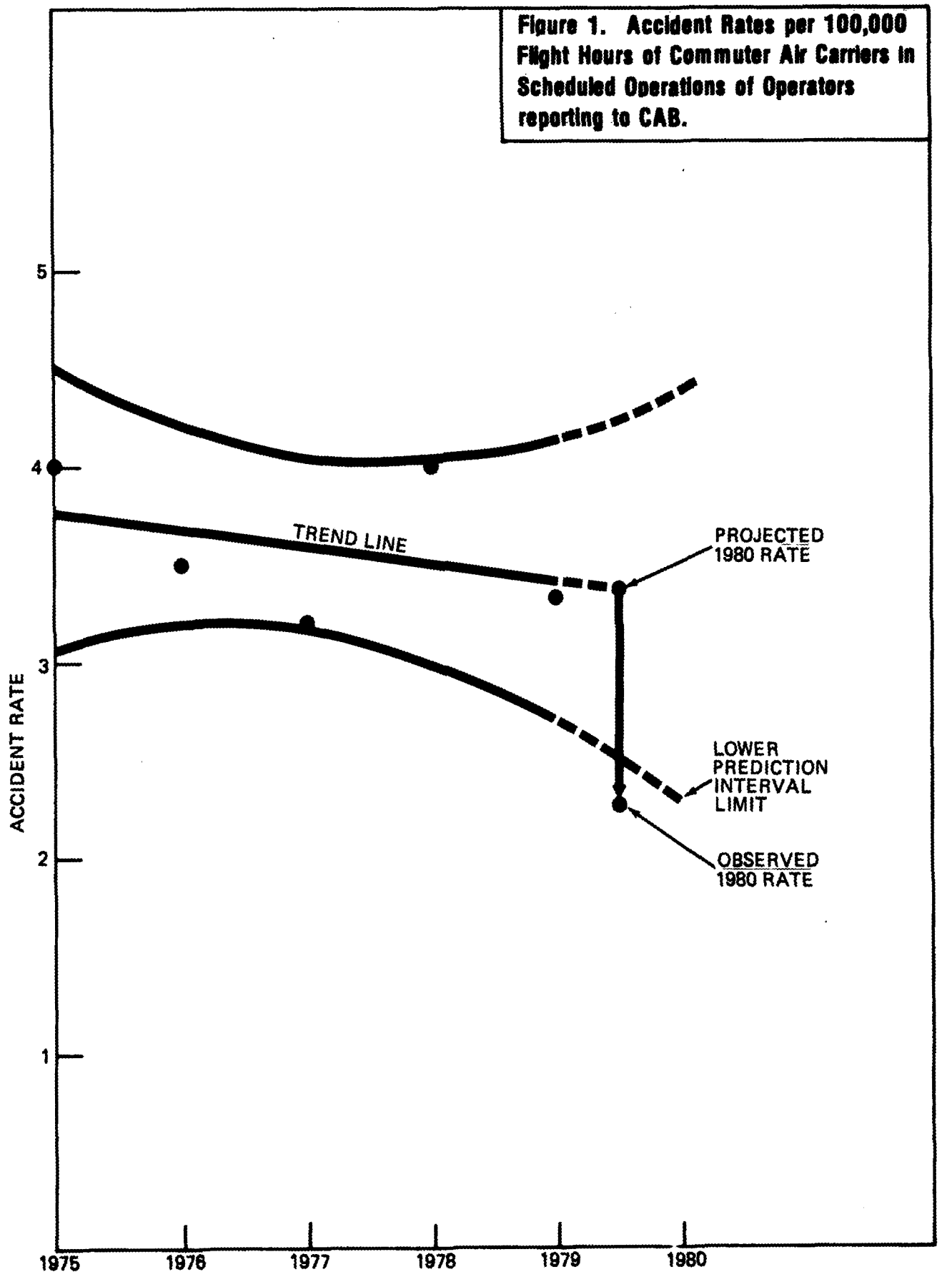
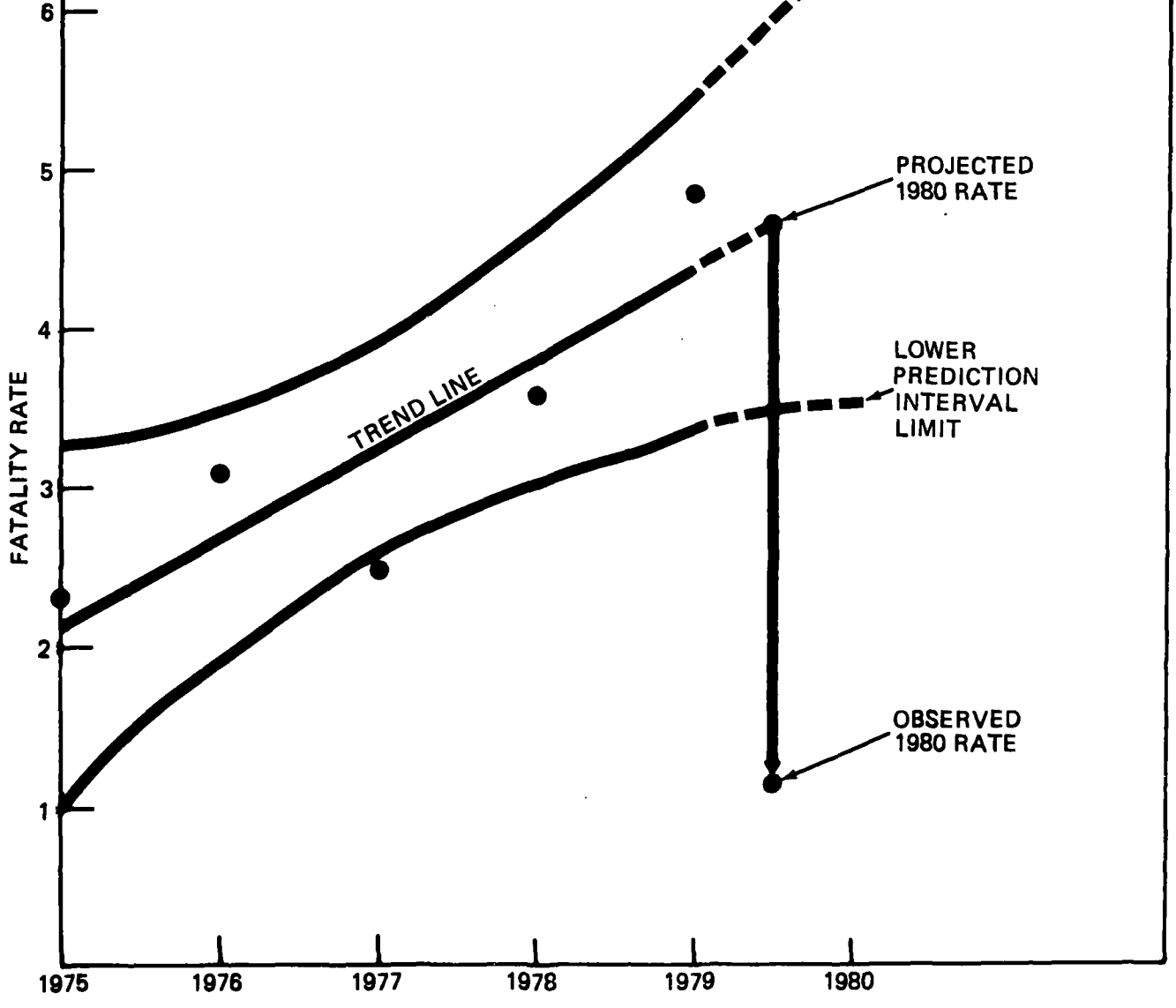


Figure 2. Fatality Rate per 100,000 Flight Hours of Commuter Air Carrier in Scheduled Operations of Operators reporting to CAB.



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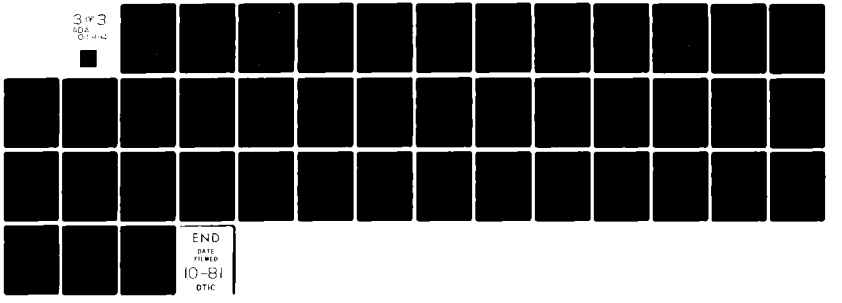

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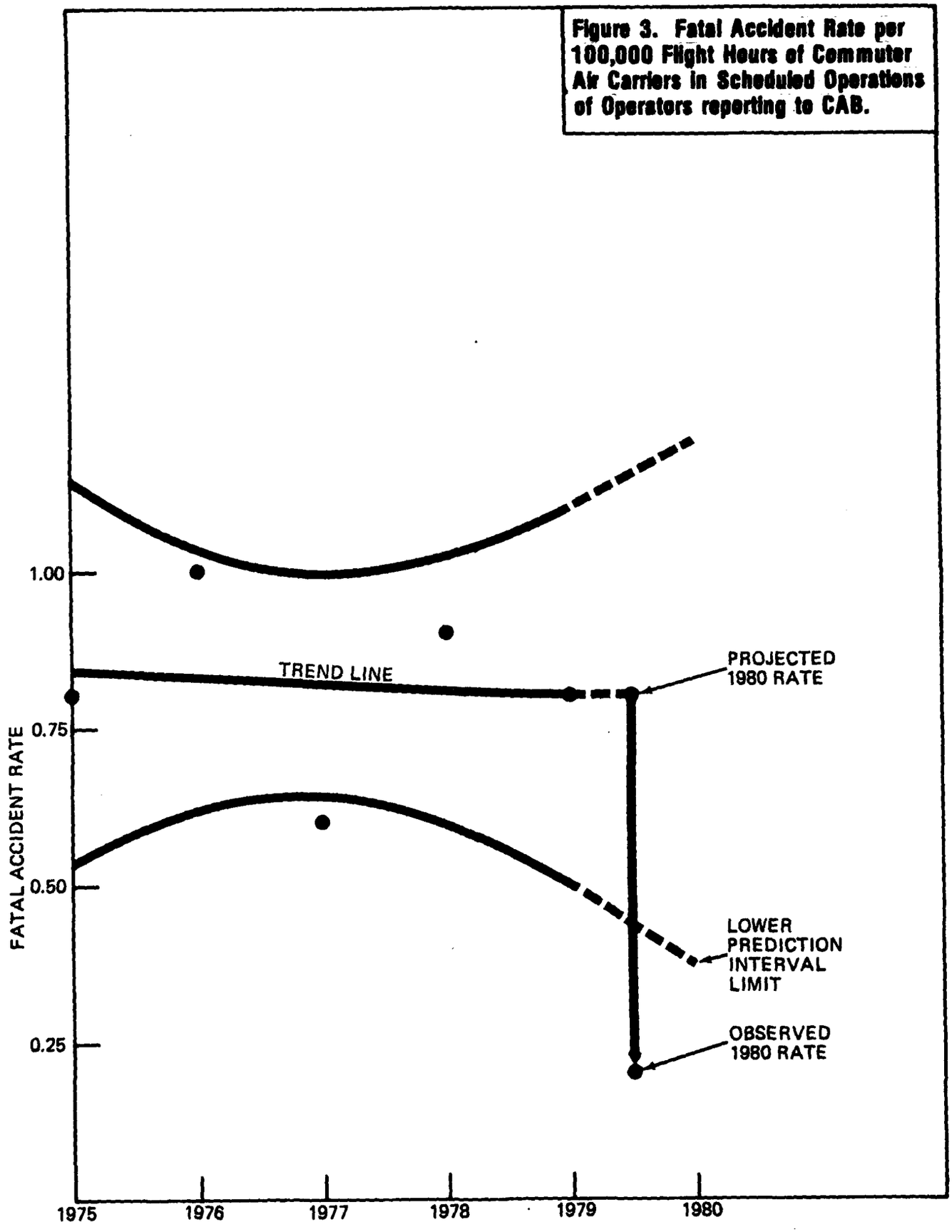
Figure 3. Fatal Accident Rate per 100,000 Flight Hours of Commuter Air Carriers in Scheduled Operations of Operators reporting to CAB.



