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16. Abstract

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions.

The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as "Closed" by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-79-21 through 24), but background material is included only for those recommendations which remain in an "Open" status. Background information for those recommendations which have been closed is available in FAA Headquarters files.

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U.S. Department of Transportation
Federal Aviation Administration

Office of Aviation Safety
Washington, D.C. 20591

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Summary Of Federal Aviation Administration Responses To National Transportation Safety Board Safety Recommendations

FEDERAL AVIATION ADMINISTRATION

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Report No. FAA-ASF-81-3

Quarterly Report

January through
March 1981

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FOREWORD

The National Transportation Safety Board as established by Public Law 93-633, Title III, "Independent Safety Board Act of 1974," has among its duties the requirement to ". . . issue periodic reports to the Congress, federal, state, and local agencies concerned with transportation safety, and other interested persons recommending and advocating meaningful responses to reduce the likelihood of recurrence of transportation accidents and proposing corrective steps."

The Act specifies that whenever the Board submits a recommendation regarding transportation safety to the FAA, or other agencies of the Department of Transportation, that the agency shall respond to each such recommendation formally and in writing not later than 90 days after receipt thereof. The Act also requires that the response to the Board shall indicate the agency's intention to initiate adoption of the recommendation in full or in part, or to refuse to adopt such recommendation, in which case the response shall set forth in detail the reasons for the refusal.

A notice of each recommendation and the receipt of a response from the agency is published in the Federal Register. There is no requirement to publish either the recommendation or the response in its entirety.

The Federal Aviation Administration places a high priority on the evaluation of the Board's investigation and its recommendations. In recognition of the importance of these recommendations and the responses, the FAA, beginning with the first quarter of calendar year 1980, publishes quarterly reports of NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions.

The NTSB system of priority classification for action provides for documented NTSB followup action for each safety recommendation in accordance with one of the following classifications:

1. Class I - Urgent Action: Urgent commencement and completion of action is mandatory to avoid imminent loss of life or injury and/or extensive property loss.

2. Class II - Priority Action: Priority commencement of action is necessary to avoid probable loss of life or injury and/or property loss.

3. Class III - Longer-Term Action: Routine action is necessary so that possible future injury and loss of life and property may be avoided.

The purpose of this publication is to provide a systematic quarterly update and summation of NTSB Safety Recommendations and FAA actions and reponses. ~This document is intended to keep the public abreast of NTSB and FAA efforts in the area of aviation safety for the applicable quarter covered by the report.

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The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as "Closed" by the NTSB as a result of acceptable FAA action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-79-21 through 24), but background material is included only for those recommendations which remain in an "Open" status. Background information for those recommendations which have been closed are available in FAA Headquarters files.

SUMMARY

Statistics for CY 1979 included:

108 new recommendations issued to FAA.

46 recommendations officially "Closed" during this period.

Statistics for CY 1980 included:

115 new recommendations issued to FAA.

74 recommendations officially "Closed" during this period.

The following exchanges of NTSB/FAA correspondence concerning NTSB Safety Recommendations occurred during the first quarter, January 2 through March 31, 1981:

- FAA initial responses to NTSB recommendations:

  10 letters involving 24 recommendations

- FAA letters to NTSB discussing reconsideration of earlier responses, current status, or followup actions:

  13 letters involving 21 recommendations

- FAA "final report" letters to NTSB:

  14 letters involving 21 recommendations

Officially "Closed" by NTSB first quarter CY 1981: 17 recommendations

There were four FAA responses to seven Class I--Urgent Action recommendations during this quarter.

Accident Date	Recommendation Number	Issue Date	Response Date	FAA Action
2/12/79	A-80-112	11/14/80	3/30/81	Issuing operations bulletin
6/12/80	A-80-115	11/19/80	2/17/81	Expetiting delivery of color display
11/17/80	A-80-120	11/21/80	2/4/81	Issued emergency AD
Incident	A-81-1, 2, 3, & 5	1/6/81	2/11/81	Evaluations, Urgent Maintenance Alert & forthcoming AD

The FAA response to Class I - Urgent Action recommendations is reflected by the following summaries:

A-81-12.

The United States was invited to participate in the investigation of the Saudi Arabian Airlines Lockheed L-1011 accident at Riyadh, Saudi Arabia, on August 19, 1980. The accident involved an in-flight fire in the aft area of the aircraft. Even though the aircraft was landed successfully, the fire spread and all 301 occupants died as a result. The investigation was conducted in accordance with the provisions of International Civil Aviation Organization Annex 13, and issuance of the report of the investigation is the responsibility of the Kingdom of Saudi Arabia. As part of U.S. assistance in the investigation, tests and research were conducted at the Lockheed California Company and at the Federal Aviation Administration (FAA) Technical Center, Atlantic City, New Jersey.

The aft baggage compartment (C-3), among others, where bulk baggage is carried beneath the aft cabin floor, was investigated as a possible fire origination area. Among the tests conducted to evaluate certain hypotheses regarding fire propagation were fire penetration tests of the C-3 compartment lining materials. One test showed that a 5-inch diameter, 12-inch-high propane burner flame (1,800 degrees F) placed beneath the C-3 compartment ceiling penetrated the ceiling liner in less than 1 minute and then penetrated the cabin floor and carpet material in less than 2 minutes. A second test using the same burner showed that a 3- to 4-foot-high flame (1,160 degrees F, fuel rich) penetrated the ceiling liner in 25 seconds, and then the cabin floor and carpet material in 4.5 minutes.

The C-3 compartment of the L-1011 is certificated as "Class D" under the provisions of 14 CFR 25.857(d). That rule states: A Class D cargo or baggage compartment is one in which--

(1) A fire occurring in it will be completely confined without endangering the safety of the airplane or the occupants;

(2) There are means to exclude hazardous quantities of smoke, flames, or other noxious gases from any compartment occupied by the crew or passengers;

(3) Ventilation and drafts are controlled within each compartment so that any fire likely to occur in the compartment will not progress beyond safe limits;

*****

(5) Consideration is given to the effect of heat within the compartment on adjacent critical parts of the airplane. For compartments of 500 cu. ft. or less, an airflow of 1,500 cu. ft. per hour is acceptable.

The NTSB contends that the L-1011 C-3 compartment was approved as "Class D" by "extrapolations" from the 500 cu. ft. volume and 1,500 cu. ft. per hour airflow guidelines in 14 CFR 25.857(d)(5). According to the Safety Board, the theoretical concept of a Class D compartment is that a fire within the compartment would be extinguished by oxygen depletion, preventing its propagation. This concept apparently has been successfully applied in narrow-bodied aircraft with limited volume compartments. However, the Safety Board expressed concern that it may not be a valid concept for larger volume compartments, such as the L-1011 C-3 compartment, because much greater volumes of oxygen are available to support combustion prior to depletion and "snuffing." The Safety Board believes that the additional air supply may support a fire for sufficient time to allow penetration of the compartment lining, thereby providing access to an unlimited oxygen supply to support propagation of the fire. The NTSB noted that preliminary tests conducted at the FAA Technical Center, using a 770 cu. ft. simulated Class D compartment tended to support this belief, since a fire of sufficient intensity to penetrate the L-1011 C-3's ceiling liner in less than 1 minute burned for more than 10 minutes after the compartment airflow was shut off.

It should be noted that the type of flames used in the tests at Lockheed and at the FAA Technical Center did not duplicate the type of flame (Bunsen burner) used to certify flammability characteristics of cargo and baggage compartment interior materials (14 CFR 25.855). However, the Safety Board believes that a small fire in a piece of baggage could generate localized intense heat similar to that from the propane burner used in the recent tests and that the fire could penetrate the ceiling before the oxygen supply is depleted.

The penetration of the L-1011 C-3 compartment ceiling could result in hazardous consequences because numerous major aircraft components are routed between the ceiling of the compartment and the floor of the cabin. Among these items are the No. 2 engine throttle cables, the No. 2 fuel line, and flight control cables. Fire reaching these components could endanger the entire aircraft, and therefore, the NTSB contends that the deisgn does not comply with the intent of 14 CFR 25.857(d)(5). The Safety Board also noted that once such a fire reaches the cabin, the cabin furnishings could become involved, and the fire would be more difficult to extinguish.

According to the Safety Board, the possibility of a fire while in-flight and the questionable capability of the L-1011 C-3 compartment to contain a fire by "snuffing" it to keep it from spreading suggest that the "Class D" certification of the C-3 compartment should be reevaluated. Accordingly, the NTSB recommended that the FAA:

> "Reevaluate the 'Class D' certification of the L-1011 C-3 cargo compartment with a view toward either changing the classification to 'C,' requiring detection and extinguishing equipment, or changing the compartment liner material to insure containment of a fire of the types likely in the compartment while in-flight."

In response to this recommendation, the FAA noted that the L-1011 is not unique in having a large Class D type cargo compartment that has been demonstrated to be in compliance with the requirements of FAR 25.857(d). For this reason, the FAA did not agree that specific action pertaining to the L-1011 as a special case was appropriate. Neither did we find that the limited tests cited by the Board were sufficient in themselves to justify the recommended action.

In response to a related recommendation, the FAA did agree to "Review the certification of all baggage/cargo compartments (over 500 cu. ft.) in the 'D' classification to insure that the intent of 14 CFR 25.857(d) is met."

The severity and progression of the Saudi Arabian fire caused the FAA to immediately question the efficacy of the Class D fire containment concept. Immediately after the accident, the FAA began formulating a research program, to be accomplished at the Technical Center, to conduct a comprehensive reevaluation of the concept and regulatory standards for Class D cargo compartments. Prior to issuance of the Board's recommendation, the FAA met informally with the NTSB staff to discuss the preliminary results of the accident investigation. At that meeting, the Board staff members were advised of our program. On January 15, 1981, the Office of Aviation Standards formally requested the establishment of a research program. In this program, detection, extinguishment, and flammability of cargo compartment liners are evaluated. The FAA believes the program that has been initiated exceeds the intent of the NTSB's recommendation and the Safety Board was fully informed of our efforts in this regard. However, the agency has received no further response from the NTSB relative to Safety Recommendation A-81-12.

A-81-39 and A-81-40.

On January 20, 1981, at 1127 p.s.t., a Beech B-99, N390CA, operated by Cascade Airways, Inc., as Flight 201, crashed about 4.5 miles southwest of Spokane International Airport, Spokane, Washington. The accident occurred while the pilot was attempting a localizer approach to runway 3 (LOC Rwy 3) at Spokane International Airport. The two pilots and five passengers died in the accident; two passengers survived with serious injuries. The aircraft was destroyed by impact and postcrash fire.

The Spokane VORTAC (115.5, GEG, Channel 102) was used for the inbound routing of Flight 201 and is used for the distance measuring equipment (DME) arc for a LOC Rwy 3 approach. Upon arrival in the Spokane area, the flight was vectored for an instrument landing system (ILS) approach to runway 21. However, before the flight began the approach to runway 21, the tower changed the active runway to runway 3 and vectored Flight 201 for the LOC Rwy 3 approach. This approach utilizes the IOLJ localizer (109.9) and collocated DME (Channel 36), both of which are located on the airport.

While Flight 201 was initially being vectored for the LOC Rwy 3 approach, the IOLJ localizer and its associated DME were not operational because the Rwy 21 was still being used by other arriving aircraft. The IOLJ localizer/DME were turned on about 1124:08. About this time, Flight 201 was advised that the aircraft was "6 miles from OLAKE intersection, cleared for the approach." Shortly thereafter, Flight 201 was advised to contact the tower and Flight 201 acknowledged. No other calls were received from the aircraft.

The normal procedure for the LOC Rwy 3 approach allows descent to minimum descent altitude (MDA)(2,760 ft.) after passing OLAKE intersection, which is 4.2 miles from IOLJ. Without the airport environment in sight, a missed approach would be executed at 0.2 DME before reaching IOLJ. One theory examined by the NTSB is that Flight 201 may have mistakenly initiated an approach and let down prematurely using DME mileage from the Spokane (GEG) facility rather than the mileage from the localizer facility depicted on the LOC Rwy 3 approach chart. If an approach was continued using the wrong DME (Spokane VORTAC), the aircraft would descend prematurely to MDA and could strike the terrain near the Spokane VORTAC, which is at approximately the same elevation as MDA. Flight 201's initial impact point was about 1,300 ft. south-southeast of the Spokane VORTAC. It should be noted, however, that similar approach configurations exist at other airports throughout the United States where there are two DME facilities located near the localizer course. In any event, the Safety Board expressed belief that this type of navigational aid configuration constitutes a hazard that must be corrected immediately. Therefore, the NTSB directed the two following Urgent Action Safety Recommendations to the FAA:

A-81-39.
"Publish a Notice to Airman pertaining to the localizer approach to runway 3 at Spokane International Airport, Spokane, Washington, emphasizing the need to use the IOLJ distance measuring equipment once established on the final approach course to runway 3."

A-81-40.
"Add a precautionary note in the plan view section of the chart for a localizer approach to runway 3 at Spokane International Airport, Spokane, Washington, such as:

CAUTION

Use 109.9 IOLJ DME (Channel 36)
For Final Approach Course
Distance Information."

In responding, the FAA noted that these recommendations were made prior to an NTSB hearing held in Spokane, Washington, in April 1981. The FAA was a party in that hearing. Based on testimony and facts presented during the hearing, review of the accident package, and data relating to this and similar procedures, the FAA found no evidence that the localizer runway 3 procedure for Spokane International Airport, Spokane, Washington, was a factor in this accident.

We reviewed the Spokane localizer procedure and found that the requirement to use the IOLJ distance measuring equipment (DME) when established on the final approach course to runway 3 is adequately reflected. Accordingly, the agency was unable to find adequate justification for publishing a Notice to Airmen. In concert with that determination, the FAA also found no justification for adding a precautionary note relative to this procedure. Accordingly, the Safety Board was informed that we intend to take no further action on Safety Recommendations A-81-39 and A-81-40. No further response has been forthcoming from the NTSB relative to these recommendations.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

January 7, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-108 and -109 issued by the Board on October 9, 1980. These recommendations resulted from the Board's investigation of the crash of a Piper Arrow aircraft, N3839M, departing Kalispell, Montana, on January 10, 1980.

A-80-108.

Amend Air Traffic Control Handbook 7110.65B so that the term "radar contact," when used in communications with pilots, means that the target is identified and that the controller is able to vector the aircraft, and to require that, if there is an operational advantage to either the controller or pilot for the controller to state "radar contact" when vectors cannot be provided, the pilot should be expressly informed that vectors cannot be provided.

A-80-109.

Amend Air Traffic Control Handbook 7110.65B, paragraph 350, to require that when a pilot requests an IFR clearance from an airport with no published instrument departure procedures, the controller-issued IFR clearance shall originate only from some point in space that insures terrain separation and that the pilot shall be instructed to remain VFR until reaching that point.

Comment.

The Federal Aviation Administration (FAA) does not concur in these recommendations. Our reasons for nonconcurrence are as follows:

- The accident summary provided in your letter of October 9, 1980, does not substantiate the recommended change from the generally accepted and time-proven definition and use of "radar contact." The AIM, paragraph 341,C.(3), states, "When informed by ATC that their aircraft are in 'RADAR CONTACT' pilots should discontinue position reports over designated reporting points." (also see the Pilot/Controller Glossary). The statement "radar contact" allows

the pilot to cease making position reports, not to stop navigating for himself--unless he has been specifically issued radar vectors (or an initial heading to be flown after departure for subsequent vectoring).

The single aircraft accident, as described, does not warrant substantive changes to Handbook 7110.65B that would transfer responsibilities for terrain avoidance, outside controlled airspace, and at uncontrolled airports, from pilots to controllers. The accident summary indicates the pilot was provided with an ATC clearance, including a route of flight and safe altitude (14,000 feet), applicable within controlled airspace. Subsequent developments reflect a lack of effective communication by the pilot concerning his interest in radar vectors and the absence of a mutual understanding as a result of the ineffective communications. More importantly, the summary reflects the pilot's failure to comply with the basic elementary obstruction avoidance responsibilities of the pilot-in-command.

As indicated in the AIM, paragraph 325 b.(5), "Each pilot, prior to departing an airport on an IFR flight, should consider the type terrain and other obstructions." and 325 b.(5)(c), "At airports where instrument approach procedures have not been published, hence no published departure procedure, determine what action will be necessary and take such action that will assure a safe departure." Moreover, IFR Pilot Exam-O-Grams No. 8, "IFR Altitudes," clearly states, "For instrument flight along routes not in controlled airspace and for which no specific minimum IFR altitude has been established, it is the pilot's responsibility to select altitudes which comply with obstruction clearance requirements." Note also that "minimum IFR altitudes," in conjunction with MEA, MOCA, etc., are a pilot's keys to safe IFR flight, rather than "minimum vectoring altitudes."

The roles and responsibilities of the pilot and controller for effective participation in the ATC system are contained in several documents. Pilot responsibilities are identified in the Federal Aviation Regulations (FAR). Additional and supplemental information for pilots can be found in the current AIM, Notices to Airmen, advisory circulars, IFR Exam-O-Grams, and aeronautical charts. The pilot-in-command of an aircraft is directly responsible for, and is the final authority as to, the safe operation of that aircraft (see FAR Section 91.3).

The roles and responsibilities of controllers intentionally overlap those of the pilot in many areas, but not outside controlled airspace. Controllers assign IFR altitudes in IFR clearances that are at or above the minimum IFR altitudes in controlled airspace (see AIM, paragraph 401.b.2). A clearance issued by ATC is predicated on known traffic. An ATC clearance means an authorization by ATC, for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified rules within controlled airspace. It is not authorization for a pilot to deviate from any rule, regulation, or minimum altitude, or to conduct unsafe operation of his aircraft.

We depend on instructor pilots to ensure that all pilots are thoroughly familiar with these basic requirements for flight under instrument flight rules. Therefore, it is incomprehensible that an instrument instructor pilot, employed at the departure airport, could be oblivious to adjacent terrain and to his own IFR responsibilities as the pilot-in-command. In this case, it is readily apparent that the pilot departed into the area of higher terrain without a positive means of avoiding that terrain until established on his ATC-cleared route of flight.

Although we do not concur in these recommendations, we have made appropriate elements within the FAA aware of the details of this accident, and our Rocky Mountain Region has taken action designed to remind pilots that obstruction avoidance is a pilot responsibility, particularly when operating outside of controlled airspace where navigational guidance is not provided by ATC. This was accomplished through publication of an article to pilots by our regional accident prevention specialist. The article addressed instrument departure procedures and appeared in the newsletter of the Montana Aeronautics Commission. We will make a copy of this article available to the Board when it is received from our regional office.

The FAA considers action on Safety Recommendations A-80-108 and -109 completed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: October 9, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-108 and -109

On January 10, 1980, N3839M, a Piper Arrow aircraft, crashed into a mountain after departing the Kalispell City Airport, Kalispell, Montana. All three persons aboard were killed.

The Safety Board's investigation disclosed that the pilot, who was employed at the Kalispell City Airport as an instrument flight instructor, had been issued, before takeoff, an IFR clearance to the Calgary Airport via direct to the Kalispell VOR, direct to the Calgary VOR. The clearance, issued by the Salt Lake City Air Route Traffic Control Center, included a climb to 14,000 feet and a transponder code. After acknowledging the clearance, the pilot asked, "Are we going to get vectors northbound?" The controller replied, "I could vector you to the Canadian border; after that I'm not sure if Canada can." The pilot answered, "We'll be receiving Lethbridge by that point."

As the aircraft reached the Kalispell VOR, the controller said "radar contact" and requested the aircraft's altitude. After the pilot reported leaving "five point five," the controller made the following transmission: "Three niner mike roger Lethbridge (unintelligible) bearing (unintelligible) five report reaching one four thousand." About 1 minute later, the pilot asked the center "...to let us know coming up on some high terrain if you would." The controller replied, ". . . are you in the clouds now?" The pilot said that they were. There were no more transmissions from N3839M.

The Kalispell Airport has no published instrument approach procedures and, thus, no published IFR departure procedures. An approach by visual reference to the terrain is the only means of access to this airport. However, there are no procedures which prohibit a pilot from filing an IFR flight plan and receiving an IFR clearance for departure from this airport or other airports not having published instrument departure procedures. Normally, a pilot files a route that may include a published Minimum En Route Altitude (MEA), a Standard Instrument Departure (SID), a Standard Arrival Route (STAR), a published IFR Departure Procedure for small airports, or a published

Instrument Approach Procedure, all of which provide sufficient altitude obstruction clearance. However, a departure clearance from an airport, such as the Kalispell Municipal, does not provide obstruction clearance. In fact, paragraph (5)(c), Instrument Departures, Obstruction Clearance During Departure, of the Airman's Information Manual, states,

> ". . . At airports where instrument approach procedures have not been published, hence no published departure procedure, determine what action will be necessary and take such action that will assure a safe departure."

Thus, in IFR conditions, such departures involve a hazard because the pilot does not have available any published procedures for instrument flight. Furthermore, he cannot get radar vectors until the aircraft climbs to the minimum vectoring altitude (MVA). The ATC issuance of an IFR clearance for the portion of a flight before it reaches "protected airspace," or airspace that insures terrain avoidance, gives the pilot implied permission to fly under actual IFR conditions via the IFR flight plan in an area where the flight can only be accomplished safely under VFR. The Safety Board believes that, in order to assure terrain clearance, a departure of this nature must be conducted visually, and that the controller-issued IFR clearance should begin only at a point that provides separation from the terrain.

During its investigation, the Safety Board interviewed pilots who said that they expect the controller to be able to issue radar vectors after saying "radar contact." The ATC handbook prohibits vectoring aircraft below the MVA. Pilots have no access to MVA information because it is contained in documents in individual ATC facilities. These are not given general distribution. During the investigation, the controller stated that the MVA for the flight was 12,500 feet, that radar contact was established as the aircraft left 5,500 feet, that the target was non-mode C, and that the bearing to Lethbridge was an "information only" item.

The Safety Board believes that, in this accident, based on the controller's transmission, the pilot expected radar vectors and was not aware that the controller had no terrain information and therefore was unable to issue vectors until the aircraft was above the MVA. Because this misconception apparently is shared by many pilots, we believe a change in procedure is warranted.

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

> Amend Air Traffic Control Handbook 7110.65B so that the term "radar contact," when used in communications with pilots, means that the target is identified and that the controller is able to vector the aircraft, and to require that, if there is an operational advantage to either the controller or pilot for the controller to state "radar contact" when vectors cannot be provided, the pilot should be expressly informed that vectors cannot be provided. (Class II, Priority Action) (A-80-108)
>
> Amend Air Traffic Control Handbook 7110.65B, paragraph 850, to require that when a pilot requests an IFR clearance from an airport with no published instrument departure procedures, the controller-issued IFR

clearance shall originate only from some point in space that insures terrain separation and that the pilot shall be instructed to remain VFR until reaching that point. (Class II, Priority Action) (A-80-109)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

This is in reply to the Federal Aviation Administration (FAA) letter dated January 16, 1981, concerning National Transportation Safety Board Safety Recommendation A-80-110 issued October 24, 1980. This recommendation stemmed from an incident involving a Cessna Model 421B at Terre Haute, Indiana, on March 20, 1980. We recommended a modification to the table configuration on certain Cessna Models 414 and 421 aircraft to eliminate interference of the table installation with the escape hatch.

We note that in the subject incident the table was not stowed in accordance with required procedures. We also note that a placard is required to specify proper stowing of the table for takeoff and landing and that an Airworthiness Alert was issued in June 1979 to caution maintenance personnel to check cup holders to ensure there was no obstruction to the emergency exit.

We thank the FAA for investigating the problem. Safety Recommendation A-80-110 is classified in a "Closed--Reconsidered" status.

Sincerely yours,

James B. King
Chairman

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ACTION ASF-1
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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

January 16, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-80-110 issued by the Board on October 20, 1980. This recommendation resulted from the Board's investigation of an incident involving a Cessna Model 421B, N82169, at Terre Haute, Indiana, on March 20, 1980.

A-80-110.

Require a modification to the table configuration on Cessna Model 414 aircraft (S/N 414-0357 through 414-0800) and Cessna Model 421 aircraft (S/N 421B-0301 through 421B-0970) to eliminate interference of the table installation with the escape hatch.

Comment.

The Federal Aviation Administration (FAA) does not concur with Recommendation A-80-110. The optional executive table on Cessna Model 400 series airplanes has always been a three-leaf folding table which is hinged to, and slides down inside, the cabinet completely stowing the table. The cabinet itself is mounted aft of the emergency exit and does not interfere with its operation. A placard is required to specify proper stowing of the table for takeoff and landing. In the incident involving N82169, the table was not stowed in accordance with required procedures. On the serial numbers cited, the cup holder is secured to the cabinet with Velcro strips. The cup holder is easily dislodged from the Velcro attachment during any attempt to open the emergency exit.

In view of the above, we are unable to justify a required modification to the table configuration. As you are probably aware, however, an Airworthiness Alert was issued in June of 1979, to caution maintenance personnel to check cup holders for ease of removal. This was done on the basis of a field report that the cup holder had been glued down. Presumably, the Velcro strips became ineffective after prolonged use and glue was used instead of replacement strips. No further reports have been received.

We do not believe any further action is necessary at this time, but we will continue to monitor this condition.

The FAA considers action on Safety Recommendation A-80-110 completed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: October 24, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-110

The National Transportation Safety Board is investigating an incident involving a Cessna Model 421B, N82169, which occurred at Terre Haute, Indiana, on March 20, 1980. Although the investigation is not complete, the Safety Board has identified a problem affecting occupant escape and survival in this incident which we believe merits remedial action by the Federal Aviation Administration.

Examination of the wreckage revealed that the forward end of the writing table and the paneling associated with the table installation overlapped the lower rear corner of the emergency escape hatch frame. The overlap restricted the removal of the emergency escape hatch. In addition, the cup holder on the forward end of the writing table further impeded the removal of the emergency escape hatch. This table configuration was optional equipment for about 240 model 414 aircraft (S/N 414-0357 through 414-0800) and 508 model 421 aircraft (S/N 421B-0301 through 421B-0970), which were manufactured between 1973 and 1975. A design installation change was made with respect to the optional table installation on these models for aircraft manufactured subsequent to 1975; therefore this problem does not exist on the later aircraft.

Numerous recommendations and proposals to improve occupant escape have been made over the years by Government and industry organizations, and significant improvements have been made. However, access to the escape hatch on these aircraft is still marginal. This incident might have resulted in fatalities if a postcrash fire had erupted, and it illustrates the need to review and monitor cabin design to insure that interior installations do not obstruct the removal and use of emergency escape hatches.

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

> Require a modification to the table configuration on Cessna Model 414 aircraft (S/N 414-0357 through 414-0800) and Cessna Model

3084

421 aircraft (SN 421B-0301 through 421B-0970) to eliminate interference of the table installation with the escape hatch. (Class II, Priority Action) (A-80-110)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

FEB 10 1981

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Thank you for your letter of January 23, 1981, responding to National Transportation Safety Board Safety Recommendation A-80-111 issued November 7, 1980. This recommendation stemmed from our investigation of an incident involving the fatigue failure and separation of a Hamilton Standard propeller blade from a Douglas DC-3C engine. We recommended that the Federal Aviation Administration (FAA) make Hamilton Standard Service Bulletins No. 329 and 329A mandatory.

The Safety Board is pleased to note that the FAA will issue a Notice of Proposed Rule Making and decide by March 1981 whether or not to make the two bulletins mandatory. We appreciate your offer to keep us apprised of the status of Safety Recommendation A-80-111 which we are maintaining in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

January 23, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-80-111 issued by the Board on November 7, 1980. This recommendation resulted from the Board's investigation of an incident on December 27, 1979, involving separation of a Hamilton Standard propeller blade (P/N 6353A-18) from the right engine of a Douglas DC-3C aircraft, N100SD.

A-80-111.

Make compliance with Hamilton Standard Service Bulletins No. 329 and 329A mandatory.

Comment.

The Federal Aviation Administration (FAA) has completed a technical evaluation of Safety Recommendation A-80-111.

Based on this review by our Great Lakes Region, we are initiating action to issue a Notice of Proposed Rule Making (NPRM) relative to the inspection described in Hamilton Standard Service Bulletin Number 329A. The anticipated date for issuance of the NPRM is January 1981 with a 60-day comment period. The decision on whether or not to proceed with a final rule is expected to be made during March 1981.

We will keep you apprised on the status of our action on NTSB Safety Recommendation A-80-111.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 7, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-111

On December 27, 1979, a Hamilton Standard propeller blade (P/N 6353A-18) separated from the right engine of a Douglas DC-3C aircraft, N100SD. The separated blade damaged the underside of the fuselage and one of the left propeller blades.

Metallurgical examination of the butt end of the separated blade (metallurgist's factual report No. 80-58) revealed that the fracture was caused by the presence of high cycle, low stress fatigue cracking which had progressed through a substantial part of the blade cross section. The primary fatigue crack initiated from an area of corrosion on the shank of the blade adjacent to the butt fillet blend. Additional areas of severe corrosive attack were found on the shank and fillet, and dried oil sludge and rusted rollers were found on the roller bearing from this area. The metallurgical examination indicated that the separated blade met engineering drawing requirements for the fillet radius, material hardness, microstructure, and chemical composition.

Aircraft logbook entries indicated the failed blade was previously installed on a propeller of a different aircraft which had accumulated less than 1,000 hours of service between 1971 and 1978. The Safety Board believes that the corrosive attack of the blade began within this time, most likely during an extended idle period when the corrosion protection provided by the oil in the hub may have been lost.

In addition to the above blade failure, the Federal Aviation Administration's (FAA) service difficulty report file revealed that, in the last 5 years, at least six instances of corrosion-related damage to the shank or fillet of Hamilton Standard Hydromatic propeller blades have been reported.

The aircraft industry has recognized the problem of corrosion damage to propeller components for many years. Hamilton Standard Service Bulletins No. 329, issued November 18, 1954, and No. 329A, issued September 15, 1960, recommended that blades be visually examined at least every 18 months. Currently, however, there are no Federal regulations that require blades to be inspected at any specific calendar interval. Hamilton Standard personnel have estimated that a visual examination would take 4 to 6 man-hours per propeller.

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

> Make compliance with Hamilton Standard Service Bulletins No. 329 and 329A mandatory. (Class II, Priority Action) (A-80-111)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

MAR 30 1981

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Thank you for your letter of February 11, 1981, responding to National Transportation Safety Board Safety Recommendations A-80-112 through A-80-114 issued November 14, 1980. These recommendations were made as a result of the accidents involving an Allegheny Airlines Nord 262 at Clarksburg, West Virginia, on February 12, 1979, and a Redcoat Air Cargo, Ltd., Bristol Brittania 253 at Billerica, Massachusetts, on February 16, 1980. They pertain to problems with the use of ethylene glycol as an anti-icing agent.

In Safety Recommendation A-80-112 we asked the Federal Aviation Administration (FAA) to advise operators of the potential hazard of an accumulation of wet snow on airfoil surfaces after deicing with a diluted ethylene glycol solution. We are pleased to learn that the FAA is preparing an operations bulletin to emphasize the dangers of snow accumulation on aircraft following deicing. The status of this recommendation is classified as "Open--Acceptable Action."

In A-80-113 we recommended that the FAA initiate a study of the effectiveness of ethylene glycol-based deicing fluid concentrations as an anti-icing agent under differing icing and snow conditions. We note that the FAA intends to initiate a study and inform the Safety Board of its findings. This recommendation is also classified in an "Open--Acceptable Action" status.

In Safety Recommendation A-80-114 we proposed that the FAA publish and distribute to operators detailed information regarding the characteristics of deicing/anti-icing fluids and guidelines regarding their use. We note that the FAA plans to issue an operations bulletin requesting air carrier certificate holders to ensure that deicing/anti-icing procedures are included in their manuals. This alternate action will satisfy the intent of A-80-114 which is classified in an "Open--Acceptable Alternate Action" status.

We thank the FAA for actions taken and ongoing to satisfy these recommendations.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-112 through A-80-114 issued by the Board on November 14, 1980. These recommendations resulted from the Board's investigation of the crash of an Allegheny Airlines Nord 262, at Clarksburg, West Virginia, on February 12, 1979. The Board also investigated the crash of a Redcoat Air Cargo, Ltd., Bristol Brittania 253, at Logan International Airport, Boston, Massachusetts, on February 18, 1980.

A-80-112.

Advise operators of the potential hazard of an accumulation of wet snow on airfoil surfaces after deicing with a diluted ethylene glycol solution.

FAA Comment.

The Federal Aviation Administration (FAA) concurs in this safety recommendation and we are preparing an operations bulletin to emphasize the dangers of snow accumulation on aircraft following deicing. Operators will be requested to review their deicing and anti-icing procedures in view of these accidents. A copy of the operations bulletin will be forwarded to the Board when it is issued.

A-80-113.

Initiate a study of the effectiveness of ethylene glycol-based deicing fluid concentrations as an anti-icing agent under differing icing and snow conditions.

FAA Comment.

During the April 1969 Federal Aviation Administration Aircraft Ice Protection Symposium, it was emphasized that prior to flight, the final inspection must assure a clean-surfaced wing. This requirement remains valid regardless of the effectiveness of either fluid used; deicing or anti-icing. The FAA believes these criteria are adequate for release to taxi.

We also believe, however, that a study on ethylene glycol-water deicing mix as anti-icing agent under differing icing and snow conditions will provide significant information on wing surface snow accumulation from taxi to takeoff. Accordingly, we intend to initiate a study through our R & D organization and the Board will be informed of the results of this study.

A-80-114.

Publish and distribute to operators detailed information regarding the characteristics of deicing/anti-icing fluids and guidelines regarding their use.

FAA Comment.

The FAA does not concur in this safety recommendation because we believe the manufacturer, rather than the FAA, should be charged with this action. Detailed information regarding the characteristics of deicing/anti-icing fluids and guidelines regarding their use should be obtained from the manufacturer of the product, since only this source has the test data to backup claims of the effectiveness of its product.

We do, however, appreciate the intent of the recommendation. Accordingly, we plan to issue an operations bulletin which will request air carrier certificate holders to ensure that deicing/anti-icing procedures are included in their manuals.