As indicated in Figures 1, 2, and 3, the observed 1980 accident and fatality rates fall below the 90 percent prediction interval limit, indicating a rate decrease. 1/ For 1980, rates per 100,000 flight hours were 3.3 projected versus 2.3 actual for accidents, 0.8 projected versus 0.2 actual for fatal accidents, and 5.0 projected versus 1.2 actual for fatalities. Appendix B lists the linear trend equation coefficients. These results suggest that the FAA safety programs combined with industry efforts have had an impact on commuter airline safety during the first half of 1980.

Figure 4 compares the commuter, certificated air route carrier, and general aviation accident rate trends. While there was virtually no relative change from 1975 to 1979 between commuters and certificated air carriers, there was a significant relative improvement in the commuter rate for the first half of 1980. In addition, while all three accident rates have declining trends, only the commuter rate dropped significantly below its trend in 1980. A similar safety improvement analysis based on rates per departure, as opposed to rates per hour, also results in the conclusion that there has been a significant improvement in commuter safety.

1/ The simplifying assumption of a constant accident rate between 1975 and 1979 does not affect the conclusions. In that case, the variance of the data is slightly greater but so is the difference between the projected and observed rates, so that the statistical significance of the decrease is maintained. The average pre-1980 rate is 3.6, the 1980 rate is 2.3, and the significance level is 90 percent.

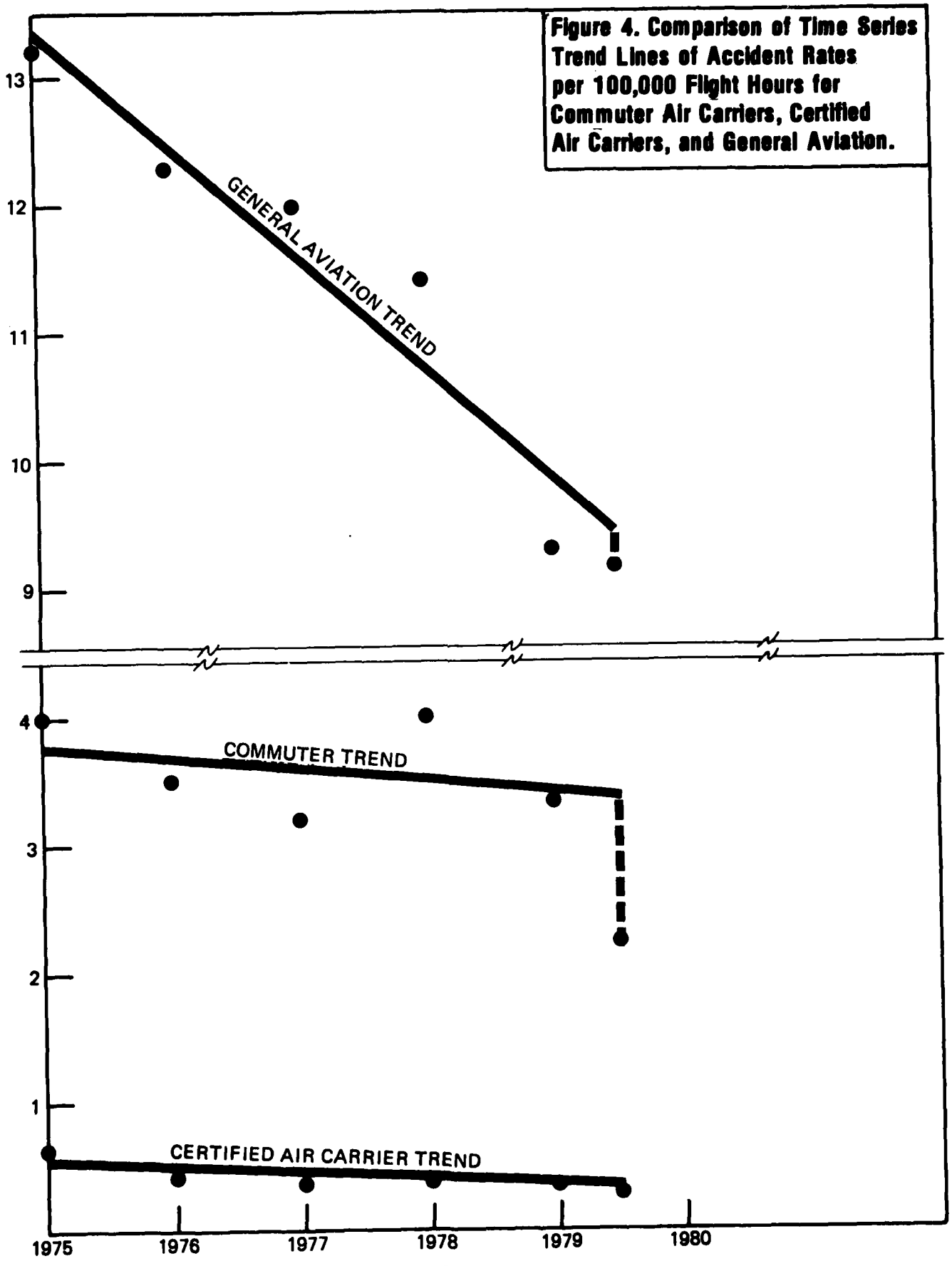


Figure 4. Comparison of Time Series Trend Lines of Accident Rates per 100,000 Flight Hours for Commuter Air Carriers, Certified Air Carriers, and General Aviation.

3. ACCIDENT ANALYSIS

During the last year, there have been ongoing, as well as newly implemented, FAA safety programs such as the Part 135 revisions discussed in Section 1 and Appendix A. The following section examines accident types and circumstances to determine potential sources of observed safety improvements in the commuter airline industry.

3.1 Accident Circumstances

Appendix A of this report summarizes the National Transportation Safety Board (NTSB) causes and related accident factors and relates them to the directly applicable recent FAA safety programs and regulatory revisions. Given the nature of the recent revisions to Part 135, the occurrence of certain accident circumstances seems more likely to be impacted by the revision than others. More stringent commuter airline maintenance and operations personnel requirements and procedures were a major element of Part 135 revisions and these elements should decrease in importance in accident circumstances. Accident circumstances not likely to be impacted by the Part 135 revisions are those involving airframe, powerplant, airport/airways facilities, weather, terrain, and miscellaneous.

NTSB has determined the causes and contributing factors for 180 commuter accidents for the period 1975-1978, however, to date, the NTSB has not completed briefs of accidents involving commuter air carriers in 1980. In order to compare the 1980 accident circumstances with the 1975-1978 accident circumstances, a preliminary analysis of the 34 commuter accidents occurring

from January 1 through October 1, 1980, was made by FAA personnel to determine circumstances contributing to these accidents. 2/ Table 4 shows the results of this analysis along with a summary of the NTSB Accident Briefs of the 180 accidents in the 1975-1978 period referred to above. Under the method used by NTSB, a single accident may be assigned more than one pilot training factor and more than one maintenance, operation or inspection personnel factor. Because of these multiple assignments of generic classifications for a single accident, the construction and statistical analysis of a meaningful simple factor rate is not possible.

TABLE 4
ACCIDENT CIRCUMSTANCES FOR 180 COMMUTER ACCIDENTS, 1975-1978, AND 34 COMMUTER ACCIDENTS, JANUARY 1 - JUNE 30, 1980

Circumstances		1975-1978		1980	
		Number	Circumstance/ Accident	Number	Circumstance/ Accident
Part 135 Related	Pilot	228	1.27	62	1.82
	Personnel	61	0.34	14	0.41
Non-Part 135 Related	Other*	242	1.34	28	0.82
Total		531	2.95	104	3.05

*Includes: airframe, powerplant, systems, airports/airways facilities, weather, terrain, and miscellaneous.

2/ These determinations are not to be considered official and are based on FAA field inquiries and preliminary accident notifications and preliminary information from NTSB Form 6120.19, Notification of Transportation Accident/Incident Reports.

In order to investigate changes in accident circumstances, time series accident data had to be constructed from data in Tables 2 and 4. This was done in the following manner: the average number of accident circumstances per accident, f_i, was computed for the 1975-1978 period for the three categories listed in Table 4; these are then multiplied by the number of accidents per year, A_n, to estimate the annual number of accident circumstances, F_{ni}, i.e., $F_{ni} = A_n x f_i$, where i is the accident circumstance index and n is the year index. The reconstructed time-series accident circumstance data are shown in Table 5 along with the accident circumstance rates. 3/

The time series data and trend lines for the three circumstance categories are displayed in Figures 5, 6, and 7. The projected and observed 1980 rates are compared with the following results. There are differences in the projected and observed 1980 pilot and personnel rates, but the differences are not great enough to establish a statistically significant change. More data are necessary to determine whether there has been a real decrease in pilot and personnel circumstances associated with accidents. The other circumstances (airframe, powerplant, systems, airports/airway facilities, weather, and terrain) show a statistically significant decrease. There is, however, less direct association between these items and Part 135 revisions and may reflect the impact of other actions on the part of FAA and the commuter airlines.

3/ It is recognized that because of the downward trend for the accident rates from 1975 through 1979, Figure 2, the relative proportion of circumstances would also probably change, however, the trend is slight and, therefore, the use of constant proportions for the accident circumstances, f_i, over the whole period should be a good approximation.

TABLE 5

ESTIMATED TIME SERIES ACCIDENT CIRCUMSTANCES AND RATES OF COMMUTER AIR CARRIERS IN SCHEDULED OPERATIONS OF OPERATORS REPORTING TO CAB*

	Number of Circumstances			Circumstance Rate (Per 100,000 Flight Hours)			Circumstance Rate (Per 100,000 Departures)		
	Part 135 Related		Non-Part 135	Part 135 Related		Non-Part 135	Part 135 Related		Non-Part 135
	Pilot	Personnel	Related**	Pilot	Personnel	Related**	Pilot	Personnel	Related**
1975	48	13	51	5.05	1.36	5.37	3.25	0.88	3.46
1976	43	12	46	4.45	1.24	4.76	2.80	0.78	2.99
1977	46	12	48	4.12	1.08	4.30	2.74	0.71	2.86
1978	65	17	68	5.11	1.34	5.34	3.33	0.87	3.07
1979	50	13	52	4.24	1.10	4.41	2.95	0.88	3.07
1980	23	6	13	3.84	1.00	2.17	2.84	0.74	1.61

*See Table 2 for number of accidents, flight hours, and departures.

**Includes: airframe, powerplant, systems, airport/airways facilities, weather, terrain, and miscellaneous.

Figure 5. Part 135 Related, Pilot Circumstance Accident Rate per 100,000 Flight Hours of Commuter Air Carriers in Scheduled Operations of Operators reporting to CAB.