We believe these actions will fulfill the intent of Safety Recommendations A-80-112 through A-80-114.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 14, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-112 through -114

On February 12, 1979, an Allegheny Airlines Nord 262 crashed on takeoff from Clarksburg, West Virginia. The accident resulted in two fatalities and seven serious injuries. At the time of takeoff, there were light snow showers at the airport with an estimated accumulation rate of approximately 1 inch per hour. Deicing of the aircraft, with a 78-percent solution of an ethylene glycol-based deicing fluid and water, was completed 25 to 40 minutes prior to takeoff. Witnesses reportedly saw snow on the exposed horizontal surfaces of the aircraft when it taxied out. The probable cause of the accident was determined to be, in part, the loss of lateral control and lift due to snow on the wings and empennage when the aircraft climbed out of ground effect. The presence of frozen snow on the upper horizontal airfoil surfaces was confirmed by photographs after the accident.

On February 18, 1980, a Redcoat Air Cargo, Ltd., Bristol Brittania 253, crashed shortly after takeoff from Logan International Airport, Boston. The accident resulted in seven deaths and one serious injury. Light snow had fallen throughout the period of flight preparation, taxi, and takeoff at a rate of between 0.5 and 0.8 inch per hour. The aircraft had been deiced with a 30-percent solution of an ethylene glycol-based deicing fluid 45 to 60 minutes prior to takeoff. Evidence indicates that wet snow, which accumulated on the wings and horizontal stabilizer prior to takeoff, was a major factor in this accident.

Although an ethylene glycol-water mix is useful as a deicing agent, only the undiluted fluid is recommended by the manufacturer as an anti-icing agent. In the above accidents, the very fact that the exposed airfoil surfaces were wetted may have actually enhanced the accumulation of wet snow and created a condition in which the wet snow was not blown off by air moving over the surfaces.

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

> Advise operators of the potential hazard of an accumulation of wet snow on airfoil surfaces after deicing with a diluted ethylene glycol solution. (Class I, Urgent Action) (A-80-112)
>
> Initiate a study of the effectiveness of ethylene glycol-based deicing fluid concentrations as an anti-icing agent under differing icing and snow conditions. (Class II, Priority Action) (A-80-113)
>
> Publish and distribute to operators detailed information regarding the characteristics of deicing/anti-icing fluids and guidelines regarding their use. (Class II, Priority Action) (A-80-114)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

April 10, 1981

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to the Federal Aviation Administration (FAA) letter of February 17, 1981, responding to National Transportation Safety Board Safety Recommendations A-80-115 through -119 issued November 19, 1980. These recommendations stemmed from the Safety Board's investigation of an accident involving an Air Wisconsin Swearingen SW-4 which crashed during a thunderstorm in eastern Nebraska on June 12, 1980, and other accidents associated with severe weather. The recommendations pertain to the installation of National Weather Service color weather radar remote equipment in all FAA Air Route Traffic Control Centers having Center Weather Service Units.

The Safety Board is pleased to note that the FAA essentially agrees with these recommendations and that actions are in progress toward their fulfillment. Safety Recommendations A-80-115 through -119 are classified in an "Open--Acceptable Action" status.

We thank the FAA for actions taken and ongoing.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-115 through -119 issued by the Board on November 19, 1980. These recommendations resulted from the Board's investigation of the crash of an Air Wisconsin Swearingen, SW-4, during an encounter with a level 5 or greater thunderstorm in eastern Nebraska on June 12, 1980. These recommendations also result from the Board's investigation of other severe weather-related accidents and examination of National Weather Service (NWS) and Air Traffic Control (ATC) radar systems.

A-80-115. Expedite the delivery of NWS weather radar color remote displays to all Air Route Traffic Control Centers' Center Weather Service Units.

FAA Comment. The Federal Aviation Administration (FAA) concurs in this recommendation and every effort is being made to expedite delivery of the color display. All contract negotiations have been completed, and the delivery schedule has been finalized. The first delivery is scheduled for June 1981 and the last for May of 1982. A copy of the NTSB recommendation has been provided to all participants of the weather radar remote program in order to emphasize the urgency of this effort. We will keep the NTSB informed of our progress in this area.

A-80-116. Schedule the planned testing of NWS weather radar color remote displays at the Cleveland Air Route Traffic Control Center to encompass the next season of frequent convective meteorological activity.

FAA Comment. The FAA concurs in the intent of this recommendation. However, testing of the weather radar remote displays in the Cleveland Air Route Traffic Control Center can take place only when sufficient convective meteorological activity is available. Accordingly, no date has been set for this testing, but we will commence this effort at the appropriate time.

A-80-117. Expedite the development of appropriate graphic mapping techniques for correlation of the NWS weather radar color remote display and the air traffic controller's radar display presentation.

FAA Comment. The FAA concurs in this recommendation and the contractor is working with the Cleveland Air Route Traffic Control Center staff in an effort to modify the off-the-shelf hardware and software so as to meet the center's requirements for an adequate display. Recent reports indicate that the equipment modification is now 80 percent complete. Several software problems remain to be solved, but these are relatively minor and relate to time source, antenna tilt, and other secondary data.

A-80-118. Expedite the development of an integrated weather radar/air traffic control radar single video display system capable of providing multiple weather echo intensity discrimination without derogation of air traffic control radar intelligence.

FAA Comment. The FAA concurs in the intent of this recommendation and, in fact, the agency requirement has always been for air traffic and weather data to be integrated on a single display. The use of separate displays is considered an interim measure to overcome existing equipment limitations. It is anticipated that an integrated weather radar/air traffic control radar single video display will be attained with the introduction of the 9020 replacement and Doppler weather radar. This effort is currently in progress and we place a high priority on completion of this program.

A-80-119. Require air route traffic control centers to make maximum use of the existing National Weather Service radar sites as inputs to the color remote displays at their facilities.

FAA Comment. The FAA concurs in the intent of this recommendation and present planning calls for 70 NWS radars to be remoted to air route traffic control centers. Twenty-nine air traffic control (ATC) radars are used in the absence of available NWS radars.

In summary, the FAA essentially agrees with the intent of these five recommendations, and agency programs have already been in progress in each area addressed. We will continue these efforts in order to improve our weather radar capabilities to the maximum extent possible.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 19, 1980

Forwarded to:
Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-115 through -119

On June 12, 1980, an Air Wisconsin Swearingen SW-4 crashed during an encounter with a level 5 or greater thunderstorm in eastern Nebraska. Thirteen persons were killed and two persons were seriously injured.

During its flight, the aircraft had been under the control of the Minneapolis Air Route Traffic Control Center's (ARTCC) Omaha low altitude sector, as well as other sectors within the same ARTCC. However, the Safety Board's investigation has revealed that none of the sector controllers transmitted information to the flightcrew regarding the location and intensity of the thunderstorm system in the path of the flight although other ARTCC air traffic control (ATC) and meteorological personnel had some information regarding the potential intensity characteristics of the storm system. Testimony given at a public hearing held in Omaha, Nebraska, during September 1980 indicated that the full extent of the area of precipitation and accurate intensity characteristics of convective meteorological phenomena are not portrayed on a controller's plan view display (PVD) because the weather fixed map unit (WFMU) is designed to be selective in its display of precipitation and is limited in its capability to display weather echo intensity levels. A controller's only alternative to obtain a more complete view of the precipitation in the area is to switch to the older broadband presentation; however, this equipment also does not have the capability of showing the various weather echo intensity levels. Further, the broadband presentation may not show aircraft which have already penetrated precipitation areas, essentially rendering this radar useless for purposes of vectoring aircraft out of areas of precipitation.

On February 24, 1980, a Beechcraft Bonanza BE-35 aircraft crashed near Valdosta, Georgia, during an encounter with severe thunderstorms. All the occupants aboard were killed when the aircraft experienced an inflight breakup. On August 26, 1978, two persons were killed when a Piper PA-28 aircraft experienced an inflight breakup during an encounter with a severe thunderstorm near Bolton, North Carolina. In both accidents, ARTCC controllers attempted to provide weather information and avoidance vectors around areas of precipitation observed on the PVDs by switching to broadband presentations to obtain a more complete characterization of the weather than that displayed on the narrowband WFMU.

In the investigations of the three accidents cited above, ATC personnel alluded several times to the fact that, in some instances, inconsistencies between the weather displayed on the PVD and the actual weather encountered by the aircraft limited their ability to confidently assist aircraft.

Following the accident involving a Southern Airways DC-9 on April 4, 1977, at New Hope, Georgia, 1/ the Safety Board recommended the expeditious development and implementation of a weather subsystem for en route and terminal radar environments which would be capable of providing real-time displays of precipitation or turbulence or both, and which would incorporate a multiple-intensity classification scheme (Safety Recommendation A-77-63). We believe the selective display of precipitation in the WFMU is an operationally sound concept where a limited distinction of precipitation levels is acceptable, but that it does not provide sufficient discrimination for effective and safe use of airspace in the vicinity of convective meteorological activity.

As part of its investigation of the June 12, 1980, crash, the Safety Board examined the National Weather Service (NWS) weather radar color remote displays located at the Cleveland ARTCC. We understand that the FAA intends to test the possible use of similar displays as an adjunct to the present narrowband WFMU system, and we believe such use would significantly contribute to aviation safety. For that matter, one practical application of the use of NWS weather radar information has already been demonstrated.

On the evening of September 22, 1980, an unusually large area of extreme convective weather extended from Ontario, Canada, south to Jonesboro, Arkansas. Several supervisors and controllers at the Cleveland ARTCC reported that, while experiencing difficulty in correlating the NWS radar maps with the ATC PVD maps, they were able to achieve sufficient correlation to issue advisories to aircraft regarding the extreme weather displayed on the NWS weather radar color remote displays in the center. In one notable instance, the PVD display of weather over the Detroit airport did not show the presence of the ongoing thunderstorm activity which was displayed clearly on the NWS weather radar color remote display. The controllers were able to use the NWS weather radar information to divert aircraft away from the Detroit airport. Throughout the evening of September 22, numerous air carrier flights were assisted in avoiding the weather which was characterized as severe and extreme on the NWS weather radar color remote displays. The comments by the ATC personnel involved were almost unanimously positive regarding this potential use of the NWS weather radar color display, even in the face of the problems of map correlation and weather intelligence updating which the FAA is seeking to resolve before the test program is begun.

The Safety Board is aware that the FAA's contemplated tests cannot begin until some remaining mapping graphics problems have been solved. However, we are concerned that the testing period may not be scheduled during the seasonal period when the most intensive evaluation of convective activity might be achieved. Moreover, the Safety Board is aware that, in the immediate future, the Cleveland ARTCC's Center Weather Service Unit (CWSU) is scheduled to acquire 25-inch NWS weather radar color remote displays which will enable the CWSU meteorologists to obtain real-time weather information directly from NWS weather radars. We believe that installation of these

1/Aircraft Accident Report: "Southern Airways Inc., DC-9-31, N1335U, New Hope, Georgia, April 4, 1977" (NTSB-AAR-78-3).

displays in all ARTCCs having CWSUs should be expedited to provide real-time depiction of the location and intensity of all convective meteorological phenomena affecting a center's airspace. Had such systems been in place before the accidents cited herein, the likelihood of their occurrence could have been greatly diminished.

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

> Expedite the delivery of NWS weather radar color remote displays to all Air Route Traffic Control Centers' Center Weather Service Units (Class I, Urgent Action) (A-80-115)
>
> Schedule the planned testing of NWS weather radar color remote displays at the Cleveland Air Route Traffic Control Center to encompass the next season of frequent convective meteorological activity. (Class II, Priority Action) (A-80-116)
>
> Expedite the development of appropriate graphic mapping techniques for correlation of the NWS weather radar color remote display and the air traffic controller's radar display presentation. (Class II, Priority Action) (A-80-117)
>
> Expedite the development of an integrated weather radar/air traffic control radar single video display system capable of providing multiple weather echo intensity discrimination without derogation of air traffic control radar intelligence. (Class II, Priority Action) (A-80-118)
>
> Require air route traffic control centers to make maximum use of the existing National Weather Service radar sites as inputs to the color remote displays at their facilities. (Class II, Priority Action) (A-80-119)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable J. Lynn Helms
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to the Federal Aviation Administration (FAA) letter dated February 4, 1981, responding to National Transportation Safety Board Safety Recommendations A-80-120 through -122 issued November 21, 1980. These recommendations stemmed from our investigation of a Piper PA-38 accident near Santa Rosa, California, on November 17, 1980. The plane's engine failed shortly after takeoff. We made the following three recommendations:

A-80-120

Issue an emergency Airworthiness Directive (AD) requiring, before further flight, (1) the immediate inspection of pushrods, of all Lycoming O-235-L2A and -L2C engines and (2) replacement of damaged or bulging aluminum pushrods.

A-80-121

Establish, in consultation with the manufacturer, an inspection interval which will assure that damaged pushrods are discovered before the damage progresses to the point of engine failure.

A-80-122

Issue an Airworthiness Directive requiring that all Lycoming O-235-L2A and -L2C engines be inspected at the established interval and that damaged pushrods be replaced.

We are pleased to note that the FAA concurred with the three recommendations and issued Emergency ADs 80-25-02 and 80-25-02R1 applicable to certain series of Avco Lycoming engines. The ADs require inspection and replacement of damaged pushrods prior to further flight and periodic inspections at 25-hour intervals. We trust that these repetitive inspections will reveal incipient damage to the pushrods before the damage progresses to the point of engine failure. Safety Recommendations A-80-120, A-80-121, and A-80-122 are now classified in a "Closed--Acceptable Action" status.

We thank the FAA for actions taken.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 4, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-120 through -122 issued by the Board on November 21, 1980. These recommendations resulted from the Board's investigation of the crash of a Piper PA-38 on November 17, 1980, near Santa Rosa, California, as a result of engine failure.

A-80-120. Issue an emergency Airworthiness Directive requiring, before further flight, (1) the immediate inspection of pushrods, of all Lycoming O-235-L2A and -L2C engines and (2) replacement of damaged or bulging aluminum pushrods.

FAA Comment. The Federal Aviation Administration (FAA) concurs in this recommendation and Emergency Airworthiness Directives 80-25-02 and 80-25-02R1 require inspection of pushrods prior to further flight and replacement of damaged pushrods.

A-80-121. Establish, in consultation with the manufacturer, an inspection interval which will assure that damaged pushrods are discovered before the damage progresses to the point of engine failure.

A-80-122. Issue an Airworthiness Directive requiring that all Lycoming O-235-L2A and -L2C engines be inspected at the established interval and that damaged pushrods be replaced.

FAA Comment. The FAA concurs in these recommendations, and Emergency Airworthiness Directives 80-25-02 and 80-25-02R1 require repetitive inspections, at 25-hour intervals, of valve clearances (intake and exhaust). These inspections are intended to discover any incipient damage to the pushrods before the damage progresses to the point of engine failure. Also Lycoming Service Instructions Nos. 1068A and 1388A continue in effect. These publications specify the engine manufacturer's valve

clearance inspections. Copies of the following applicable documents are enclosed for your review: (a) AD Briefing Paper; (b) Emergency AD's 80-25-02 and 80-25-02R1; (c) Lycoming Service Publications referenced in AD; and (d) final draft AD with preamble.

The FAA considers action on Safety Recommendations A-80-120 through A-80-122 completed.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosures

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 21, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-120 through -122

On Monday, November 17, 1980, a Piper PA-38 crashed and two persons were killed near Santa Rosa, California, when the plane's engine failed shortly after takeoff. The engine, a Lycoming O-235-L2A, was manufactured in 1979 and had accumulated about 70 hours at the time of the accident.

Safety Board investigators and a representative of the engine manufacturer disassembled the engine and found that two intake valve pushrods had failed, and as a result their length had been shortened. One of the pushrods was too short to operate the rocker arm; the other pushrod was still operating its rocker arm, but the amount of valve opening and the valve timing had been reduced considerably.

The pushrods consisted of a hollow aluminum tube with a steel ball-end insert which was pressed into the end of the tube. When the rods failed the aluminum tube bulged immediately below the flange of the steel insert. One aluminum tube had split longitudinally and had peeled back, and as a result, the steel insert had been forced into the tube more than one-fourth inch. The operator of the PA-38 is inspecting all O-235 engines in his fleet. Thus far he has discovered two other engines with similar pushrod damage. Both were Lycoming O-235-L2C. In one case, the tube bulging was visible on two rods but was not considered severe; the engine had 350 service hours since new. In the other case, all eight tubes were severely compressed or bulged and were beginning to split; this engine had 1,050 service hours since new.

The engine manufacturer has indicated that it is aware of pushrod problems in service, but that it has not been aware of any failures that have progressed to the point of engine failure. According to the manufacturer, the rate of occurrence of these failures has been decreasing, and it has no plans to take further corrective action.

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However, in view of the potentially serious consequences associated with an engine failure, the Safety Board believes that immediate action to preclude further engine failures of this type is warranted.

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

> Issue an emergency Airworthiness Directive requiring, before further flight, (1) the immediate inspection of pushrods, of all Lycoming O-235-L2A and -L2C engines and (2) replacement of damaged or bulging aluminum pushrods. (Class I, Urgent Action) (A-80-120)
>
> Establish, in consultation with the manufacturer, an inspection interval which will assure that damaged pushrods are discovered before the damage progresses to the point of engine failure. (Class II, Priority Action) (A-80-121)
>
> Issue an Airworthiness Directive requiring that all Lycoming O-235-L2A and -L2C engines be inspected at the established interval and that damaged pushrods be replaced. (Class II, Priority Action) (A-80-122)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Please refer to the Federal Aviation Administration (FAA) letter of March 3, 1981, responding to National Transportation Safety Board Safety Recommendations A-80-123 and -124 issued December 9, 1980. These recommendations stemmed from the Safety Board's investigation of incidents involving engine flameouts in Bell helicopters powered by Detroit Diesel Allison 250C-20 engines.

In response to Safety Recommendation A-80-123, we note that the FAA intends to have applicable Rotorcraft Flight Manuals revised to contain instructions for pilots to drain the fuel filter with the fuel booster pump on, and thus preclude the inflow of air during the draining procedure. Pending the revision to the manuals, Safety Recommendation A-80-123 will be maintained in an "Open--Acceptable Action" status.

Regarding Safety Recommendation A-80-124, we have evaluated the FAA's review of the fuel system and the determination that having drain provisions in all filter bowls is necessary. This recommendation is now classified in a "Closed--Acceptable Action" status.

We appreciate the responsiveness of the FAA and request to be informed when actions on Safety Recommendation A-80-123 are completed.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 3, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-123 and A-80-124 issued by the Board on December 9, 1980. These recommendations resulted from the Board's investigation of several incidents involving engine flameout of Bell helicopters, Model 206. Investigation revealed that when the engine, an Allison 250-C20B, is operated without the fuel boost pumps on, air can enter the fuel lines through loose fittings or a partially open valve and then be trapped in the fuel filter of the engine-driven pump. When this trapped air migrates through the engine fuel system, it causes fuel flow interruption and engine flameout or loss of power.

A-80-123.

Require, for all helicopters powered by Detroit Diesel Allison 250C-20 engines, the revision of the FAA-approved flight manual to include a detailed preflight procedure for draining the engine-driven fuel pump low-pressure filter which will preclude the entrance of air into the fuel system, or alternatively a procedure for purging the system of air after draining the filter.

FAA Comment.

The BHT Model 206 Rotorcraft Flight Manuals (RFM) require that the fuel boost pump be in the "on" position during engine operations. Apparently, the helicopters involved in the flameouts which generated these recommendations were not being operated in accordance with RFM's since with the fuel pump on, the fuel system is pressurized and air will not enter the system. The BHT Model 206 RFM's for Detroit Diesel Allison Model 250-C20 engine-powered helicopters contain drain procedures for the airframe fuel filter. These procedures include turning the fuel boost pump on prior to opening the drain valve. This pressurizes the system and prevents entrance of air into the system.

We believe the difficulties cited in this recommendation are a matter of proper crew procedure, and adequate instructions are contained in the RFM's. However, we appreciate the intent of the recommendation and, accordingly, we have taken steps to insure that the applicable RFM's will be revised to instruct the pilot to drain the engine inlet casting filter with a fuel pump on to prevent inflow of air during the draining procedure. We believe this action will fulfill the intent of Safety Recommendation A-80-123 and, accordingly, the Federal Aviation Administration (FAA) considers action on this recommendation completed.

A-80-124.

Review fuel system designs with helicopter manufacturers to determine if drain valves on the Detroit Diesel Allison 250C-20 engine-driven fuel pump low-pressure filters are necessary. If determined to be unnecessary, issue appropriate Airworthiness Directives to require removal.

FAA Comment.

We have reviewed fuel system design criteria and it is our belief that good fuel system design principles, as well as pertinent certification rules, should require drain provisions for all filter bowls. If the pumps are on during all engine operations and during filter bowl draining procedures, no danger of air flow into the fuel system will exist. Based on this conclusion, we do not consider removal of drains to be appropriate and, accordingly, no Airworthiness Directive (AD) action is contemplated.

The foregoing comments are based on our findings relative to the Bell Helicopter Textron (BHT) Model 206 helicopter. We have verbally coordinated our findings with FAA regions where other helicopter manufacturers utilizing the Detroit Diesel Allison 250C-20 engines are located. This coordination procedure has disclosed no significantly different or new information than that revealed during our initial investigation of the BHT Model 206 helicopter.

Accordingly, the FAA considers action on Safety Recommendation A-80-124 completed.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: December 9, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-123 and -124

On May 9, 1980, a Bell 206B helicopter operating as an unscheduled air-taxi passenger flight crashed near Brighton, Utah, during an emergency autorotation following an engine flameout. There were no injuries, but the aircraft was damaged substantially. At the time, investigators were unable to determine the cause of the engine flameout. About 2 weeks later another Bell 206 from the same operation had four flameouts in one flight, with successful engine relight each time. The investigation determined that a drain valve on the engine-driven fuel pump in this second aircraft was leaking. Based on this determination, further investigation and testing of the Brighton accident engine determined that when the engine, an Allison 250C-20B, is operated without the fuel boost pumps operating, air can enter the fuel lines through loose fittings or a partially open valve and then be trapped in the fuel filter of the engine-driven pump. When this trapped air migrates through the engine fuel system, it causes fuel flow interruption and engine flameout or loss of power.

Some helicopter manufacturers install a drain valve on the engine-driven fuel pump low-pressure filter. Some of these valves have been found to leak, which permits air to enter the filter during engine operation. If the boost pump is not operating, air can also enter the system when the valve is opened to drain the filter during preflight.

The engine manufacturer, Detroit Diesel Allison, recognized over a year ago that air could be trapped in the filter housing. In June 1979, the manufacturer issued Service Letter CSL-1081 which advised operators of the possibility of trapped air and presented a procedure for purging air from the engine system.

Following the two cited incidents, Detroit Diesel Allison advised all helicopter manufacturers using the 250C-20 engine that air from any number of sources, when ingested into the fuel system, can cause a power loss or flameout. Specifically, the manufacturer cited the filter drain valves as a source of the introduction of air into the fuel system and recommended that the system be purged using the procedure in Service Letter CSL-1081 any time the system is opened. A review of several FAA-approved

flight manuals for helicopters using the 250C-20 engine revealed that the procedures for draining this filter during preflight inspection are vague and do not require that the system be pressurized to insure that air will not enter the filter when the valve is opened. Detroit Diesel Allison has stated that the system should be purged after opening the valve, or the system should be pressurized by means of the boost pumps before opening the valve.

Because of the serious consequences which can result from engine flameout or power loss, the Safety Board believes that positive action is necessary to preclude the loss of power from air trapped in the engine low-pressure filter. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Require, for all helicopters powered by Detroit Diesel Allison 250C-20 engines, the revision of the FAA-approved flight manual to include a detailed preflight procedure for draining the engine-driven fuel pump low-pressure filter which will preclude the entrance of air into the fuel system, or alternatively a procedure for purging the system of air after draining the filter. (Class II, Priority Action) (A-80-123)
>
> Review fuel system designs with helicopter manufacturers to determine if drain valves on the Detroit Diesel Allison 250C-20 engine-driven fuel pump low-pressure filters are necessary. If determined to be unnecessary, issue appropriate Airworthiness Directives to require removal. (Class III, Longer Term Action) (A-80-124)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

MAR 20 1981

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Thank you for your letter of February 11, 1981, responding to the National Transportation Safety Board's Safety Recommendation A-80-141. This recommendation stemmed from the Safety Board's investigation of a Texas International Airlines DC-9-10 accident at Ryan Airport, Baton Rouge, Louisiana, on March 17, 1980. The recommendation was addressed jointly to the Federal Aviation Administration (FAA) and the National Oceanic and Atmospheric Administration. We asked the FAA to:

> "Install appropriate recording equipment and make a continuous recording of both wind direction to the nearest degree and speed to the nearest knot at those airports where hourly surface aviation weather observations are made."

The Safety Board is pleased to note that the FAA is exploring means to accurately record wind speed and direction, and we appreciate the FAA's offer to keep us advised of its research efforts. Safety Recommendation A-80-141 is classified in an "Open - Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

cc: Mr. T. B. Owen
Assistant Administrator
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-80-141, issued by the Board on December 31, 1980. This recommendation resulted from the Board's investigation of the crash of a Texas International Airlines DC-9-10 on March 17, 1980, at Ryan Airport, Baton Rouge, Louisiana. The aircraft ran off the side of the runway during landing rollout causing injuries to two crewmembers and considerable damage to the aircraft.

A-80-141.

Install appropriate recording equipment and make a continuous recording of both wind direction to the nearest degree and speed to the nearest knot at those airports where hourly surface aviation weather observations are made.

FAA Comment.

This recommendation is directed jointly to the Federal Aviation Administration (FAA) and the National Oceanic and Atmospheric Administration (NOAA).

The FAA has, for some time, been exploring this area of accurate recording of wind information. Since this is already an ongoing effort, we believe it would be prudent to continue our research for the next 60 to 90 days in order to retain continuity and momentum in this program area. During this period we plan to examine current accuracy requirements for providing wind information to the pilot, current wind recording procedures, recording capability planned for future terminal systems, and coordinating procedures and capabilities with the National Weather Service. Accordingly, we intend to pursue these efforts and provide further response to the Board on or about April 30, 1981.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: December 31, 1980

Forwarded to:

Honorable Richard A. Frank
Administrator
National Oceanic and Atmospheric
Administration
Rockville, Maryland 20852

SAFETY RECOMMENDATION(S)

A-80-141

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On March 17, 1980, a Texas International Airlines DC-9-10 ran off the side of the runway during landing rollout at Ryan Airport, Baton Rouge, Louisiana, causing injuries to two crewmembers and considerable damage to the aircraft. Weather conditions at the time included light rain and winds which were veering from southerly to northwesterly and increasing from light to moderate, giving the aircraft an apparent tailwind on a runway that the Jeppesen Approach Chart indicated was restricted when wet to aircraft below 25,000 lbs with a zero tailwind or 10-knot crosswind. In determining the circumstances of this accident, the Safety Board investigators needed detailed information regarding the direction and speed of the surface wind prior to and at the time of the accident. However, the only detailed wind data available was wind speed as recorded by the gust recorder. Wind direction information was recorded on the operations recorder, but only once per minute and then only to the nearest 45 degrees of the 360-degree compass rose. Investigators need more detailed wind direction information when determining the environmental conditions that existed in the immediate vicinity of an airport at the time of an accident. There have been other major accidents in which the lack of surface wind direction information hindered the investigation; these include the Allegheny Airlines DC-9 accident at Philadelphia International Airport on June 23, 1976, and the Continental Airlines Boeing 727 accident at Tucson International Airport on June 3, 1977.

Adverse surface winds have been and continue to be a major problem in terminal operations. To determine accurately the cause of accidents involving such winds and to obtain data for the research necessary to improve wind forecasts and warnings, more complete wind records at airports are required. These should be continuous graphical records which provide values for both wind direction to the nearest degree and speed to the nearest knot on a common time ordinate.

Therefore, the National Transportation Safety Board recommends that the National Oceanic and Atmospheric Administration and the Federal Aviation Administration:

> Install appropriate recording equipment and make a continuous recording of both wind direction to the nearest degree and speed to the nearest knot at those airports where hourly surface aviation weather observations are made. (Class III, Longer-Term Action) (A-80-141)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
FOR Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in response to National Transportation Safety Board (NTSB) Safety Recommendations A-81-1 through A-81-5 issued by the Board on January 6, 1981. These recommendations resulted from the Board's investigation of a Lockheed L-1011-200 airplane operated by a foreign carrier which experienced an inflight failure of a main landing gear outboard wheel flange on December 22, 1980. The following comments are provided in response to these recommendations.

A-81-1

Issue an immediate Airworthiness Directive to require that operators of L-1011 aircraft at the next tire change or within 20 cycles, whichever is sooner, measure the flange thickness on all P/N 3-1365 wheels with serial number up to 1404 which have been used on aircraft with a gross takeoff weight of 430,000 pounds or more, and include in the Airworthiness Directive a requirement to remove all wheels with outer flange thicknesses of less than 0.490 inch and installed on aircraft operating at gross takeoff weights of 430,000 pounds or more. Further requirements should include at each wheel disassembly of all P/N 3-1365 and P/N 3-1311 wheels, an inspection in accordance with procedures which have been evaluated by the FAA and demonstrated by industry experience to be effective in detecting in-service cracking prior to failure.

FAA Comment:

For the purpose of comment, we have separated this recommendation into two parts: First, to require early identification and removal of wheels with outer flange thicknesses of less than 0.490 inch, i.e., "thinner flange wheels," from airplanes having a takeoff gross weight of more than 430,000 pounds, but not greater than 466,000 pounds, i.e., "heavier airplanes;" and, secondly, to require appropriate inspections of wheels at each wheel disassembly, i.e., at each tire change. Each of these parts is addressed separately.

The B. F. Goodrich P/N 3-1311-3 and P/N 3-1365 wheels, including the thinner flange P/N 3-1365 wheels, are approved for installation on the heavier airplanes. We have reevaluated this approval and have found no significant difference in safety between these parts. The dimensional

differences are slight, and, considering the typical fatigue failure mode, the increased thickness is not, of itself, significant enough to contribute to the safety of the wheel.

As you know, there are strong indications that corrosion pits initiated the crack that caused the subject wheel failure. Corrosion has been present in many of the cracked or failed wheels from L-1011 airplanes that have been returned to B. F. Goodrich or Lockheed for analysis. Once a surface anomaly such as a corrosion pit develops, and these can develop at any time during the wheel service life, a fatigue crack can be expected to initiate and grow from that anomaly. The minor difference in flange thickness is an insignificant factor when this phenomenon occurs.

Federal Aviation Administration (FAA) specialists have been working with specialists from Lockheed and B. F. Goodrich in an effort to investigate the crack propagation characteristics of a thinner flange wheel on a heavier airplane once a detectable fatigue crack is present. The purpose of the investigation is to determine the appropriateness of present inservice inspection intervals. Enlarged photographs of the fracture surface of the subject failed wheel have been compared with the fracture surfaces of four other wheels that had been returned to Lockheed for analysis prior to the subject failure. In all cases, "marker bands" are apparent that can be correlated with the number of landings. Fractographic analysis shows that, for typical wheel failures originating from a surface anomaly such as a corrosion pit, which would be the most severe case of stress concentration, inspection using appropriate procedures at every tire change will allow several inspection opportunities to detect a crack prior to wheel flange failure on the thinner flange wheels, even on the heavier airplanes.

Therefore, we have concluded that appropriate flange inspection procedures, including method and period, are the key factors in preventing future wheel flange fatigue failures on L-1011 airplanes. Given the proper inspection, the differences in flange thickness are insignificant to safety. Moreover, if a proper inspection program is not implemented, the differences in flange thickness would not significantly forestall failure. Since we do not find the differences in flange thickness significant to safety, we are unable to justify the initiation of the action recommended, i.e., flange wheels measurement or removal of wheels with thinner flanges.

The last sentence of the recommendation seems to infer that presently there is no effective inspection procedure in use by the operators to detect inservice wheel cracking prior to failure. At the joint FAA/NTSB meeting with the Air Transport Association (ATA) member operators of L-1011 airplanes at Atlanta, GA, on December 31, 1980, several eddy current inspection techniques were described that are presently being used by L-1011 operators. Data was presented which shows that L-1011 wheel cracks are being detected on a regular basis prior to inservice failure. One of the operators rejected 73 wheels in a 29 month period using these eddy current inspections. All of the inspection procedures used by the operators are reviewed by the FAA and approved as part of the operator's maintenance procedures. Thus, the basic intent of the last sentence of the recommendation is presently being accomplished.

Since the joint FAA/NTSB/ATA meeting, the FAA has been following an analysis by Lockheed and B. F. Goodrich to improve even further the safety record of L-1011 wheels by defining an optimum inspection procedure for all wheels used on all L-1011 series airplanes. Many L-1011 operators have been involved in this intense effort at Lockheed. We are now confident that an optimum eddy current wheel flange radius inspection procedure for these B. F. Goodrich wheels has been developed. Consistent with our determination and in concurrence with the second part of your recommendation, we will issue an Airworthiness Directive (AD) to require application of these procedures at an appropriate inspection interval.

After the issuance of this AD, we consider FAA action completed on Recommendation A-81-1. Upon publication, we will furnish a copy of the AD to the Board.

A-81-2

> Initiate an immediate survey of B. F. Goodrich manufacturing facilities by a Quality Assurance Systems Analysis Review Team or equivalent to assure the manufacturer's compliance with current regulatory requirements governing production certification and specifically the issuance and approval of service bulletins, investigation and reporting of service difficulties, maintenance of appropriate production and inspection records, and coordination of service difficulties with primary airframe manufacturers.

FAA Comment:

Upon return of the failed wheel to your metallurgical laboratory in Washington, DC, we observed that the outboard wheel half P/N 10-1323 had been stamped over a previously stamped P/N 10-1213.

As soon as we saw the part number overstamping, i.e., part renumbering on the subject wheel, we requested our Great Lakes Region manufacturing specialist to initiate an investigation at B. F. Goodrich. Our manufacturing specialist visited the B. F. Goodrich plant on December 30, 1980, and, as reported at the joint FAA/NTSB/ATA meeting in Atlanta, GA, on December 31, 1980, he found that the part renumbering was covered by appropriate engineering orders which our review has shown to be appropriate. The error with respect to identification of the P/N 3-1311-3 cross-section shown on B. F. Goodrich Service Bulletin No. 369, which confused both the FAA and NTSB investigators at the outset, has no relationship to the B. F. Goodrich quality control system. In the service bulletin figure, B. F. Goodrich erroneously labeled the outboard flange of the P/N 3-1311-3 wheel with the inboard flange dimensions. We do not find that the errors in the service bulletin are indicative of lax quality control procedures at B. F. Goodrich. Also, since we have concluded that there is no safety significance to the small differences in flange thickness through the change in P/N's 3-1311-3 to 3-1365, we do not find that the confusion in part numbers could have contributed to the subject wheel failure.

Notwithstanding the above, consistent with your recommendation, we completed a special Quality Assurance System Analysis Review (QASAR) audit of the B. F. Goodrich wheel manufacturing facility at Troy, Ohio, on January 12 through 14. Emphasis was placed on reviewing the production and quality control procedures applied to the manufacture of wheels for L-1011 airplanes. The QASAR team leader has advised that there were no safety significant deficiencies found that could have contributed to the subject wheel failure, or that would affect the safety of wheels being manufactured at the facility.

We consider FAA action completed on recommendation A-81-2.

A-81-3

Require tire, wheel, and airframe manufacturers to publish and disseminate to all operators all engineering data necessary to determine the effect on fatigue life of aircraft wheels by increasing or decreasing tire inflation pressures.

FAA Comment:

The predicate of this recommendation appears to be that a discrete fatigue life can be placed on an aircraft wheel and used to prevent wheel failures. Since our experience with prior cracks in L-1011 wheels indicates that surface anomalies (corrosion pits, etc.), are the principal initiators of wheel flange fatigue cracks, which may occur at any wheel service life and are independent of variations in operational stress level due to differences in tire pressure, we do not find this predicate valid. Therefore, we do not plan to implement Recommendation A-81-3.

As you know, the FAA has recently hired an internationally respected specialist in fracture mechanics and metallurgy. This specialist has been working with Lockheed and B. F. Goodrich in their analyses of the subject wheel failure and their review of earlier, less catastrophic failures. He will continue in his study of the wheel fatigue phenomenon on all U.S.-manufactured transport category airplane types in service so that we might better understand and thus miminize future wheel failures from whatever cause. As stated in response to Recommendation A-81-1, we believe the key to precluding "on-airplane" wheel flange failures lies in the integrity of the operators' wheel inspection program. As more is learned about the wheel flange fatigue phenomenon, improved wheel inspection procedures and periods will be defined for each wheel model.

We are concerned that the premature dissemination of the tire pressure effects information per your recommendation could cause operators to

reduce tire pressure to reduce wheel fatigue. We are concerned that since corrosion pits or other surface anomalies appear to be the predominant fatigue initiators, this action could lead to a false sense of security without improving wheel safety.

A-81-4

Establish a program with air carriers, wheel, and airframe manufacturers to determine effective nondestructive inspection techniques for the variety of aircraft and wheel combinations in air carrier service and require operators to implement effective inspection programs.

FAA Comment:

This recommendation will be implemented as an integral part of the study mentioned in our response to Recommendation A-81-3. The details of the inspection procedure must be tailored to the principal failure causes and modes of each wheel type. Interim maintenance bulletins will be published and the final results of our study will be published in an Advisory Circular, both of which will be made available to the Board.

A-81-5

Expeditiously disseminate any required wheel inspection and service programs to all foreign civil aviation authorities with regulatory responsibilities over operators of U.S.-manufactured aircraft and equipment.

FAA Comment:

As you know, on January 9 the Director of Airworthiness sent an "Urgent Maintenance Alert" telegraphically to the airworthiness authorities of all countries having L-1011 airplanes on their registry. The alert was also copied to the ATA and International Air Transport Association for dissemination to their member carriers. The alert emphasized the importance of an eddy current inspection of the critical wheel flange area at each tire change. The information in that alert will be upgraded by the forthcoming AD mentioned in our response to Recommendation A-81-1.

Any new information gained as a result of our wheel study mentioned in response to Recommendation A-81-3 will be made available to foreign authorities and all operators on a priority basis.

Technical Corrections and Clarification:

The preamble to your Recommendations A-81-1 through A-81-5 contained a number of factual errors that need to be corrected for the record.

In paragraph two, the B. F. Goodrich P/N 3-1311-3 and 3-1365 wheels are approved for use on L-1011 airplanes having a maximum certificated gross takeoff weight of up to 466,000 pounds, not 460,000 as stated. In paragraph three, the recommendation states "Subsequent engineering drawing changes strengthened the P/N 3-1365 wheel by including thicker outer flanges, anodizing, and shot peening." Anodizing does not strengthen the wheel, but is used to improve the corrosion resistance of the wheel. A review of drawing 10-1323, which makes up the outer half of wheel assembly P/N 3-1365, shows that the inside radius of the wheel bead, where the crack occurred, is not shot peened but is stress rolled. Other portions of the wheel are shot peened. The stress rolling of the wheel bead was not added as a revision to the drawing but was on the initial issue of the drawing.

Also, we would like to clarify some issues. The Board states in its letter that domestic air carriers have reported a significant number of fatigue-related failures of B. F. Goodrich P/N 3-1311-3 wheels, while P/N 3-1365 wheels have a satisfactory service record. It should be pointed out that both of these wheels were certificated to the same load rating for use on L-1011 airplanes up to a gross weight of 466,000 pounds, and both part number wheels have a satisfactory safety-related service record. The service record does not show a significantly higher failure rate of P/N 3-1311-3 or thin-flanged P/N 3-1365 wheels operated on airplanes with gross weights of 466,000 pounds. The FAA has not found that the P/N 3-1311-3 or P/N 3-1365 wheels with the thinner flanges have a more significant number of fatigue-related failures, and, in absence of engineering data to the contrary, finds that the P/N 3-1311-3 and P/N 3-1365 wheels are safe on all gross weight airplanes up to 466,000 pounds. The changes in P/N 3-1365 wheel flange thickness were instituted to increase service life and are not related to safety deficiencies. Some operators may elect to use only the P/N 3-1365 thicker flange wheels on high gross weight L-1011 airplanes to increase the service life of the wheels.

There appears to be an inference in the text of your discussion concerning these recommendations that inservice wheel rejections as a result of cracks are indicative of poor wheel design. These wheels were designed to meet the requirements of TSO-C26b, and the warranty service life desired by operators. The desired wheel life strongly dictates the design of the wheel. Wheels are not life limited but are used in service until cracks are detected, and the wheel is then scrapped. Airline maintenance procedures and inspection intervals are designed and FAA

approved to detect cracks prior to catastrophic failure of the wheel. The criterion of concern with respect to wheels is not the total number of wheel rejections, but whether the occurrence of a catastrophic crack between inspection intervals can be prevented.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 6, 1981

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-1 through -5

A Lockheed L-1011-200 aircraft operated by a foreign carrier recently experienced an in-flight failure of a main landing gear inboard wheel flange. The failure caused major damage to flight control, electrical, and hydraulic systems, caused major damage to the aircraft structure, and resulted in explosive decompression of the cabin. There were two fatalities. Members of the FAA technical staff have been working closely with the National Transportation Safety Board's staff to determine the nature of the problem and the corrective actions required to prevent similar occurrences.

The continuing investigation has determined that the failed wheel was a B.F. Goodrich part No. (P/N) 3-1365, serial No. (S/N) 185. Information from Goodrich and Lockheed disclosed that Goodrich wheels P/N 3-1311-3 and P/N 3-1365 were both qualified to technical standard order (TSO) requirements for use on L-1011 aircraft having a maximum gross takeoff weight of up to 460,000 pounds. Domestic air carrier users of the L-1011 have reported a significant number of fatigue-related failures of the P/N 3-1311 wheels, but the P/N 3-1365 wheels have had a satisfactory service history. Goodrich warranty provisions, the relative service histories, and Goodrich Service Bulletin No. 369 all fostered the belief that the P/N 3-1365 wheels were stronger than the P/N 3-1311 wheels. Consequently, most operators use only the P/N 3-1365 wheels on those L-1011 aircraft operating at high gross weights.

Goodrich Service Bulletin No. 369 states that the thicknesses of P/N 3-1365 wheel outer flanges up to S/N 1404 are 0.490 to 0.550 inch. However, the Safety Board has learned from Goodrich that it manufactured an early quantity of wheels given P/N 3-1365 which were dimensionally and materially identical to the P/N 3-1311 wheels. Subsequent engineering drawing changes strengthened the P/N 3-1365 wheel by including thicker outer flanges, anodizing, and shot peening. Goodrich initially stated that the first flange dimensional change to the P/N 3-1365 wheel was effective on S/N 165. However, a postaccident laboratory examination disclosed that the outer flange of the failed wheel, S/N 185, measured less than 0.470 inch, which is below the minimum tolerance of 0.490 for the strengthened P/N 3-1365 wheel. The Service Bulletin does not mention that an early quantity of P/N 3-1365 wheels were manufactured before the engineering changes were incorporated.

Goodrich Service Bulletin No. 369 also states that the thicknesses of the P/N 3-1311 wheel outer flanges are 0.450 to 0.510 inch. According to engineering drawings submitted to the Safety Board by Goodrich, the specified dimensions for the P/N 3-1311 outer flanges are 0.410 to 0.470 inch. We believe that these errors are indicative of lax quality control procedures. The erroneous Service Bulletin information is misleading to the user and could contribute to confusion regarding the strength and durability of those wheels which are selected for use on L-1011 aircraft having higher gross weight configurations. Additional uncertainty as to the actual dimensional characteristics of the P/N 3-1365 wheels is created by the fact that Goodrich has previously indicated that P/N 3-1365 wheel assemblies up to about S/N 165 are the "same" as P/N 3-1311 assemblies. Disclosure of the less than 0.470 inch flange thickness on the failed S/N 185 wheel assembly thus creates a question as to exactly how many wheels with these dimensions are identified as P/N 3-1365 assemblies.

Discussions among the Safety Board staff, FAA staff, and the domestic air carriers have disclosed that all of the operators employ some inspection programs involving periodic eddy current or dye penetrant techniques. Before the accident it was generally believed that these programs were effective in detecting fatigue damage before catastrophic failure. However, the Safety Board remains concerned that the inspection requirements are not standardized and have not been uniformly effective in reliably detecting cracks prior to in-service failures. In fact, the foreign operator involved in this accident also used an eddy current inspection program and the failed wheel was inspected only 28 cycles before the accident. The Safety Board strongly believes that an effective inspection program is a vital element in the prevention of wheel failures and that the procedures proven by industry experience to be effective should be identified and required to be implemented by all carriers.

Furthermore, the Safety Board notes from Service Difficulty Reports that wheel failures are occurring with nearly all types of commercial aircraft. Therefore, the Safety Board believes that action to establish more reliable wheel inspection procedures should not be limited to the L-1011 wheels.

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

> Issue an immediate Airworthiness Directive to require that operators of L-1011 aircraft at the next tire change or within 20 cycles, whichever is sooner, measure the flange thickness on all P/N 3-1365 wheels with serial number up to 1404 which have been used on aircraft with a gross takeoff weight of 430,000 pounds or more, and include in the Airworthiness Directive a requirement to remove all wheels with outer flange thicknesses of less than 0.490 inch and installed on aircraft operating at gross takeoff weights of 430,000 pounds or more. Further requirements should include at each wheel disassembly of all P/N 3-1365 and P/N 3-1311 wheels, an inspection in accordance with procedures which have been evaluated by the FAA and demonstrated by industry experience to be effective in detecting in-service cracking prior to failure. (Class I, Urgent Action) (A-81-1)

Initiate an immediate survey of B.F. Goodrich manufacturing facilities by a Quality Assurance Systems Analysis Review Team or equivalent to assure the manufacturer's compliance with current regulatory requirements governing production certification and specifically the issuance and approval of service bulletins, investigation and reporting of service difficulties, maintenance of appropriate production and inspection records, and coordination of service difficulties with primary airframe manufacturers. (Class I, Urgent Action) (A-81-2)

Require tire, wheel, and airframe manufacturers to publish and disseminate to all operators all engineering data necessary to determine the effect on fatigue life of aircraft wheels by increasing or decreasing tire inflation pressures. (Class I, Urgent Action) (A-81-3)

Establish a program with air carriers, wheel, and airframe manufacturers to determine effective nondestructive inspection techniques for the variety of aircraft and wheel combinations in air carrier service and require operators to implement effective inspection programs. (Class II, Priority Action) (A-81-4)

Expeditiously disseminate any required wheel inspection and service programs to all foreign civil aviation authorities with regulatory responsibilities over operators of U.S.-manufactured aircraft and equipment. (Class I, Urgent Action) (A-81-5)

KING, Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

James B. King

By: James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 27, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-81-8 issued by the Board on January 28, 1981. This recommendation resulted from the Board's investigation of the crash of a Beech Kingair 200, N456L, on March 27, 1980, 14 miles southeast of the Arapahoe County Airport, Englewood, Colorado.

A-81-8. Develop and implement a priority message-handling procedure to assure the immediate delivery of urgent weather messages to all weather circuits that originate from the Weather Message Switching Center in Kansas City, Missouri.

FAA Comment. The Federal Aviation Administration (FAA) has already initiated efforts in this area based on our own requirements and recognition of inadequate capacity. Our Weather Message Switching Center (WMSC) has already been tasked with modifying and expanding its "Urgent Routing" capabilities. These changes will include immediate dissemination on all appropriate circuits. We hope to finish this project during the first quarter of 1982, but ultimate completion of this task is dependent on the expansion of core memory in our WMSC processors. This expanded capacity is scheduled to take place in the last quarter of CY 81.

We will keep the Board informed of significant progress in this area as our program continues.

Sincerely,

Charles E. Weithoner
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 28, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-8

On March 27, 1980, the National Transportation Safety Board investigated an accident near Denver, Colorado, involving a Beech Kingair 200, N456L. The aircraft departed Arapahoe County Airport, Englewood, Colorado, at 1432 mountain standard time on an instrument flight rules (IFR) flight plan to Lufkin, Texas. About 7 minutes after takeoff at an altitude of about 12,800 feet, the pilot reported to Denver departure control that the aircraft was encountering icing and requested a return to the Arapahoe County Airport.

Shortly thereafter, the pilot stated that he wanted to go to Stapleton International Airport rather than Arapahoe. The aircraft was cleared to 11,000 feet, but the pilot radioed that the aircraft was not able to maintain altitude. About this time, the Denver radar controller offered the pilot of N456L a precision approach radar (PAR) approach to the Buckley Air National Guard Base. The aircraft was not able to reach Buckley and crashed in an open field about 14 miles southeast of the Arapahoe County Airport. There were 10 fatalities.

The pilot of N456L called the Denver Flight Service Station (FSS) at 1020 and requested a weather briefing for a proposed flight from Arapahoe County Airport to Lufkin, Texas, departing at 1330. The weather briefing lasted from 1020 to 1024.

The Safety Board's investigation of the accident disclosed that the lack of priority message handling on the leased service-A high-speed weather data circuit, which serves the Denver FSS, resulted in the omission of an urgent weather message, SIGMET GOLF 1, calling for severe icing in eastern Colorado, from the weather briefing at 1020.

Priority message handling exists only on the low-speed, service-A circuits that originate at the Weather Message Switching Center (WMSC) in Kansas City, Missouri. Therefore, SIGMET GOLF 1 was available over the low-speed, service-A weather data circuit at 1011, 1 minute after it was issued by the National Weather Service (NWS). However, there is no priority message-handling procedure for the leased high-speed service-A weather data circuit, and SIGMET GOLF 1 was not available to the Denver FSS specialist responsible for aviation weather briefings until 1025--too late to include in the briefing of the pilot of N456L. Although both weather data circuits serve the Denver FSS, the leased service-A circuit is used primarily for receiving weather data necessary for weather briefings; the low-speed, service-A circuit serves as a backup.

The leased high-speed, service-A circuit serves not only the Denver FSS but also more than 140 other flight service stations nationwide. In addition, medium- and high-speed weather data circuits that originate at the WMSC at Kansas City serve the meteorological departments of many of the major air carriers as well as other nongovernment users engaged in aviation forecasting and weather briefing.

Urgent weather messages contain information pertaining to the safety of all aircraft. Information contained in these messages must be made available immediately to the aviation community. To do so requires the immediate delivery of urgent weather messages to all weather data circuits that originate from the WMSC.

The Safety Board is aware that the Federal Aviation Administration (FAA) on April 14, 1980, made a temporary format change in the delivery of urgent weather messages to the leased high-speed, service-A weather data circuit. The change provides for the immediate delivery of urgent weather messages to the FSS supervisor's printer. This information is then disseminated by the supervisor to FSS specialists responsible for weather briefings. This format change only affects those flight service stations on the leased service-A circuit and does not affect nongovernment users on other medium- and high-speed circuits. The Safety Board believes that, in the interest of air safety, immediate delivery of urgent weather messages to all circuits that originate at the WMSC at Kansas City is necessary.

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

> Develop and implement a priority message-handling procedure to assure the immediate delivery of urgent weather messages to all weather circuits that originate from the Weather Message Switching Center in Kansas City, Missouri. (Class II, Priority Action) (A-81-8)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NEW RECOMMENDATIONS

Following is a listing of the 32 new recommendations received during the second quarter of CY 1981:

NTSB Rec. No.	Subject	Page
A-81-1 thru 5	Lockheed L-1011-200 in-flight failure of main landing gear inboard wheel flange	73
A-81-6 & 7	Engine failures in general aviation aircraft accidents	77
A-81-8	Beech Kingair 200 accident near Denver, Colorado, March 27, 1980	79
A-81-9 thru 11	Cessna 207A crash into hangar at Merrill Field, Anchorage, Alaska, October 8, 1979	81
A-81-12 & 13	Saudi Arabian Airlines Lockheed L-1011 accident at Riyadh, Saudi Arabia, August 19, 1980	85
A-81-14	United Air Lines DC-8-61 crash near Portland International Airport, Portland Oregon, December 28, 1978	89
A-81-15 & 16	Cessna Model 172K crash during takeoff from Eagle Creek airport near Indianapolis, Indiana, February 26, 1980	91
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A-81-18	British Redcoat Air Cargo, Ltd., Bristol Britannia crash in wooded area near Billerica, Massachusetts, February 16, 1980	93
A-81-19 & 20	Boeing 727 crash into water near Pensacola, Florida, May 8, 1979	97
A-81-21 & 22	Beech King Air explosion decompression - forward lefthand cabin window failure March 3, 1980	101
A-81-23	Air Wisconsin, Inc., Swearingen SA-226 Metro crash near Valley, Nebraska, June 12, 1980	103
A-81-24 & 25	Scenic Airlines Cessna 404 crash during takeoff from Grand Canyon National Park Airport, Tusayna, Arizona, July 21, 1980	105
A-81-26 thru 28	Piper PA-28-140 Cherokee crash near Lavina, Montana, June 24, 1977	109

NTSB Rec. No.	Subject	Page
A-81-29	Cessna 414A aircraft charter radial centering knob difficulty July 8, 1980	113
A-81-30 & 31	Piper PA-22-150 Tri-Pacer crash near Clear Spring, Maryland February 18, 1980	115
A-81-32 & 33	Avions Marcel Dassault Breguet Falcon 10 crash into Lake Michigan January 30, 1980	117
A-81-34 - Not directed to FAA.		
A-81-39 thru 42	Cascade Airways, Inc., Beech B-99 crash southwest of Spokane International Airport, Spokane, Washington January 20, 1981	119

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 6, 1981

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-1 through -5

A Lockheed L-1011-200 aircraft operated by a foreign carrier recently experienced an in-flight failure of a main landing gear inboard wheel flange. The failure caused major damage to flight control, electrical, and hydraulic systems, caused major damage to the aircraft structure, and resulted in explosive decompression of the cabin. There were two fatalities. Members of the FAA technical staff have been working closely with the National Transportation Safety Board's staff to determine the nature of the problem and the corrective actions required to prevent similar occurrences.

The continuing investigation has determined that the failed wheel was a B.F. Goodrich part No. (P/N) 3-1365, serial No. (S/N) 185. Information from Goodrich and Lockheed disclosed that Goodrich wheels P/N 3-1311-3 and P/N 3-1365 were both qualified to technical standard order (TSO) requirements for use on L-1011 aircraft having a maximum gross takeoff weight of up to 460,000 pounds. Domestic air carrier users of the L-1011 have reported a significant number of fatigue-related failures of the P/N 3-1311 wheels, but the P/N 3-1365 wheels have had a satisfactory service history. Goodrich warranty provisions, the relative service histories, and Goodrich Service Bulletin No. 369 all fostered the belief that the P/N 3-1365 wheels were stronger than the P/N 3-1311 wheels. Consequently, most operators use only the P/N 3-1365 wheels on those L-1011 aircraft operating at high gross weights.

Goodrich Service Bulletin No. 369 states that the thicknesses of P/N 3-1365 wheel outer flanges up to S/N 1404 are 0.490 to 0.550 inch. However, the Safety Board has learned from Goodrich that it manufactured an early quantity of wheels given P/N 3-1365 which were dimensionally and materially identical to the P/N 3-1311 wheels. Subsequent engineering drawing changes strengthened the P/N 3-1365 wheel by including thicker outer flanges, anodizing, and shot peening. Goodrich initially stated that the first flange dimensional change to the P/N 3-1365 wheel was effective on S/N 165. However, a postaccident laboratory examination disclosed that the outer flange of the failed wheel, S/N 185, measured less than 0.470 inch, which is below the minimum tolerance of 0.490 for the strengthened P/N 3-1365 wheel. The Service Bulletin does not mention that an early quantity of P/N 3-1365 wheels were manufactured before the engineering changes were incorporated.

Goodrich Service Bulletin No. 369 also states that the thicknesses of the P/N 3-1311 wheel outer flanges are 0.450 to 0.510 inch. According to engineering drawings submitted to the Safety Board by Goodrich, the specified dimensions for the P/N 3-1311 outer flanges are 0.410 to 0.470 inch. We believe that these errors are indicative of lax quality control procedures. The erroneous Service Bulletin information is misleading to the user and could contribute to confusion regarding the strength and durability of those wheels which are selected for use on L-1011 aircraft having higher gross weight configurations. Additional uncertainty as to the actual dimensional characteristics of the P/N 3-1365 wheels is created by the fact that Goodrich has previously indicated that P/N 3-1365 wheel assemblies up to about S/N 165 are the "same" as P/N 3-1311 assemblies. Disclosure of the less than 0.470 inch flange thickness on the failed S/N 185 wheel assembly thus creates a question as to exactly how many wheels with these dimensions are identified as P/N 3-1365 assemblies.

Discussions among the Safety Board staff, FAA staff, and the domestic air carriers have disclosed that all of the operators employ some inspection programs involving periodic eddy current or dye penetrant techniques. Before the accident it was generally believed that these programs were effective in detecting fatigue damage before catastrophic failure. However, the Safety Board remains concerned that the inspection requirements are not standardized and have not been uniformly effective in reliably detecting cracks prior to in-service failures. In fact, the foreign operator involved in this accident also used an eddy current inspection program and the failed wheel was inspected only 28 cycles before the accident. The Safety Board strongly believes that an effective inspection program is a vital element in the prevention of wheel failures and that the procedures proven by industry experience to be effective should be identified and required to be implemented by all carriers.

Furthermore, the Safety Board notes from Service Difficulty Reports that wheel failures are occurring with nearly all types of commercial aircraft. Therefore, the Safety Board believes that action to establish more reliable wheel inspection procedures should not be limited to the L-1011 wheels.

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

> Issue an immediate Airworthiness Directive to require that operators of L-1011 aircraft at the next tire change or within 20 cycles, whichever is sooner, measure the flange thickness on all P/N 3-1365 wheels with serial number up to 1404 which have been used on aircraft with a gross takeoff weight of 430,000 pounds or more, and include in the Airworthiness Directive a requirement to remove all wheels with outer flange thicknesses of less than 0.490 inch and installed on aircraft operating at gross takeoff weights of 430,000 pounds or more. Further requirements should include at each wheel disassembly of all P/N 3-1365 and P/N 3-1311 wheels, an inspection in accordance with procedures which have been evaluated by the FAA and demonstrated by industry experience to be effective in detecting in-service cracking prior to failure. (Class I, Urgent Action) (A-81-1)

Initiate an immediate survey of B.F. Goodrich manufacturing facilities by a Quality Assurance Systems Analysis Review Team or equivalent to assure the manufacturer's compliance with current regulatory requirements governing production certification and specifically the issuance and approval of service bulletins, investigation and reporting of service difficulties, maintenance of appropriate production and inspection records, and coordination of service difficulties with primary airframe manufacturers. (Class I, Urgent Action) (A-81-2)

Require tire, wheel, and airframe manufacturers to publish and disseminate to all operators all engineering data necessary to determine the effect on fatigue life of aircraft wheels by increasing or decreasing tire inflation pressures. (Class I, Urgent Action) (A-81-3)

Establish a program with air carriers, wheel, and airframe manufacturers to determine effective nondestructive inspection techniques for the variety of aircraft and wheel combinations in air carrier service and require operators to implement effective inspection programs. (Class II, Priority Action) (A-81-4)

Expeditiously disseminate any required wheel inspection and service programs to all foreign civil aviation authorities with regulatory responsibilities over operators of U.S.-manufactured aircraft and equipment. (Class I, Urgent Action) (A-81-5)

KING, Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 15, 1981

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-6 and -7

The National Transportation Safety Board's aircraft accident data indicate that engine failures are a substantial initiating factor in general aviation accidents. One problem associated with engine failures is the separation of the throttle linkage. The results of these separations vary among models of aircraft; the variations include the fuel control commanding one of three settings: idle power, full power, or shutoff (no power) position.

Our records indicate that between 1964 and 1979 there were 148 reports of single-engine aircraft accidents initiated by throttle linkage failures. These accidents resulted in 5 deaths, 250 injuries, 15 destroyed aircraft, and 133 substantially damaged aircraft. The Safety Board believes that this type of accident can be reduced and that aggressive preventive action is needed.

A typical example of this kind of accident involved a Cessna 207 which was climbing in VFR conditions. Shortly after the flight was cleared to climb and to maintain 5,000 feet, the engine quit. The pilot could not return to the airport because the engine had stopped, so he landed the aircraft on a partially lighted city street. During the landing roll, the aircraft struck signs on both sides of the street when the pilot attempted to avoid automobile traffic. The aircraft received substantial damage, but the pilot escaped injury. Our investigation disclosed that the throttle linkage had separated. During the investigation the engine was started by operating the throttle control at the injector manually, and the engine operated normally at all speeds from idle to maximum power. When the throttle control was released, the engine immediately returned to idle and quit.

This mishap is representative of many accidents and incidents which evolve in approximately the same manner each year. The Safety Board's data indicate that this type of accident is increasing. Our investigations indicate that the causes of throttle linkage separation include such factors as design, maintenance and inspection practices, improper maintenance procedures, improper operation of powerplant controls, and inadequate preflight inspections.

In existing aircraft, when the throttle linkage separates, one of the following three things happens: the throttle closes and the engine idles or stops; the throttle remains at the power set at the time of failure; or the throttle goes to the full open position. If the throttle closes and the engine idles or quits, the pilot is committed to land without regard for weather or proximity to a suitable landing area. We believe this condition is unsatisfactory.

If the throttle goes to the full open position after linkage separation, the pilot has a different problem. It may be difficult to descend at a safe speed, particularly at night or in IFR conditions. This problem can be compounded when the available maneuvering area is restricted by terrain or other obstacles. It may take more than ordinary piloting ability to maintain control of an aircraft and its speed under those conditions.

The third condition--power remaining at the selected setting when separation occurs--is the best of the three in most cases. However, if the extremes of idle power for descent or maximum power for takeoff exist when separation occurs, the problems would be the same as those associated with the other two conditions.

Considering these factors, we believe that the safest solution to this problem would be to establish a requirement that, when throttle linkage separation occurs, the fuel control would automatically travel to a setting which would allow the pilot to maintain level flight in a cruise configuration.

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

> Establish a requirement that, when throttle linkage separation occurs in a small single engine aircraft the fuel control will go to a setting which will allow the pilot to maintain level flight in the cruise configuration. (Class II, Priority Action) (A-81-6)
>
> Review the service experience of throttle linkage separations in single engine general aviation aircraft and issue an Airworthiness Alert to the owners and operators of such aircraft, to increase their awareness of the problems associated with such linkage separations. The alert should be worded to improve maintenance practices and inspection techniques. (Class II, Priority Action) (A-81-7)

KING, Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 28, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-8

On March 27, 1980, the National Transportation Safety Board investigated an accident near Denver, Colorado, involving a Beech Kingair 200, N456L. The aircraft departed Arapahoe County Airport, Englewood, Colorado, at 1432 mountain standard time on an instrument flight rules (IFR) flight plan to Lufkin, Texas. About 7 minutes after takeoff at an altitude of about 12,800 feet, the pilot reported to Denver departure control that the aircraft was encountering icing and requested a return to the Arapahoe County Airport.

Shortly thereafter, the pilot stated that he wanted to go to Stapleton International Airport rather than Arapahoe. The aircraft was cleared to 11,000 feet, but the pilot radioed that the aircraft was not able to maintain altitude. About this time, the Denver radar controller offered the pilot of N456L a precision approach radar (PAR) approach to the Buckley Air National Guard Base. The aircraft was not able to reach Buckley and crashed in an open field about 14 miles southeast of the Arapahoe County Airport. There were 10 fatalities.

The pilot of N456L called the Denver Flight Service Station (FSS) at 1020 and requested a weather briefing for a proposed flight from Arapahoe County Airport to Lufkin, Texas, departing at 1330. The weather briefing lasted from 1020 to 1024.

The Safety Board's investigation of the accident disclosed that the lack of priority message handling on the leased service-A high-speed weather data circuit, which serves the Denver FSS, resulted in the omission of an urgent weather message, SIGMET GOLF 1, calling for severe icing in eastern Colorado, from the weather briefing at 1020.

Priority message handling exists only on the low-speed, service-A circuits that originate at the Weather Message Switching Center (WMSC) in Kansas City, Missouri. Therefore, SIGMET GOLF 1 was available over the low-speed, service-A weather data circuit at 1011, 1 minute after it was issued by the National Weather Service (NWS). However, there is no priority message-handling procedure for the leased high-speed service-A weather data circuit, and SIGMET GOLF 1 was not available to the Denver FSS specialist responsible for aviation weather briefings until 1025--too late to include in the briefing of the pilot of N456L. Although both weather data circuits serve the Denver FSS, the leased service-A circuit is used primarily for receiving weather data necessary for weather briefings; the low-speed, service-A circuit serves as a backup.

The leased high-speed, service-A circuit serves not only the Denver FSS but also more than 140 other flight service stations nationwide. In addition, medium- and high-speed weather data circuits that originate at the WMSC at Kansas City serve the meteorological departments of many of the major air carriers as well as other nongovernment users engaged in aviation forecasting and weather briefing.

Urgent weather messages contain information pertaining to the safety of all aircraft. Information contained in these messages must be made available immediately to the aviation community. To do so requires the immediate delivery of urgent weather messages to all weather data circuits that originate from the WMSC.

The Safety Board is aware that the Federal Aviation Administration (FAA) on April 14, 1980, made a temporary format change in the delivery of urgent weather messages to the leased high-speed, service-A weather data circuit. The change provides for the immediate delivery of urgent weather messages to the FSS supervisor's printer. This information is then disseminated by the supervisor to FSS specialists responsible for weather briefings. This format change only affects those flight service stations on the leased service-A circuit and does not affect nongovernment users on other medium- and high-speed circuits. The Safety Board believes that, in the interest of air safety, immediate delivery of urgent weather messages to all circuits that originate at the WMSC at Kansas City is necessary.

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

> Develop and implement a priority message-handling procedure to assure the immediate delivery of urgent weather messages to all weather circuits that originate from the Weather Message Switching Center in Kansas City, Missouri. (Class II, Priority Action) (A-81-8)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 6, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-9 through -11

On October 8, 1979, a Cessna 207A, N6424H, crashed into a hangar at Merrill Field, Anchorage, Alaska, moments after lift-off from runway 33. All four occupants were killed, and the postcrash fire destroyed the hangar.

Investigation of the accident revealed that: the fuel system showed evidence of extensive water and rust contamination; the underground fuel tank at Merrill Field where the aircraft was last fueled contained a large quantity of water and rust; the underground fuel tank's filtration system was heavily contaminated; and an incorrect fuel system dispensing filter, intended for use with diesel fuel, had been installed.

In 1978, the National Transportation Safety Board investigated 17 general aviation accidents involving fuel contamination "exclusive" of water as a cause or factor, and 66 general aviation accidents involving water "in" the fuel as a cause or factor. In March 1980, the Safety Board's Anchorage field office mailed a questionnaire to all known commercial/air taxi operators in the State of Alaska. Of the operators who replied, 4 percent did not know what type of filtration assemblies and filters they used, 4 percent performed no inspections to determine when the dispensing filters should be changed, 30 percent inspected the dispensing filter daily, and 20 percent inspected the dispensing filter "at least yearly." The remaining operators inspected at intervals ranging from "once every 3 days" to "once every 3 years."

The Safety Board recognizes that the pilot is responsible for assuring that a general aviation aircraft has uncontaminated fuel. Pilots of general aviation aircraft procedurally drain a small amount of fuel from the tanks and the fuel strainer and check for the presence of water and particulate matter. If a partially filled tank cools, condensation results and settles to the bottom of the tank. This is detectable using normal preflight procedures.

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However, when fuel contaminated by water is added to an uncontaminated tank, considerable time is needed for the water to completely settle to the bottom of the tank. This creates the opportunity for contaminated fuel to go undetected. Also, the uncontaminated fuel in the lines and fittings must first be drained to detect the water-contaminated fuel. On some aircraft, more than a quart of fuel must be drained before any water appears. Most tiedown areas where preflights checks are performed belong to flight schools or fixed-base operators, most of whom do not encourage pilots to drain a quart of fuel on the asphalt because aircraft fuel tends to dissolve this particular surface. The pilot then, although responsible, is presented with situations in which water detection is difficult.

While the Board believes that pilots must conduct an adequate preflight check, we are concerned that this is not a total solution to the problem of fuel contamination. In addition to the current pilot responsibility, the Board believes that other measures should be taken to insure against contamination. For example, fuel dispensing systems could be required to be equipped with filter/separator units which respond to the presence of free water by shutting down.