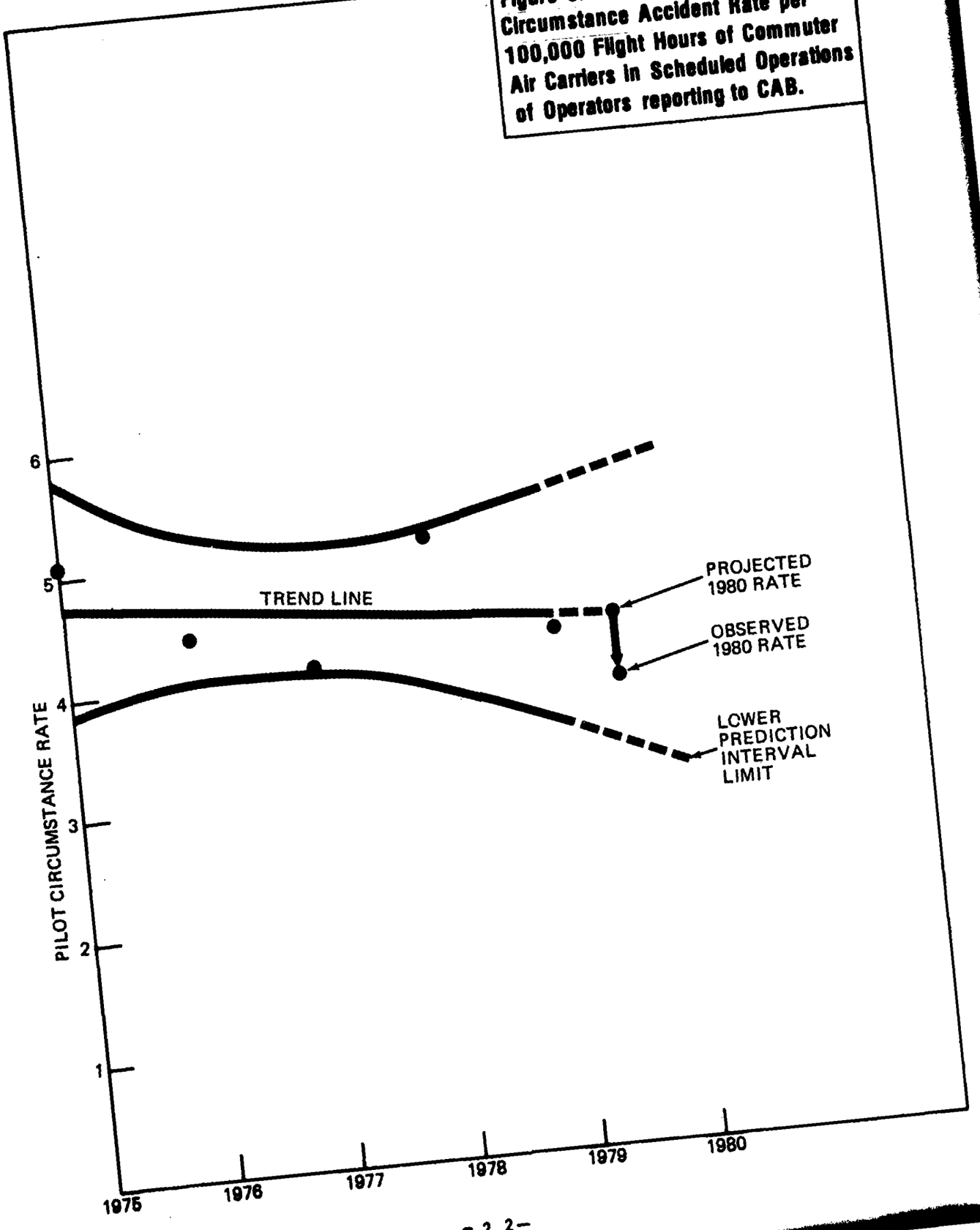


Figure 6. Part 135 Related, Personnel Circumstance Accident Rate per 100,000 Flight Hours of Commuter Air Carriers in Scheduled Operations of Operators reporting to CAB.

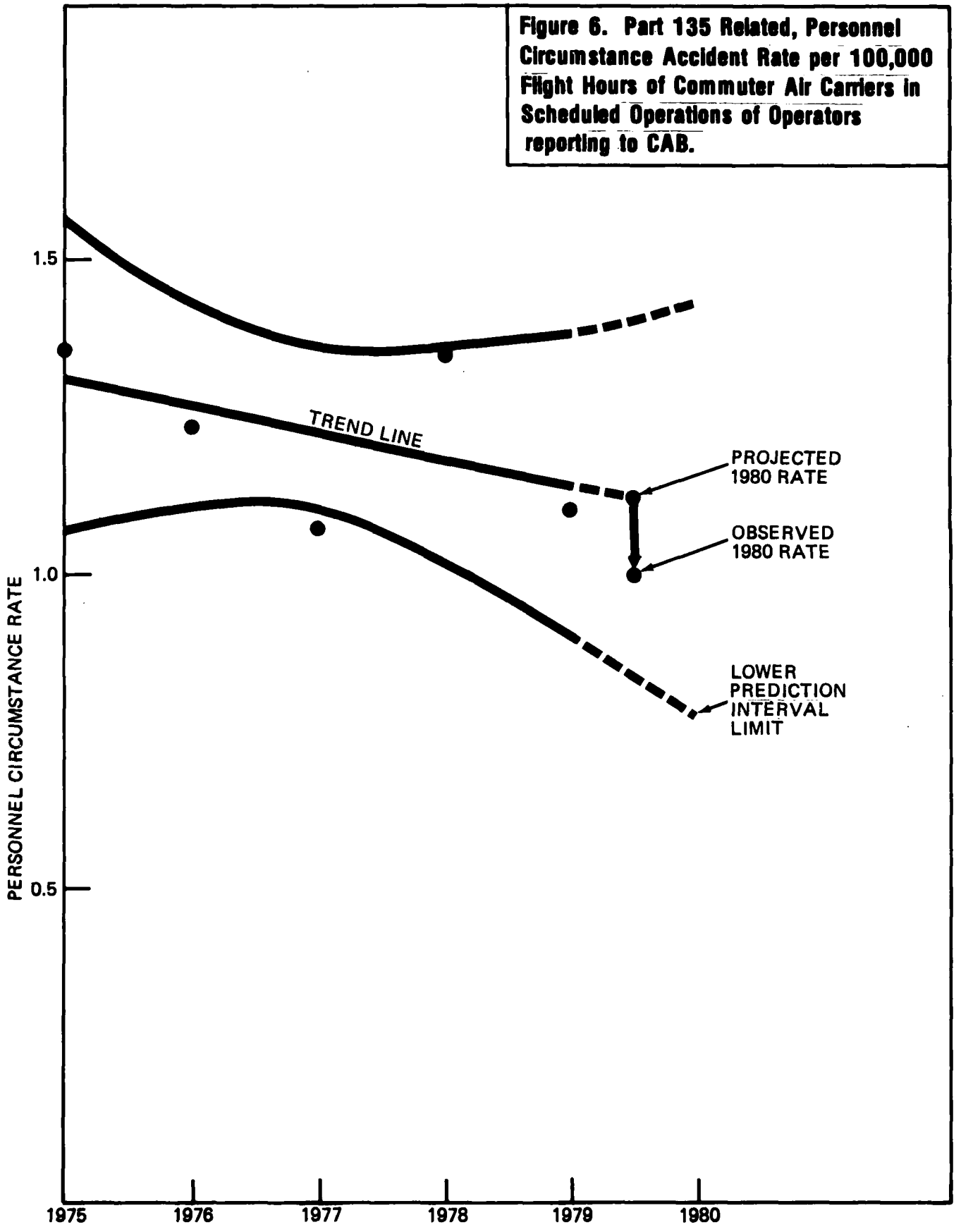
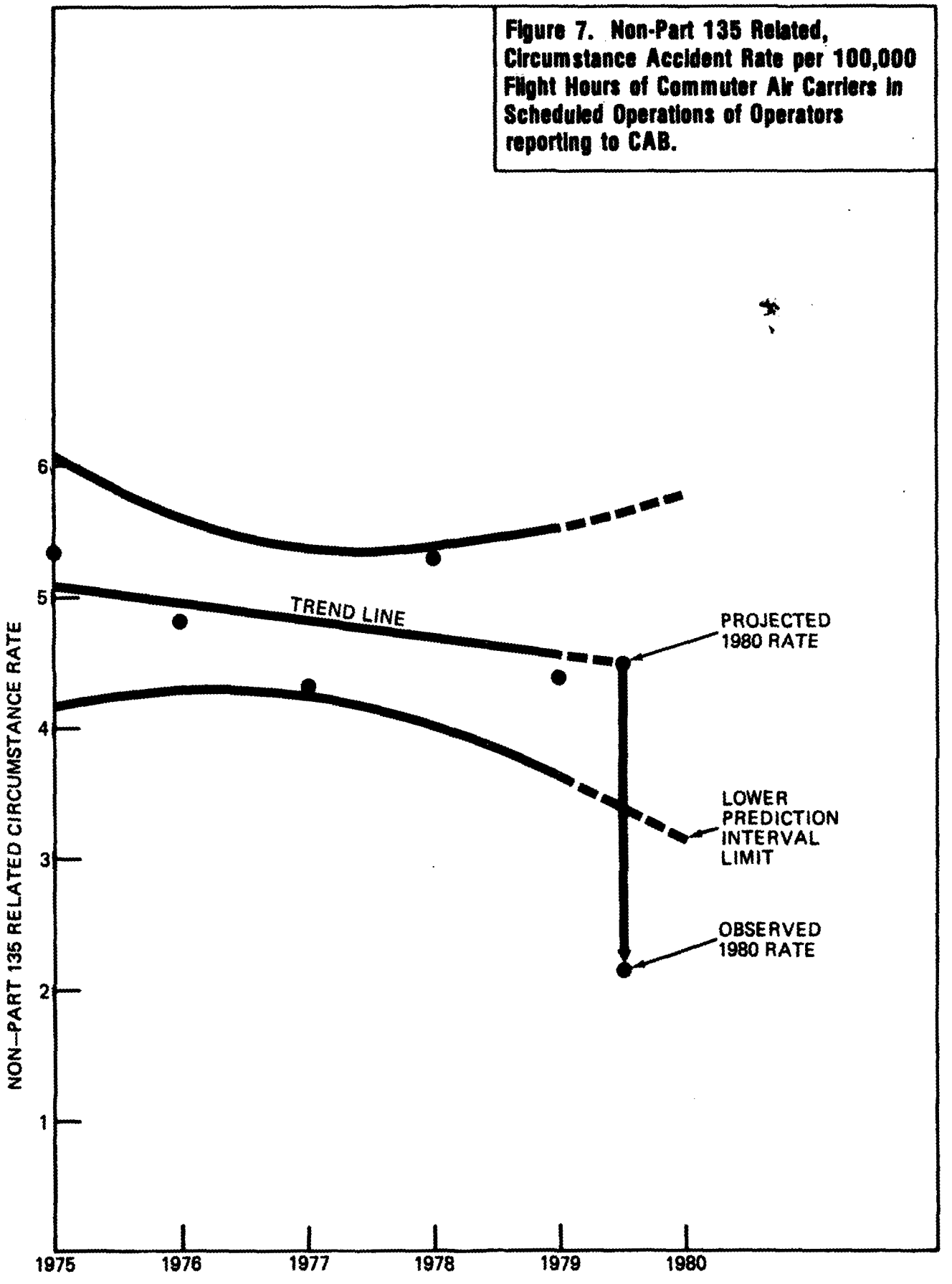


Figure 7. Non-Part 135 Related, Circumstance Accident Rate per 100,000 Flight Hours of Commuter Air Carriers in Scheduled Operations of Operators reporting to CAB.



3.2 Type of Accident

A list of accident type categories is given in Appendix C. The number of total commuter accidents and fatalities categorized by "first accident type" were tabulated from NTSB Accident Briefs for 1975-1978. NTSB Briefs were not available for 1980 and a preliminary determination of commuter accidents by type was made by FAA personnel for accidents occurring through October 1, 1980. These determinations are not official but are preliminary assessments based on FAA field inquiries and preliminary accident notifications (Telegraphic Accident Notification, FAA Form 8020-9, Accident/Incident Record, FAA Form 8020-5; or NTSB Form 6120.19, if available).

Although types of accidents do not relate directly to the accident circumstances discussed in Section 3.1, types of accidents may be loosely associated with them. For example, gear collapse and airframe failure accident types might be termed an "airframe" accident circumstance. Less obvious, gear retracted or undershoot/overshoot accident types might result in a "pilot" accident circumstance. Such a grouping of accident types and circumstances is shown in Table 6 for all commuters (as opposed to only operators reporting to the CAB). Only the collision grouping shows any apparent decrease in the relative share of accidents, fatal accidents, and fatalities after the revision of Part 135. Collision type accidents might be impacted by Part 135 revisions as well as other things. Chi-square analysis

TABLE 6

COMPARISON OF ALL COMMUTER ACCIDENTS BY FIRST ACCIDENT TYPE -
PRE AND POST-PART 135 REVISION
(1975-1978 AND 1980 THROUGH OCTOBER 1, 1980)

	Accidents				Fatal Accidents				Fatalities			
	Pre 135		Post 135		Pre 135		Post 135		Pre 135		Post 135	
	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Power Plant												
Engine Failure or Malfunction	23.4	(43)	20.6	(7)	30.2	(13)	50.0	(3)	23.8	(30)	73.9	(17)
Air Frame	9.2	(17)	8.8	(3)	2.3	(1)	0.0	(0)	4.8	(6)	0.0	(0)
Gear Collapse	5.4	(10)	8.8	(3)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Air Frame Failure	3.8	(7)	-	-	2.3	(1)	0.0	(0)	4.8	(6)	0.0	(0)
Collision	25.5	(47)	17.6	(6)	41.9	(18)	16.7	(1)	42.9	(54)	8.7	(2)
Collision with Ground/ Water (Controlled & Uncontrolled)	7.1	(13)	5.9	(2)	25.6	(11)	16.7	(1)	24.6	(31)	8.7	(2)
Collision With Objects on Ground	13.6	(25)	8.8	(3)	11.6	(5)	0.0	(0)	5.6	(7)	0.0	(0)
Collision With Aircraft (Both on Ground)	3.8	(7)	2.9	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Collision-Mid Air	1.1	(2)	0.0	(0)	4.7	(2)	0.0	(0)	12.7	(16)	0.0	(0)
Pilot	27.7	(51)	29.4	(10)	14.0	(6)	16.7	(1)	27.2	(28)	4.3	(1)
Gear Retracted	3.3	(6)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Stall/Mush or Spin	6.0	(11)	8.8	(3)	11.6	(5)	16.7	(1)	19.8	(25)	4.3	(1)
Undershoot/Overshoot	5.4	(10)	5.9	(2)	2.3	(1)	0.0	(0)	2.4	(3)	0.0	(0)
Wheels-Up	3.3	(6)	5.9	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Hard Landing	2.7	(5)	2.9	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Ground/Water Loop Swerve	7.1	(13)	5.9	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Other	14.1	(26)	23.5	(8)	11.6	(5)	16.7	(1)	6.3	(8)	13.0	(3)
Fire/Explosion	5.4	(10)	5.9	(2)	4.7	(2)	0.0	(0)	3.2	(4)	0.0	(0)
Turbulence	1.1	(2)	8.8	(3)	0.0	(0)	16.7	(1)	0.0	(0)	13.0	(3)
Miscellaneous	7.6	(14)	8.8	(3)	7.0	(3)	0.0	(0)	3.2	(4)	0.0	(0)
TOTAL	100	(184)	100	(34)	100	(43)	100	(6)	100	(126)	100	(23)

Totals and subtotals may not sum to 100% due to rounding.

Source: 1975-1978: First Commuter Air Carrier Safety Symposium, January 16-17, 1980, Appendix A, Exhibit 16. 1980: FAA Field Inquiry and Preliminary Accident Notifications (Telegraphic Accident Notification, FAA From 8020-9. Accident/Incident Record Form 8020-5; or NTSB Form 6120.19 if available).

of a 2 x 5 classification of the data indicated that there is no statistically significant difference between the two percentage distributions of the accident types at the .05 level of confidence ($X^2 = 2.52$). [4/]

A similar analysis was conducted for passenger commuter accidents. Table 7 contains the relative share and number of accidents by type for commuters reporting to the CAB. (A list of type accidents for all passenger commuters reporting and not reporting to CAB through October 1 is given in Appendix D). As can be seen in Table 7, the 1980 percentages for the pilot and collision groupings decreased after Part 135 revision. Proportion testing (.05 level of confidence) indicated that differences between the two time periods were not great enough to establish a statistically significant change.

The accident type rate per 100,000 departures before and after Part 135 revision is shown in Table 8. The rates decline in 1980 for the pilot, collision, and total of all accident type groupings. Statistical tests of the accident type rate indicated a significant difference between the two time periods at the .05 level of significance for the pilot and collision groupings, but the total showed no difference. The rate differences for the pilot and collision groupings between the two periods suggest that FAA and

4/ Alternatively, the total data for 1975-1978 were considered population percentages and the 1980 data were treated as sample percentages. Statistical testing of the differences between the 1980 and the 1975-1978 proportions indicates that the differences may be due to chance. They are not sufficiently large to reject the null hypothesis.

TABLE 7

COMPARISON OF PASSENGER COMMUTER ACCIDENTS BY FIRST ACCIDENT TYPE -
PRE AND POST-PART 135 REVISION
(OPERATORS REPORTING TO CAB DURING 1975-1978 AND 1980 THROUGH JUNE 30, 1980)

	Accidents				Fatal Accidents				Fatalities			
	Pre 135		Post 135		Pre 135		Post 135		Pre 135		Post 135	
	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Power Plant												
Engine Failure or Malfunction	24.0	(25)	36.4	(4)	31.8	(7)	100.0	(1)	21.2	(21)	100.0	(7)
Air Frame	8.7	(9)	18.2	(2)	4.5	(1)	0.0	(0)	6.1	(6)	0.0	(0)
Gear Collapse	5.8	(6)	18.2	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Air Frame Failure	2.9	(3)	0.0	(0)	4.5	(1)	0.0	(0)	6.1	(6)	0.0	(0)
Collision	24.0	(25)	9.1	(1)	36.4	(8)	0.0	(0)	43.4	(43)	0.0	(0)
Collision with Ground/ Water (Controlled & Uncontrolled)	6.7	(7)	0.0	(0)	22.7	(5)	0.0	(0)	25.3	(25)	0.0	(0)
Collision With Objects on Ground	10.6	(11)	0.0	(0)	4.5	(1)	0.0	(0)	2.0	(2)	0.0	(0)
Collision With Aircraft (Both on Ground)	4.8	(5)	9.1	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Collision-Mid Air	1.9	(2)	0.0	(0)	9.9	(2)	0.0	(0)	16.2	(16)	0.0	(0)
Pilot	26.9	(28)	9.1	(1)	13.6	(3)	0.0	(0)	23.2	(23)	0.0	(0)
Gear Retracted	4.8	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Stall/Mush or Spin	4.8	(5)	0.0	(0)	9.1	(2)	0.0	(0)	20.2	(20)	0.0	(0)
Undershoot/Overshoot	5.8	(6)	9.1	(1)	4.5	(1)	0.0	(0)	3.0	(3)	0.0	(0)
Wheels-Up	4.8	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Hard Landing	1.9	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Ground/Water Loop Swerve	4.8	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Other	16.3	(17)	27.3	(3)	13.6	(3)	0.0	(0)	6.1	(6)	0.0	(0)
Fire/Explosion	5.8	(6)	9.1	(1)	4.5	(1)	0.0	(0)	3.0	(3)	0.0	(0)
Turbulence	1.0	(1)	9.1	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Miscellaneous	9.6	(10)	9.1	(1)	9.1	(2)	0.0	(0)	3.0	(3)	0.0	(0)
TOTAL	100	(104)	100	(11)	100	(22)	100	(1)	100	(99)	100	(7)

Totals and subtotals may not sum to 100% due to rounding.

Source: 1975-1978: First Commuter Air Carrier Safety Symposium, January 16-17, 1980, Appendix A, Exhibit 16. 1980: FAA Field Inquiry and Preliminary Accident Notifications (Telegraphic Accident Notification, FAA From 8020-9. Accident/Incident Record Form 8020-5; or NTSB Form 6120.19 if available).

TABLE 8

COMPARISON OF COMMUTER ACCIDENTS BY FIRST ACCIDENT TYPE
PER 100,000 DEPARTURES - PRE AND POST-PART 135 REVISION
(OPERATORS REPORTING TO CAB DURING 1975-1978 AND 1980 THROUGH JUNE 30, 1980)

	Accidents				Fatal Accidents				Fatalities			
	Pre 135		Post 135		Pre 135		Post 135		Pre 135		Post 135	
	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.
Power Plant												
Engine Failure or Malfunction	.427	(25)	.494	(4)	.119	(7)	.123	(1)	.358	(21)	.865	(7)
Air Frame	.154	(9)	.247	(2)	.017	(1)	0.0	(0)	.102	(6)	0.0	(0)
Gear Collapse	.102	(6)	.247	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Air Frame Failure	.051	(3)	0.0	(0)	.017	(1)	0.0	(0)	.102	(6)	0.0	(0)
Collision	.427	(25)	.124	(1)	.136	(8)	0.0	(0)	.734	(43)	0.0	(0)
Collision with Ground/ Water (Controlled & Uncontrolled)	.120	(7)	0.0	(0)	0.0	(5)	0.0	(0)	.427	(25)	0.0	(0)
Collision With Objects on Ground	.188	(11)	0.0	(0)	.017	(1)	0.0	(0)	.034	(2)	0.0	(0)
Collision With Aircraft (Both on Ground)	.085	(5)	.124	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Collision-Mid Air	.034	(2)	0.0	(0)	.034	(2)	0.0	(0)	.273	(16)	0.0	(0)
Pilot	.478	(28)	.124	(1)	.051	(3)	0.0	(0)	.392	(23)	0.0	(0)
Gear Retracted	.085	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Stall/Mush or Spin	.085	(5)	0.0	(0)	.034	(2)	0.0	(0)	.341	(20)	0.0	(0)
Undershoot/Overshoot	.102	(6)	.124	(1)	.017	(1)	0.0	(0)	.051	(3)	0.0	(0)
Wheels-Up	.085	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Hard Landing	.034	(2)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Ground/Water Loop Swerve	.085	(5)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Other	.290	(17)	.371	(3)	.051	(3)	0.0	(0)	.102	(6)	0.0	(0)
Fire/Explosion	.102	(6)	.124	(1)	.017	(1)	0.0	(0)	.051	(3)	0.0	(0)
Turbulence	.017	(1)	.124	(1)	0.0	(0)	0.0	(0)	0.0	(0)	0.0	(0)
Miscellaneous	.171	(10)	.124	(1)	.034	(2)	0.0	(0)	.051	(3)	0.0	(0)
TOTAL	1.775	(104)	1.359	(11)	.375	(22)	.123	(1)	1.69	(99)	.865	(7)
Departures (10)[5]	58.6		8.1		58.6		8.1		58.6		8.1	

Totals and subtotals may not sum to 100% due to rounding.