The Board is aware that 14 CFR 139 prescribes rules governing the certification of land airports serving air carriers that hold certificates of public convenience and necessity issued by the Civil Aeronautics Board. Part 139.51 states that "... the applicant for an airport certificate must show that it (or its tenant), as the fueling agent, has a sufficient number of trained personnel and procedures for safely storing, dispensing, and otherwise handling fuel, lubricants, and oxygen on the airport (other than articles and materials that are, or are intended to be, aircraft cargo). . . ." This is the only rule that addresses the subject of storing and dispensing aviation fuel, and in addition, applies solely to air carrier airports. In the Board's opinion, 14 CFR 139 is inadequate even for those airports it covers because it does not address fuel contamination. Our accident statistics do not indicate that fuel contamination has been a problem to air carrier aircraft. However, informal communication with the FAA indicates that control of contamination is considered during airport certification via a rather broad interpretation of 14 CFR 139.51. The Board believes that the problem of fuel contamination should be specifically addressed for both air carrier and general aviation airports. In our judgment, fuel contamination should be specifically addressed for all segments of aviation rather than only that segment in which there is an apparent current problem. It has been generally accepted that standards for air carrier operations must be as stringent as they are for general aviation. We believe that the regulations should reflect this consistency.

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

> Expand 14 CFR 139 to include minimum specifications and design criteria for the installation, maintenance, and inspection of aviation fuel storage and dispensing systems at airports certificated under 14 CFR 139. (Class II, Priority Action) (A-81-9)
>
> Take necessary action to establish minimum specifications and design criteria for aviation fuel storage and dispensing systems at public-use airports not certified under 14 CFR 139. In addition to the equipment itself, such criteria should address their installation, operation, maintenance, and inspection. (Class II, Priority Action) (A-81-10)

When specifications and criteria are established for aviation fuel storage and dispensing systems at public-use airports are not certified under 14 CFR 139, establish and implement procedures to verify compliance. (Class II, Priority Action) (A-81-11)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 10, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-12 through 13

The National Transportation Safety Board sent a U. S. Accredited Representative and accompanying advisors to participate in the investigation of the Saudi Arabian Airlines Lockheed L-1011 accident at Riyadh, Saudi Arabia, on August 19, 1980. The accident involved an in-flight fire in the aft area of the aircraft. Even though the aircraft was landed successfully, the fire spread and all 301 occupants died as a result. The investigation, conducted in accordance with the provisions of International Civil Aviation Organization Annex 13, is continuing and a report of the investigation will be issued by the Kingdom of Saudi Arabia upon completion. As part of U.S. assistance in the investigation, tests and research were conducted at the Lockheed California Company and at the Federal Aviation Administration (FAA) Technical Center, Atlantic City, New Jersey.

The fire ignition source and exact area in which the in-flight fire originated have not yet been determined. The aft baggage compartment (C-3), among others, where bulk baggage is carried beneath the aft cabin floor, is being investigated as a possible origination area. Among the tests conducted to evaluate certain hypotheses regarding fire propagation were fire penetration tests of the C-3 compartment lining materials. One test showed that a 5-inch diameter, 12-inch-high propane burner flame (1,800° F) placed beneath the C-3 compartment ceiling penetrated the ceiling liner in less than 1 minute and then penetrated the cabin floor and carpet material in less than 2 minutes. A second test using the same burner showed that a 3- to 4-foot-high flame (1,160° F, fuel rich) penetrated the ceiling liner in 25 seconds, and then the cabin floor and carpet material in 4.5 minutes.

The C-3 compartment of the L-1011 is certificated as "Class D" under the provisions of 14 CFR 25.857(d). That rule states, A Class D cargo or baggage compartment is one in which--

(1) A fire occurring in it will be completely confined without endangering the safety of the airplane or the occupants;

(2) There are means to exclude hazardous quantities of smoke, flames, or other noxious gases from any compartment occupied by the crew or passengers;

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(3) Ventilation and drafts are controlled within each compartment so that any fire likely to occur in the compartment will not progress beyond safe limits;

*****

(5) Consideration is given to the effect of heat within the compartment on adjacent critical parts of the airplane. For compartments of 500 cu. ft. or less, an airflow of 1,500 cu. ft. per hour is acceptable.

The Safety Board notes that its predecessor, Civil Air Regulation 4B.383, "Cargo Compartment Classification," contained the following regarding Class D compartments: "Note: For compartments having a volume not in excess of 500 cu.ft. an airflow of not more than 1,500 cu.ft. per hour is acceptable. For larger compartments lesser airflow may be applicable." This guideline at least suggested more conservative criteria should be followed for larger compartments while the existing rule does not address the airflow allowance in compartments larger than 500 cu.ft.

The volume of the C-3 compartment of the L-1011 is 700 cu. ft. Safety Board investigators have been advised by FAA that the L-1011 C-3 compartment was approved as "Class D" by "extrapolations" from the 500 cu. ft. volume and 1,500 cu. ft. per hour airflow guidelines in 14 CFR 25.857(d)(5). However, the theoretical concept of a Class D compartment is that a fire within the compartment would be extinguished by oxygen depletion, preventing its propagation. This concept apparently has been successfully applied in narrow-bodied aircraft with limited volume compartments. However, the Safety Board is concerned that it may not be a valid concept for larger volume compartments, such as the L-1011 C-3 compartment, because much greater volumes of oxygen are available to support combustion prior to depletion and "snuffing." The additional air supply can readily support a fire for sufficient time to allow penetration of the compartment lining, thereby providing access to an unlimited oxygen supply to support propagation of the fire. In fact, preliminary tests conducted at the FAA Technical Center, using a 770 cu.ft. simulated Class D compartment, illustrated that a fire of sufficient intensity to penetrate the L-1011 C-3's ceiling liner in less than 1 minute burned for more than 10 minutes after the compartment airflow was shut off.

The Safety Board is aware that the type of flames used in the tests at Lockheed and at the FAA Technical Center do not duplicate the type of flame (bunsen burner) used to certify flammability characteristics of cargo and baggage compartment interior materials (14 CFR 25.855). However, the Safety Board believes that a small fire in a piece of baggage could generate localized intense heat similar to that from the propane burner used in the recent tests and that the fire could penetrate the ceiling before the oxygen supply is depleted.

The penetration of the L-1011 C-3 compartment ceiling carries extremely hazardous consequences because numerous major aircraft components are routed between the ceiling of the compartment and the floor of the cabin. Among these items are the No. 2 engine throttle cables, the No. 2 fuel line, and flight control cables. Fire reaching these components could easily endanger the entire aircraft, and therefore, the design does not comply with the intent of 14 CFR 25.857(d)(5). Moreover, once such a fire reaches the cabin, the cabin furnishings will become involved, and the fire will be difficult to extinguish.

The Safety Board is aware of several instances of fire in checked baggage from ignition of matches and other items. In most of these instances, fires ignited while the aircraft were on the ground and the aircraft were not damaged. However, the possibility of such a fire while in-flight and the questionable capability of the L-1011 C-3 compartment to contain a fire by "snuffing" it to keep it from spreading suggest that the "Class D" certification of the C-3 compartment should be reevaluated.

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

> Reevaluate the "Class-D" certification of the L-1011 C-3 cargo compartment with a view toward either changing the classification to "C," requiring detection and extinguishing equipment, or changing the compartment liner material to insure containment of a fire of the types likely in the compartment while in-flight. (Class I, Urgent Action) (A-81-12)
>
> Review the certification of all baggage/cargo compartments (over 500 cu. ft.) in the "D" classification to insure that the intent of 14 CFR 25.857(d) is met. (Class II, Priority Action) (A-81-13)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 24, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-14

On December 28, 1978, United Air Lines Flight 173, a DC-8-61 aircraft, crashed as a result of fuel exhaustion near the Portland International Airport, Portland, Oregon, after holding in the vicinity of the airport for approximately 1 hour while the flightcrew attempted to resolve landing gear problems. Of the 181 passengers and 8 crewmembers aboard, 8 passengers and 2 crewmembers were killed, and 21 passengers and 2 crewmembers were injured seriously.

On October 20, 1979, a Pan American Airways Boeing 747 declared an inflight emergency because of a low fuel state. The investigation revealed an error in the aircraft's fuel quantity gages which indicated more fuel than the fuel tanks actually contained. Although the error was within the manufacturer's allowable tolerances, it contributed to the crew's failure to declare an emergency fuel situation earlier in the flight.

The Safety Board is concerned that the pilot-in-command of the DC-8-61 aircraft did not have guidance information for a minimum allowable amount of fuel with which to begin the approach/landing. The Safety Board believes that minimum fuel quantities below which landing should not be delayed should be specified for all aircraft that are operated under 14 CFR 121 and 14 CFR 135. Moreover, the Board believes that allowances for fuel quantity measuring system tolerances should be considered in making a minimum approach/landing fuel determination.

The Safety Board has learned informally that United Air Lines, recognizing a need for the foregoing guidance, has worked with the Boeing Company and McDonnell Douglas Corporation to incorporate into its aircraft flight manuals fuel limitations and specifications, including the minimum fuel quantity required for an approach and go-around.

The National Transportation Safety Board fully supports this United Air Lines effort in the interest of aviation safety. The Safety Board believes that the operational deficiencies associated with a lack of guidance on fuel minimums and fuel quantity measurement system tolerances can be eliminated by an industrywide implementation of procedures similar to the United Air Lines program.

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

> Amend 14 CFR 121 and 14 CFR 135 to require that all air carrier operators include in their flight operations manuals minimum operational fuel requirements for their aircraft, including fuel quantities below which a landing should not be delayed. In determining minimum fuel quantities, allowances should be made for fuel quantity measuring system tolerances and for the possiblity of a missed approach. (Class II, Priority Action) (A-81-14)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 24, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-15 and -16

On February 26, 1980, a Cessna Model 172K (XP) crashed during normal takeoff from the Eagle Creek airport near Indianapolis, Indiana. The pilot, a commercial flight instructor and the only occupant of the aircraft, was killed. According to witnesses, the aircraft pitched up to a steep nose high attitude, about 60° or 70°, and the sound of engine power reduced abruptly from takeoff power to idle. The aircraft then pitched down and rotated about 160° to the left before crashing on the edge of the asphalt runway.

Investigation revealed that the pilot's seat was not locked and had slid rearward on the seat rails during liftoff. The pilot weighed 105 pounds and was 5 feet 3 inches tall. Acquaintances stated that she flew all types of aircraft with her seat in a full-forward position and required an extra seat cushion to enable her to see over the glareshield of the instrument panel. Because of her relatively short stature, she could not reach the throttle or rudder pedals or fully manipulate the control wheel of the above aircraft with her seat in its rearmost position. Consequently, once the seat slid aft, she was not able to maintain control or regain control when the pitch angle increased abruptly. The pitch up of the aircraft to a steep nose high attitude and the reduction in power would be the expected consequences of the pilot's holding onto the control yoke and the throttle as her seat slid aft.

If the pilot had attempted to position and lock her seat in the full forward position in the aircraft, the left front corner of the seat would have contacted and wedged against the door jamb. This interference, which is typical in this aircraft model, can prevent the seat locking pins from reaching the forwardmost locking holes. More importantly, however, the wedging of the seat can lead the pilot to believe that the seat is locked when, in fact, the locking pins are actually positioned between locking holes. Any subsequent forces on the seat, such as those occurring during takeoff, liftoff, or landing, can cause the seat to release abruptly and slide aft.

The pilot's operating handbook for the Cessna model 172K (XP) aircraft includes the pilot's check of the adjustment and locking of seats, belts, and shoulder harnesses on the "before starting engine" checklist. However, because some pilots may find it necessary to readjust the seat before takeoff, the Safety Board believes that a check to ensure that front seats, belts, and harnesses are adjusted and locked also should be included on the "before takeoff" checklist.

Between 1970 and 1979, various Cessna aircraft were involved in 20 accidents in which slippage of the pilot's seat during takeoff or landing was determined to have been a causal element.

In view of the above, the Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive for Cessna aircraft in which interference between seats in the full forward position and door jambs currently exists requiring that the seat rail stops be positioned to permit proper seat locking in all seat positions. (Class II, Priority Action) (A-81-15)
>
> Require the Cessna Aircraft Company to include an adjustment and locking check of front seats, belts, and shoulder harnesses on the "before takeoff" checklists applicable to all Cessna aircraft. This item should be included on new checklists as soon as possible. (Class II, Priority Action) (A-81-16)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 24, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-18

About 1416 e.s.t. on February 16, 1980, a British Redcoat Air Cargo, Ltd., Bristol Britannia, 253F, crashed in a wooded area near Billerica, Massachusetts, about 7 minutes after takeoff from Logan International Airport in Boston. Of the six crewmembers and two passengers aboard, only the flight engineer survived.

Although weight and balance and center of gravity problems did not contribute to the cause of this accident, the National Transportation Safety Board's investigation revealed apparent lax practices in determining the weight of individual pieces in bulk cargo shipments. These practices appear to involve manufacturer/shippers and freight forwarders, as well as air carriers and flightcrews. The Safety Board believes that this laxness is perpetuated by the absence of regulatory guidelines.

During its investigation, the Safety Board learned that the aircraft loadmaster was told that the 168 pieces had a total weight of 35,574 lbs. The investigation revealed that the actual weight of the cargo was 32,860 lbs—a 2,714-lb error. According to the testimony of the freight forwarder's loaders, the loadmaster estimated the weight of each unit as he selected it for loading. He made selections from cargo located on the ramp while he stood on the aircraft. These random selections involved individual cartons, or skids containing a number of cartons, which were not marked with individual weights. Although a scale was readily available, it was not used to determine the weight of any cartons or skids. No attempt was made by the freight forwarder to cross-check the declared weight by weighing representative pieces. The loadmaster used the declared total weight to compute the weight and balance in accordance with company procedures on the form provided. As far as determining the accuracy of the computed c.g. is concerned, the loadmaster is reported to have checked the nose wheel strut extension for movement several times. This procedure, although better than nothing, cannot be condoned by the Safety Board.

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During the investigation, the loading of another Britannia was observed at the Hopkins International Airport, Cleveland, Ohio. The load consisted of shipments from several sources; for most of the shipments only the total weight was provided, with no weights marked on, or attached to, individual pieces or skids of varying sizes and weights. Because the shipments were about the same weight and volume ,the shipments were treated as equal entities and balanced one against the other. However, a part of one shipment consisted of a large, unmarked crate which was not identified on the shipper's waybill. Because of its size, it had to be separated from the rest of the shipment. A discussion ensued between the aircraft loadmaster and the freight forwarder supervisor regarding the placement of the large, unmarked crate in the aircraft. When the Safety Board investigator asked that the crate be weighed, the freight forwarder supervisor stated that he had no scale. When a scale was eventually located, the crate was found to weigh 2,195 lbs. After recalculation, the crate was placed where the ground loader had originally said it should go. The Safety Board is aware of the value of experience; however, it is also aware of what can happen when inexperienced personnel operate according to their own inclinations in the absence of sound, proven procedures.

Although, as noted earlier, weight and balance and center of gravity problems did not contribute to the cause of the crash of the Redcoat Air Cargo, Ltd., Bristol Britannia, the use of trial and error methods in loading creates a great potential for error in bulk loaded aircraft. Especially vulnerable are those operated by supplemental air carriers and commercial operators who do not have their own ground personnel and facilities and who, therefore, have to rely on the freight forwarder or shipper for vital information.

Regulation 14 CFR 121.665 holds each certificate holder responsible for the preparation and accuracy of a load manifest form before each takeoff. Regulation 14 CFR 121.693(a) requires that the load manifest contain, among other items, the total weight of the cargo aboard. There are no Federal Aviation Regulations that require the labeling of individual items according to weight, and there are no regulations to require a freight forwarder to even have a scale available for use whenever the weight of a shipment is unknown or questionable. In fact, there appears to be no regulation that fixes the responsibility of anyone but the certificate holder, and in his case, it is directed to the preparation of a load manifest. In addition, air freight forwarders no longer are required to be certificated by the Civil Aeronautics Board. This requirement was removed when the airline industry was deregulated.

Therefore, the Safety Board is concerned that when a shipment's declared weight is inaccurate, whatever the reason, or when individual items are not marked with their weight, serious weight and balance problems could result and that there are no means, short of refusing the shipment, to compel a shipper to furnish this information or to verify its accuracy.

The Safety Board is cognizant of the fact that the FAA does not have jurisdiction over the movement of freight by modes other than aviation; however, the Board believes that the FAA must take a more active role in regulating the movement of freight by air. In that regard, the Safety Board has made the following recommendation to the Department of Transportation:

> Determine which agencies have jurisdiction over shippers and freight forwarders, and coordinate joint efforts with those agencies to promulgate guidelines that specify the responsibilities of shippers, freight forwarders, and air carrier certificate holders in determining unit weights in bulk air cargo shipments so as to facilitate compliance with current manifest requirements by air carrier certificate holders. (Class II, Priority Action) (A-81-17)

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

> Promulgate regulations to require that unit pieces in bulk load air cargoes are labeled as to actual weight. (Class II, Priority Action) (A-81-18)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in this recommendation. GOLDMAN, Member, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 27, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-19 and -20

On May 8, 1978, near Pensacola, Florida, a Boeing 727 crashed into the water after receiving a terrain closure "pull-up" ground proximity warning system alert. The company's procedures stated that, upon receipt of the system's visual and aural terrain closure warning, "positive action to alter the flightpath to stop the warning should be initiated immediately." Despite these guidelines, the pilot continued his descent while the ground proximity warning system's terrain closure warning continued unabated for 9 seconds until the flight engineer--on the mistaken belief that he had been ordered to do so--turned the system off and silenced the warning. The investigation showed that, except for a slight decrease in the rate of descent which occurred 7 seconds after the warning began, the descending flightpath remained virtually unchanged throughout the entire 9-second interval that the warning was in progress. The Safety Board believes that had the pilot complied in a timely manner with his company's flightcrew response procedures, the crash would have been avoided.

On April 25, 1980, a Boeing 727, operated by a United Kingdom charter air carrier, crashed into a mountain ridge on the island of Tenerife, Grand Canary Islands, Spain, 5 seconds after the flightcrew received a "pull-up" warning from the ground proximity warning system. After the warning began, the pilot applied the maximum available thrust and attempted to stop the aircraft's descent by reversing the direction of the turn the aircraft was in when the alarm began; however, the pilot failed to rotate his aircraft and initiate a climb. Performance data showed that the ridge could have been cleared if a best angle climb had been initiated when the warning began.

In both accidents, the evidence indicated that the flightcrews were not in visual contact with the terrain.

The Safety Board is concerned that the two accidents may be indicative of a tendency of pilots to question the reliability of the ground proximity warning system and, thus, delay their response to the terrain closure warning, and that some existing flightcrew response procedures do not emphasize either the necessity for an immediate response to the warning or the type of response that will insure that timely and adequate measures have been taken to forestall ground impact. Our concern over the latter area resulted from our examination of the published procedures of 12 air carriers. While 8 of the 12 required their flightcrews to execute an immediate pullup on receipt of the warning, only 5 of these 8 specified the manner in which the maneuver was to

be made with regard to aircraft rotation and thrust application. The published procedures of three of the remaining four air carriers require their flightcrews to "immediately" alter the aircraft's flightpath to stop the warning. Finally, one air carrier's procedure states that when the "pull-up" warning occurs, an immediate pullup will be made unless it is readily apparent that the warning is due to a malfunction or it is clear that a hazardous condition does not exist.

Recently, the Boeing Commercial Aircraft Company's flightcrew training department published "The Delayed Response Syndrome," which discussed the pilot's response to the ground proximity warning system. The paper noted that, although human factors research has shown that, depending on the workload, the normal response time to a critical warning is 1 to 4 seconds (Boeing Document D6-44200, "Human Factors Guidelines for Caution and Warning Systems), data from flight and voice recorders have shown that the response time to a terrain closure "pull-up" warning varied from a minimum of 5 seconds to 15 seconds or longer.

Boeing believes that this delay is attributable to two factors. First, during the early period of ground proximity warning system operations, flightcrews were subjected to frequent nuisance and unwanted terrain closure warnings that reached a level of 1 in every 10 approaches. Consequently, flightcrews began to verify the warnings by flight instrument displays (or visually if in visual meteorological conditions) before applying corrective action.

The situation was compounded by the incompatibility of the early ground proximity warning systems with certain training maneuvers, such as back course, nonprecision, below-glide-slope approaches to displaced thresholds, and demonstrated approaches that intentionally exceeded the ground proximity systems envelopes. The resultant warnings, which occurred during these maneuvers, further compromised the system's credibility.

Secondly, most of the terrain warnings occurred while the aircraft was operating under radar control. Understandably, some time would be required to recover from the mental impact of such a warning under these conditions, especially if doubts concerning the system's credibility still lingered. Interestingly, in the accidents cited one aircraft was operating under radar control and the other had been cleared by a controller to enter a holding pattern and was trying to do so. The Safety Board believes that the accidents tend to validate the rationale concerning the existence of a "delayed response syndrome" within the pilot community to this type of warning, and, therefore, corrective action should be taken to counteract and eliminate any resistance to a ground proximity system terrain closure warning.

The Safety Board believes that conditioned responses are not generally acceptable in the cockpit. In most instances, some analysis of the situation is desired or required, but the criticality of ground impact demands an instant response to a warning of its imminence, rather than an analysis of the validity of the warning and the reliability of the system supplying the warning. The desired response to this type of warning should be set forth precisely, and it should require the immediate application of the maximum available thrust and rotation of the aircraft to achieve best climb performance. The Safety Board believes these procedures are now necessary, especially since design improvements of the ground proximity warning system have virtually eliminated nuisance warnings.

Therefore, the Safety Board recommends that the Federal Aviation Administration:

> Instruct all air carriers to include in their flightcrew procedures instructions which require an immediate response to the ground proximity system's terrain closure "pull-up" warning when proximity to the terrain cannot be verified instantly by visual observation. The required response to this warning should be that the maximum available thrust be applied and that the aircraft be rotated to achieve the best angle climb without delay. (Class II, Priority Action) (A-81-19)
>
> Instruct air carriers to include in their initial and recurrent simulator training curricula situations involving radar controlled as well as noncontrolled flight wherein ground proximity warning system alarms are given and flightcrew response to those warnings system alarms are evaluated. (Class II, Priority Action) (A-81-20)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 12, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-21 and -22

On March 3, 1980, a Beech King Air (65A90), N30AA, was being operated as an air taxi passenger flight and had departed the Dallas/Fort Worth Airport, Texas, at 1200 c.s.t. en route to Higgins, Texas. At 1230 c.s.t., the aircraft experienced an explosive decompression at 11,500 feet m.s.l. when the forward left-hand cabin window failed. The pilot reduced power, slowed the aircraft, and started an immediate descent to Love Field, Dallas, Texas. The aircraft was landed without further incident.

The National Transportation Safety Board's investigation of the incident and its review of pertinent Service Difficulty Reports indicate that corrective action is necessary to reduce the potential for similar occurrences.

Pieces of the failed cast acrylic window, P/N 50-420013-191, and a like window from the aircraft cabin, which showed evidence of a stress craze of less than 3/8-inch in length, were examined at the Beech Aircraft facility in Wichita, Kansas. The examination revealed indications of failure modes similar to those that occurred in other failures of cast acrylic cabin windows from King Air aircraft.

A survey of the FAA Maintenance Analysis Center records on the Beech King Air indicated that 70 cockpit and cabin window discrepancies have been reported over the last 6 years. Three of the discrepancies involved failure of cabin window P/N 50-420013-191 at altitude. In one case, the aircraft was at 20,000 feet and the window that failed had been inspected 20 flight-hours before.

According to AD 77-23-07 and the manufacturer's class-I mandatory compliance Service Instruction, No. 0711-110, Revision II, replacement of cockpit side windows, cabin windows, and baggage compartment windows is predicated upon the finding of a stress craze or crack 3/8 inch or longer. If a 3/8-inch or longer stress craze or crack is discovered during any inspection, the window is to be replaced with a new stretched acrylic window (P/N 50-430013-1053) before the next flight or the aircraft must be placarded and left unpressurized until a new window is installed. If a craze or crack less than 3/8 inch is discovered, the window must be reinspected each 100 flight-hours. Otherwise, the windows need only be inspected at 500-hour intervals. The fact that one cast acrylic window failed about 20 hours after an inspection indicates that the inspection intervals and criteria may not be adequate.

The Safety Board was informed by the aircraft manufacturer, during a recent 12-month period, that 21 cast acrylic windows have failed, 9 of which were cabin windows. Additionally, a review of the manufacturer's data indicated that there were no stretched acrylic window, P/N 50-430013-1053, failures reported during that 12-month period.

In view of the potential catastrophic results of aircraft window failures at high altitude, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend Airworthiness Directive 77-23-07 to require more frequent inspections of cast acrylic windows and consider reducing the length of the crack or craze at which the windows must be replaced. (Class II, Priority Action) (A-80-21)
>
> Advise owners/operators of affected Beech aircraft of the hazards of operating their aircraft with crazed or cracked cast acrylic windows, and recommend that cast windows be replaced with stretched acrylic windows at the earliest opportunity. (Class II, Priority Action) (A-80-22)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 3, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-23

About 1546 c.d.t., on June 12, 1980, an Air Wisconsin, Inc., Swearingen SA-226 Metro operating as Flight 965 crashed near Valley, Nebraska. Flight 965 encountered an area of severe thunderstorms while at an altitude of less than 6,000 feet and experienced a simultaneous loss of power to both engines because of massive water ingestion. The aircraft crashed in a field and was destroyed. Of the 15 persons aboard the aircraft, 13 were killed and 2 were injured seriously.1/

During the investigation, an examination of Air Traffic Control (ATC) Handbook 7110.65B revealed that procedures for handling Center Weather Advisories (CWAs) are not contained in the Handbook. CWAs are prepared by meteorologists in the Air Route Traffic Control Centers (ARTCC) and are issued as an update to reflect changing conditions in current hourly Convective SIGMETS, 2/ as well as when meteorological conditions meet SIGMET 3/ criteria. CWAs are disseminated by the weather coordinator/flow controller in the ARTCC to the affected sectors and Federal Aviation Administration facilities.

Currently, procedures for handling Convective SIGMETS and SIGMETS are contained in paragraph 41 of ATC Handbook 7110.65B. However, because of the nature and importance of CWAs to the safety of all aircraft, the Safety Board believes that procedures for handling CWAs should also be included in the Handbook.

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

1/ For more detailed information, read "Aircraft Accident Report—Air Wisconsin, Inc., Swearingen SA-226 Metro, N650S, Valley, Nebraska, June 12, 1980" (NTSB-AAR-80-15).
2/ A weather advisory issued by the National Severe Storms Forecast Center in Kansas City, Missouri, concerning convective weather significant to the safety of all aircraft.
3/ A weather advisory issued by the National Weather Service concerning weather significant to the safety of all aircraft. A SIGMET is issued for severe and extreme turbulence, severe icing, and widespread duststorms/sandstorms lowering visibilities to below 3 miles.

Publish procedures in Air Traffic Control Handbook 7110.65B covering the handling of Center Weather Advisories. (Class II, Priority Action) (A-81-23)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 12, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-24 and -25

On July 21, 1980, Scenic Airlines Flight 306, a Cessna 404, N26835, crashed during takeoff from the Grand Canyon National Park Airport, Tusayan, Arizona. The left engine turbocharger failed after takeoff causing a substantial power loss. The aircraft was not able to climb or maintain altitude because the pilot failed to establish immediately a minimum drag configuration which further degraded the aircraft's performance significantly. The aircraft was 856 lbs below its certificated maximum gross takeoff weight and was within c.g. limits; however, the density altitude at the time of the takeoff was 10,000 ft m.s.l. The pilot and six of the seven passengers were killed. One passenger survived the accident but died 5 days later because of thermal injuries. Except for the postcrash fire, the accident was survivable.

Based on the aircraft flight manual, the aircraft should have had a best single-engine rate of climb of 160 fpm at a speed (Vyse) of 99 knots indicated airspeed (KIAS). This performance is predicated on the use of takeoff power on the operating engine with the landing gear and wing flaps up, the propeller on the inoperative engine feathered, a 5° angle of bank into the operative engine, and a 1/2-ball width slip deflection on the turn and bank indicator. The 160 fpm rate of climb, which was established under optimum flight test conditions, is barely discernible on the vertical climb indicator. Additionally, the manufacturer's data indicated that the climb performance of the Cessna 404 will be adversely affected by certain pilot actions. For example, a 5° bank into the inoperative engine will decrease the climb performance by 100 to 150 fpm, while a wings-level attitude would cause a 20 to 30 fpm decrease in climb performance. A 10° bank into the operative engine will decrease the climb capability by 150 to 200 fpm. Since the capability of the aircraft to climb in a single-engine configuration can be degraded by small increments of bank angle in either direction, the pilot must exercise exceptional skill to achieve the airplane's maximum performance under single-engine emergency circumstances. This fact was underscored in the Safety Board's special study 1/ on light twin-engine aircraft (nine passengers or less), wherein the Board stated "the ability to fly the aircraft in precisely the proper attitude and single-engine configuration to achieve maximum climb performance is difficult, and highly dependent on the knowledge of, and proficiency in, emergency situations."

1/ Special Study --"Light Twin-Engine Aircraft Accidents Following Engine Failures, 1972-1976" (NTSB-AAS-79-2).

A second similar accident occurred on March 21, 1980, when an Eagle Commuter Airlines, Inc., Piper PA-31-350, crashed after the takeoff. The accident occurred following a power loss in the right engine during a night departure. The pilot, who had considerable experience in the PA-31-350, the copilot, and five of the eight passengers were killed. The investigation revealed that the aircraft was about 90 ft above the runway and at, or just below, Vyse when power was lost. From the point where the power was lost, sufficient runway and clear zone remained to make a survivable emergency landing. However, the pilot elected to continue single-engine flight, although he did not raise the wing flaps or feather the propeller. As a result, he lost control of the aircraft, and it crashed 90° off the runway heading.

The foregoing accidents involved a critical emergency in these types of aircraft of a partial power loss at low altitude resulting in an extremely short period of time in which a pilot must decide whether or not to feather the propeller of the malfunctioning engine and take other immediate corrective actions. Pilots in this situation have allowed their aircraft to decelerate to dangerously slow speeds. Pilots, degrading the marginal single-engine performance by attempting to increase the climb of their aircraft, have lost control of the aircraft when the only realistic alternative was a controlled, straight-ahead emergency landing. The Safety Board believes that these pilots have responded improperly to single-engine emergencies because they have not prepared themselves for a power loss on takeoff. In part, this is because the performance data upon which a decision to continue the takeoff or make an emergency landing must be made has not been adequately defined or adequately understood by pilots. Additionally, some pilots apparently have not understood the necessity of establishing a zero sideslip attitude, and have exhibited difficulty controlling the yaw and roll associated with a sudden power loss.

The Safety Board believes that critical information relating to a power loss on takeoff in light, twin-engine aircraft is not stressed sufficiently in aircraft flight manuals or in pilot training programs. These manuals and programs should emphasize that a light, twin-engine aircraft which loses power on an engine shortly after takeoff will not have the capability to continue the takeoff climb unless the pilot analyzes the emergency correctly and responds immediately. The pilot must also be prepared to accept the possibility that continued single-engine flight is not possible and that a controlled emergency landing is the safest option available to him. Further, we believe it imperative that the pilots of these aircraft have complete knowledge of the critical performance data of the aircraft to enable them to determine quickly whether the aircraft has the capability to continue a single-engine climb or whether a controlled emergency landing is the safest option.

The Safety Board believes that emergency training must stress that most light, twin-engine aircraft, even when properly configured for a single-engine climb, have a marginal capability to maintain level flight at speeds below Vyse and very limited capability to climb even at airspeeds of Vyse. A pilot whose aircraft loses power on takeoff must raise the landing gear and flaps, identify and feather the propeller on the inoperative engine, and establish a 5° bank into the operative engine before the airspeed falls below Vyse. Concurrently, he will probably have to lower the nose of the aircraft to a level flight attitude, or a slightly nosedown attitude, to maintain the airspeed. Finally, each of these actions must be precise and timely because the available time, altitude, and aircraft performance leave little or no margin for error.

Realistically, a pilot needs 3 to 8 seconds to determine and accomplish the proper emergency response, during which time the aircraft can decelerate as much as 3 kns per second. Therefore, the aircraft should be accelerated to an airspeed greater than Vyse as soon as possible in order to provide the pilot with the opportunity to configure the aircraft properly and still maintain Vyse. The FAA, in Advisory Circular 61-21A, "Flight Training Handbook," recognizes the need for the posttakeoff attainment of an airspeed above Vyse and concludes that, ". . .the initial climb speed for a normal takeoff with both engines operating should permit the attainment of a safe single-engine maneuvering altitude as quickly as possible; it should provide for good control capabilities in the event of a sudden power loss on one engine; and it should be a speed sufficiently above Vyse to permit attainment of that speed quickly and easily in the event power is suddenly lost on one engine. The only speed that meets all of these requirements for a normal takeoff is the best rate-of-climb speed with both engines operating (Vy)."

As a result of the Safety Board's accident investigation experience and the special study on commuter airlines, we believe that the current training programs for 14 CFR 135 certificate holders do not discuss adequately the issue of emergency response to an engine loss on takeoff, or the marginal single-engine performance of light twin-engine aircraft. Furthermore, the training programs do not address adequately the specific capabilities of the aircraft used by the individual airlines. Finally, the Safety Board believes that most training programs and aircraft flight manuals do not contain sufficient data to inform the pilot of the marginal capability of many light twin-engine aircraft to maintain level flight, in a single-engine configuration, at airspeeds below Vyse.

On December 31, 1979, the Safety Board issued Safety Recommendation A-79-95, requesting that the FAA periodically disseminate additional information concerning how to manage engine failures in light twin-engine aircraft. Although the FAA responded by publishing three articles on light twin-engine operational safety, and accident prevention coordinators had conducted safety meetings with air taxi operators, it appears that the actions taken may not be sufficient. Therefore, the Safety Board reiterates the following recommendation:

> Periodically disseminate to pilots, certificated flight instructors, and FAA inspectors and their designees, additional information on how to manage light twin-engine aircraft following an engine failure, using advisory circulars, safety seminars, or other means at its disposal. (Class II, Priority Action) (A-79-95)

The Safety Board recognizes that more comprehensive aircraft flight manuals and improved pilot training and proficiency, while essential elements in a strategy to minimize accidents involving light twin-engine aircraft which experience an engine power loss during the critical takeoff regime, are not the ultimate solution to the prevention of these accidents. Therefore, the Board intends to conduct a more comprehensive investigation during which manufacturers, operators, and pilots will be solicited to assist the Board in identifying other possible and feasible corrective measures. Such measures could include standardized training, making more explicit performance data available to the pilot, and modifications of operational procedures.