Source: 1975-1978: First Commuter Air Carrier Safety Symposium, January 16-17, 1980, Appendix A, Exhibit 16. 1980: FAA Field Inquiry and Preliminary Accident Notifications (Telegraphic Accident Notification, FAA From 8020-9. Accident/Incident Record Form 8020-5 or NTSB Form 6120.19 if available).

industry safety programs may have helped in these areas. It appears that there has been a decrease in these categories since the new safety program changes were initiated and this strengthens the conclusion that pilot and personnel accident
circumstances discussed in Section 3.1 have decreased since the inception of the FAA safety program. The upper and lower critical values and the Z values for the proportion tests are given in Appendix E.

Commuter accident and fatality rates for the first half of 1980 have decreased from those experienced between 1975 through 1978. The impact of the safety program has affected a large segment of the commuter operators. The rate
of certain types of accidents has also decreased. Although one would also expect corresponding changes in the relative share of accident types, statistical analysis of available data does not verify a shift in the proportion of accident types.

4. CONCLUSIONS

1) The analysis indicates a significant improvement in commuter airline safety during the first half of 1980.

2) In particular, the data indicate a reduction in the accident and fatality rates for the first half of 1980.

3) Moreover, there has also been a relative improvement in the accident rates as compared to the certificated route carriers and general aviation.

4) There are differences between the observed and projected 1980 occurence of pilot and personnel accident circumstances. The lower than expected rates of these items might be directly influenced by the Part 135 revision, but the observed decrease is not great enough to establish a statistically significant change.

5) There is a statistically significant decrease in the incidence of airframe, powerplant, systems, airports/airways facilities, weather, terrain, and miscellanous circumstances associated with accidents.

6) There are statistically significant decreases in accident type rates which might be associated with commuter pilot requirements instituted by the Part 135 revision.

APPENDIX A

MAJOR SAFETY CHANGES TO PART 135 AND RELATION OF THESE AND OTHER FAA SAFETY PROGRAMS TO NTSB CAUSE/FACTORS

The appendix lists the major changes to Part 135, and relates these and the other FAA safety programs to the NTSB Cause/Factors (Exhibit 1), as reclassified in Appendix A, Commuter Airlines and Federal Regulations, 1926-1979, of the proceedings of the First Commuter Air Carrier Safety Symposium, January 1980 (see Exhibit 2). The NTSB Cause/Factors were consolidated in that study in order to facilitate data presentation.

List of Major Changes

Training-Related Cause/Factor

As a result of the revision of Part 135, 97 percent of the RPM's flown by commuter carriers will be by a pilot in command who holds an ATC certificate (135.243). In addition, Parts 135.321-351 call for an FAA approved training program for pilots (and other personnel), while Part 135.97 will insure that all carriers provide aircraft at facilities for pilot training and proficiency checks. Other Part 135 revisions which should reduce the incidence of training-related causes or factors include:

- Part 134.245, which calls for the co-pilot in commuter flights to hold a commercial pilot's license, with appropriate category, class and instrument ratings.
- Part 135.293 which requires yearly competency checks for pilots and co-pilots.
- Part 135.297 which requires IFR proficiency checks for pilots in command.

Attempted Operations with Known Deficiencies in Equipment: Cause/Factor

There are three Part 135 revisions which directly address this cause/factor. Part 135.179 specifies rules for flight with inoperable equipment and also a minimum equipment list for multi-engine aircraft. Part 135.69 includes rules which specify restrictions on or suspension of operations and continuation of flight rules during emergencies. Part 135.65 pertains to procedures for reporting flight irregularities, some of which may be due to equipment failures or deficiencies.

Weather-Related Cause/Factor

As a result of the Part 135 revision, 75 percent of commuter RPM's will be flown in aircraft with either weather radar or thunderstorm detection equipment (Part 135.173, .175). Other Part 135 revisions which should reduce the incidence of weather-related accidents include:

EXHIBIT 1

NTSB CAUSE/FACTORS AND DIRECTLY APPLICABLE FAA SAFETY PROGRAMS AND REGULATORY REVISIONS

Broad Cause/Factor	Detailed Cause/Factor	Directly Applicable FAA Safety Programs & Regulatory Revisions
Pilot	Training Related	135.97 135.243 135.245 135.293 135.297 135.321-.351
	Attempted Operations With Known Deficiencies in Equipment	135.65 135.69 135.179
	Weather Related	135.173, .175 135.213, .225 135.219 135.227
	Inadequate Pre-Flight Preparation and/or Planning	135.21, .23 135.27, .39
	Mismanagement of Fuel	135.223
	Familiarity with Operations	135.299
	Other Pilot Error/Faults	135.97 135.243 135.245 135.293 135.297 135.299 135.321- .351 Proposed Flight and Duty Time Regulations
Personnel	Maintenance, Servicing, Inspection	New Office of Airworthiness 135.21, .23 135.37- .39 135.411- .443
	Operational Supervising Personnel	135.37- .39 135.69 135.77
	Production-Design Personnel	Part 24 Lead Region Certification
	Other Personnel Inadequacies	135.21 135.37- .39
Airframe		Lead Region Certification
Powerplant Systems		Part 24 New Office of Airworthiness
Airports/Airways Facilities		Satellite Airports Programs Collision Avoidance System
Weather		Approach and Landing Systems
Terrain		Aviation Weather Detection
Miscellaneous		Short-Term Weather Tracking

EXHIBIT 2

RECLASSIFICATION OF NTSB CAUSES AND FACTORS

BROAD CAUSE/FACTOR	DETAILED CAUSE/FACTOR
PILOT	Training Related
	Attempted Operations Beyond Experience/Ability
	Delayed Action in Aborting Takeoff
	Delayed in Initiating Go-Around
	Exceeded Design Stress Limits of Aircraft
	Failed to Obtain/Maintain Flying Speed
	Failed to Follow Approved Procedures, Directives
	Improper Operation of Powerplant and Powerplant Controls
	Improper Operation of Brakes and/or Flight Controls
	Improper Operation of Flight Controls
	Premature Liftoff
	Improper Leveloff
	Improper IFR Operation
	Improper In-Flight Decision and Planning
	Inadequate Supervision of Flight
	Failed to Assure the Gear was Down and Locked
	Improper Recovery from Bounced Landing
	Misused or Failed to Use Flaps
	Failed to Maintain Directional Control
	Failed to Abort Takeoff
	Failed to Initiate Go-Around
	Other Pilot Errors/Faults
	Failed to See and Avoid Other Aircraft
	Failed to Use or Incorrectly Used Miscellaneous Equipment
	Exercised Poor Judgment
	Operated Carelessly
	Physical Impairment
	Spatial Disorientation
	Check Pilot Error
	Direct Entries
PERSONNEL	Maintenance, Servicing, Inspection
	Improper Maintenance (Maintenance Personnel)
	Improperly Serviced Aircraft (Ground Crew)
	Inadequate Inspection of Aircraft (Maintenance Personnel)
	Inadequate Maintenance and Inspection
	Operational Supervisory Personnel
	Inadequate Flight Training--Procedures
	Inadequate Supervision of Flight Crew
	Failure to Provide ADEQ Directives, Manuals, Equipment
	Deficiency, Company-Maintained Equipment, Service Reqs.
	Production-Design Personnel
	Poor/Inadequate Design
	Other Personnel Inadequacies
	Flight Instructor
	Weather Personnel
	Miscellaneous Personnel
	Third Pilot
	Flight Engineer
	Flight Attendant
	Dispatching
	Traffic Control Personnel
	Airport Supervisory Personnel
AIRFRAME	All NTSB Categories
POWERPLANT	All NTSB Categories
SYSTEMS	All NTSB Categories
AIRPORTS/AIRWAY FACILITIES	All NTSB Categories
WEATHER	All NTSB Categories
TERRAIN	All NTSB Categories
MISCELLANEOUS	All NTSB Categories
UNDETERMINED	

- o Parts 135.213 and 225 which require weather reports for IFR operations and takeoff, approach, and landing minimums for IFR operations.

- o Part 135.219 which specifies that weather at destination airports must be at or above IFR minimums before flight commences.

- o Part 135.227 which prohibits flying into icing conditions under either IFR or VFR without sufficient icing protection.

Inadequate Pre-Flight Preparation and/or Planning: Cause/Factor

One of the more important revisions to Part 135 pertains to this cause/factor. Part 135.21 calls for the development of a detailed manual of procedures for compliance with FAA operations rules (135.23).

Mismanagement of Fuel: Cause/Factor

Part 135.223 directly addresses this cause/factor by requiring that sufficient fuel to reach an alternate airport in IFR conditions with 45-minute reserves be available before flight commences.

Familiarity with Operations: Cause/Factor

Many pilot errors which are included in this cause/factor category may be prevented by the line checks on representative routes and representative airports called for by Part 135.299. Compliance with this rule will help to ensure that pilots are more familiar with the terrain, airports, and other details of the routes which they normally fly.

Other Pilot Errors/Faults: Cause/Factor

The Part 135 revisions discussed above for (1) training-related and (2) familiarity with operations causes and factors should help to prevent many of the errors in judgment and procedures which are included in this category.

The importance of these new programs, and especially revisions of Part 135, cannot be over-emphasized. Pilot errors and inadequacies accounted for 56.7 percent of the causes of commuter accidents in the period 1975 through 1978 while 18.3 percent of the factors contributing to accidents were attributable to this broad category in that same period. The effectiveness of these new programs can only be judged once they have become fully effective. The year 1979 has been a transition period from the old Part 135 regulations to the new. Thus, 1980 will be the first full year in which commuter operations are affected by revised Part 135.

Broad Cause/Factor: Personnel

Maintenance, Servicing, and Inspection: Cause/Factor

As a result of the Part 135 revision, two-thirds of the commuter aircraft fleet will be maintained to Part 121 (scheduled carrier) standards. In addition, in its headquarters' reorganization, the FAA has created a new Office of Airworthiness. Among the responsibilities of this new office will be the approval of operator aircraft maintenance programs and airworthiness certification. The specific changes in Part 135 regulations which pertain to this cause/factor category are:

- Parts 135.37-.39 which requires a qualified director of maintenance who, in addition to other requirements, holds certificates with airframe and powerplant ratings.
- Part 135.433 which requires that carriers provide adequate training programs and facilities for training of maintenance personnel.
- Parts 135.411-.433 which require certificated inspection personnel, approved aircraft inspection and maintenance programs, reports to the FAA on mechanical failures, and responsibilities of the carriers for maintenance programs.

Operational Supervisory Personnel: Cause/Factor

The requirements in Parts 135.37 and .39 for management personnel, including the chief pilot, director of operations, and director of maintenance, should improve the performance of operations personnel.

Production/Design Personnel: Cause/Factor

Two programs currently underway at the FAA should help to prevent design deficiencies of future commuter aircraft. The light transport airplane-airworthiness review (Part 24) contemplates the development of a separate set of airworthiness standards for multi-engine airplanes that have a suggested maximum passenger seating configuration of about 60 seats, and a maximum gross weight of about 50,000 pounds. These new aircraft will be required to meet certification standards which more nearly approximate those required of Part 25 (scheduled carrier) aircraft. In addition, the FAA's new lead region aircraft type certification program should insure that the best agency employees are utilized in the type certification procedures and approval process.

Other Personnel Inadequacies: Cause/Factor

Improvement in the qualifications of operations supervisory personnel should aid in reducing the incidence of accidents attributable to other personnel--e.g., weather personnel, third pilots, flight engineers,

flight attendants, and dispatchers. In addition, manual procedures for compliance with FAA operating rules called for in Part 135.21 also apply to the activities of these other personnel.

Personnel causes and factors accounted for 11.5 percent of all factors and causes of commuter accidents in the 1975-1978 period.

Other Broad Cause/Factor Categories: Airframe, Powerplant, Systems, Airports/Airways/Facilities, Weather, Terrain, and Miscellaneous

The new FAA safety programs instituted since 1977 also apply to these broad cause/factor categories. The lead region program, the new Part 24, and the creation of the new Office of Airworthiness all should contribute to a reduction in the incidence of accidents attributable to Airframe deficiencies. The lead region program also will apply to the certification of new aircraft and Powerplants. In addition, the collision avoidance system currently being evaluated and tested by the FAA should also improve the performance of airports and airways. Ongoing FAA research and development programs pertaining to approach and landing systems and collision avoidance systems directly pertain to the System deficiencies. The same research and development program contemplates the introduction of improved aviation weather detection and display and short-term weather tracking and prediction and should, therefore, aid in the reduction of accidents attributable to Weather-related phenomena.

As a group, these other broad cause/factor categories accounted for 32.4 percent of the causes of all commuter accidents in the 1975-1978 period and were also mentioned as factors in 69.1 percent of these accidents.

APPENDIX B

LINEAR TREND EQUATION COEFFICIENTS

The linear trend equation is

$$Y_T = A + Bt, \qquad (B.1)$$

where t represents time, and the coefficients A and B are calculated from the time series data based upon the method of least squares. Table B.1 lists the coefficients for the trend lines shown in Figures 1 through 7.

TABLE B.1

LIST OF LINEAR TREND EQUATION COEFFICIENTS

Figure		Coefficient	
		A	B
1		3.78	-0.09
2		2.14	0.57
3		0.84	-0.01
4	Commuter	3.78	-0.09
	Certificated Air Carrier	0.55	-0.06
	General Aviation	13.12	-0.61
5		4.79	-0.10
6		1.31	-0.04
7		5.10	-0.13

APPENDIX C

LIST OF ACCIDENT TYPES
(National Transportation Board Categories

Type of Accident

1. Ground-Water Loop - Swerve
2. Dragged Wingtip, Pod, or Float
3. Wheels-Up
4. Wheels-Down Landing in Water
5. Gear Collapsed
6. Collision With Aircraft
   a. Both in Flight
   b. One Airborne
   c. Both on Ground
7. Collision with Ground/Water
   a. Controlled
   b. Uncontrolled
8. Collided With
   a. Wires/Poles
   b. Trees
   c. Residence(s)
   d. Other Buildings
   e. Fence, Fenceposts
   f. Electronic Towers (includes guy wires)
   g. Runway or Approach Lights
   h. Airport Hazard
   i. Animals, Livestock
   j. Crop
   k. Flagman, Loader
   l. Ditches
   m. Snowbank
   n. Parked Aircraft (unattended)
   o. Automobile
   p. Dirt Bank
   q. Other
9. Bird Strike (Collision With Birds)

10. Stall

    a. Spin
    b. Spiral
    c. Mush

11. Fire or Explosion

    a. In Flight
    b. On Ground

12. Airframe Failure

    a. In Flight
    b. On Ground

13. Engine Tearaway

14. Engine Failure or Malfunction

15. Propeller/Rotor Failure

    a. Propeller
    b. Tail Rotor
    c. Main Rotor

16. Propeller/Rotor Accident to Person

17. Jet Intake/Exhaust Accident to Person

18. Propeller/Jet/Rotor Blast

19. Turbulence

20. Hail Damage to Aircraft

21. Lightning Strike

22. Evasive Maneuver

23. Uncontrolled Altitude Deviations (Transport Type Aircraft Only)

24. Ditching

25. Missing Aircraft, Not Recovered

26. Miscellaneous/other

27. Undetermined

APPENDIX D

PASSENGER COMMUTER ACCIDENTS THROUGH OCTOBER 1, 1980 FOR ALL OPERATORS BY FIRST ACCIDENT TYPE (OPERATORS REPORTING AND NOT REPORTING TO CAB)

	Accidents		Fatal Accidents		Fatalities	
	%	No.	%	No.	%	No.
Power Plant						
Engine Failure or Malfunction	26.1	(6)	75.0	(3)	85.0	(17)
Air Frame	13.0	(3)	0.0	(0)	0.0	(0)
Gear Collapse	13.0	(3)	0.0	(0)	0.0	(0)
Collision	13.0	(3)	0.0	(0)	0.0	(0)
Collision with Ground/Water (Controlled & Uncontrolled)	4.3	(1)	0.0	(0)	0.0	(0)
Collisions With Objects on Ground	4.3	(1)	0.0	(0)	0.0	(0)
Collisions With Aircraft (Both on Ground)	4.3	(1)	0.0	(0)	0.0	(0)
Pilot	26.1	(6)	0.0	(0)	0.0	(0)
Stall/Mush or Spin	4.3	(1)	0.0	(0)	0.0	(0)
Undershoot/Overshoot	8.7	(2)	0.0	(0)	0.0	(0)
Wheels-Up	8.7	(2)	0.0	(0)	0.0	(0)
Ground/Water Loop Swerve	4.3	(1)	0.0	(0)	0.0	(0)
Other	21.7	(5)	25.0	(1)	15.0	(3)
Fire/Explosion	4.3	(1)	0.0	(0)	0.0	(0)
Turbulence	13.0	(3)	25.0	(1)	15.0	(3)
Miscellaneous	4.3	(1)	0.0	(0)	0.0	(0)
TOTAL	100.0	(23)	100.0	(4)	100.0	(20)

Totals and subtotals may not sum to 100% due to rounding.

Source: FAA Field Inquiry and Preliminary Accident Notifications (Telegraphic Accident Notification FAA Form 8020-9, Accident/Incident Record FAA Form 8020-5; or NTSB Form 6120.19 if available).

APPENDIX E

UPPER AND LOWER CRITICAL VALUES FOR PASSENGER COMMUTER FIRST ACCIDENT TYPE PER DEPARTURE (OPERATORS REPORTING TO CAB)

	Lower Critical Value ($x10^{-5}$)	p_1-p_2 ($x10^{-5}$)	Upper Critical Value ($x10^{-5}$)	Accept H_o	Reject H_o	Z Value (Must be Greater Than 1.96 to Reject H_o
Power Plant	-.512	-.067	+.512	X		-0.26
Air Frame	-.357	-.093	+.357	X		-0.51
Collision	-.294	+.303	+.294		X	2.02
Pilot	-.300	+.354	+.300		X	2.31
Other	-.441	-.081	+.441	X		-0.36
Total	-.872	+.416	+.872	X		0.94
Fatal Accidents	-.288	+.252	+.288	X		1.72
Fatalities	-.721	+.825	+.721		X	2.24

Hypothesis = H_o

H_o: $p_1-p_2 = 0$ (the proportion of 1975-1978 and 1980 accident type per departure is equal and no disparity exists)

H_1: $p_1-p_2 \neq 0$ (the proportion of 1975-1978 and 1980 accident type per departure is not equal and a disparity exists)

p_1 = 1975-1978 proportions

p_2 = 1980 through 6/30/80 proportions

+ for p_1-p_2 shows that the percentage decreased in 1980

α = 0.05 level of confidence

Z = tabular value under areas of normal curve. Z must be greater than 1.96 to reject H_o

Decision Rule

Accept H_o if $CV_1 < p_1-p_2 < CV_2$

Reject H_o if $p_1-p_2 \leq CV_1$ or $p_1-p_2 \geq CV_2$

where (CV_1 and CV_2 are the lower and upper critical values.

Source: Table 8

APPENDIX B

LIST OF REGISIRANTS

REGISTRANTS

SECOND ANNUAL COMMUTER AIR CARRIER SYMPOSIUM
JANUARY 15 - 16, 1981

Gary Adamson
Air Midwest
Wichita, Kansas 67209

James P. Andersen
Transportation Systems Center
Kendall Square
Cambridge, MA 02142

Wayne C. Andersen
Nebraska Department of
Aeronautics
P.O. Box 82088
Lincoln, NE 68501

Thomas Appleton
DeHavilland Aircraft Ltd.
Downsview, Ontario
Canada M3K 145

William S. Arner
Wings Airways
Pennsylvania Aviation, Inc.
Wings Field
Blue Bell, PA 19422

Frederick J. Arnold
Crown Airways Inc.
Box 268
Falls Creek, PA 15899

Ray P. Arvin
Kansas Department of Transportation
State Office Building
Topeka, KS 66612

Walter T. Atkinson
Cooper Aviation
7555 Lemmon Avenue
Dallas, TX 75209

Gordon F. Autry
Rocky Mountain Airways, Inc.
Hangar #6, Stapleton International
Airport
Denver, CO 80207

George Balaz
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, VA 22202

Dick Bardelmeier
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Wayne Barlow
Federal Aviation Administration
2300 East Devon Ave.
Des Plaines, Illinois 60018

J. H. Barnes
Pratt & Whitney Aircraft of Canada
P.O. Box 10
Longueuil, Quebec, Canada

Robert A. Barnes
AeroMech Airlines
P.O. Box 2550
Clarksburg, WV 26301

Steven Bauml
Port Authority of New York
and New Jersey
1 World Trade Center Rm 65E
New York, New York 10048

William R. Beech
Fairchild Swearingen
P.O. Box 32486
San Antonio, Texas 78284

Richard C. Beitel
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Stanley Bernstein
Air Line Pilots Association
Air New England

Don Bethel
Royale Airlines, Inc.
Shreveport Regional Airport
Shreveport, LA 71118

Philip Biazzo, Jr.
Union of Professional Airmen
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

Roy A. Bird
De Havilland Aircraft
Garrett Blvd.
Downsview, Ontario, Canada

Harold P. Bishop
Transportation Systems Center
Kendall Square
Cambridge, MA 02142

Neal A. Blake
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Paul P. Bollinger
American Assoc. of Airport
Executives
2029 "K" St., N.W., Suite 701
Washington, D.C. 20006

Langhorne Bond
Administrator, FAA
800 Independence Ave., S.W.
Washington, D.C. 20591

Edward Bonekemper
Civil Aeronautics Board
1825 Connecticut Ave., N.W.
Washington, D.C. 20428

Marva Hylton Booker
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Bruce M. Bowen
National Equipment Leasing
McLean, VA 22102

William Bowne
Chase Manhattan Bank
1 Chase Manhattan Plaza
New York, New York 10081

Robert E. Breiling
International Learning Systems, Inc.
P.O. Box 4814
Stamford, Connecticut 06907

John Brito
Swearingen - Fairchild
Box 32486
San Antonio, Texas 78284

Bill Britt
Britt Airlines
Hulman Field
Terre Haute, Indiana 47803

A. Oakley Brooks, Jr.
Shorts (USA) Inc.
2222 Martin Drive, Suite 255
Irvine, CA 92715

Charles E. Bowler
11809 Yates Ford Rd.
Fairfax Station, VA 22039

Bernard C. Brown
British Aerospace, Inc.
Dulles International Airport
Washington, D.C. 20041