As an interim measure the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that pilot training programs for 14 CFR 135 certificate holders which operate light twin-engine aircraft include specific ground and flight training in: (1) the factors related to achieving and maintaining Vyse; (2) the capability of company aircraft to maintain level flight at airspeeds below Vyse while in a single-engine configuration; (3) the capability of company aircraft to accelerate to Vyse while in a single-engine configuration; and (4) rapid appraisal of those situations in which a controlled, straight-ahead emergency landing is the safest or only option available. (Class II, Priority Action) (A-81-24)

Require that aircraft flight manuals for light twin-engine aircraft used in 14 CFR 135 operations contain data related to those conditions in which the aircraft, in a single-engine configuration and at airspeeds between Vmc and Vyse, has the capability to maintain level flight. (Class II, Priority Action) (A-81-25)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and BURSLEY, Members, concurred in these recommendations. GOLDMAN, Member, did not participate.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 20, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-26 through -28

On June 4, 1977, a Piper PA-28-140 Cherokee crashed near Lavina, Montana, while attempting to take off from a narrow unpaved country road. The aircraft departed the road at a bend and struck an embankment. Family members and local residents who were watching the takeoff arrived moments after the accident. They observed at least one occupant alive. She was unable to extricate herself and was asking for assistance. Repeated attempts were made to open the cabin door and break out the windows. Shortly thereafter, a small fire erupted and quickly spread to the cabin. Efforts to contain the fire with a portable chemical fire extinguisher were unsuccessful, and the occupants died in the fire.

The National Transportation Safety Board's investigation of the accident disclosed aircraft design features which can seriously compromise occupant survival and rescue. Safety Board accident records from 1975 through 1978 revealed five other Cherokee accidents in which emergency egress difficulties were experienced. These five accidents accounted for 2 fatalities and 13 injuries. Summaries of these five accidents are as follows:

On July 5, 1975, a Piper PA-28-160 experienced an engine failure while flying along a beach area near Ruskin, Florida. Since there were people on the beach the pilot ditched the aircraft in the water. The aircraft immediately took on water and sank. The pilot stated that the door was jammed. Fortunately, the three occupants were able to swim out of the aircraft through the windshield which had broken on impact.

On August 26, 1975, near Whittier, Alaska, the right wingtip of a PA-28-180 struck a tree shortly after takeoff. The aircraft rolled to the right and impacted inverted. A fire erupted immediately. The two passengers in the rear of the cabin escaped by kicking out a window. Once outside the aircraft they heard a cry for help from within. Rescuers arrived shortly thereafter and contained the fire sufficiently with a handheld fire extinguisher so that they could remove the right front seat occupant. The pilot was not rescued. The survivors sustained burn injuries.

A similar egress was made by the pilot of a PA-28-140 which crashed while attempting a crosswind landing on July 1, 1976, near Memphis, Tennessee. The pilot stalled the aircraft during an attempted go-around and struck power lines and trees. The aircraft impacted inverted and caught fire immediately. The pilot, unable to open the door, kicked out the window and escaped. He received second- and third-degree burns.

On August 7, 1976, a PA-28R-200, while executing a tight turn on final approach at Oshkosh, Wisconsin, developed a high sink rate and touched down almost simultaneously on the aircraft's right main gear, nose gear, and right wingtip. The aircraft bounced and the gear collapsed on the second touchdown. The aircraft skidded, flipped over, caught fire, and burned. The two front seat occupants escaped by kicking out a back window. The third occupant died in the fire.

The fifth accident involved a PA-28-151 which crashed on July 30, 1977, 1/2 mile short of runway 24 while attempting to land in marginal weather conditions at Martha's Vineyard Airport. The aircraft clipped the tops of the trees and impacted the ground inverted. A fire erupted immediately. The passenger door was either jammed or blocked by a fallen tree. Nevertheless, all four persons aboard, although severely burned, escaped from the burning aircraft through a broken window on the right side of the cabin.

The cabin door on the Cherokee, like several other single-engine aircraft designed for five or less persons, is the only available exit. Therefore, when the cabin door becomes jammed, blocked, or otherwise unusable during an accident, there are no alternate means of egress. Furthermore, the Cherokee door is designed with two separate latches: a locking latch located on the rearward side of the door, and a safety latch at the center top of the door which should be latched prior to flight to provide a proper seal around the door. The prompt location and operation of the top safety latch can be difficult for occupants and rescuers alike. If the occupants have not been briefed on the operation of the Cherokee door and/or their experience has been with doors with only one latch or handle, they could easily overlook the top latch. Also, rescue personnel unfamiliar with the Cherokee door may not be aware of the additional latch at the top of the door. This latch is not clearly marked and, to those who are not familiar with it, may go unnoticed in an emergency.

It is not the Safety Board's purpose to single out the Piper Cherokee as presenting a singular problem; other single-engine aircraft have just one exit. The Cherokee was identified for study as a result of its recent accident history. These accidents alerted the Safety Board to the unique Cherokee door design and the hazards associated with all single-exit aircraft in a postcrash environment, particularly one involving fire or water.

An entry door meeting the requirements of CAR 3.389 or 14 CFR 23.783 is the only required emergency exit for this class of aircraft as specified in CAR 3.387 or 14 CFR 23.807; i.e., on a single-engine aircraft with a seating capacity of five or less, no additional emergency exits are required. The Safety Board believes that additional emergency exits on small, single-engine aircraft are necessary and feasible, and in the case of the PA-28, could be easily provided. Discussions with Piper engineers have indicated that a rear window opposite the cabin door could readily be converted to an emergency exit window without airframe structural modifications. Windows on other aircraft models also could be readily converted to emergency exits without extensive alterations.

The Safety Board further believes that the airworthiness and operating regulations for general aviation aircraft specified in 14 CFR 23 and 14 CFR 91 should require exits to be easily operated with a single handle, be clearly marked as to their use, and be operable from outside the aircraft. The Board also believes that pilots should be encouraged to properly brief passengers on the emergency exits regardless of aircraft size or passenger capacity.

Small, single-engine aircraft represent a large portion of the general aviation fleet. Currently, there are over 19,000 active Cherokees in a fleet of over 198,000 single-engine aircraft. The Safety Board believes that an important increase in the level of protection offered to the general aviation flying public as a whole can be achieved by measures to improve egress from small, single-engine aircraft in an emergency.

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

> Amend 14 CFR 23.783 to require that each external door on all aircraft manufactured after a specified date can be opened using only one handle or latching mechanism and that the means of operation be simple and apparent. (Class II, Priority Action) (A-81-26)
>
> Amend 14 CFR 23.807(a)(1) to require all aircraft with a seating capacity of two or more, excluding aircraft with canopies, manufactured after a specified date to have at least one emergency exit located on the opposite side of the cabin from the main door and to require that each emergency exit can be opened from both the inside and the outside of the aircraft. (Class II, Priority Action) (A-81-27)
>
> Amend 14 CFR 23.783, 14 CFR 23.807(b)(3), and 14 CFR Part 91 to require external doors and emergency exits of aircraft to be conspicuously marked on the outside with directions for opening the door. (Class II, Priority Action) (A-81-28)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 26, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-29

On July 8, 1980, N36891, a Cessna 414A aircraft, was being operated on a Part 135 charter flight from Sacramento, California, to Fresno, California. About 15 minutes before landing at Fresno, the pilot attempted to press the radial centering knob on the Omni bearing indicator to establish a bearing to the station. However, when he pressed the knob, the instrument dropped partially inside the instrument panel and jammed the elevator control which restricted the aft movement of the elevator control to a position slightly aft of the neutral position. The aircraft was successfully landed at Fresno, California.

Investigation disclosed that the Marion Screw Products' mounting clamp, part number MSP9963, had loosened because one of the four rivets which maintains the clamp retaining capability was missing. When the condition was duplicated, it was found that with the loss of any rivet the instrument could be freed in its clamp and could create the difficulty experienced by the pilot.

Other instruments on the aircraft's instrument panel are mounted with the same type of clamp. Examination of two other clamps revealed a missing rivet from one and a loose rivet that could be moved by hand in the other.

A review of Service Difficulty Reports indicates that other Cessna 400 series aircraft have experienced this problem and, based on information received from the Federal Aviation Administration's Engineering and Manufacturing District Office in Wichita, Kansas, the problem could exist on other aircraft models.

The Cessna Aircraft Company is aware of the instrument mounting clamp problem; however, Cessna does not know whether the problem is caused by excessive torque being applied to the clamp adjusting screw or by a manufacturing defect. Cessna indicated that Service Letter AV79-17 which was issued on May 4, 1979, required the installation of a strap on the instrument mounting clamp to prevent the instrument from moving forward in the event of clamp failure. Service Letter AV79-17 was directed to certain Cessna series 300 and 400 aircraft where the Omni indicators were installed in the lowest position of the pilot's instrument panel, above or adjacent to the control column. Service Letter AV79-17 had not been complied with on the incident aircraft. Cessna also indicated that they plan to release another service letter on the instrument mounting clamps after its investigation is completed.

Although the aircraft was landed successfully, the Safety Board is concerned that this potentially dangerous situation is likely to recur and could contribute to or cause an accident. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Take action to notify all owners/operators of those Cessna model aircraft identified in Service Letter AV79-17 of the possible elevator control difficulties which can be encountered as a result of the Omni bearing indicator mounting clamp failure. (Class II, Priority Action) (A-81-29)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 26, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-30 and -31

On February 18, 1980, a Piper PA-22-150 Tri-Pacer aircraft crashed in a rural area near Clear Spring, Maryland. Witnesses observed the aircraft in erratic flight and saw it enter into a steep right bank before crashing into trees. The pilot died of acute carbon monoxide intoxication and multiple injuries.

The Safety Board's investigation of the accident did not disclose any evidence of a structural, control, or engine malfunction. However, two cracks were found in the exhaust muffler assembly, one of which was located along a welded seam. The seam crack allowed exhaust gases to impinge upon and stain the inner surface of the muffler shroud assembly and escape from the confines of the exhaust system. The path which the exhaust gas stain followed indicated that the crack was not impact-related. It was also evident that this crack was not recent, nor the result of the accident. The other crack was in one of the other exhaust stacks. The exhaust muffler cracks would have allowed escaping exhaust gas to enter the cabin through open air vents and cause the pilot to become incapacitated.

Airworthiness Directive (AD) 68-05-01, effective March 31, 1968, and revised March 5, 1969, requires that exhaust mufflers on certain Piper aircraft models with less than 950 hours time in service be inspected for cracks and other deficiencies at intervals not to exceed 100 hours until reaching 950 hours time in service. At and beyond 950 hours, the repetitive inspections are to be conducted at 50-hour intervals.

The accident aircraft's records indicated that the exhaust muffler assembly had been installed during June 1967, the muffler had been last inspected in accordance with the provisions of AD 68-05-01 during October 1971, and the aircraft had been operated for 269 hours between June 1967 and October 1971. The aircraft was operated an additional 159 hours between October 1971 and October 1979. The maintenance logs of the aircraft also indicated that its exhaust system had been "checked" during several annual inspections, including the last annual inspection conducted 10 hours before the accident; however, the exhaust system cracks were not detected.

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The Safety Board recognizes that the operator of the accident aircraft did not maintain the aircraft in accordance with AD 68-05-01. However, we believe that this accident points to a particular problem to which aircraft with low utilization rates are prone, and which is not addressed by the AD. Although the apparent intent of the AD is to insure routine detailed inspections of the exhaust systems, the requirement for a detailed inspection in aircraft with utilization rates as low as that of the accident aircraft could be triggered only once in 5 years. The muffler assembly had been in service for 13 years and had 438 hours of operation when the accident occurred.

AD 68-05-01 is based on hours of operation. However, corrosion (one of the key factors in muffler degradation) occurs continuously, even when the aircraft is not being operated. In fact, mufflers that are used only occasionally tend to corrode more rapidly than those with higher utilization rates. It does not appear that this fact was fully considered during the preparation of AD 68-05-01.

If the inspection requirements in AD 68-05-01 were extended to require also inspections at a prescribed calendar interval, such as during the aircraft's annual inspections, exhaust muffler assembly cracks would be more likely to be detected, particularly on aircraft with low utilization rates.

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

> Amend Airworthiness Directive (AD) 68-05-01 to require that an inspection of the muffler and exhaust systems meeting the requirements of the AD be performed during the aircraft's annual inspection if a detailed inspection of the system has not been made during the preceding year on the basis of the time-in-service requirements of the AD. (Class II, Priority Action) (A-81-30)

> Pending amendment of Airworthiness Directive (AD) 68-05-01, as an interim measure, issue an Airworthiness Alert to all owners/operators of Piper aircraft listed in the AD describing the circumstances of the failure of the muffler which caused this accident. (Class II, Priority Action) (A-81-31)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 26, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-32 and -33

At 1548:35 c.s.t., on January 30, 1980, an Avions Marcel Dassault Breguet Falcon 10, N253K, crashed into Lake Michigan shortly after an attempted takeoff from runway 18 at Meigs Field, Chicago, Illinois. The aircraft came to rest in 25 feet of water about 300 feet from the departure end of the runway. Of the four passengers and two crewmembers aboard, one passenger and one crewmember were killed, and four persons were injured seriously. The aircraft was destroyed. The pilot stated that although the aircraft had accelerated to rotation speed during the takeoff roll, it did not lift off the runway when he rotated for flight, and he elected to continue the takeoff because there was insufficient runway remaining to stop the aircraft.

Although the Safety Board's investigation of the accident has not been completed, evidence indicates that certain precautionary actions should be initiated to prevent a similar occurrence. Metallurgical examination of the emergency/park brake lever and quadrant showed that the lever was in the "park" position during the takeoff roll. With this lever in the "park" position, the Falcon 10 can be set in motion with relative ease when thrust is applied for taxi. In order to prevent this occurrence, the manufacturer installed a red warning light on the lower right corner of the pilot's instrument panel which will illuminate when the lever is in either the "park" or the "emergency" position. However, the Safety Board is concerned about the location of this brake warning light. With both pilots seated normally, the light can be hidden partially from the pilot by his right knee and from the copilot by the emergency/park brake lever. Additionally, the light is not within the normal instrument scan area for either pilot. The Safety Board believes that this brake light should be moved to a position on the instrument panel where it can be monitored easily by both pilots under all internal and external light conditions.

Comparison of the manufacturer's suggested checklist for the Falcon 10 with the company checklist approved by the Federal Aviation Administration and used by the flightcrew of N253K indicated that the manufacturer's suggested checklist recommended that the status of the brake light be checked on three separate occasions before the start of the takeoff roll. However, none of the checks appeared on the company checklist. The Safety Board believes that, had these checks appeared on the checklist used by the flightcrew of N253K, the possibility of an attempted takeoff with the parking brake set would have decreased considerably.

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

> Issue an airworthiness directive to move the emergency/park brake light on all Falcon 10 aircraft from its present location to a location on the pilot's instrument panel where it can be monitored more readily by both pilots when seated normally in the cockpit. (Class II, Priority Action) (A-81-32)
>
> Review the checklists of all Falcon 10 operators to insure that they include checks that the parking brake is released and the emergency/park brake light is "out" before taxi and before takeoff. (Class II, Priority Action) (A-81-33)

KING, Chairman, DRIVER, Vice Chairman, amd McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: March 30, 1981

Forwarded to:

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-39 thru -42

On January 20, 1981, at 1127 p.s.t., a Beech B-99, N390CA, operated by Cascade Airways, Inc., as Flight 201, crashed about 4.5 miles southwest of Spokane International Airport, Spokane, Washington. The accident occurred while the pilot was attempting a localizer approach to runway 3 (LOC Rwy 3) at Spokane International Airport. The two pilots and five passengers died in the accident; two passengers survived with serious injuries. The aircraft was destroyed by impact and postcrash fire.

The Spokane VORTAC (115.5, GEG, Channel 102) was used for the inbound routing of Flight 210 and is used for the distance measuring equipment (DME) arc for a LOC Rwy 3 approach. Upon arrival in the Spokane area, the flight was vectored for an instrument landing system (ILS) approach to runway 21. However, before the flight began the approach to runway 21, the tower changed the active runway to runway 3 and vectored Flight 201 for the LOC Rwy 3 approach. This approach utilizes the IOLJ localizer (109.9) and collocated DME (Channel 36), both of which are located on the airport.

While Flight 201 was initially being vectored for the LOC Rwy 3 approach, the IOLJ localizer and its associated DME were not operational because the Rwy 21 ILS was still being used by other arriving aircraft. An interlock switch in the tower prevents simultaneous operation of these two facilities. The IOLJ localizer/DME were turned on about 1124:08. About this same time, Flight 201 was advised that the aircraft was "6 miles from OLAKE intersection, cleared for the approach." Shortly thereafter, Flight 201 was advised to contact the tower and Flight 201 acknowledged. No other calls were received from the aircraft.

The normal procedure for the LOC Rwy 3 approach allows descent to minimum descent altitude (MDA) (2,760 ft) after passing OLAKE intersection, which is 4.2 miles from IOLJ. Without the airport environment in sight, a missed approach would be executed at 0.2 DME before reaching IOLJ. Although the investigation of the Cascade Airways accident is continuing, one theory being examined is that Flight 201 may have mistakenly initiated an approach and let down prematurely using DME mileage from the

Spokane (GEG) facility rather than the mileage from the localizer facility depicted on the LOC Rwy 3 approach chart. Investigators conducting the Safety Board's continuing investigation have interviewed five pilots, including airline and military crews, who have mistakenly commenced the LOC Rwy 3 approach using distance information from the Spokane DME instead of the IOLJ DME. If an approach was continued using the wrong DME (Spokane VORTAC), the aircraft would descend prematurely to MDA and could strike the terrain near the Spokane VORTAC, which is at approximately the same elevation as MDA. Flight 201's initial impact point was about 1,300 ft south-southeast of the Spokane VORTAC.

The Safety Board is aware that similar approach configurations exist at other airports throughout the United States where there are two DME facilities located near the localizer course, increasing the possibility that a tuning error could result in improper descent to terrain. Incident reports have been received from the NASA-sponsored Aviation Safety Reporting System Office describing similar occurrences where confusion existed at other airports with respect to proper distances from approach navigational aids.

The Safety Board has learned that the United States Air Force is considering the addition of a precautionary note in its instrument training manual (AFM 51-37) as well as publishing an All Command Safety Communication (ALSAFCOM) alerting pilots to the hazard of transition to an approach using one DME while another DME is associated with the final approach course.

The Safety Board believes this type of navigational aid configuration constitutes a hazard that must be corrected immediately. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Publish a Notice to Airman pertaining to the localizer approach to runway 3 at Spokane International Airport, Spokane, Washington, emphasizing the need to use the IOLJ distance measuring equipment once established on the final approach course to runway 3. (Class I, Urgent Action) (A-81-39)
>
> Add a precautionary note in the plan view section of the chart for a localizer approach to runway 3 at Spokane International Airport, Spokane, Washington, such as:
>
> CAUTION
>
> Use 109.9 IOLJ DME (Channel 36)
> For Final Approach Course
> Distance Information
> (Class 1, Urgent Action) (A-81-40)
>
> Review all approach procedures and identify those airports that have a localizer or instrument landing system approach with distance measuring equipment facilities at two points along the final approach course, leading to the possibility of erroneous tuning, and add a precautionary note on the pertinent approach chart. (Class II, Priority Action) (A-81-41)

Alert pilots of the potential for error in making approaches at airports equipped with distance measuring equipment at two points along the final approach course through publication of appropriate precautionary information in the Airman's Information Manual. (Class II, Priority Action) (A-81-42)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.

By: James B. King
Chairman

FOLLOWUP FAA RESPONSES

NTSB Rec.No.	Subject	Page
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National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

A-A-6

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

Reference is made to the Federal Aviation Administration (FAA) letter of March 17, 1981, further responding to Safety Recommendation A-72-50 issued May 9, 1972, and supplementing FAA letters of May 17, 1972, and February 3, 1978. This recommendation stemmed from the National Transportation Safety Board's investigation of several accidents and incidents involving the inability to extend the landing gear in various models of Beech aircraft. The Safety Board recommended that the FAA "Modify FAR 23.729(c) to require an independent means for the emergency extension of the landing gears comparable to the wording of FAR 25.729(c)."

We have referred to the Federal Register of Thursday, September 11, 1980. The revision to FAR Section 23.729(c) on page 60171 meets the intent of A-72-50 which we now classify in a "Closed--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-72-50 issued May 9, 1972, and supplements our letters of May 17, 1972, and February 3, 1978. This also responds to your letter of August 25, 1980, in which you requested a progress report.

A-72-50. Modify FAR 23.729(c) to require an independent means for the emergency extension of the landing gears comparable to the wording of FAR 25.729(c).

FAA Comment. In our letter of February 3, 1978, we advised the Board that a proposal to revise FAR Section 23.729(c) was in the normal regulatory process. This process is now completed and Airworthiness Review, Amendment No. 8A: Aircraft, Engine and Propeller Airworthiness, and Procedural Amendments dated August 27, 1980, has been published in the Federal Register, September 11, 1980. A copy of this document is enclosed.

The Federal Aviation Administration considers action completed on Safety Recommendation A-72-50.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

August 25, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board Safety Recommendation A-72-50 issued May 9, 1972. This is one of a group of four recommendations concerning failures of Beechcraft landing gear actuators. Safety Recommendations A-72-47, 48, and 49 have been resolved and are in a closed status. Safety Recommendation A-72-50, however, is still maintained in an "Open--Acceptable Action" status.

In A-72-50 we recommended that the Federal Aviation Administration (FAA) "Modify FAR 23.729(c) to require an independent means for the emergency extension of the landing gears comparable to the wording of FAR 25.729(c)." The FAA's response of February 3, 1978, stated, "Notice of Proposed Rule Making 75-31, issued July 1975, proposes to revise FAR 23.729(c). This proposal is in the normal regulatory process." In order to evaluate the status of this recommendation and update the public docket, we would appreciate a progress report.

Sincerely yours,

James B. King
Chairman

654

AOA#:
ACTION/INFORMATION: ASF-1
DUE DATE(S): 9-8-80
FOR SIGNATURE OF: AOA-1
COORDINATION WITH/THRU:
INFORMATION COPY: AOA-1/ADA-1
AVS-1/AWS-1 AED-1
APA-1 - AGC-1 - ATF-1

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OFFICE OF THE ADMINISTRATOR
FEDERAL AVIATION ADMINISTRATION

Mr. Hooker

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

February 3, 1978

Honorable Kay Bailey
Acting Chairman
National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Miss Bailey:

This is to advise the status of our actions with respect to NTSB Safety Recommendations A-72-47 through 50.

A-72-47. Forward a notice to all owners, operators, and repair facilities, describing the lubrication and overhaul problems of the model aircraft mentioned above. This should include the necessary corrective procedures to improve the reliability of the landing gear actuators.

A-72-48. Issue an Airworthiness Directive requiring a one-time inspection of all landing gear actuators on applicable type aircraft to ensure proper configuration and lubrication.

A-72-49. Reduce the time interval between the recommended service periods, as indicated in the service manual, to preclude future failures caused by corrosion, lack of lubrication, and service wear.

A-72-50. Modify FAR 23.729(c) to require an independent means for the emergency extension of the landing gears comparable to the wording of FAR 25.729(c).

Airworthiness Directive (AD) 72-10-4 which applies to Beech Model 99 airplanes was issued. The maintenance and overhaul procedures for the Beech Model 65 airplanes were reviewed and found satisfactory.

A-72-47 Comment. The AD action on the Beech Model 99 serves as a notice to all responsible parties. Since the maintenance and overhaul procedures for the Beech Model 65 were found satisfactory, notification to responsible parties was not required.

A-72-48 & 49 Comment. The AD on the Beech Model 99 and the negative findings on the Beech Model 65 maintenance and overhaul procedures satisfy these recommendations.

Since we have no evidence of further problems in this area, we consider the actions on the above recommendations complete.

A-72-50 Comment. Notice of Proposed Rule Making 75-31, issued July 1975, proposes to revise FAR 23.729(c). This proposal is in the normal regulatory process.

Sincerely,

Quentin S. Taylor
Acting Administrator

Enclosure:
Beech Amendment 39-1440

for J ca

5-25-72
FS-52

17 MAY 1972

Honorable John H. Reed
Chairman, National Transportation Safety Board
Department of Transportation
Washington, D.C. 20591

Dear Mr. Chairman:

This replies to your Safety Recommendations A-72-47 thru 50 issued 9 May 1972 which included recommendations resulting from reported landing gear failures involving Beechcraft B-99 and B-65 airplanes.

We wish to advise you that mandatory action has been taken covering improved maintenance and overhaul of the B-99 landing gear retraction system. An airworthiness directive was issued on 5 January 1972 under Amendment 39-1368 which provided a mandatory inspection, replacement, lubrication and rerigging requirement in accordance with Beech 99 Airliner Shop Manual 99-590015B. This directive was recently superseded by a new revision which becomes effective on 12 May 1972. This revision under Amendment 39-1445 requires repetitive inspections for all B-99 airplanes and specifies fixed overhaul times for certain landing gear components. It also refers to the manufacturer's revised Beech 99 Airliner Shop Manual which provides a more comprehensive instruction for maintaining the normal and emergency landing gear system.

The need for improved maintenance and overhaul procedures for the B-65 landing gear system was reviewed after the reported landing gear actuator malfunction in Kansas City, Missouri, on 15 September 1971. Such procedures and instructions were found to be satisfactory. However, a mechanic's error in not following the actuator installation procedures properly was considered the cause of failure. Corrective action was subsequently taken. We understand that the cited occurrence was classified as an incident since the airplane successfully landed through the use of its emergency landing gear extension system.

No AD needed on B-65

Concerning your recommended changes to FAR 23.729(c), the FAA is presently considering the need to require the emergency gear extension system to be capable of properly functioning after a likely failure in the normal system.

Sincerely,

[illegible] SIGNED BY
[illegible] SHAFFER
ADMINISTRATOR

cc:
TSA-1, NA-81, OP-1, FS-50, FS-1, FS-100, S-80, PA-1, FS-4, FS-120, FS-102, OA-1, and FS-123, CF-2/2
JOHNSON:sr:FS-123:X68382:4 May 1972
REW per FS-120:8 May 1972

FS-9 1628
OA # 831

UNITED STATES OF AMERICA
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 9, 1972

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 19th day of April 1972

FORWARDED TO:

Honorable John H. Shaffer
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATIONS A-72-47 thru 50

The National Transportation Safety Board's investigation of several accidents and incidents involving the inability to extend the landing gear in various models of Beechcraft airplanes has revealed a number of internal failures in the gear actuator assemblies. The gear actuators on many different models of Beechcraft airplanes are similar in design (Models A-65, A-65-70, 65-80, B-99).

Examination of the subject actuators has indicated that improper lubrication, rigging, and overhaul procedures were the primary causes for the operational failures of these actuators. Moreover, a failure in one of the gear actuators nullifies the operation of both the normal and the emergency gear extension systems.

The Safety Board believes that the actuator failures can be attributed to inadequacies in the Beech maintenance and overhaul manuals. These manuals do not contain sufficient information regarding lubrication, servicing, and overhaul of the actuators.

There are no grease fittings on the actuators to service them externally on the aircraft; thus, when required, they must be removed, disassembled, serviced with grease, reinstalled, and rerigged.

Evidence in three of the accidents indicated improper overhaul procedures. In two of the accidents (Beech 65-80, Kansas City, Missouri, September 15, 1971, and Beech 99, Houston, Texas, December 17, 1971), the

pinion bearings in the actuator apparently were installed improperly at overhaul. In the third accident (Beech 99, New York City, New York, September 30, 1971), there was apparently no grease servicing of the actuator at overhaul. The Board believes that the overhaul manuals do not clearly indicate the proper procedures for the installation of the pinion bearing, nor do they state that disassembly is required for lubrication during overhaul.

In the cases cited above, the aircraft were extensively damaged as a result of landing gear-up. To prevent recurrence of such incidents and accidents, we believe that Part 23 of the Federal Aviation Regulations (FAR) should be comparable to Part 25, in that an independent emergency means for extending the landing gear should be required upon any reasonable failure in the normal system.

Accordingly, the Safety Board recommends that the Federal Aviation Administration:

1. Forward a notice to all owners, operators, and repair facilities, describing the lubrication and overhaul problems of the model aircraft mentioned above. This should include the necessary corrective procedures to improve the reliability of the landing gear actuators.

A-72-48

2. Issue an Airworthiness Directive requiring a one-time inspection of all landing gear actuators on applicable type aircraft to ensure proper configuration and lubrication.

3. Reduce the time interval between the recommended service periods, as indicated in the service manual, to preclude future failures caused by corrosion, lack of lubrication, and service wear.

4. Modify FAR 23.729 (c) to require an independent means for the emergency extension of the landing gears comparable to the wording of FAR 25.729 (c).

Still in progress

Our technical staff is available for any further assistance or information you may desire.

These recommendations will be released to the public on the issue date shown above. No public dissemination of the content of this document should be made prior to that date.

Reed, Chairman; Laurel, McAdams, Thayer and Burgess, Members, concurred in the above recommendations.

By: John H. Reed
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

April 22, 1981

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Reference is made to the Federal Aviation Administration (FAA) letter of March 11, 1981, further responding to National Transportation Safety Board Safety Recommendations A-75-35 through A-75-37 issued April 25, 1975. These recommendations stemmed from the midair collision between a Cessna 150H and a USAF T-29D at Newport News, Virginia, on January 9, 1975.

In response to A-75-35, we note that the Norfolk Terminal Radar Service Area (TRSA) was expanded on December 5, 1976, to include Langley Air Force Base, and that the remaining airports are projected to be included in the Norfolk TRSA in 1981. Pending the completion of such action, this recommendation is classified as "Open--Acceptable Action."

In A-75-36 we asked the FAA to extend the approach gates to runways 7-25 at Langley Air Force Base to a distance of 12 nmi. We note that the distance of the protected airspace has been extended to encompass an area up to 14 miles from the ends of runways 7-25, providing protected airspace beyond the 12 miles stipulated by the Safety Board. This action adequately satisfies the intent of the recommendation which we now classify in a "Closed--Acceptable Alternate Action" status.

In A-75-37 we requested the FAA to determine which other military bases or areas require the establishment of either a Terminal Control Area or TRSA and establish them. We are pleased to learn that TRSA's have been established at Webb Air Force Base, Big Springs, Texas; Patrick Air Force Base, Cocoa Beach, Florida; Columbus Air Force Base, Columbus, Mississippi; Laughlin Air Force Base, Del Rio, Texas; Pope Air Force Base, Fayetteville, North Carolina; and Shaw Air Force Base, Sumter, South Carolina. This recommendation is now classified "Closed--Acceptable Action."

We thank the FAA for actions taken and we appreciate the offer to keep us informed on the progress of A-75-35.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-75-35 through A-75-37 issued April 25, 1975, and supplements our letter of September 21, 1978.

A-75-35. Establish a Group II traffic control area to encompass the following airports in the Tidewater area: Oceana Naval Air Station, Norfolk Naval Air Station, Norfolk Regional Airport, Langley Air Force Base, Patrick Henry Airport, and Felker Army Airfield. Should this prove impractical, we recommend that the FAA and Department of Defense (DOD) Joint Review Group coordinate and establish a Terminal Radar Service Area (TRSA), similar to the one in Sacramento Valley, California, which will encompass the Tidewater area.

FAA Comment. The Norfolk TRSA was expanded on December 5, 1976, to include Langley Air Force Base. The remaining airports are projected to be included in the Norfolk TRSA in 1981.

Brite equipment is expected to be commissioned at Patrick Henry International Airport in May 1981. Langley Air Force Base radar is projected to be remoted to Norfolk Tower in 1981, which will facilitate the expansion of the Norfolk TRSA.

A-75-36. Extend the approach gates to runways 7-25 at Langley Air Force Base to a distance of 12 nmi.

FAA Comment. On December 5, 1976, the Norfolk TRSA was expanded to include Langley Air Force Base. This expansion encompassed an area up to 14 miles from the ends of runways 7-25 with the resultant effect of providing protected airspace beyond the 12 miles the Board originally had in mind. That change has proven satisfactory in providing the necessary protection to aircraft.

A-75-37. Determine which other military bases or areas require the establishment of either a terminal control area or terminal radar service area and establish them.

FAA Comment. We believe our action in response to A-75-38 (TRSA's at military locations) described in our letter of September 21, 1978, also satisfies this recommendation. This response appears below.

A-75-38. Initiate action to enable DOD to establish and maintain Group I type terminal control areas around selected military facilities.

FAA Comment. During the past 3 years, FAA/DOD established TRSA's at selected military locations. These locations include military airfields at Webb Air Force Base, Big Springs, Texas; Patrick Air Force Base, Cocoa Beach, Florida; Columbus Air Force Base, Mississippi; Laughlin Air Force Base, Del Rio, Texas; Pope Air Force Base, Fayetteville, North Carolina; and Shaw Air Force Base, Sumter, South Carolina.

In summary, the Federal Aviation Administration considers action completed on Safety Recommendations A-75-36, A-75-37, and A-75-38. We will keep you informed of our progress in completing action on Safety Recommendation A-75-35.

Sincerely,

Charles E. Weithoner
Acting Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

SEP 21 1975

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

The following information updates the Federal Aviation Administration's (FAA) NTSB Safety Recommendations.

Recommendation A-74-97. Take positive action to assure that low-level military intercept training operations are confined to designated restricted airspace.

Comment. On July 1, 1975, FAA inserted a new paragraph in FAA Handbook 7610.4C, as follows: Interceptor training operations shall be conducted in either ATC assigned airspace or within currently designated restricted/warning areas during existing published hours of operation. To the extent feasible, first preference shall be given to the use of restricted/warning areas. While conducting interceptor training within air traffic control (ATC) assigned airspace, the aircraft shall be under radar surveillance at all times by the appropriate military facility.

Recommendation A-75-11. Review the locations of all military aerial refueling tracks and verify their accuracy as described in the Airman's Information Manual (AIM), Part 4.

Comment. A review of the locations of all military aerial refueling tracks to assure their accuracy was completed on June 24, 1975.

Recommendation A-75-12. Include a diagram of the aerial refueling tracks in the AIM.