Daniel Burke
Air New England
Barnstable Airport
Hyannis, MA 02601

Fred Burnham
AVCO Lycoming
652 Oliver St.
Williamsport, PA. 17701

G. H. Patrick Bursley
National Transportation Safety
Board
800 Independence Ave., S.W.
Washington, D.C. 20594

Roy Byrd
De Havilland Aircraft of Canada
4858 Chevy Chase Blvd.
Washington, D.C. 20015

Bill Campbell
Lockheed Corp.
Marietta, GA 30063

Louis J. Cardinali
Federal Aviation Administration
P.O. Box 20636
Atlanta, GA 30320

James S.Carey
AVMARK, Inc.
1120 19th St., N.W.
Washington, D.C. 20002

J. Keith Carter
Pratt & Whitney Aircraft of Canada
P.O. Box 10
Longuevil, Quebec, Canada

R. Castro
Castro-Duco Associates Inc.
130 W Liberty Dr.
Wheaton, Ill 60187

Allyn J. Caruso
Bar Harbor Airlines
138 Maine Avenue
Bangor, ME 04401

Jerry M. Chavkin
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Tristram C. Colket, Jr.
Altair Airlines, Inc.
Scott Plaza 2
Philadelphia, PA 19113

Heather C. Conover
Massachusetts Port Authority
99 High St.
Boston, MA 02110

William V. Costello
Systems Analysis and Research Corp.
1801 K Street, N.W., Suite 801
Washington, D.C. 20006

John M. Cook
Piper Aircraft Corp.
3000 Medulla Rd.
Lakeland, Florida 33803

Richard Cook
Air Chaparral
P.O. Box 21060
Reno, Navada 89510

Kathryn B. Creedy
Commuter Air
4827 Rugby Ave.
Bethesda, MD 20008

Albert J. Crook
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591
San Antonio, Texas 78216

Scott Crossfield
Technical Consultant
Committe on Science & Technology
2321 Rayburn House Office Bldg.
Washington, D.C. 20515

Cal Crowder
Flight Safety International
P.O. Box 17923
San Antonio, TX 78216

Dennis J. Curcio
Genasys Corp.
11400 Rockville Pike
Rockville, MD 20850

Dan L. Dandrea
US Air
Commuter Activities
Washington National Airport
Washington, D.C. 20001

Gordon R. Davis
Glynn Co. Airport Commission
Glynco Jetport
500 Connole Street
Brunswick, GA 31520

Lou Davis, Editor
Commuter Air
4823 Rugby Rd.
Bethesda, MD 20014

Calvin Davison
Crowell & Moring
1100 Connecticut Ave., N.W.
Washington, D.C. 20036

Bill Deankyne
King Radio Corp.
400 W. Rogers Rd.
Olath, KS. 66062

Sidney DeKadt
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway Corp.
Arlington, VA 22202

Vincent DeMaggio
Cooper Airmotive
7555 Lemmon Avenue
Dallas, Texas 75209

Ken A. Denyer
British Aerospace Inc.
P.O. Box 17414 ent Leasing
Dulles International Airport
Washington, D.C. 20041

Gilbert DeVore
DeVore Aviation Corporation
6104 B Kircher Blvd., N.E.
Albuquerque. NM 87109

Patrick L. DeYoung
Aviation Equipment Leasing
P.O. Box 34449
Washington, D.C. 20034

Alan Diehl
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Barbara Dixon
National Transportation Safety Board
800 Independence Ave., S.W.
Washington, D.C. 20594

Wayne Dixon
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

John Dodson
Union of Professional Airmen
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

Stanley L. Doepke, Jr.
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

F. Charles Doney
San Jaun Airlines
P.O. Box 21060
Reno, Navada 89510

Mark F. Donnelly
Sikorsky Aircraft
North Main St.
Division Planning and Analysis
Strafford, CT 06602

David B. Dorriss
Wings Airways
Pennslyvania Aviation, Inc.
Wings Field
Blue Bell, PA 19422

Richard Dutton
Bar Harbor Airlines
138 Maine Avenue
Bangor, ME 04401

Duane R. Ekedahl
Commuter Airline Association
1101 Connecticut Ave., N.W.
Washington, D.C. 20036

John I. Elliott
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Robert F. Epp
Transport Workers Union of America
142 Mineola Avenue
Roslyn Heights, N.Y. 11577

George Ernwine
Shorts USA Inc.
2222 Martin Drive, Suite 255
Irvine, CA 92715

George A. Eyer
George Eyer Associates
27 E 62nd
New York, N.Y. 11021

Robert L. Faith
Federal Aviation Administration
P.O. Box 14
Anchorage, Alaska 99513

Ed C. Fell
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Jim Fenske
Union of Professional Airmen
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

David Ferron
Wilcox Electric
1400 Chestnut
Kansas City, MO 64127

Jerry W. Fesmire
Mid South Airlines
P.O. Box 1301
Southern Pines, N.C. 28387

Genese L. Fileccia
AFWAL IFIGR
W-PAFB, Ohio 45433

Matthew Finucane
Aviation Consumer Action Project
P.O. Box 19029
Washington, D.C. 20036

Charles R. Foster
Federal Aviation Administration
King County International Airport
Seattle, WA 98108

Ralph Freeman
Air Line Pilots Association
43 Dixwell Ave.
Quiney, MA 02169

William P. Gamble
New Air
Tweed New Haven Airport
New Haven, CT 06512

Jack Gardner
Pacer Systems
87 Second Ave.
Burlington, Massachusetts 01803

Ron Gartenschlaeger
The Garrett Corporation
P.O. Box 29003
Phoenix, Arizona 85038

Aaron J. Gellman
Gellman Research Associates
100 West Ave.
Jenkintown, PA 19046

Al Gleske
Flight Safety International
1629 K St., N.W., Suite 400
Washington, D.C. 20006

Edward J. Godec
Air Wisconsin Inc.
Outagamie County Airport
Appleton, WI 54911

Arthur W. Gorman
Atlantic Aviation Corporation
P.O. Box 15000
Wilmington, Delaware 19850

Joseph Gude
de Havilland Aircraft of Canada
4858 Chevy Chase Blvd.
Washington, D.C. 20015

Richard M. Guetzow
Desert Pacific Airlines
15233 Ventura Blvd., Suite 212
Sherman Oaks, CA 91403

Bruce M. Gunberg
Rocky Mountain Airways, Inc.
Hangar #6, Stapleton International
Airport
Denver, CO 80207

William Hackenberg
Cardlon Electronic
Long Island Expressway
Woodbury, New Jersey 11797

Arthur G. Hailand
Arthur G. Hailand Jr.
Mississippi Valley Airlines
222 East Wisconsin Ave.
Lake Forest, Illinois 60045

Trevor Hall
British Aerospace
Chadderton Works
Greengate, Middleton
Manchester, M24 1SA, England

Dave Hansen
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, D.C. 22202

John R. Harrison
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

John Hawarth
De Havilland Aircraft of Canada
4858 Chevy Chase Blvd.
Washington, D.C. 20015

George C. Hay
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Joseph O. Hearne
Peat, Marwick, Mitchell and Co.
1900 K Street, N.W.
Washington, D.C. 20006

Richard L. Hellman
General Electric Co.
1000 Western Ave.
Lynn, Massachusetts 01910

Bill Hendricks
National Transportation Safety
Board
Washington D.C. 20594

Jill M. Hendrickson
Travel Management Daily
1625 I St., N.W. Suite 820
Washington, D.C. 20006

George R. Henry
Scheduled Skyways
P.O. Box 1344
Fayetteville, Arkansas 72701

Richard A. Henson
Henson Airlines
P.O. Box 689
Hagerstown, MD 21740

James W. Hines
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Cornish F. Hitchcock
Aviation Consumer Action Project
P.O. Box 19029
Washington, D.C. 20036

John R. Hokason
Civil Aeronautics Board
Washington, D.C. 20428

John T. Hoffman
Air-Lift Associates, Inc.
P.O. Box 173
Morrisville, N.C. 27560

William Hollenbeck
American CASA Distributors, Inc.
6869 Airport Drive
Riverside, CA 92504

A. F. Horne, M.D.
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Seymour M. Horowitz
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

George E. Horwood
De Havilland Aircraft of Canada
Garrett Blvd.
Downsview, Ontario, Canada M3K 145

John Howarth
De Havilland Aircraft of Canada
Garrett Blvd.
Downsview, Ontario, Canada M3k 145

Roger J. Hoy
Pacer Systems
Burlington, MA 01803

Edward L. Huie
National Association of Air
Traffic Specialists
Suite 415
Wheaton Plaza North
Wheaton, MD 20902

David M. Hulick
American Security Bank
1501 Pennsylvania Ave., N.W.
Washington, D.C. 20013

Clinton L. Hunt
Aero-Craft Hydraulics
2428 W. Carson
Torrance, CA 90501

Kenneth S. Hunt
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Jack Hunter
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Charles Hutcheson
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Dennis C. Jackson
British Aerospace, Inc.
P.O. Box 17414
Dulles International Airport
Washington, D.C. 20041

Paul R. Jaeger
Air Virginia
P.O. Box 10065
Lynchburg, VA 24506

Denise Janes
San Juan Arlines
Box 487
Friday Harbor, WA 98250

Kurt C. Jensen
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Dan Johnson
AVEMCO Insurance Company
P.O. Box 30007
Bethesda, MD 20014

Marvin D. Juliar
Algenene Bank Nederland
Suite 1607
135 So. LaSalle St.
Chicago, IL 60603

Lewis A. Kaplan
Air Nevada
P.O. Box 11207
McCarran International Airport
Las Vegas, Nevada 89111

Bruce R. Keiner, Jr.
Crowell & Moring
1100 Connecticut Ave., N.W.
Washington, D.C. 20036

Edmund P. Kennedy
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Sherry Kinland
Civil Aeronautics Board
1825 Connecticut Ave., N.W.
Washington, D.C. 20428

Rocky Kistner
Professional Pilot Magazine
Washington National Airport
West Bldg.
Washington, D.C. 20001

John Kirkwood
British Aerospace
Chadderton Works
Greengate, Middletown
Manchester, M24 1SA England

Dick Klass
DGA International
1225 19th Street, N.W.
Washington, D.C. 20036

Rene Koch
Air Virginia
P.O. Box 10065
Lynchburg, VA 24506

Steven Koenig
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, VA. 22202

Carolyn S. Kramp
Civil Aeronautics Board
1825 Connecticut Ave., N.W.
Washington, D.C. 20428

Emmett F. Kraus
Cessna Aircraft Co.
P.O. Box 7704
Wichita, Kansas 67277

Paul E. Krebs
Union of Professional Airmen
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

Richard H. Laird
Offshore Logistics, Inc.
1700 W. Loop S., Suite 1290
Houston, Texas 77090

Richard F. Lally
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Elizabeth Landers
Henson Airlines
828 Schumaker Dr. #201
Salisbury, MD 21801

Margaret W. Lamb
Aviation Lawyer/Charter Pilot
P.O. Box 2841
Santa Fe, New Mexico 87501

John W. Larmer II
Genasys Corporation
11300 Rockville Pike
Rockville, MD 20852

James R. Lawver
Scenic Airlines, Inc.
241 E. Reno Ave.
Las Vegas, NV 89119

Alan Lea
Project Controller
Pratt & Whitney Aircraft of Canada
Box 10, Longueuil
Quebec, Canada J4K 4X9