Comment. Aerial refueling tracks, established outside of positive control airspace, are depicted in the AIM. The format is in graphic form and is derived from the textual description of the route as published in the Department of Defense (DOD) Flip military training routes (copy enclosed).

Recommendation A-75-13. Broadcast appropriate alerting information periodically on the VOR voice frequency, when operations are being conducted within military aerial refueling tracks.

Comment. On July 1, 1975, the FAA inserted a new paragraph in FAA Handbook 7610.4C, which requires the air route traffic control centers (ARTCC) to notify the appropriate tie-in flight service station (FSS) at least 2 hours in advance when an established aerial refueling track will be activated if all or part of the activity will take place outside of restricted/warning areas or positive control area.

The tie-in FSS will then transmit an all circuit message to all FSSs within 200 nautical miles of the track centerline. This information is then provided to pilots upon request during inflight/preflight briefings. (Exception - mandatory briefing item in Southern Region.)

Recommendation A-75-35. Establish a Group II traffic control area (TCA) to encompass the following airports in the Tidewater area: Oceana Naval Air Station, Norfolk Naval Air Station, Norfolk Regional Airport, Langley Air Force Base, Patrick Henry Airport, and Felker Army Airfield. Should this prove impractical, we recommend that FAA and DOD Joint Review Group coordinate and establish a Terminal Radar Service Area (TRSA), similar to the one in Sacramento Valley, California, which will encompass the Tidewater area.

Comment. The expansion of the Norfolk TRSA is being implemented in two phases. On December 5, 1976, the TRSA was expanded to include Langley AFB. Equipment needed to further expand the TRSA to include both Patrick Henry International Airport and Felker Army Airfield was included in the FY 1978 budget. On completion of the Norfolk Tower modification, the TRSA will be expanded to include the remaining airports.

Recommendation A-75-36. Extend the approach gates to runway 7-25 at Langley Air Force Base to a distance of 12 miles.

Comment. As stated in Mr. Dow's letter dated June 19, 1975, to the Chairman of the NTSB, the expansion of TRSA would provide for additional control zone protection.

Recommendation A-75-37. Determine which other military areas require the establishment of either a terminal control area or terminal radar service area and establish them.

Comment. The DOD letter dated September 15, 1975, stated that the DOD accepted the FAA conclusion that Stage III service offers a practicable alternative to TCAs. As a result, they plan to implement Stage III service at selected military airfields.

Recommendation A-75-38. Initiate action to enable DOD to establish and maintain Group I type terminal control area around military facilities.

Comment. During the past 3 years, FAA/DOD established TRSAs at selected military locations. These locations include military airfield at Webb Air Force Base, Big Springs, Texas; Patrick Air Force Base, Cocoa Beach, Florida; Columbus Air Force Base, Mississippi; Laughlin Air Force Base, Del Rio, Texas; Pope Air Force Base, Fayetteville, North Carolina, and Shaw Air Force Base, Sumter, South Carolina.

Recommendation A-75-36. Include all of the various meanings of the word "Beacon" in a revision to the Pilot/Controller Glossary.

Comment. FAA has included the various meanings of the word "Beacon" in the Pilot/Controller Glossary. They appeared in Handbooks 7110.65, Change 4 and 7110.10D, dated January 1977, and in the AIM effective February 1977 (copy enclosed).

The FAA considers action completed on the above recommendations and unless you let us know otherwise, we will not report further on these.

Sincerely,

Langhorne Bond
Administrator

Enclosures

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

22 DEC 1978

AOA#:
ACTION/~~INFORMATION~~: ASF-1
DUE DATE(S):
FOR SIGNATURE OF:
COORDINATION WITH/THRU:
INFORMATION COPY: AOA-1/ADA-1
AVS-1

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to the Federal Aviation Administration's (FAA) letter of September 21, 1978, responding to nine recommendations made by the National Transportation Safety Board. The Board's action on these responses is as follows:

Recommendation A-74-97. The Safety Board is pleased to note that the FAA has inserted a new paragraph in the FAA Handbook 7610.4C to require intercept training exercises to be carried out in designated restricted/warning areas or under radar surveillance in air traffic control assigned airspace. The status of this recommendation has been classified as "Closed - Acceptable Action."

Recommendation A-75-11. Since we are assured that there is now no disparity between the descriptions of the aerial refueling tracks in the Airman's Information Manual (AIM) and the Department of Defense (DOD) Flight Information Publication, the status of this recommendation is classified as "Closed - Acceptable Action."

Recommendation A-75-12. We note from the DOD Flip military training routes that diagrams of aerial refueling tracks are now being included in the AIM. The status of this recommendation has, therefore, been classified as "Closed - Acceptable Action."

Recommendation A-75-13. We believe your action as a result of this recommendation is responsive and have evaluated the status of this recommendation as "Closed - Acceptable Action."

Recommendations A-75-35 Through A-75-37. In response to the FAA's earlier letters of June 19, 1975 and January 14, 1976 and our examination of the military/FAA "Procedural Review of Norfolk/Langley AFB Terminal Area Project" of September 1975, these three recommendations were evaluated;and their status classified as "Open - Acceptable Alternate Action." We are pleased to note that actions are continuing to resolve these recommendations. We intend to maintain their present open status until these actions are completed.

Recommendation A-75-38. We are also pleased to note the establishment of Terminal Radar Service Areas at selected military locations and have placed this recommendation in the "Closed - Acceptable Alternate Action" status.

Recommendation A-76-96. The Safety Board is pleased to note that the various meanings of the word "beacon" have been included in the Pilot/Controller Glossary and in the FAA Handbooks 7110.65, Change 4, and 7110.10D. The status of this recommendation has now been classified as "Closed - Acceptable Action."

Sincerely,

James B. King
Chairman

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OFFICE OF THE
ADMINISTRATOR
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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

JAN 14 1976

Honorable John H. Reed, Chairman
National Transportation Safety Board
Washington, D. C. 20594

Dear Mr. Chairman:

This letter follows our June 19 letter to you in which we responded to NTSB Safety Recommendations A-75-35 through A-75-38.

The Department of Defense has tentatively accepted the FAA position that establishment of Terminal Radar Service Areas (TRSAs) offer a practicable alternative to military Terminal Control Areas (TCAs). After a trial period, however, they would propose Part 93 action at specific locations if hazards created by nonparticipating aircraft proved unacceptably high. As a result, we plan to implement TRSAs at selected military airfields that are experiencing unique traffic problems.

We believe the establishment of TRSAs and implementation of Stage III radar service at certain military airfields may be the most realistic approach toward reduction of the midair collision potential, since evidence indicates that TRSAs are providing a high level of safety.

Proposals set forth in the final report of the Norfolk/Langley AFB procedural review committee encompass the concerns voiced in NTSB Recommendation No. 2.

Sincerely,

John L. McLucas
Administrator

Enclosure:
Norfolk/Langley AFB Project

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

JUN 19 1975

Honorable John H. Reed
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to Safety Recommendations A-75-35 through 38.

Recommendation No. 1.

Establish a Group II traffic control area to encompass the following airports in the Tidewater area: Oceana Naval Air Station, Norfolk Naval Air Station, Norfolk Regional Airport, Langley Air Force Base, Patrick Henry Airport, and Felker Army Airfield. Should this prove impractical, we recommend that the FAA and Department of Defense (DOD) Joint Review Group coordinate and establish a Terminal Radar Service Area (TRSA), similar to the one in Sacramento Valley, California, which will encompass the Tidewater area. (Class II)

Comment.

A Terminal Control Area (TCA) as designed at the present time encompasses the approach and departure paths of turbine-powered airplanes at large air traffic hubs. A large hub is defined as an area in which one percent or more of the total passengers within the U. S. are enplaned. The Tidewater area does not presently meet this criteria.

A TRSA exists at Norfolk (described in Airman's Information Manual, Part 4, TRSA-33). This TRSA does not include Langley Air Force Base, Patrick Henry Airport, Oceana Naval Air Station or Felker Army Airfield. Our Eastern Region has a working group studying the feasibility of expanding this service to cover these airports. The working group was organized April 14 and 51 attendees representing all segments of the aviation community met to participate in the solution of this problem. A status report is expected by June 16 and a final report by July 18.

Recommendation No. 2.

Extend the approach gates to runways 7-25 at Langley Air Force Base to a distance of 12 nmi. (Class II)

Comment.

Mr. Martin Speiser of the National Transportation Safety Board advised us that the recommendation is for establishment of a control zone extension.

A comprehensive procedural review of the Norfolk/Langley Air Force Base terminal area is underway. A final report is expected October 1.

Recommendation No. 3.

Determine which other military bases or areas require the establishment of either a terminal control area or terminal radar service area and establish them. (Class III) See Comment No. 4.

Recommendation No. 4.

Initate action to enable DOD to establish and maintain Group I type terminal control areas around selected military facilities. (Class III)

Comment.

We are presently working with military representatives to explore the possibility of TCAs at certain military airports. There are factors which must be thoroughly investigated before any action can be started to implement TCAs at additional locations.

We expect a report of the review by November 14.

Sincerely,

ORIGINAL SIGNED BY:
JAMES E. DOW

ACTING ADMINISTRATOR

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.D.S.T., APRIL 25, 1975

ISSUED: April 25, 1975

Forwarded to:

Mr. James E. Dow
Acting Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)
A-75-35 thru 38

The National Transportation Safety Board is continuing its investigation of the midair collision between a Cessna-150H and a USAF T-29D at Newport News, Virginia, on January 9, 1975. Thus far, the investigation has disclosed that the Cessna was on a local VFR flight, that the pilot had not filed a flight plan, and that he was not, at the time of the accident, in radio contact with any air traffic control (ATC) facility. The T-29 was on its final approach to Langley Air Force Base, and was under the control of the ground control approach (GCA) final controller. The final controller had issued two traffic advisories concerning the Cessna to the T-29's flightcrew. Although it was dark, the weather was clear, and the reported visibility was 7 miles. Despite these facts, there is no conclusive evidence to indicate that either pilot saw the other's aircraft.

The Safety Board believes that this accident again points out the hazards of an IFR-VFR traffic mix, and the inadequacies of the "see and avoid" concept in terminal areas, in which moderate to heavy traffic exists. The very nature of operations within a terminal area defeats the viability of the "see and avoid" doctrine since the flightcrew in at least one, or possibly both, aircraft become involved with the duties and problems of landing. Within these areas, aircraft must be protected, and the only method is the control of traffic by the air traffic control system.

The Tidewater area around Norfolk, Virginia, should have a terminal control area. There are six major civil and military airports within 35 nmi of each other: Norfolk Regional Airport, Patrick Henry Airport, Oceana Naval Air Station, Norfolk Naval Air Station, Langley Air Force Base, and Felker Army Airfield. Numerous general aviation airfields are situated throughout the Tidewater area. These fields generate a traffic mix ranging from small general aviation aircraft, helicopters, and air carrier aircraft (both prop-jet and turbine), to the various tactical aircraft of the military.

During 1974, there were 205,600 IFR operations in the Tidewater area. Based on data compiled by the Langley Air Force Base Air Traffic Control Board, the Safety Board has estimated that the combined IFR and VFR operation in this area totaled about 709,000, and that these will increase to about 886,000 in 1975.

The Safety Board believes that the traffic situation in the Tidewater area and at Langley Air Force Base requires corrective action to avoid a recurrence of such midair collisions. We also believe that the nature of the traffic mix and the volume of the traffic within the Tidewater area warrant the establishment of a terminal control area which would encompass the area's major airfields. Therefore, the Safety Board recommends that the Federal Aviation Administration:

1. Establish a Group II traffic control area to encompass the following airports in the Tidewater area: Oceana Naval Air Station, Norfolk Naval Air Station, Norfolk Regional Airport, Langley Air Force Base, Patrick Henry Airport, and Felker Army Airfield. Should this prove impractical, we recommend that the FAA and Department of Defense (DOD) Joint Review Group coordinate and establish a Terminal Radar Service Area (TRSA), similar to the one in Sacramento Valley, California, which will encompass the Tidewater area. (Class II)

2. Extend the approach gates to runways 7-25 at Langley Air Force Base to a distance of 12 nmi. (Class II)

The Safety Board's investigation has disclosed other areas of the military-civilian aviation interface within the U. S. wherein air traffic control procedures could be instituted in a further effort to prevent midair collisions. Therefore, the Safety Board further recommends that the FAA-DOD Joint Review Group:

3. Determine which other military bases or areas require the establishment of either a terminal control area or terminal radar service area and establish them. (Class III)

4. Initate action to enable DOD to establish and maintain Group I type terminal control areas around selected military facilities. (Class III)

The Safety Board believes that these recommended procedures require no new hardware, are well within present capabilities and methodologies and, if adopted, will lower the exposure rate of both military and civil aircraft to the dangers of terminal-area midair collisions.

Our Bureau of Aviation Safety staff is available for additional discussion if desired.

REED, Chairman, McADAMS, THAYER, and BURGESS, Members, concurred in the above recommendations. HALEY, Member, did not participate.

By: John H. Reed
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

April 15, 1981

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administratio
Washington, D.C. 20591

Dear Mr. Helms:

This is to acknowledge Federal Aviation Administration (FAA) letter of March 2, 1981, further responding to National Transportation Safety Board Safety Recommendations A-76-82 and -83 issued June 17, 1976. These recommendations stemmed from the Safety Board's investigation of an accident involving a Beech Model D95A which crashed shortly after takeoff into Padilla Bay near Anacortes, Washington, on July 11, 1974. The recommendations pertain to malfunctions in the combustion heater, causing smoke and toxic fumes to enter the cabin through the heating and ventilation system.

The Safety Board has examined pages 70386 through 70388 of the Federal Register dated October 23, 1980, and we are satisfied with the revisions to 14 CFR 23.859 fulfilling the two recommendations. The status of A-76-82 and -83 is now classified as "Closed--Acceptable Action."

We thank the FAA for actions taken.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 2, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-76-82 and A-76-83 issued June 17, 1976, and supplements our letter of September 15, 1976. This also responds to your letter of July 30, 1980, in which you requested an updated status report on these recommendations.

A-76-82.

Amend 14 CFR 23.859 to incorporate the provisions set forth in 25.859(c) combustion air ducts, Paragraph (1).

A-76-83.

Require that the ducts for both combustion air and ventilating air which are in close proximity to a combustion heater be made of fireproof materials.

FAA Comment.

Enclosed is a copy of the final rule published in the Federal Register dated October 24, 1980. The Federal Aviation Administration considers action on Safety Recommendations A-76-82 and A-76-83 completed.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

JUL 30 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board Safety Recommendations A-76-82 through 84 issued June 17, 1976. These recommendations stemmed from the Safety Board's investigation of a Beech Model D95A which crashed shortly after takeoff into Padilla Bay near Anacortes, Washington, on July 11, 1974. The recommendations pertained to malfunctions in the combustion heater, causing smoke and toxic fumes to enter the cabin through the heating and ventilating system. Safety Recommendation A-76-84 is in a "Closed--Acceptable Alternate Action" status. However, A-76-82 and 83 are maintained in an "Open--Acceptable Action" status awaiting further responsive action by the Federal Aviation Administration (FAA). The FAA's letter of September 15, 1976, indicated that the subject was under study and that further action would be based on the results of the study. In order to evaluate the progress of these recommendations and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

September 15, 1976

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-76-82 through 84.

Recommendation No. 1. Amend 14 CFR 23.859 to incorporate the provisions set forth in 25.859(c) combustion air ducts, Paragraph (1).

Recommendation No. 2. Require that the ducts for both combustion air and ventilating air which are in close proximity to a combustion heater be made of fireproof materials.

Comment. We are currently conducting a regulatory study with respect to these recommendations. The study is scheduled for completion February 1, 1977. The decision for further action will be based on the results of the study.

Recommendation No. 3. Issue a maintenance bulletin which emphasizes the importance of a preflight inspection of the heater combustion air inlet hose and plastic ventilating air inlet plenum on Beech Model D95 aircraft and other Beech Model aircraft heater systems so equipped.

Comment. The General Aviation Inspection Aids, Supplement No. 3, dated November 1976 will carry an inspection aid emphasizing the importance of preflight and followup inspection of combustion air inlet hoses and plenums on Beech D95A and similarly equipped aircraft.

Sincerely,

J. W. Cochran
Acting Deputy Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.D.T., JUNE 17, 1976

(202) 426-8787

ISSUED: June 17, 1976

Forwarded to:

Honorable John L. McLucas
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-76-82 through 84

On July 11, 1974, a Beech Model D95A (N8888V) crashed shortly after takeoff into Padilla Bay near Anacortes, Washington; four persons were killed. The National Transportation Safety Board's investigation revealed a malfunction within the combustion heater, which we believe warrants corrective action in order to prevent similar accidents.

Our investigation revealed that smoke and toxic fumes entered the cabin through the heating and ventilating system as a result of a fire in the combustion air-inlet hose and its associated plastic air-inlet plenum of the combustion heater.

An analysis of the combustion products from the flexible air-inlet hose and the plastic foam insulation material (in the aircraft nose cone, adjacent to the combustion hose) indicates that both materials emit poisonous or noxious fumes when heated. The flexible hose emits chloroprene, which depresses the central nervous system. The plastic foam material emits tolylene-diisocyanate (TDI) an extremely noxious eye and lung irritant.

An analysis of the combustion products from the plastic air-inlet plenum indicates that it emits acrylonitrite, a severe skin and eye irritant which inhibits cellular respiration in a manner similar to hydrogen cyanide.

Trace amounts of hydrogen cyanide were detected in the combustion products of the plastic foam material; a more significant amount of hydrogen cyanide was detected in the combustion products of the plastic air-inlet plenum.

The Safety Board believes that the combustion air duct should not have a common opening with the ventilating airstream unless flames from backfires or reverse burning cannot enter the ventilating airstream under any operating condition, including reverse flow or malfunctioning of the heater or its associated components.

Finally, the Board believes that any combustion air-inlet hose and ventilating air ducts which are in close proximity to the combustion heater should be constructed of fireproof materials.

In view of these hazards, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend 14 CFR 23.859 to incorporate the provisions set forth in 25.859(c) combustion air ducts, Paragraph (1). (Class II--Priority Followup.) (A-76-82)
>
> Require that the ducts for both combustion air and ventilating air which are in close proximity to a combustion heater be made of fireproof materials. (Class II--Priority Followup.) (A-76-83)
>
> Issue a maintenance bulletin which emphasizes the importance of a preflight inspection of the heater combustion air inlet hose and plastic ventilating air inlet plenum on Beech Model D95 aircraft and other Beech Model aircraft heater systems so equipped. (Class II--Priority Followup.) (A-76-84)

TODD, Chairman, McADAMS, HOGUE, BURGESS, and HALEY, Members concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

March 17, 1981

OFFICE OF
THE ADMINISTRATOR

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-76-110 and A-76-113 issued August 20, 1976, and supplements our letter of November 19, 1976.

A-76-110.

Evaluate the feasibility of specifying stick force gradient requirements uniquely applicable to aerobatic airplanes in 14 CFR 23.155, "Elevator Control Force in Maneuvers."

FAA Comment.

Our letter dated November 19, 1976, responding to A-76-110, indicated that the Federal Aviation Administration (FAA) had a study project in progress. That project has been completed and results documented in Report No. FAA-RD-78-113 dated August 1978. This report is titled, "A Study of Longitudinal Controllability and Stability Requirements for Small General Aviation Airplanes" (copy enclosed). This report generally supports the provisions in Section 23.155 relative to elevator control forces in maneuvers. As a result of our findings, we do not believe uniquely applicable stick force gradient requirements are needed for aerobatic airplanes and, accordingly, FAA considers action on Safety Recommendation A-76-110 completed.

A-76-113.

Require the installation of accelerometers in all aerobatic airplanes.

FAA Comment.

In our letter of November 19, 1976, we pointed out that the report upon which the recommendation was based failed to show that the accidents mentioned could have been prevented if an accelerometer had been installed. Nevertheless, we agreed to conduct a study on the need for a rule change to require accelerometers in all aerobatic aircraft.

In the process of developing such a program, we have concluded that a research and development effort is not warranted. Aerobatic airplane load factors are currently plus 6 and minus 3. Should the pilot approach these limits, he receives adequate physiological warning in the form of approach to blackout or redout and would normally be expected to ease-off on the maneuver, thereby, naturally reducing load forces.

In the absence of further justification, we cannot find reasonable grounds to pursue any further study on this recommendation. Accordingly, FAA considers action completed on Safety Recommendation A-76-113.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

November 19, 1976

OFFICE OF
THE ADMINISTRATOR

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-76-105 through 115.

We certainly share your concern over general aviation accidents involving acrobatic flight. We do not believe, however, that all of the accidents listed in the Special Study, Report No. NTSB-AAS-76-4, support the intent of the recommendations. For example, 51 of the 105 accidents listed indicated stall/spin involved. An analysis of the data included revealed the following: Twelve cases involved low flying, "buzzing," etc., which preceded a stall, four cases involved pilot use of alcohol, three cases involved improper c.g. location and six involved low experience pilots. Thus, 25 of the 51 stall/spin accidents may not have involved intentional acrobatics, but were likely the consequence of inexpert, careless, or reckless operation.

The FAA is continually campaigning against unauthorized acrobatics and careless and reckless operations.

Recommendation No. 1. Expand the presentation of flight instructor stall/spin indoctrination clinics patterned after the one initially held in FAA's Central Region on August 15-17, 1975, to include all FAA Regions and various popular make and model airplanes.

Comment. We issued FAA Order 8440.11, "Guidelines for Flight Instructor Stall/Spin Clinics," on March 10. This order encourages all regions to develop and implement stall/spin clinic presentations.

Recommendation No. 2. Require a commercial flight instructor to hold a "letter of competence" or its equivalent before providing aerobatic instruction other than that routinely required during the normal course of training for airman certification tests.

Recommendation No. 3. Require that pilots obtain a logbook endorsement from an aerobatic flight instructor before performing aerobatic maneuvers other than those required in connection with airman certification tests.

Comment. Certain pilot training maneuvers which are classified as acrobatic maneuvers in accordance with 14 CFR 91.71 are required for pilot certification. Proficiency in teaching these maneuvers is required of flight instructors. We do not believe that the establishment of a class of acrobatic flight instructors is justified based on the evidence available at this time.

Recommendation No. 4. Issue an Advisory Circular explaining the operational considerations, airworthiness requirements, and safety aspects associated with the performance of aerobatics.

Comment. We concur with this recommendation. A project to develop an advisory circular is being established. We expect issuance by March 1, 1977.

A76-109

Recommendation No. 5. Require that all airplanes subsequently certificated in the aerobatic category, including those previously certificated in another category under a Regulatory Part other than 14 CFR 23, conform with the currently applicable structural criteria in Subpart C of FAR 23, particularly the provisions relating to limit maneuvering load factors.

Comment. The structural failures listed in the study and in our records do not justify action at this time.

Recommendation No. 6. Evaluate the feasibility of specifying stick force gradient requirements uniquely applicable to aerobatic airplanes in 14 CFR 23.155, "Elevator Control Force in Maneuvers."

Comment. The accidents listed in the study do not support action to increase stick force for acrobatic aircraft. 14 CFR 23.155, Elevator Control Force in Maneuvers, was first introduced in 1973 in an attempt to relate stick force to weight and, therefore, size, to be applicable to all Part 23 aircraft. We have had insufficient feedback as yet from industry to assess the effects of applying this rule since aircraft are generally being certificated under the older certification rules. We have already initiated a project to study the desired minimum linearity and gradient of stick forces for generating positive load factors. The project is scheduled for completion in mid-1977. The program results, if valid, will apply to all 14 CFR 23 aircraft.

Recommendation No. 7. Amend 14 CFR 91.71, "Aerobatic Flight," to include a schedule of minimum initial spin altitudes.

Comment. Because of the many types and models of spin-capable airplanes, we believe that a regulatory schedule of initial spin altitudes to recognize individual performance and characteristics would be cumbersome and impractical. We believe that the minimum altitude for recovery or completion of maneuvers specified in 14 CFR 91.71(d) provides a satisfactory

margin of safety. We also believe that airmen should be reminded that spin entry altitudes are essential to assure the safe altitude margins specified in 91.71(d). We will include such a reminder in the proposed advisory circular which we discussed in A-76-108.

Recommendation No. 8. Conduct an intensive accident prevention campaign to emphasize and enforce effectively the provisions of 14 CFR 91.71, "Acrobatic Flight," and 14 CFR 91.9, "Careless or Reckless Operation."

Comment. The accident prevention program emphasizes and will continue to emphasize safety measures for acrobatic flight and 14 CFR 91.9, "Careless or Reckless Operation." During the period covered by the study, calendar years 1972 through 1974, the FAA processed 183 acrobatic violation reports.

Recommendation No. 9. Require the installation of accelerometers in all aerobatic airplanes.

Comment. We do not nave any evidence that accelerometers would have prevented any of the three overload cases listed in the study. However, a more thorough study may reveal support for the recommendation. We intend to conduct such a study and will report our findings to you by July 1, 1977.

A-76-114 & 115

Recommendation No. 10. Amend 14 CFR 23.337, "Limit Maneuvering Load Factor," to increase the minimum required, negative limit maneuvering load factor for aerobatic airplanes from -3.0 to -4.5.

Recommendation No. 11. Amend 14 CFR 23.333, "Flight Envelope," to require that the negative maneuvering load factor specified in 14 CFR 23.337 for the aerobatic category remain constant between design cruising speed and design dive speed.

Comment. We do not have any evidence of failures due to negative loading. We do not believe that amendment of CFR 23.337 is justified at this time.

Sincerely,

Jeff Cochran

J. W. Cochran
Acting Deputy Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.D.T., AUGUST 20, 1976

(202) 426-8787

ISSUED: August 20, 1976

Forwarded to:

Honorable John J. McLucas
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-76-105 through 115

The National Transportation Safety Board has completed a special safety study titled, "General Aviation Accidents Involving Aerobatics, 1972-1974." This study was prompted by the continued occurrence in recent years of fatal aerobatic accidents. For example, from 1972 through 1974, 105 such accidents resulted in 107 fatalities and 21 serious injuries. The Safety Board believes that, in view of the growing interest in sport aerobatics and the continuing manufacture of airplanes certificated for aerobatic operation, an effort should be made to reduce the number of aerobatic accidents.

The study revealed several areas in which corrective action is necessary:

Aerobatic Training--. There are no regulations which relate directly to the aerobatic curriculum or to a pilot's aerobatic proficiency or experience since there are no certification tests or airman ratings required in connection with the performance of aerobatics. This lack of regulatory influence prompts concern in two related areas: The qualifications of the aerobatic flight instructor, and the unrestricted performance of aerobatic maneuvers by pilots lacking adequate training or experience. The operational implications and safety aspects relating to aerobatics are, in many respects, no less critical than those associated with other areas of operation requiring special training and experience, for example, instrument flight. It is essential, therefore, that all pilots performing aerobatics be thoroughly familiar with all of the approved flight maneuvers, specialized operational techniques, and performance flight characteristics of each make and model airplane flown aerobatically. Moreover, the student aerobatic pilot should not perform solo aerobatic maneuvers without the explicit approval of a qualified aerobatic flight instructor.

Aerobatic Operations/Airworthiness--. It is recognized that the airworthines. standards in 14 CFR 23 are only minimal standards and that certification in the aerobatic category does not necessarily mean that all types of aerobatic maneuvers may be performed. Moreover, if those aerobatic maneuvers approved for a particular airplane were always flown by experienced aerobatic pilots, the probability of exceeding the design flight envelope would not be significant. Professional aerobatic pilots, however, tend to fly higher strength, higher performance airplanes with relatively few restrictions while the novice aerobatic pilots routinely fly more restricted types. Because of the significant difference in structural limitations between several currently popular aerobatic airplanes, the label "certified for aerobatics" may result in a false sense of security by suggesting or implying an operational or structural capability that does not exist. In view of this fact, the expanded interest in aerobatics, and the performance of increasingly sophisticated aerobatic maneuvers by relatively inexperienced pilots, it is increasingly essential for pilots to completely understand all of the operational implications associated with the performance of aerobatics and for manufacturers and FAA to assure an adequate mangin of safety in maneuvers flown by these pilots, particularly inverted maneuvers.

Regulatory requirements for certification in the aerobatic category have been improved and expanded over the years with respect to structural standards which distinguish between type of airplane operation, demonstration of maneuvers for which certification is requested, specifications regarding approved types of aerobatic maneuvers and entry speeds, etc. While applications for original certification are processed in accordance with 14 CFR 23, an airplane previously certificated in the normal category under an older Regulatory Part such as CAR 4A may be currently certificated in the aerobatic category under that same (less rigorous) Part. This does not appear appropriate from an operational, technological, or safety point of view and the number of years in which a product may be certificated in accordance with a particular version of the airworthiness requirements should be limited.

The National Aeronautics and Space Administration has studied the actual flight loads on a number of general aviation airplanes for comparison with their design flight envelopes, including accelerations measured during individual practice, and competitive aerobatics. The study disclosed significant exceedences of the negative limit load factor required by 14 CFR 23 for certification in the aerobatic category when obligatory groups of outside-type competitive maneuvers were performed. They also found that pilot control forces were not necessarily a reliable indication of negative normal load factors nor would the control forces be a physical limit for load factors that exceeded the minimum required negative load factors. The Safety Board recognizes that these competitive type maneuvers are not approved in all aerobatic airplanes. Nonetheless,

in view of the novice pilot's increasing exposure to aerobatics, the relative ease of inducing high negative load factors, and the demonstrated manufacturing and economic feasibility of increased structural limits (for example, the Bellanca Decathlon has limit maneuvering load factors ranging from -5 to +6), consideration should be given to expanding the design flight envelope for aerobatic certification and to the specification of stick force gradients uniquely applicable to aerobatic airplanes.

Aerobatic Accidents At Low Altitude--. The majority of stalls and spins in aerobatic related accidents occur at low altitudes--altitudes that make recovery difficult or impossible. In addition, many of the collisions with ground or water, wires, poles, and trees also reflect the hazards of performing aerobatics at low altitude. Flights conducted at these altitudes are, for the most part, contrary to and in violation of the provision contained in FAR 91.9 "Careless or reckless operations," and FAR 91.71 "Acrobatic Flight" which prohibits aerobatics at an altitude below 1,500 ft above the surface. Accident prevention efforts, therefore, should logically focus primarily on the application of more effective measures of enforcement.

Spins--. In years past, spins and spin recovery procedures have been over-simplified to some degree and only recently has it been emphasized that the recovery process required for consistent, optimum results in some airplanes may be very precise. There are, moreover, various operational circumstances stemming from confusion, apprehension, disorientation, or the misapplication of flight controls which may seriously thwart the recovery process. Because some of the knowledge regarding spin recovery techniques has only recently been attained, flight instructors are not generally aware of many of the operational implications. In an effort to disseminate the most recent spin recovery information, the FAA's Central Region devoted the entire issue of their "Flight Instructor Bulletin" of August 1975 to the subject of spins. In addition, the Central Region also initiated a series of stall spin clinics for flight instructors in order to brief them regarding the precise spin characteristics of various make and model airplanes and, through actual flight demonstrations, provide appropriate operational indoctrination. The flight instructor plays a vital role in connection with both the prevention and teaching of spins. The Safety Board believes, therefore, that these stall spin clinics should be conducted in all FAA Regions.

In a number of accidents involving spins it appeared that the relatively low altitude involved provided little or no margin for operational error such as inept or delayed recovery, misjudgment of altitude, disorientation, etc. Also, certain operational vagaries or anomalies were recently given considerable attention when several flight instructors complained of experiencing difficulties in recovering from spins. As a result of these accidents and incidents, the initiation of spins at

higher, conservative altitudes is being increasingly emphasized. Moreover, in view of the expanding interest in aerobatics, the Safety Board believes that FAR 91.71 should be amended to include a schedule of minimum initial spin altitudes; for example, no spin regardless of time, duration, or number of turns should be permitted to be initiated below an altitude of 3,500 ft above the surface and spins initiated at this altitude should not exceed a designated number of turns before recovery is begun. A conservative increment in altitude should be required for each additional spin turn or fraction thereof.

Load Factor Measurement--. Despite all the emphasis placed on the critical importance of observing an airplane's limit load factors during the performance of aerobatic maneuvers, accelerometers are not required on most aerobatic airplanes. While aerobatic pilots may acquire a general "seat of the pants" capability for sensing the approximate order of magnitude of load factors, critical dependence on this means alone to assure operation within rather precise limits does not appear justified. As previously pointed out, stick forces themselves are not necessarily a reliable indication of load factor, particularly negative load factor. Nor do stick forces pose any significant physical constraint to the generation of excessive load factors. Because accelerometers are operationally useful and fundamentally related to the performance of aerobatic maneuvers, the Safety Board believes that they should be installed in all aerobatic airplanes.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Expand the presentation of flight instructor stall/spin indoctrination clinics patterned after the one initially held in FAA's Central Region on August 15-17, 1975, to include all FAA Regions and various popular make and model airplanes. (Class II--Priority Followup.) (A-76-105).
>
> Require a commercial flight instructor to hold a "letter of competence" or its equivalent before providing aerobatic instruction other than that routinely required during the normal course of training for airman certification tests. (Class III--Longer-Term Followup.) (A-76-106).
>
> Require that pilots obtain a logbook endorsement from an aerobatic flight instructor before performing aerobatic maneuvers other than those required in connection with airman certification tests. (Class III--Longer-Term Followup.) (A-76-107).

Issue an Advisory Circular explaining the operational considerations, airworthiness requirements, and safety aspects associated with the performance of aerobatics. (Class II--Priority Followup.) (A-76-108).

Require that all airplanes subsequently certificated in the aerobatic category, including those previously certificated in another category under a Regulatory Part other than 14 CFR 23, conform with the currently applicable structural criteria in Subpart C of FAR 23, particularly the provisions relating to limit maneuvering load factors. (Class II--Priority Followup.) (A-76-109).

Evaluate the feasibility of specifying stick force gradient requirements uniquely applicable to aerobatic airplanes in 14 CFR 23.155, "Elevator Control Force in Maneuvers." (Class III--Longer-Term Followup.) (A-76-110).

Amend 14 CFR 91.71, "Aerobatic Flight" to include a schedule of minimum initial spin altitudes. (Class II--Priority Followup.) (A-76-111).

Conduct an intensive accident prevention campaign to emphasize and enforce effectively the provisions of 14 CFR 91.71, "Acrobatic flight," and 14 CFR 91.9, "Careless or Reckless Operation," (Class II--Priority Followup.) (A-76-112).

Require the installation of accelerometers in all aerobatic airplanes. (Class III--Longer-Term Followup.) (A-76-113).

Amend 14 CFR 23.337, "Limit Maneuvering Load Factor," to increase the minimum required, negative limit maneuvering load factor for aerobatic airplanes from -3.0 to -4.5. (Class III--Longer-Term Followup.) (A-76-114).

Amend 14 CFR 23.333, "Flight Envelope" to require that the negative maneuvering load factor specified in 14 CFR 23.337 for the aerobatic category remain constant between design cruising speed and design dive speed. (Class III--Longer-Term Followup.) (A-76-115).

TODD, Chairman, BAILEY, Vice Chairman, McADAMS, HOGUE, and HALEY, Members, concurred in the above recommendations.

Kay Bailey for

By: Webster B. Todd, Jr.
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 3, 1981

The Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Ave., S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

The following information updates the status of action taken by the Federal Aviation Administration (FAA) concerning NTSB Safety Recommendation A-77-48.

Recommendation A-77-48. Standardize word and phrase contractions contained in Federal Aviation Administration publications, or in interagency publications approved by the Federal Aviation Administration to assure that there are no authorized abbreviations with dual meanings, or different abbreviations with the same meanings, used for air traffic control, communications, or associated services.

Comment. Our letter of June 7, 1979, advised you of the actions we had taken to resolve the problems enumerated in your Recommendation A-77-48. At that time, we also advised you that the solution to the problem was not an easy one and would necessitate an ongoing committee to study the problem and to monitor the fu. re assignment of contractions.

We would like to update our response on the current status of this recommendation.

1. Air Traffic Service manuals and handbooks have been purged of unauthorized or inconsistent abbreviations that were not in consonance with the FAA Contractions Handbook.

2. The working group comprised of FAA, National Weather Service, and the Department of Defense will be an ongoing forum for coordinating the introduction of new contractions into general use and monitoring the use of contractions and abbreviations used in air traffic control, communications, and associated services.

Based on the above actions, we feel that we have met the intent of NTSB Recommendation A-77-48.

Sincerely,

Charles E. Weithoner
Acting Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

June 7, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Ave., S.W.
Washington, D. C. 20594

Dear Mr. Chairman:

The following information updates the status of action taken by the Federal Aviation Administration (FAA) concerning NTSB Safety Recommendation A-77-48.

Recommendation A-77-48. Standardize word and phrase contractions contained in Federal Aviation Administration publications, or in interagency publications approved by the Federal Aviation Administration, to assure that there are no authorized abbreviations with dual meanings, or different abbreviations with the same meanings, used for air traffic control, communications, or associated services.

Comment. Our letter of August 25, 1977, agreed with your recommendation. A study of the project established for the purpose of standardizing word and phrase contractions contained in FAA publications was coordinated with user agencies and the International Civil Aviation Organization. A tentative completion date for the project was 18 months.

The project has not been completed nor do we anticipate it will be before June 1980. A solution to the problem of one organization using a particular contraction to mean one thing, and another organization using the same contraction to mean something else, is not easy. It is an ongoing problem; one which requires continuous attention of our ongoing committee to keep contractions as uncomplicated as possible. To date the following actions have been taken:

1. Formed an informal working group comprised of Federal Aviation Administration, National Weather Service and Department of Defense personnel to study this problem and to monitor the future assignment of contractions.

2. Incorporated into the United States Civil Notice to Airmen (NOTAM) System Handbook, 7930.2, instructions to NOTAM originators to use only those contractions contained in the Contractions Manual, 7340.1.

3. Completed a study of contractions used by the Military, Federal Aviation Administration, National Weather Service and the International Civil Aviation Organization. Where possible, differences will be eliminated.

An interim status report concerning the completion of this project will be provided to your office in January of 1980.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF
THE ADMINISTRATOR

August 25, 1977

Honorable Webster B. Todd, Jr.
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-77-48.

We agree that commonly used contractions should be standardized and should have precise meanings.

The Air Traffic Service has initiated a total review of contractions being used in the air traffic control system. The project will be coordinated with other agencies and the International Civil Aviation Organization (ICAO).

We anticipate completion of this project will take approximately 18 months.

Sincerely,

Quentin S. Taylor
Acting Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 24, 1977

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)
A-77-48

On February 10, 1977, a twin engine airplane was operating on an instrument flight rules (IFR) flight plan at 10,000 feet m.s.l. along Victor Airway 456 near Mt. Iliamna, Alaska. The airplane was 3,000 feet below the minimum en route altitude (MEA) for that segment of the airway and presumably crashed, although no wreckage has been found.

The investigation of this accident revealed that a current Notice to Airmen (NOTAM) read "AKN BAK-12 CNTR 11/29 OTS," indicating that an arresting system at King Salmon Airport, Alaska, the destination airport, was out of service. The remarks section of the pilot's IFR flight plan read"AKN BC 12 OTS" indicating that he believed a localizer (back course) for runway 12 at King Salmon Airport was out of service. Based on the disparity between the NOTAM and the pilot's remarks, the Board believes that the pilot misunderstood the NOTAM. We believe that some aviation contractions are ambiguous because various segments of the aviation community use contractions which are not standardized. Some examples are:

CONTRACTIONS	MEANING	SOURCE
OTS	Out of Service	Airman's Information Manual Contractions Handbook 7340.1E
OTS	Organized Track System	ATC Handbook 7110.65
O/S	Out of Service	Flight Information Publication

OT	Other Times	Flight Information Publication
OT	On Time	Contractions Handbook 7340.1E

Although the pilot's apparent misinterpretation of the NOTAM was not a causal factor in this accident, we believe that commonly used contractions should be standardized and should have precise meanings.

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

> Standardize word and phrase contractions contained in Federal Aviation Administration publications, or in interagency publications approved by the Federal Aviation Administration, to assure that there are no authorized abbreviations with dual meanings, or different abbreviations with the same meanings, used for air traffic control, communications, or associated services. (Class III Longer-term followup.) (A-77-48)

TODD, Chairman, BAILEY, Vice Chairman, McADAMS, HOGUE, and HALEY, Members, concurred in the above recommendation.

By: Webster B. Todd, Jr.
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

This is to acknowledge the Federal Aviation Administration (FAA) letter dated March 17, 1981, further responding to National Transportation Safety Board Safety Recommendation A-77-58 issued September 9, 1977. The recommendation pertained to a problem involving supplemental oxygen masks for general aviation aircraft. We recommended that the FAA develop a Technical Standard Order (TSO) for continuous flow oxygen masks.

The Safety Board is pleased to note that the FAA is proposing a TSO for general aviation oxygen masks and will seek public comment on the proposal prior to May 1, 1981. We appreciate the FAA's offer to keep us informed of further significant progress. Safety Recommendation A-77-58 is maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-77-58 issued September 9, 1977, and supplements our letter of June 14, 1978. This also responds to your letter of August 18, 1980, in which you requested an updated status report.

A-77-58.

Develop a Technical Standard Order (TSO) for continuous flow oxygen masks.

FAA Comment.

In 1978 the Society of Automotive Engineers (SAE) issued Aerospace Standard (AS) 1224A, Continuous Flow Oxygen Masks, (For Non-Transport Category Aircraft). Project work on a Technical Standard Order (TSO) for such masks was then deferred because of a continuing regulatory backlog. In order to resolve this problem, the TSO revision program project was initiated in 1979 and adopted in 1980. Under the new TSO system, the public will be given 90 days to comment on proposed new or revised TSO's but it will not be necessary to go through the formal rulemaking process.

The Federal Aviation Administration intends to incorporate AS 1224A by reference as a TSO for general aviation oxygen masks, and seek public comment on the subject prior to May 1, 1981. We will keep the Board informed of further significant progress on Safety Recommendation A-77-58 after the close of this public comment period.

Sincerely,

Charles E. Weithoner
Acting Administrator

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

August 18, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board Safety Recommendation A-77-58 issued September 9, 1977. This recommendation pertained to a problem involving supplemental oxygen masks for general aviation aircraft. We recommended that the Federal Aviation Administration (FAA) develop a Technical Standard Order (TSO) for continuous flow oxygen masks.

In your letter of November 4, 1977, you indicated that the FAA had initiated a project to develop a standard for a new TSO, and that a regulatory project would be initiated when the Society of Automotive Engineers (SAE) standard was completed. In your further response of June 14, 1978, you indicated that the completion of the SAE Committee A-10, Aircraft Oxygen Equipment Standard development project, had been delayed and that you expected to receive the standard by the end of 1978.

In order to evaluate the progress of this recommendation and update the public docket, we would appreciate an updated status report.

Sincerely yours,

for James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

June 14, 1978

OFFICE OF
THE ADMINISTRATOR

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is to advise that Federal Aviation Administration action with respect to NTSB Safety Recommendation A-77-56 has been completed and to inform you of the status of A-77-58.

A-77-56. Issue an Airworthiness Directive to require that all Scott Aviation "Sky Masks" be modified so that the dilution valve filter is positively retained.

Action. We conducted a Quality Assurance Systems Review (QASAR) at the Scott manufacturing plant. The findings were as follows:

1. Scott has delivered approximately 10,000 masks per year for ten years. No reports of problems similar to the one described have been received.

2. Scott has designed and produced a filter retainer which is available to all owners of earlier production masks. This retainer is supplied to the owners at no cost. All new production masks have the retainer installed.

3. Scott has publicized the mask modification and the availability of the filter retainer through Business and Commercial Aviation and AOPA Pilot magazines.

The March 1978 Supplement to the General Aviation Inspection Aids contains a description of the incident and information on the procedure for obtaining a filter retainer. A copy of the "Aids" item is enclosed.

In view of the above, we do not consider the issuance of an airworthiness directive is justified. We plan no further action on this ite..

The following is the status of FAA action with respect to NTSB Safety Recommendation A-77-58.

A-77-58. Develop a Technical Standard Order (TSO) for continuous flow oxygen masks.

Status. Completion of the SAE Committee A-10, Aircraft Oxygen Equipment Standard development project, noted in our November 4, 1977, letter, has been delayed. We now expect to receive this standard by the end of 1978.

Sincerely,

Quentin S. Taylor
Deputy Administrator

Enclosure

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

November 4, 1977

Honorable Kay Bailey
Acting Chairman
National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Miss Bailey:

This is in response to NTSB Safety Recommendations A-77-56 thru A-77-58.

A-77-56. Issue an Airworthiness Directive to require that all Scott Aviation "Sky Masks" be modified so that the dilution valve filter is positively retained. (Class I - Urgent Followup)

Comment. We conducted a Quality Assurance Systems Analysis Review (QASAR) during the week of October 3. We are evaluating the report of findings and will make further comments on this recommendation as soon as our evaluation is complete. We expect to complete this within the next 30 days.

A-77-57. Issue a Telert Maintenance Bulletin to alert all operators of aircraft equipped with Scott Aviation "Sky Masks" to check visually the security of the dilution valve filter before each use of the mask until the mask is modified. (Class I - Urgent Followup)

Comment. We have issued General Aviation Notice No. N 8620.4 which directs airworthiness inspectors to alert operators of aircraft equipped with the Scott "Sky Mask" of the possible dislodging of the dilution valve filter.

A-77-58. Develop a Technical Standard Order (TSO) for continuous flow oxygen masks. (Class II - Priority Followup)

Comment. We have initiated a project with SAE Committee A-10, Aircraft Oxygen Equipment, to prepare a standard to be referenced in a new TSO for non-transport category oxygen masks. We expect the SAE standard to be completed by January 1, 1978. We will initiate a regulatory project when we receive the SAE document.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 9, 1977

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-77-56 through 58

The National Transportation Safety Board has become aware of a serious problem involving supplemental oxygen masks for general aviation aircraft. The Safety Board believes that the problem has potentially disastrous consequences and requires immediate action by the Federal Aviation Administration (FAA).

On August 3, 1977, a Piper Aztec (PA-23), N62816, was en route from Bozeman, Montana, to Salt Lake City, Utah, with two pilots aboard. The flight was a return trip of an air taxi flight for which the passengers deplaned at Bozeman. Immediately after the pilots donned their oxygen masks, the copilot began to choke because an object had lodged in his throat. He managed to dislodge and swallow the object with great difficulty. The pilot-in-command removed his mask and found a circular filter that had been partially dislodged. This diluter valve filter was missing from the copilot's mask and obviously was the object on which he had choked. Had this flight been a single-pilot operation, aircraft control might have been lost.

These oxygen masks were manufactured by the Scott Aviation Division of A-T-O, Inc., as "Sky Mask," Part No. 28314-17. The masks were supplied by Piper Aircraft Corporation as part of the aircraft oxygen system. According to Scott Aviation personnel, this type of mask is used in all types of general aviation aircraft for pilot and passenger supplemental oxygen. Other masks manufactured with the same dilution valve filter as the filter involved in this incident are manufactured under Part Nos. 28314, 28315, and 28317.

Our inspection of the "Sky Mask" revealed that the filter can be dislodged easily by squeezing the pliable face piece of the mask as one might do when donning the mask or adjusting it to the facial contours. An inspection of the container in which this oxygen mask is sold revealed the following legend on the container in large print: "FAA Proven to 34,000 feet." While this legend implies that the mask was FAA approved, it was not. Since the mask is a continuous-flow, restricted-phase dilution mask, it does not have to conform to Technical Standard Order (TSO) requirements.

The Safety Board found that the FAA's Civil Aeromedical Institute (CAMI) had tested this mask along with other dilution-type masks from a biomedical standpoint. No engineering design evaluations were made by CAMI. Since there are no definitive requirements for oxygen masks in 14 CFR 23, an FAA inspector would have no basis on which to approve a mask as part of an aircraft's installed oxygen system. FAA approval also is not required when the mask is bought and used by an individual aircraft operator. The Board believes that equipment so closely related to the safety of flight should be more closely controlled by appropriate technical standards.

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

> Issue an Airworthiness Directive to require that all Scott Aviation "Sky Masks" be modified so that the dilution valve filter is positively retained. (Class I - Urgent Followup) (A-77-56)
>
> Issue a Telert Maintenance Bulletin to alert all operators of aircraft equipped with Scott Aviation "Sky Masks" to check visually the security of the dilution valve filter before each use of the mask until the mask is modified. (Class I - Urgent Followup) (A-77-57)
>
> Develop a Technical Standard Order (TSO) for continuous flow oxygen masks. (Class II - Priority Followup) (A-77-58)

TODD, Chairman, BAILEY, Vice Chairman, McADAMS and HOGUE, Members, concurred in the above recommendations; HALEY, Member, did not participate.

Kay Bailey

By: Kay Bailey
Acting Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

We acknowledge the Federal Aviation Administration (FAA) letter dated March 17, 1981, further responding to Safety Recommendation A-77-63 issued September 27, 1977. This recommendation emanated from our investigation of a Southern Airways DC-9 accident at New Hope, Georgia, on April 4, 1977. We recommended that the FAA:

> "Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments, which is capable of providing a real-time display of either precipitation or turbulence, or both and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link."

The Safety Board is pleased to note the FAA's many efforts to improve weather detection and display. We would appreciate being kept informed of further significant progress on this recommendation which we are maintaining in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 17, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Recommendation A-77-63 issued September 27, 1977, and supplements our letter of October 3, 1979. This also responds to your letter of September 12, 1980, in which you requested an updated status report on Safety Recommendation A-77-63.

A-77-63.

Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments, which is capable of providing a real-time display of either precipitation or turbulence, or both and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link.

FAA Comment.

In our October 3, 1979, letter we identified a number of ongoing efforts designed to improve weather detection and display. These various programs are progressing as planned. The scope of some programs has changed and, consequently, we have encountered some modest delays. However, the Federal Aviation Administration (FAA) continues to make good progress, and the current status of these various efforts is outlined below for your information.

Remoting Color Weather Radar Data to Air Route Traffic Control Centers (ARTCC) and En Route Flight Advisory Service Locations - This program was delayed approximately 15 months due to a new requirement by the National Weather Service (NWS) to provide an isolation distribution amplifier between the NWS radars and the color weather radar remoting equipment. This equipment will protect the NWS radar from damage should an electrical fault occur in the remoting equipment and threaten to work its way into the radar. The design and cost of the isolation equipment have been agreed to by all parties. Delivery of the system is scheduled to begin in June 1981 with completion planned in May 1982.

Doppler Weather Radar - A Joint System Program Office (DOT-DOC-DOD) has been established. The office is staffed and funded. Requirements are being finalized in preparation for the drafting of the specifications and this program is on schedule.

Color Weather Radar in Terminal Facilities - Color weather radar was installed in the Atlanta TRACON and controllers referred to the weather radar during periods of severe weather. The ATC radar was also utilized. The conclusion was that because the airport surveillance radar, which is an S-band radar (good band for detecting weather), and the terminal controllers have a broadband display capability, color weather radar was not an absolute necessity. In view of these findings, there is no program to remote color weather radar into terminal facilities.

Meteorologist/Center Weather Service Units - Twenty CONUS centers, Anchorage ARTCC, and the Systems Command Center now have meteorologists permanently assigned to review and advise controller personnel on hazardous weather situations. This program was completed on schedule.

Weather Radar Displays for ARTCC Sector Controllers - A prototype sector display system will be evaluated in the Cleveland Center. The evaluation will validate system specifications, compare existing systems to the color display, demonstrate an improved mapping technique, and provide a means for operational evaluation. The evaluation could last from 1 to 12 months. A contract for a production system could be awarded in FY-81 with first delivery in 1982. This program has slipped about 6 months in order to validate the concept with more sophisticated hardware in an operational setting.

We will continue to keep the Board informed of significant progress on this recommendation.

Sincerely,

Charles E. Weithoner
Acting Administrator

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

SEP 12 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board Safety Recommendation A-77-63 issued September 27, 1977. This recommendation stemmed from our investigation of a Southern Airways DC-9 accident at New Hope, Georgia, on April 4, 1977. We recommended that the Federal Aviation Administration (FAA):

> "Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments, which is capable of providing a real-time display of either precipitation or turbulence, or both, and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link."

The FAA's response of October 3, 1979, indicated many actions underway to resolve this recommendation. In order to evaluate its progress and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King
Chairman

for

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

October 3, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr.Chairman:

This is in response to your August 8 letter concerning the Federal Aviation Administration's (FAA) action relating to NTSB Recommendation A-77-63.

Recommendation A-77-63. Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments which is capable of providing a real-time display of either precipitation or turbulence, or both, and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link.

Comment. The mode settings for air traffic control radars are intended to provide the controller with the maximum strength in aircraft return with the least amount of distortion from all other sources, ground clutter, weather, and anomalous propagation. The need for improved weather detection and display is recognized. Our present program involves the remoting of 75 National Weather Service (NWS) radars to air route traffic control centers (ARTCCs) and En Route Flight Advisory Service (EFAS) locations. An FY-80 budget item will provide each ARTCC controller with direct access to a color weather radar display showing real-time weather with multiple-intensity levels. This program will be implemented beginning in 1981 and completed sometime in 1982. A large part of the Western United States, including Alaska and Hawaii, does not have NWS radar installations. FAA primary radar from sites in these areas will be equipped with a weather intensity decoding device, remoted to ARTCCs, and depicted on a separate display in color. Once the weather radar system is installed using dedicated communications, the primary radar will be relegated to a less significant role in weather detection and display.

Future plans call for replacement of NWS radars with a doppler weather radar sometime in the mid-1980's. The doppler weather radar or next generation weather radar will be a joint NWS/FAA/Air Weather Service Program. The next generation radar requirements and a program development offfice are expected to be established in the near future. This system will in all probability be remoted and displayed in the same manner as the forthcoming color weather radar remoting and display system.

The following is a brief summary of our R & D efforts and future plans.

1. The R & D study concluded that "neither the ARSR nor the ASR radar system, as presently operated for optimum detection of aircraft targets, can provide accurately calibrated reflectivity measurements of severe weather suitable for subsequent conversion to contour levels." (SRDS Report, "Use of Air Traffic Control Radars for Hazardous Weather Data," dated June 1978, enclosed.)

2. The NWS radar evaluation in the Atlanta ARTCC concluded that the NWS radar remoting and color display of six levels of intensity as calibrated contours was feasible. The color weather radar remoting and display system will remain in the Atlanta ARTCC until replaced by an FAA production model of the same system in 1980.

3. The production model of the color weather radar remoting and display system is under contract. The General Time Corporation will begin delivering transmission, receiving, and display systems to our 20 CONUS ARTCCs and 44 EFAS locations in April 1980 and complete deliveries by March 1981.

4. Color weather radar displays are being evaluated in the Atlanta TRACON. The evaluation is expected to be completed in October 1980.

5. Three meteorologists are now assigned to permanent duties in 13 ARTCCs (eastern two-thirds of CONUS). Eight additional ARTCCs are programmed to receive three meteorologists plus associated equipment in early to mid-FY-80 (remaining CONUS ARTCCs plus Anchorage). The meteorologists are assigned to Center Weather Service Units, an integral part of the ARTCC. The meteorologist works directly in support of the ARTCC and supports all terminal and FSS facilities within the ARTCC area of jurisdiction.

You may be assured that all weather enhancement activities will be continued until we are satisfied that we have the best weather detection and display system possible within the state-of-the-art.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Enclosure

National Transportation
Safety Board

Washington, D.C. 20594

Office of the
Chairman

August 8, 1979

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

On September 27, 1977, the National Transportation Safety Board recommended that the Federal Aviation Administration (FAA):

> "Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments, which is capable of providing a real-time display of either precipitation or turbulence, or both, and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link." (Class II-Priority Followup) (A-77-63)

The Federal Aviation Administration's response to this recommendation was:

> A-77-63
>
> "Comment. In August 1975, the Air Traffic Service (ATS) initiated an R&D effort requesting: (a) en route and terminal radars be evaluated to ascertain their capabilities to detect and display weather; (b) a comparison of ARSR/ASR and National Weather Service (NWS) radar detection capabilities; (c) identification of modifications to improve ATC radars; and (d) improve radar weather detection without derogation in aircraft detection."

The Safety Board classified the FAA's response as acceptable action but has been holding the recommendation in open status.

On August 26, 1978, N41786, a PA-28-200, broke up in flight after encountering turbulence associated with a severe thunderstorm over Bolton, North Carolina. The pilot and his passenger were killed in the crash.

During its investigation of this accident the Safety Board learned that weather information displayed to controllers on the NAS stage A en route radar display was not consistent with the meteorological environment actually being experienced by flightcrews in the area.

The Safety Board is concerned about the FAA's plans to phase out all existing broad band radar systems, which presently serve as a backup to the newer narrow band radar, especially since it is the only source of primary radar intelligence available to en route controllers from which raw weather information can be derived. The Board believes there is a continuing need for primary radar in the en route system to aid in the detection and mapping of hazardous weather conditions.

In the light of continuing occurrences of fatal aircraft accidents where severe weather is involved, the Safety Board believes that the present ARTCC radar systems do not adequately meet the needs of the users of the national airspace system with regard to reliable severe weather avoidance operational requirements. The R&D effort cited in your response to Safety Recommendation A-77-63 was initiated in August 1975, which predates the Recommendation. We therefore request that you apprise us of current radar weather detection improvement efforts and future plans.

Sincerely yours,

Patricia A. Goldman
for

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 1, 1978

Honorable Kay Bailey
Acting Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Miss Bailey:

This is in response to your February 8 letter concerning NTSB Recommendation A-77-63.

Recommendation A-77-63. Expedite development and implementation of an aviation weather subsystem for enroute and terminal facilities, capable of real-time display of precipitation with multiple-intensity levels.

Comment. We concur with your suggestion that the test currently being conducted at the Atlanta Air Route Traffic Control Center should be continued through the spring and summer season in order to test its effectiveness during the period of greatest thunderstorm activity. The Federal Aviation Administration had planned to and shall continue the Weather Radar Remoting System evaluation through CY 1978 with particular emphasis on the summer thunderstorm season. You may be assured that all weather enhancement activities will be continued until we are satisfied that we have the best weather detection and display system possible within the state-of-the-art.

Sincerely,

Quentin S. Taylor
Deputy Administrator

National Transportation
Safety Board

Washington, D.C. 20594

Office of the
Chairman

February 8, 1978

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Bond:

On April 4, 1977, Southern Airways, Inc., Flight 242, a DC-9-31, crashed at New Hope, Georgia, after penetrating an area of severe thunderstorms, resulting in 70 fatalities and 24 injuries. Subsequent to the investigation of this accident, the National Transportation Safety Board made several recommendations to the Federal Aviation Administration among which were recommendations to improve the severe weather information made available to air traffic controllers and pilots.

Based in part upon the NTSB recommendations, the FAA is presently testing a Weather Radar Remoting System at the Atlanta Air Route Traffic Control Center. This system provides a remote radar display from three National Weather Service radars located at Athens, Georgia; Centerville, Alabama; and Volens, Virginia. The display shows convective precipitation (thunderstorm activity) in six levels of intensity and offers significantly improved weather information to air traffic controllers for their use in controlling traffic and for transmission to pilots. It is our understanding that this test began during November 1977, and is presently scheduled to continue until February 1978.

The National Transportation Safety Board supports the objectives of this test and believes it may contribute significantly to aviation safety.

We believe that the test should be continued through the spring and summer season in order to test its effectiveness during the period of greatest thunderstorm activity. In addition to providing a more comprehensive test of the Weather Radar Remoting System, we believe there is a potential for saving lives and preventing property damage because of the improved weather information in the system.

Sincerely yours,

Kay Bailey

Kay Bailey
Acting Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

December 8, 1977

Honorable Kay Bailey
Acting Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Miss Bailey:

This is in response to the NTSB Recommendations A-77-63 and 64.

Recommendation A-77-63. Expedite development and implementation of an aviation weather subsystem for en route and terminal facilities, capable of real-time display of precipitation with multiple-intensity levels.

Comment. In August 1975, the Air Traffic Service (ATS) initiated an R&D effort requesting: (a) en route and terminal radars be evaluated to ascertain their capabilities to detect and display weather; (b) a comparison of ARSR/ASR and National Weather Service (NWS) radar detection capabilities; (c) identification of modifications to improve ATC radars; and (d) improve ATC radar weather detection without derogation in aircraft detection.

As of October 1 the following has taken place:

1. R&D has completed 2 years of data collection on the ASR (including New Orleans) and is finalizing a data collection effort on the ARSR. A decision will be made on our proposed solutions to weather detection and display problems, following receipt of an R&D final report to AAT-1, due in April 1978.

2. Three NWS radars have been remoted into the Atlanta ARTCC. (The NWS Tampa radar will be remoted to the Miami FSS.)

3. A comprehensive NWS radar evaluation is in progress in the Atlanta ARTCC. Guidelines for the evaluation of the Enterprise Electronics Corporation WR-100 Radar Data Remoting System being demonstrated are enclosed. (Enclosure 1)

4. ATS has established a $7.6M FY-79 program to improve weather detection and display. This program will provide a system for detecting and displaying radar weather echoes as calibrated contours of varying intensities in ARTCCs. Equipment will be procured to receive and process weather information which will be able to function independently of the radar signal processing used for aircraft target detection. The system will use a digital transmission over narrowband communications lines.

5. ATS has requested the National Oceanic and Atmospheric Administration to staff ARTCCs with meteorologists. The meteorologists will analyze radar weather returns and pilots will be informed by safety advisories.

6. Satellite weather imagery equipment has been validated as an ARTCC program.

7. The supervisory sections of ARTCCs are being remodeled to accommodate the expanded weather functions associated with en route control.

8. ATS and NWS conducted a Severe Thunderstorm Alert Test between June 15 and September 15. The 3-month program was designed to provide pilots available weather intelligence to assist them in avoiding severe thunderstorm areas. A similar test was conducted during the summer of 1976.

A total of 426 thunderstorm alerts were provided on 45 days out of the 93-day test. Considering the 45 days when alerts were provided, the average was over 9 alerts per day. The highest number of alerts in a single day was 37.

Field reports indicated that: alerts were received long after avoidance actions were taken (reroute, deviations, radar vectors); flights sought to stay clear of areas below VIP Level 4 intensity and this action took place long before receipt of the alert; and, when the alert was received it was either no longer useful, superfluous, or provided at a time when the system was being taxed to its limit. The controller could ill afford to take the time to receive and/or disseminate the alert to the cockpit.

User organizations were alerted and feedback requested; however, no useful comments were received.

While no recommendations are being made for another test because of the apparent impracticability of this alert procedure, ATS will explore the feasibility of computer technology to develop an automated system to transmit storm intensities.

Recommendation A-77-64. Establish a standard scale of thunderstorm intensity.

Comment. ATS has taken appropriate steps for implementing the NTSB recommendation to establish a standard scale of thunderstorm intensity, based upon the NWS six-level scale. Action has been taken to promote widespread use throughout the Air Traffic Service of a common language to describe thunderstorm intensity. The DOT/FAA Notice N7110.510 dated June 12 served to acquaint air traffic control specialists with the descriptive terms developed by the NWS, and authorizes their use in the air traffic system.

Thunderstorm intensity levels were published in the Airman's Information Manual, Part 3A, on September 1 (Enclosure 2). This publication advises pilots of the NWS standard six-level scale and cites examples of standard phraseology to be used by controllers describing thunderstorm intensity levels. Definitions, and an explanation of the standard six-level scale, will also be contained in the Pilot-Controller Glossary of the Air Traffic Control Manual and the Flight Service Station Manual, effective January 1, 1978.

Sincerely,

Quentin S. Taylor
Deputy Administrator

Enclosures

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 27, 1977

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-77-63 and 64

On April 4, 1977, Southern Airways, Inc., Flight 242, a DC-9-31, crashed at New Hope, Georgia, as its crew attempted an emergency landing on a highway; 70 persons died and 24 persons were injured as a result. The National Transportation Safety Board's investigation disclosed that the flight had entered a relatively small precipitation area classified by the National Weather Service (NWS) as intense, or level-5. This small intense area was part of a considerably larger area of lesser intensities. By the time the flight had left this small intense area, the level had risen to a level-6, the highest level currently used by NWS. The Board believes that had this intense area been identified adequately and in real-time to both the pilot and controller, the flightpath of Flight 242 might have differed from that actually flown.

As a result of the Ozark Airlines' accident at St. Louis, Mo., in 1973, the Safety Board recommended that the Federal Aviation Administration, "Develop and install terminal air traffic control radar capable of locating severe weather and displaying convective turbulence." Also, as a result of the Eastern Air Lines' accident, at Jamaica, N.Y., in 1975, the Safety Board recommended that the FAA, "Conduct a research program to define and classify the level of flight hazard of thunderstorms using specific criteria for the severity of a thunderstorm and the magnitude of change of the wind speed components measured as a function of distance along an airplane's departure or approach flight track and establish operational limitations based upon these criteria." Although the Southern Airways jet did not encounter severe weather in terminal airspace, the Board believes that the concept of the above recommendations should be pursued with the inclusion of en route airspace as well.

2059B

The Safety Board is aware of various project reports prepared for the FAA which demonstrate that real-time classifications of the severity of precipitation areas could be displayed via air traffic control radar. Also, during its recent public hearing into the Southern Airways accident, the use of pulse doppler techniques for turbulence detection was discussed. The Safety Board believes that the technology is available for providing this critical information, and that these concepts must be made an operational reality as soon as possible.

The Safety Board also believes that this information should be transmitted to the flightcrew so that effective and timely decisions can be made. Testimony received at the public hearing for the Southern Airways accident revealed that the Beacon Collision Avoidance System would use a data link and that this same system could be made available for the transmission of an automatic display of weather information to the pilot.

As a more immediate remedial measure, the Board believes that the dimensioning of thunderstorm precipitation intensity in terms of a common language should be accomplished and promoted throughout government and industry. The National Weather Service (NWS) has established a six-level scale based on the strength of the received radar signal which has been related to precipitation intensity and thus to thunderstorm intensity. The system is in use with NWS ground-based weather radars and observations made by these radars are transmitted to aviation interests in the six-level terminology.

The Safety Board believes that the NWS six-level scale should be adopted as a standard of description of thunderstorm intensity, and that this would be of use with severe weather forecasts, ground observations, and pilot reports; and thus would provide pilots with a clearer picture of potential and actual thunderstorm activity. Pilots could also benefit by the use of this standard if used as a reference for the capability of their present-day airborne radar.

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

> Expedite the development and implementation of an aviation weather subsystem for both en route and terminal area environments, which is capable of providing a real-time display of either precipitation or turbulence, or both and which includes a multiple-intensity classification scheme. Transmit this information to pilots either via the controller as a safety advisory or via an electronic data link. (Class II-Priority Followup) (A-77-63)

Establish a standard scale of thunderstorm intensity based on the NWS' six-level scale and promote its widespread use as a common language to describe thunderstorm precipitation intensity. Additionally, indoctrinate pilots and air traffic control personnel in the use of this system. (Class II-Priority Followup) (A-77-64)

BAILEY, Acting Chairman, McADAMS, HOGUE and HALEY, Members concurred in the above recommendations.

Kay Bailey

By: Kay Bailey
Acting Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-77-69 issued November 7, 1977, and supplements our letter of July 19, 1978. This also responds to your letter of July 28, 1980, in which you requested an updated status report.

A-77-69.

Revise the Airman's Information Manual and issue or revise other official guidance materials to clarify pilots' and controllers' responsibilities in implementing an IFR departure from an airport which has a published IFR departure procedure.

FAA Comment.

In July of 1978, the Federal Aviation Administration (FAA) revised the Airman's Information Manual (AIM) to more clearly reflect pilot and controller responsibilities for instrument departure operations. The revisions to the AIM, coupled with other actions outlined in our letter of July 19, 1978, served to clarify the pilot and controller responsibilities addressed in NTSB Recommendation A-77-69. We did not adopt the draft revision to Handbook 7110.65B, Air Traffic Control, paragraph 350, referred to in our July 19, 1978, letter because the revision would have changed, rather than clarified, existing procedures and responsibilities.

However, in a separate but related action, the FAA has drafted a joint proposal for complete and comprehensive revision of the AIM, paragraph 325, Instrument Departures. The proposed change will more fully describe the relationships between IFR Departure Procedures, Standard Instrument Departures, and the departure/climb-out instructions assigned in an IFR clearance. It also further addresses pilot actions when departing uncontrolled airports, with regard to obstruction/terrain avoidance. A copy of the proposed AIM change, proposal AAT-330-80-2, was sent to NTSB and other aviation industry groups for comment (a copy of this document is enclosed). Based on comments received to date, we expect the revision to be adopted with only minor modifications.