Philippe Lebouc
Aerospatiale
37 BD De Montmorency
75781 Paris Cedex 16

Burce A. Lederer
Committee on Public Works and
Transportation
House of Representatives
Washington, D.C. 20515

Daniel P. Leonard
Aviation Convention News
651 Maryland Ave., N.E.
Washington, D.C. 20002

John Lind
AVEMCO Insurance Company
P.O. Box 30007
Bethesda, MD 20014

Gary L. Link
Boeing Commercial Airplane Co.
1700 N. Moore St.
Arlington, VA 22209

Richard Livingston
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Joseph Lobrige
Royale Airlines, Inc.
Shreveport Regional Airport
Shreveport, La. 71118

William A. Luby
Pennsylvania Airlines
P.O. Box 432
Middletown, PA 17057

Walter S. Luffsey
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Patricia Lynott
Chase Manhattan Bank
1 Chase Manhattan Plaza
New York, N.Y. 10081

Ralph W. Marol
Attn: Group L, 7th floor
First National Bank of Chicago
One First National Plaza
Chicago, IL 60670

John H. MacKinnon
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

John E. Marsh
Aviation Consultant
4617 N. Chambliss St.
Alexandria, VA 22312

David P. Marshall
Piper Aircraft Corp.
Lock Haven, PA 17745

John Masters
British Aerospace Inc.
P.O. Box 17414
Dulles International Airport
Washington, D.C. 20041

Stuart Mathews
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, VA 22202

Stephen C. Matula
3713 - 813 S. George Mason Dr.
Falls Church, VA 22041

John T. McDaniel
Langenthal Mills Inc.
P.O. Box 965
Rural Hall, N. Carolina 27045

George McDevitt
McDevitt & Sons, Inc.
875 Providence Highway
Dedham, Mass. 02026

Curtis McKay
Aviation Consultant
5311 Acacia Ave.
Bethesda, MD 20014

John P. McNamara
American CASA Distributors Inc.
6869 Airport Drive
Riverside, CA 92504

J. P. McVicker
Federal Aviation Administration
400 7th Ave., S.W.
Washington, D.C. 20591

Charles W. McWilliams
Wilcox Electric
1400 Chestnut St.
Kansas City, MO 21204

O. H. Mendenhall
Federal Aviation Administration
12 New England Executive Park
Burlington, MA 01803

Richard R. Merriman
Federal Aviation Administration
601 E. 12th St., Room 1664
Kansas City, Missouri 64106

C. O. Miller
System Safety, Inc.
7722 Bridle Path Lane
McLean, VA 22102

Dr. Stan Mohler, MD
Wright State University
Dayton, Ohio 45401

Manuel S. Monteiro
Embraer Aircraft Corporation
1100 N.E. 7th Ave.
Dania, Florida 33004

Laura M. Moore
American Security Banks
1501 Pennsylvania Ave., N.W.
Washington, D.C. 20013

Wesley C. Moore
Republic Airlines, Inc.
Hartsfield Atlanta International
Airport
Atlanta, Georgia 30320

Earl E. Morton
Swearingen Aviation Corporation
P.O. Box 32846
San Antonio, Texas 78284

John R. Munger
Emery Air Freight Corporation
2222 Camden Court, Suite 235
Oakbrook, Illinois 60521

Roger T. Munt
British Aerospace, Inc.
P.O. Box 17414
Dulles International Airport
Washington, D.C. 20041

Howard E. Murphy
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Richard A. Noble
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

J. E. O'Dell
Beech Aircraft Corporation
9709 East Central
Wichita, KA 67206

Kent Olsen
Pearson Air
1402 Fairchild
Port Angeles, WA 98362

Marvin Olson
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Robert E. Olson
Cochise Airlines
P.O. Box 41450
Tucson, Arizona 85717

Andrew Openchowski
DGA International
1225 19th St., N.W.
Washington, D.C. 20036

Austin F. Pacher
Federal Aviation Administration
P.O. Box 20636
Atlanta, Georgia 30320

John Park
Federal Aviation Administration
400 7th St., S.W.
Washington, D.C. 20590

Jerry C. Patterson
Harbor Airlines
P.O. Box J
Oak Harbor, Washington 98277

George Pelaez
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, VA 22202

Joseph Pontecorvo
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

B. Keith Potts
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Michael S. Potts
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Tom Prescott
Air Chaparral
1755 E. Plumb
Reno, Nevada 89510

Marisue C. Prince
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Donald Proctor
Boeing Commercial Aircraft
P.O. Box 3707
Seattle, Washington 98124

Dawson Ransome
Ransome Airlines
North Philadelphia Airport
Grant & Acadamy Rd.
Philadelphia, Pennsylvania 19114

Alan Read
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Gene Rehrig
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Jack Richardson
Rettectone Inc.
13203 Conrad Ct.
Woodbridge, VA 22191

Jose R. Rios
Captain, Prinair
25 Yagrumo, Valle Arriba Heigats
Carolina, Puerto Rico 00630

Jose Roman, Jr.
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Jack Sain
Federal Aviation Administration
12 New England Executive Park
Burlington, MA 01803

Harvey B. Safeer
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Charles A. Sangiovanni
Vice President
Dave Ellies Industrial Design, Inc
142 E 39th St.
New York, N.Y. 10016

Chester J. Schickling
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Gerald C. Schirmer
Scenic Airlines, Inc.
241 E. Reno Ave.
Las Vegas, Nevada 89119

Raymond F. Schramel
Air Illinois, Inc.
P.O. Box 201
Carbondale, Illinois 62901

Usto Schulz
Golden Gate Airlines
805 Airport Rd.
Box 1447
Monterey, California 93940

Donald C. Shaklee
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Bartlett M. Shaw
Gulfstream American
P.O. Box 2206
Savannah, Georgia 31402

Jim Sherrell
San Juan Airlines
Box 487
Friday Harbor, WA 98250

Ronald K. Shull
AeroMech Airlines
P.O. Box 2550
Clarksburg, WV 26301

John W. Sibley
Lockheed Georgia Co.
Marietta, GA. 30063

Marilyn M. Sidewell
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Fredrick R. Simmonds
Altair Airlines, Inc.
Scott Plaza 2
Phila., PA 19113

Leroy Simpson
Fokker Aircraft USA, Inc.
2361 Jefferson Davis Highway
Arlington, VA 22202

Thomas W. Small
Johnson & Higgins
95 Wall St.
New York, New York 10005

Murray Smith
Federal Aviation Administration
John F. Kennedy International
Airport
Jamaica, New York 60018

Robert C. Smith
Bayly, Martin & Fay, Inc.
1700 Market St.
Philadelphia, PA 19103

Fredrick A. Spatz
Suburban Airlines
Box 1201
Reading, PA 19603

Roger D. Sperry
Cessna Aircraft Company
P.O. Box 1521
Wichita, KS 67201

Robert E. Staggs
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Edward A. Stark
Singer - Link
Binghamton, N.Y. 13902

Jan W. Steenblik
Air Line Pilots Magazine
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

David S. Stempler
Florida Airlines, Inc.
1919 Penn. Ave., N.W.
Washington, D.C. 20006

Alan Stephen
Commuter Airline Association
1101 Connecticut Ave., N.W.
Washington, D.C. 20036

John A. Stern
Palo Alto Aeronautical Consultants
510 Emerson St., Suite 202
Palo Alto, California 94301

Clark Stevens
Chaparral Airlines
Box 206
Abilene, TX 79604

Janet St. Mark
SMS Associates Inc.
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

Dr. Janis H. Stoklosa
National Transportation Safety Boar
800 Independence Ave., S.W.
Washington, D.C. 20594

Michael V. Straus
V. Michael Straus, P.C., Suite 401
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

William J. Sullivan
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Richard L. Sulzer
Wright State University
204 Hemlock Drive
Linwood, New Jersey 08221

Howard Suskind
Fairchild Industries
Germantown, MD 20767

Patti Szrom
Civil Aeronautics Board
1825 Connecticut Ave., N.W.
Washington, D.C. 20428

David F. Thomas
National Transportation Safety Board
800 Independence Ave., S.W.
Washington, D.C. 20594

Joseph A. Thomas
4407 N. 20th Rd.
Arlington, VA 22207

Lewis O. Thompson
General Electric
1000 Western Ave.
Lynn, MA 01944

Cesar D. Toledo
PRINAIR
International Airport
Isla Verde, Puerto Rico 00913

David F. Traynham
House of Representatives
Committee on Public Works and
Transportation
Washington, D.C. 20515

Joseph M. Trudo
Shorts Aircraft (USA) Inc.
1725 Jefferson Davis Highway
Arlington, VA 22202

Leslie E. S. Tuck
British Aerospace, Inc.
P.O. Box 17414

David Underwood
Canadian Aviation Magazine
Box 310 CARP
Ontario, Canada KOA 1LO

John C. Van Arsdale
Provincetown-Boston Airlines
3201 Radio Rd.
Naples Municipal Airport
Naples, Florida 33942

John C. Van Arsdale, Jr.
Provincetown-Boston Airlines
3201 Radio Rd.
Naples Municipal Airport
Naples, Florida 33942

Regina Van Duzee
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

John Vance
Old West Regional Commission
1730 K St., N.W.
Washington, D.C. 20006

Glenn Valentine
Mall Airways
Albany County Airport
Albany, New York 12211

Arthur Varnado
Federal Aviation Administration
10455 East 25th Avenue
Aurora, Colorado 80010

James M. Vines
Aviation Consultant
717 Fontaine St.
Alexandria, VA 22302

James S. Waugh
Flight Safety International
Marine Air Terminal
LaGuardia Airport
New York, New York 11371

M. (Ed) Weaster, Jr.
Metro Airlines
P.O. Box 58608
Houston, TX 77058

Richard Weiss
Federal Aviation Administration
400 7th Street S.W.
Washington, D.C. 20590

Neil Whitehouse
Civil Aeronautics Board
Washington, D.C. 20428

Ralph U. Whitten
Royale Airlines, Inc.
Shreveport Regional Airport
Shreveport, LA 71118

Robert E. Whittington
Federal Aviation Administration
12 New England Executive Park
Burlington, MA 01803

Dr. Bill Wilkins
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

W. Frank Wilkinson
Florida Airlines
P.O. Box 13084
Sarasota, Florida 33578

Edgar M. Williams
Federal Aviation Administration
800 Independence Ave., S.W.
Washington, D.C. 20591

Edward R. Williams
Associated Aviation Underwriters
90 John St.
New York, New York 10038

W. D. Wise
Beech Aircraft Corporation
9709 East Central
Wichita, KS 67206

Robert L. Wiseman
Transportation System Center (TSC)
55 Broadway
Cambridge, MA 02142

Al Woldin
Bendix Avionics Division
P.O. Box
Fort Lauderdale, FL 33310

Ed C. Wood
Flight Safety Foundation
5510 Columbia Pike
Arlington, VA 22204

Joanne W. Young
Meyers, Marshall & Young
1050 Seventeenth St., N.W.
Washington, D.C. 20036

Ray Young
Air Line Pilots Association
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

William L. Young
U.S. Air Force
AFWAL/FIGL
W-PAFB, Ohio 45433

Adrian M. Zeffert
Hazeltine Corp.
Cuba Hill Road
Greenlawn, New York 11740

Robert Ziegler
Federal Aviation Administration
P.O. Box 50109
Honolulu, Hawaii 96850

Marilyn Zimmerc
Fairchild Swearingen
San Antonio, Texas 78284

☆U.S. GOVERNMENT PRINTING OFFICE: 1981-341-428/1318