Appropriate follow-on action will be taken to update the applicable air traffic control facility operations and management handbooks once our present revision effort with the AIM has been completed. We believe these measures satisfy the intent of Safety Recommendation A-77-69 and, accordingly, the FAA considers action completed on this recommendation.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of Chairman

July 28, 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Please refer to your letter of July 19, 1978, responding to National Transportation Safety Board Safety Recommendation A-77-69 issued November 7, 1977. This recommendation stemmed from a Cessna 421 accident near Nogales, Arizona, on January 22, 1977. Your letter indicated that a proposed revision of Federal Aviation Administration Handbook 7110.65A, paragraph 350, was being redrafted. In order to evaluate the progress of this recommendation and update the public docket, we would appreciate an updated status report.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

July 19, 1978

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to your May 30 letter concerning the Federal Aviation Administration's (FAA) action relating to NTSB Recommendation A-77-69.

Recommendation A-77-69. Revise the Airman's Information Manual (AIM) and issue or revise other official guidance materials to clarify pilots' and controllers' responsibilities in implementing an instrument flight rules (IFR) departure from an airport which has a published IFR departure procedure.

Comment. Actions taken by FAA after the accident involving N99MB at Nogales, Arizona, on January 22, 1977, are as follows:

A GENOT was sent to FAA field activities to reemphasize procedures in FAA Handbook 7110.10D for processing pilot requests for route elements, fixes, etc., that are not computer adapted (action to preclude repeat of the initial contributing factor in the accident). See Enclosure 1.

An article on controller actions in regard to instrument departure procedures was published in the March 1977 issue of the Air Traffic Service (ATS) Bulletin. See Enclosure 2.

A paragraph titled "Instrument Departure" was published in the July 1978 AIM, Part 1, under "Pilot/Controller Responsibilities" on page 82. See Enclosure 3.

A proposed revision of FAA Handbook 7110.65A, paragraph 350 is being drafted and will be sent to FAA Regions, aviation groups and others, including NTSB, for comment. The revision will be constructed to improve clarity and ease of understanding of departure clearance procedures. Final disposition of the proposal will be sent to NTSB and others who comment on the proposal.

I feel that these actions amply address the procedures indicated in the accident investigation. Pilot and controller adherence to existing procedures and responsibilities remain the key to preventing accidents of the type that generated the NTSB recommendation.

Sincerely,

Q. S. Taylor

Quentin S. Taylor
Deputy Administrator

Enclosures

National Transportation
Safety Board

Washington D.C. 20594

Office of the
Chairman

May 30, 1978

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Bond:

We have reviewed your response, dated January 16, 1978, to our Safety Recommendation A-77-69.

In your response, you stated that, "Existing procedures and guidance contained in Handbook 7110.65A, paragraph 350, and AIM, Part 1, pages 1-61, outline the pilots' and controllers' responsibilities pertinent to obstruction avoidance." The Safety Board carefully considered these existing procedures and the guidance in these documents before we made our recommendation. We believe that the procedures do not satisfy the needs of aviation safety, and the circumstances of the accident involving N999MB, a Cessna 421A, at Nogales, Arizona, on January 22, 1977, reinforced this belief.

Controllers who had provided ATC services to N999MB expressed their belief that, notwithstanding the departure clearance which indicated Nogales direct to Tucson, the pilot could have departed Nogales by using the applicable published IFR departure procedure involving an initial climb on a northwesterly heading. The departure controller stated that he was concerned about the possibility of the pilot's departing via Nogales direct to Tucson, but he hoped the pilot "was coming out on another route."

Directives contained in ATC Handbook 7110.65, dated January 1, 1976, supported the controllers' contention that, at airports which have a published IFR departure procedure, the portion of a flight from takeoff to the first en route fix, although specified as "via direct," permits the pilot to (1) follow the published IFR departure procedure, or (2) take a different route of flight (including a straight-line course) to the en route fix, provided he can clear obstructions. These directives remain unchanged in ATC Handbook 7110.65A, dated January 1, 1978. Paragraph 350.e. (Note) states, "If a published IFR departure procedure is not included in an ATC clearance, compliance with such a procedure is the pilot's prerogative."

Apparently, if other traffic is not a factor, a variety of choices are available to the pilot without any requirement on his part to specify which choice he has in his flight plan, or to otherwise advise ATC which option he is taking.

Under the provisions of 14 CFR 91.75, the pilot's course of action evidently was correct when he proceeded on a straight-line course after being cleared direct from Nogales to Tucson. On the other hand, the provisions of ATC Handbook 7110.65A -- and to a lesser extent the procedural guidelines in the AIM -- tend to support the controllers in their belief that options were available to the pilot.

The action of the pilot of N999MB while complying with his clearance, and the expressed belief of the controllers regarding the options available to the pilot, indicate that procedures and regulations are incompatibile with regard to controller and pilot responsibilities during departures from an airport with a published IFR departure routing (other than a SID).

We believe it should be understood clearly by both pilots and controllers how an IFR departure is to be effected, especially over mountainous terrain, as was the case in Nogales. Otherwise, it is difficult for the controller to be responsive to the needs of the confused or uninformed pilot. We note that the pilot aboard N999MB was apparently aware of the published IFR departure since he attempted to include it in his IFR flight plan. The FSS specialist at Tucson who received the flight plan was completely unaware of the published IFR departure procedure and the controllers at Davis Monthan RAPCON were only vaguely familiar with it.

We believe safety demands that this confusion be resolved. Moreover, the Safety Board believes that reiterating currently available guidance is not likely to resolve it. Therefore, we urge that you reconsider Safety Recommendation A-77-69.

Sincerely yours,

James B. King
For Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

January 16, 1978

Honorable Kay Bailey
Acting Chairman, National Transportation Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Miss Bailey:

This is in response to NTSB Recommendation A-77-69.

Recommendation A-77-69. Revise the Airman's Information Manual (AIM) and issue or revise other official guidance materials to clarify pilots' and controllers' responsibilities in implementing an instrument flight rules (IFR) departure from an airport which has a published IFR departure procedure.

Comment. Existing procedures and guidance contained in Handbook 7110.65A, paragraph 350, and AIM, Part 1, page 1-61, outline the pilots' and controllers' responsibilities pertinent to obstruction avoidance. As an added measure, we will reiterate pilots' and controllers' responsibilities in a new paragraph titled, "Instrument Departures," to be added to the AIM, Part 1, on page 1-80.

Sincerely,

Quentin S. Taylor
Deputy Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 7, 1977

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-77-69

On January 22, 1977, N999MB, a Cessna 421A, crashed in mountainous terrain about 21 nmi north of Nogales, Arizona. The pilot had received an instrument flight rules (IFR) clearance to depart Nogales and proceed to Tucson, Arizona, before proceeding west toward his destination, Fresno, California. Although the pilot initially requested a routing via a navigational fix to the northwest of the airport, he accepted the direct clearance and proceeded to the north on a straight line course from Nogales to Tucson, with an assigned altitude which did not provide adequate terrain clearance.

The flight service station specialist who relayed the IFR clearance to N999MB stated that he had expected the pilot to "fly west" and he advised the pilot to expect radar vectors after takeoff. The departure controller at Davis-Monthan RAPCON indicated that he was generally aware of a published departure procedure at Nogales (which included a northwesterly climb from the airport). However, he did not know if the pilot would fly the published departure route and, based on the IFR flight plan, believed the pilot might possibly proceed on a direct route from Nogales to Tucson. An assistant chief at the RAPCON, who had formulated the IFR clearance, stated that he expected the pilot to comply with the published departure procedure even if it was not included in the clearance, and even though it diverged from the direct route by about 12 nmi.

The Safety Board believes that this difference in understanding among the controllers and the pilot is symptomatic of inadequacies in the official procedural guidance available to controllers and pilots concerning IFR departures. Informal discussion with other controllers and officials within the FAA indicate that misunderstandings in this area extend beyond the personnel involved in this accident. The Board concludes that phraseology used in the Airman's Information Manual (AIM) to describe the use of published IFR departure procedures is unclear as

to whether the pilot should inform air traffic control of his intent to use a published IFR departure procedure (other than a SID) or whether he can fly the procedure without specific air traffic control authorization.

The danger inherent in this ambiguous procedural guidance has been demonstrated by this accident. The controller's belief that the pilot was flying the published IFR departure route, when in fact the pilot was following a direct course to Tucson, contributed to the controller's assignment of an altitude which did not provide the required obstacle clearance. The Safety Board believes operational procedures should build upon and be compatible with all relevant federal regulations.

In light of the foregoing, the Safety Board concludes that the ambiguities can be resolved by publication of clarifying information in an advisory circular, an exam-o-gram, revisions to the AIM and ATC Handbook 7110.65, or by some combination of these, and by inclusion of these in appropriate pilot and controller training programs.

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

> Revise the Airman's Information Manual and issue or revise other official guidance materials to clarify pilots' and controllers' responsibilites in implementing an IFR departure from an airport which has a published IFR departure procedure. (Class II-Priority followup) (A-77-69.)

BAILEY, Acting Chairman, McADAMS, HOGUE, and KING, Members, concurred in the above recommendation.

By: Kay Bailey
Acting Chairman

Francis H. McAdams for

National Transportation Safety Board

Washington, D.C 20594

Office of the Chairman

April 15, 9181

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

Please refer to the Federal Aviation Administration (FAA) letter of February 19, 1981, further responding to National Transportation Safety Board Safety Recommendation A-78-42 issued July 5, 1978. This recommendation stemmed from our investigation of a DC-7 accident at Yakutat, Alaska, on September 12, 1977, and from our investigations of many other accidents involving aircraft operated under the provisions of 14 CFR 91 Subpart D (Large and Turbine-Powered Multiengine Airplanes). We recommended that the FAA:

> "Revise 14 CFR 91 Subpart D to assure that an adequate level of safety is provided wherever these rules are applicable."

The Safety Board has examined the October 9, 1980, issue of the Federal Register, in which is published the final rule, Certification and Operation Rules for Certain Large Airplanes. We appreciate the immense effort that has gone into the revisions and amendments of the relevant regulations including 14 CFR 91 Subpart D.

We thank the FAA for the many actions taken toward fulfilling the intent of Safety Recommendation A-78-42 which we now classify in a "Closed--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 19, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in further response to Safety Recommendation A-78-42. This recommendation was issued as a result of a Douglas DC-7BF crash on September 12, 1977, immediately after takeoff from Yakutat Airport, Yakutat, Alaska. All four crewmembers were killed and the aircraft was destroyed. The aircraft had been operated under the provisions of 14 CFR 91, Subpart D (Large and Turbine-Powered Multiengine Airplanes). The National Transportation Safety Board's investigation of this accident revealed that the aircraft was improperly loaded; the proper lease agreements had not been arranged; the aircraft was not maintained in accordance with 14 CFR 91.217(a); there was no evidence the copilot met the provisions of 14 CFR 91.213 or 14 CFR 61.55; and that no qualified flight engineer was on board.

A-78-42.

Revise 14 CFR 91 Subpart D to assure that an adequate level of safety is provided wherever these rules are applicable.

FAA Comment.

The Federal Aviation Administration (FAA) stated in previous letters dated September 11 and October 4, 1978, that the intent of this recommendation would be satisfied with the completion of certain ongoing efforts. Specifically, we referred to the Airworthiness and Operational Review Programs, the 14 CFR Part 91 regulatory project, and the agency's surveillance program as stated in FAA Order 1800.12D, Flight Standards Program Guidelines.

These efforts are now completed, and enclosed for your review is the October 9, 1980, issue of the Federal Register, in which is published the final rule, Certification and Operation Rules for Certain Large Airplanes. The amendment to 14 CFR Part 91 completes the regulatory action outlined in our letters of September 11 and October 4, 1978. Accordingly, the FAA considers action completed on Safety Recommendation A-78-42.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

October 4, 1978

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This will supplement our September 11 response to NTSB Safety Recommendation A-78-42. Since that time we have had an opportunity to do a more detailed evaluation of the 65 accident reports used by the Board to support the statement in the recommendation that maintenance was a cause or factor in 46 percent of the 65 accidents.

Our indepth analysis of the accident reports reveals that 14 or 21.5 percent of the 65 accidents could be attributed to improper maintenance. This review disclosed that 17 of the accidents were in the following categories:

1. Six of the accidents cited involved air carriers operating under the rules of FAR 121.

2. Three of the accidents cited were FAA airplanes which are maintained under the rules of FAR 121.

3. Two accidents involved small airplanes which are not required to be maintained in compliance with 14 CFR 91, Subpart D.

4. One accident involved a military type airplane operated by the CIA which was not required to be in compliance with the FAR, however, the airplane did display an "N" number.

5. Five accidents occurred in foreign countries and are being investigated by the foreign authorities. The information presently available does not, conclusively, indicate that maintenance was a cause or factor.

Our review further indicates that maintenance was a related or causal factor in 14 of the remaining 48 accidents and, of the 98 fatalities cited with the safety recommendation, we find 3 that occurred in a maintenance-associated accident.

As stated in our letter of September 11, we believe that the intent of the recommendation will be satisfied with the completion of the Airworthiness and Operational Review Programs, the 14 CFR Part 91 regulatory project, and the agency's surveillance program as stated in FAA Order 1800.12D, Flight Standards Program Guidelines.

Sincerely,

Langhorne Bond
Administrator

ASF-1

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

SEP 11 1978

OFFICE OF
THE ADMINISTRATOR

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-78-42.

A-78-42. Revise 14 CFR 91 Subpart D to assure that an adequate level of safety is provided wherever these rules are applicable.

Comment. The FAA, Flight Standards Service, has recently conducted two extensive reviews of certain of the Federal Aviation Regulations (FAR), both of which included 14 CFR 91. The Airworthiness and Operations Review Programs generated many proposals that have been adopted as amendments to the FAR and other proposals still being considered in the rulemaking process. In addition to these programs, the FAA has recently initiated a comprehensive regulatory project to review 14 CFR 91, including its Subpart D.

Our review of the 65 accidents cited by the Board as occurring between 1972 and 1976 indicates a 25 percent maintenance involvement could be identified as a cause or factor rather than the 46 percent cause factor given in the information supplied with the recommendation. We do not find that the supporting data identifies specific deficiencies in 14 CFR 91, Subpart D, but that it appears to relate to accidents caused by noncompliance with the current rule.

We are aware of the increasing numbers of surplus airline and military aircraft being operated under 14 CFR 91. At this time, our information is that these aircraft represent approximately 5 percent of the total number of large aircraft being operated under Subpart D of Part 91. We have placed a high priority on the surveillance of operators using these aircraft and have so indicated in FAA Order 1800.12D, Flight Standards Program Guidelines (copy enclosed).

We believe that the intent of Safety Recommendation A-78-42 will be satisfied with the completion of the current Part 91 regulatory project, the Airworthiness and Operations Review Programs, and the surveillance directed at certain operations conducted under 14 CFR 91, Subpart D.

Sincerely,

(Signed) Quentin S. Taylor
Deputy Administrator

Enclosure

cc: AI-1/P-20/S-80/AOA-1/ASF-1/APA-1/~~AFS-1~~/50/800/900
AFS-50:RTBoggs:gg:x63120:8/29/78
MC: AOA#682, AFS#1980

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 5, 1978

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)
A-78-42

On September 12, 1977, a Douglas DC-7BF crashed immediately after takeoff from Yakutat Airport, Yakutat, Alaska. All four crewmembers were killed and the aircraft was destroyed. The aircraft had been operated under the provisions of 14 CFR 91, Subpart D (Large and Turbine-Powered Multiengine Airplanes).

The National Transportation Safety Board's investigation of this accident revealed that the aircraft was improperly loaded; that the proper lease agreements had not been arranged; that the aircraft was not maintained in accordance with 14 CFR 91.217 (a); that there was no evidence that the copilot met the provisions of 14 CFR 91.213 or 14 CFR 61.55; and that no qualified flight engineer was on board.

Before this accident the Safety Board had investigated an accident involving a Convair 880-22M at Miami International Airport. The aircraft, which was operated under 14 CFR 91 Subpart D, crashed on takeoff when the pilot was unable to rotate the aircraft as a result of improperly loaded cargo. In addition, the investigation revealed that the basic operating weight and the weight and balance of the aircraft were incorrect in the records of the aircraft.

These are but two examples extracted from the records of 65 accidents which occurred from 1972 to 1976 involving aircraft operated under 14 CFR 91 Subpart D. (The Safety Board's review did not include the aerial application or fire control categories.) These 65 accidents resulted in 98 fatalities since, in many instances, the aircraft was hauling only cargo and crewmembers. These data revealed that the maintenance of the aircraft was either a cause or a factor in 46 percent of the accidents. This percentage of maintenance involvement is extremely high when compared to other categories of operations and indicates that a significant number of operators of 14 CFR 91 Subpart D aircraft are not maintaining their aircraft properly.

Many Subpart D aircraft are old, surplus air carrier or military aircraft. They are bought as cheaply as possible to make a profit for the owners. It is not unusual to find inadequate maintenance programs, crews which are minimally qualified, and confusing or illegal leasing arrangements. Frequently, FAA surveillance of Subpart D operators is difficult because of the instant creation of companies and the interchange of pilots.

We believe that the problems associated with Subpart D operators will grow as the number of surplus air carrier aircraft grows. Airlines are phasing out older B-707's, DC-8's, DC-9-10's, B-727-100's and turbopropeller aircraft. As these more complex and sophisticated aircraft replace the older DC-3's -4's -6's and 7's, the need for more reliable maintenance programs, pilot qualifications and training, and surveillance will increase correspondingly. For this reason, we believe it is necessary for the FAA to review and update all aspects of 14 CFR 91 Subpart D.

Consequently, we believe the requirements of Subpart D must be revised to assure that they provide adequate levels of safety to the crews which operate the aircraft and to the general public at and around the airports from which Subpart D aircraft operate. The review and revision should include maintenance program requirements, leasing stipulations, flightcrew qualifications, flight and duty time limitations, operational control, and weight and balance procedures.

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

> Revise 14 CFR 91 Subpart D to assure that an adequate level of safety is provided wherever these rules are applicable. (Class III, Longer-Term Action) (A-78-42)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendation.

By: James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 18, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendation A-78-48 issued July 24, 1978, and supplements our letter of September 11, 1978. This also responds to your letter of October 21, 1980, in which you requested a progress report. This recommendation concerned the hazard of induction icing in aircraft using engines with injection-type carburetors.

A-78-48.

Require manufacturers of aircraft equipped with the subject carburetors to publish and provide to all owners the necessary information about this hazard and how to cope with it in flight.

FAA Comment.

The Federal Aviation Administration's (FAA) regions, with type certification responsibility for airplanes equipped with the Stromberg PS series carburetors, reviewed the manufacturers' operating instructions for induction icing. The following action has been taken by the manufacturers:

- Beech Aircraft issued Letter No. 29012-11 applicable to Models 50, B50, C50, and D50;
- Cessna issued Pilots Checklist procedures for Models 310, 310A, and 310B; and
- Rockwell Commander issued a revision to the Owners Flight Manual for the Model 560E airplane.

Copies of these documents are enclosed for your information. We believe these actions correct the deficiencies that were of concern to the NTSB in Safety Recommendation A-78-48. Accordingly, the FAA considers action completed on this recommendation.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington D.C. 20594

Office of the Chairman

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ASF-1
12/5/80
AOA-1
AVS-1/AOA-1
ADA-1

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to National Transportation Safety Board Safety Recommendation A-78-48 issued July 24, 1978. This recommendation concerned the hazard of induction icing in aircraft using engines with injection-type carburetors. We recommended that the Federal Aviation Administration (FAA) require manufacturers of aircraft equipped with these carburetors to publish and provide to all owners the necessary information about the hazard and how to cope with it in flight.

By letter dated September 11, 1978, we were informed that the FAA was requesting its regions with type certification responsibility for airplanes equipped with the Stromberg PS Series carburetor to review the manufacturers' operating instructions for induction icing and to take necessary corrective action. The FAA expected to complete this project by late February 1979.

In our response of October 25, 1978, we stated that Safety Recommendation A-78-48 was being maintained in an "Open--Acceptable Action" status pending the FAA's review of the manufacturers' operating instructions. In order to evaluate the present status of this recommendation and update the public docket, we request a further progress report.

Sincerely yours,

James B. King
Chairman

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OFFICE OF THE ADMINISTRATOR
FEDERAL AVIATION ADMINISTRATION

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

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ACTION: ASF-1
DUE DATE:
FOR SIGNATURE OF:
COORDINATION WITH/THRU:
INFORMATION COPY:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

This is to acknowledge receipt of the Federal Aviation Administration's (FAA) letter of September 11, 1978, received in response to National Transportation Safety Board Safety Recommendations A-78-47 and 48. These two recommendations pertain to the hazards of induction icing for aircraft using engines with injection-type carburetors. With regard to A-78-47, the Safety Board is pleased to note that copies of the recommendations have been forwarded to FAA's accident prevention coordinators for use in meetings with pilots. The status of this recommendation has been classified as "Closed - Acceptable Alternate Action." Recommendation A-78-48 has been placed in an "Open - Acceptable Action " status pending the FAA's review of the manufacturer's operating instructions.

Sincerely yours,

James B. King
Chairman

247

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

September 11, 1978

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-78-47 and 48.

A-78-47. Direct accident prevention specialists, flight instructors, and flight examiners, as part of their training or biennial review programs, to inform all owners and pilots of aircraft which use injection-type, pressure carburetors of the aircrafts' susceptibility to impact ice in the induction system.

Comment. In keeping with the established policy in our Accident Prevention Program and flight instructor courses, we will continue to stress to pilots the need to know the contents of aircraft owners' manuals and pilot operating handbooks. In addition, we have forwarded copies of this recommendation to our accident prevention coordinators and requested that the information be used in meetings with pilots.

A-78-48. Require manufacturers of aircraft equipped with the subject carburetors to publish and provide to all owners the necessary information about this hazard and how to cope with it in flight.

Comment. This information is required by FAR 23.1581(c) and 23.1585(a). The General Aviation Manufacturers Association (GAMA) Specification for Pilots Operating Handbook, Section 7, Paragraph 7.25(g), also contains a requirement for the information concerning air induction system ice protection. Future pilot handbooks will be prepared by the airplane manufacturers in compliance with the specifications in this handbook. A copy of the pertinent part of the GAMA Handbook is enclosed.

We are requesting our regions with type certification responsibility for airplanes equipped with the Stromberg PS Series carburetors to review the manufacturers' operating instructions for induction icing and take any necessary corrective action. We expect to complete this project by the end of February 1979.

Sincerely,

Quentin S. Taylor
Deputy Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: July 24, 1978

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-78-47 and -48

On November 17, 1977, N3837C, an Aero Commander 560E, crashed on a farm after the pilot initiated an emergency descent near Queen, Pennsylvania. The pilot, who was injured seriously in the crash, died shortly after he was released from a hospital.

The pilot reported that while flying at 9,500 feet between cloud layers he noticed a drop in manifold pressure and experienced engine roughness accompanied by a loss of power in both engines. Although he applied alternate air to both engines, he was not able to regain normal engine operation.

Investigation revealed that both engines were capable of developing full power and that there was sufficient uncontaminated fuel in the fuel tanks to power the engines.

On November 26, 1975, in a similar accident, N699E, an Aero Commander 560E, crashed about a mile from the Quad City Airport, Moline, Illinois. The pilot was killed in the crash.

The National Transportation Safety Board's investigation of the accident disclosed that the pilot had been flying at 11,000 feet on an instrument flight rules (IFR) flight plan when he reported to air traffic control that he could no longer obtain sufficient power from his engines to maintain his assigned altitude. The airplane was being vectored to the Quad City Airport when it crashed in a residential area. Persons who arrived first at the crash site noted that the ram air tubes and mixing chambers of both carburetors were packed with ice.

The Aero Commander 560E uses Stromberg PS Series, Model 5BD carburetors. This is an injection-type, single-barrel, low-pressure carburetor. Fuel is introduced downstream from the throttle valve and beyond the venturi chamber. This design feature virtually eliminates fuel vapor ice and reduces the hazard of throttle ice in the induction system.

A third type of induction ice--impact ice--does pose a problem for aircraft which use injection-type pressure carburetors. When these aircraft are flown for extended periods in weather conditions conducive to the formation of ice on leading edges of the aircraft structure, impact ice may form in the carburetor air inlet ducts, the carburetor screen, the carburetor elbow, the heat valve, and the carburetor metering elements.

Because of the generally favorable design and performance characteristics of the injection-type pressure carburetor, pilots of airplanes such as the Aero Commander 560E may not recognize that impact ice poses a potential hazard for their aircraft. Moreover, undue delay in switching to the alternate air system in some icing conditions may result in an ice accumulation which immobilizes the heat valves. Once this has happened, the pilot may be powerless to counter further ice buildup, and he may subsequently lose all power.

The flight operations manual for the Aero Commander 560E gives the pilot no guidance as to when the alternate air system should be used. The pilot must rely on other sources to obtain this information. One such source is Advisory Circular 60-9, Induction Icing - Pilot Precaution and Procedures, dated February 28, 1973. The AOPA Air Safety Foundation Flight Instructors Safety Report is another informative publication. We believe, however, that additional measures should be undertaken to disseminate this information more widely among the users.

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

> Direct accident prevention specialists, flight instructors, and flight examiners, as part of their training or biennial review programs, to inform all owners and pilots of aircraft which use injection-type, pressure carburetors of the aircrafts' susceptibility to impact ice in the induction system. (Class II -- Priority Action) (A-78-47)

Require manufacturers of aircraft equipped with the subject carburetors to publish and provide to all owners the necessary information about this hazard and how to cope with it in flight. (Class II -- Priority Action) (A-78-48)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendations.

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

April 15, 1981

Mr. Charles E. Weithoner
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Weithoner:

This is to acknowledge the Federal Aviation Administration (FAA) letter of March 11, 1981, updating the status of National Transportation Safety Board Safety Recommendations A-79-21, A-79-22 and A-79-24 issued April 18, 1979, and further supplementing FAA letters of July 16, 1979, and September 29, 1980. These recommendations stemmed from our investigation of an incident on March 9, 1979, involving a Learjet Model 24B while it was en route between Greensboro, North Carolina, and Nashville, Tennessee. The recommendations pertain to the malfunction of a magnetic clutch assembly used in the autopilot pitch axis servos of aircraft manufactured by Gates Learjet Corporation.

We are appreciative of the many actions taken by the FAA including the issuance of Airworthiness Directive (AD) 80-22-10 and the proposed change in the Gates Learjet Airplane Flight Manual. We note that the FAA is continuing to investigate problems associated with A-79-21 and A-79-22, and will provide the Safety Board with a progress report. These two recommendations remain in an "Open--Acceptable Action" status.

In Safety Recommendation A-79-24 we asked the FAA to "Determine whether other model aircraft use the same servo drive unit clutches and take appropriate action to advise the operators of those aircraft of the potential problem." The FAA's letter of July 16, 1979, identified the aircraft models using the same servo drive unit clutches and the issuance of AD 80-22-10 satisfied this recommendation which we now classify in a "Closed--Acceptable Action" status.

We thank the FAA for actions taken and underway.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

March 11, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-79-21, A-79-22 and A-79-24 issued April 18, 1979, and supplements our letters of July 16, 1979, and September 29, 1980.

These safety recommendations are three of four recommendations relating to the Learjet Model 24B. Recommendation A-79-23 was classified as "Closed--Acceptable Action" on December 5, 1979. By letter dated November 26, 1980, the Board requested that Safety Recommendation A-79-24, which has been classified as "Open--Acceptable Action," be addressed in our further response to Safety Recommendations A-79-21 and A-79-22. We have included our further response to A-79-24 herein.

A-79-21. Initiate a program immediately to expedite the determination of cause for the clutch malfunction in JET Electronic part No. 2380066, servo drive unit, devise a means to detect potential problems, and define corrective action.

FAA Comment. Subsequent to the original investigation of the magnetic clutch assembly, and the FAA position which found it unnecessary to restrict the operation of all Learjet aircraft equipped with magnetic clutch assembly, a Learjet Model 25, Serial No. 25-010, was involved in a nose-up pitch malfunction which caused the flameout of both engines. After considerable loss of altitude, the crew restarted both engines and completed a safe recovery and landing. During the investigation of that incident, the autopilot pitch axis servo was found to have a defective magnetic drive clutch. The servo installed on the aircraft was equipped with a magnetic powder clutch, which is suspected to have become coagulated and caused the clutch to jam. The jammed clutch caused the elevator to be displaced and the autopilot continuously retrimmed the horizontal stabilizer, causing the nose-up condition. Further investigation of the clutch assembly determined the assembly to be a modified unit which required a lesser amount of powder and addition of a new lubricant in the powder. It was noted that the

powder in the pitch servo clutch of aircraft 25-010 was not found to be coagulated when immediately inspected after landing, but was only suspected because of the absence of proper color of the powder. The analysis of powder was made by an independent laboratory and the results showed that sufficient lubricant had not been added to the powder. The composition of the powder should have been 1 to 4 percent lubricant, and the suspected powder was analyzed as having only .07 to .06 percent Molybdenum and less than .12 percent Molybdenum Disulfide.

It was concluded from this evidence that the clutch did become coagulated, causing the clutch to jam, and the resultant aircraft attitude caused the engines to flameout. It was also concluded that the modification developed by Learjet would not eliminate the problem because of the requirement for a strict quality control method to assure the proper amount of powder lubricant.

Consequently, the FAA determined, in the interest of safety, to issue an Airworthiness Directive (AD) 80-22-10, requiring that the autopilot pitch axis be deactivated to reduce the hazard created by a possible malfunction in that axis. Airworthiness Directive 80-22-10 became effective October 11, 1980, and was applicable to all Gates Learjet 23, 24, 25, 28, and 29 series aircraft. A copy of this AD has already been forwarded to the Board.

The deactivation of the autopilot pitch axis will continue until the following modifications are incorporated.

1. Replacement of the existing pitch axis servo equipped with magnetic powder clutches with a DC torque servo assembly;

2. Inspection of the autopilot trim coupler board to assure that the proper transistors are installed; and

3. Incorporation of a trim monitor preflight test switch.

Prior to reactivation of the autopilot pitch axis, a temporary Airplane Flight Manual (AFM) change pertaining to emergency procedures for pitch axis malfunction shall be inserted in the appropriate section of the existing AFM. This supplemental emergency procedure in the AFM is the result of FAA flight test.

A-79-22. If defining and implementing the corrective action described above will require prolonged effort, restrict the operation of all Learjet aircraft equipped with this servo drive unit.

FAA Comment. As a result of the aforementioned AD action, all Learjet Models 23, 24, 25, 28, and 29 series airplanes will be restricted by the appropriate AFM airspeed limitation for an inoperative autopilot until the modification required by the AD is accomplished. This restriction will be in effect until April 1, 1981, or until the autopilot modification requirements are performed.

A-79-24. Determine whether other model aircraft use the same servo drive unit clutches and take appropriate action to advise the operators of those aircraft of the potential problem.

FAA Comment. In our letter dated July 16, 1979, we identified the aircraft models using the same servo drive unit clutches. We believe the issuance of AD 80-22-10 fulfills the intent of Safety Recommendation A-79-24.

The investigation of problems addressed in Safety Recommendations A-79-21, -22, and -24 is still underway and we expect this effort to continue for several more months. Conclusions resulting from this investigation may dictate the need for additional airworthiness directives or other appropriate action. We will inform the Board of significant findings as we continue our investigation.

Sincerely,

Charles E. Weithoner
Acting Administrator

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

NOV 26

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Reference is made to your letter of September 29, 1980, responding to National Transportation Safety Board Safety Recommendations A-79-21 and 22. These are two of four recommendations that stemmed from the Safety Board's investigation of an incident on March 9, 1979, involving a Learjet Model 24B while it was en route between Greensboro, North Carolina, and Nashville, Tennessee. The recommendations pertain to the malfunction of a magnetic clutch assembly used in the autopilot pitch axis servos of aircraft manufactured by Gates Learjet Corporation.

The Safety Board is informed through staff sources that after another inflight incident on October 13, 1980, involving Learjet N102PS of National Jet Industries, the Federal Aviation Administration (FAA) reached conclusions that run counter to the views expressed in your letter of September 29, 1980. We are also informed that the FAA will issue an emergency Airworthiness Directive directly related to these recommendations.

In order to evaluate the correct status of these recommendations and bring the public docket up to date, we would appreciate receiving an amended progress report. Please note that companion Safety Recommendation A-79-24 remains in an "Open--Acceptable Action" status. We request that it be treated with the FAA's further response to Safety Recommendations A-79-21 and 22.

Sincerely yours,

James B. King
Chairman

RECEIVED

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

September 29, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This will supplement our initial response of July 16, 1979, to National Transportation Safety Board (NTSB) Safety Recommendations A-79-21 and 22, related to the malfunction of a magnetic clutch assembly used in the autopilot pitch axis servos of aircraft manufactured by Gates Learjet Corporation.

A-79-21. Initiate a program immediately to expedite the determination of cause for the clutch malfunction in JET Electronic part No. 2380066, servo drive unit, devise a means to detect potential problems, and define corrective action.

Comment. In our initial response to this recommendation, we indicated that the Gates Learjet Corporation was testing an improved magnetic clutch in preparation for a retrofit program. In letters directed to its Service Centers and to Owners and Operators during November 1979, (copies enclosed) Gates Learjet urged compliance with Airplane Modification Kit No. AMK 79-4, "Replacement of Clutch Assemblies in the Autopilot Pitch Axis Servo." This kit provides for replacement with an improved magnetic clutch assembly for in-service Model 23, 24 and 25 airplanes having the autopilot servo actuator with the older magnetic clutches. AMK 79-4 called for compliance within the next 75 flight hours. This kit does not remove the 600-hour overhaul compliance of the pitch servo. A copy of 79-4 is enclosed.

On January 8, 1980, Gates Learjet advised our Central Region that there were sufficient numbers of the DC torquer/capstan used on later production airplanes to make them available as replacements for the magnetic clutch assemblies. Gates Learjet subsequently issued its Airplane Modification Kit No. AMK 80-3, "Replacement of Pitch Servo Actuator and Capstan," copy of which is enclosed.

Installation of either of these Airplane Modification Kits is voluntary on the part of the operator since the possibility of Airworthiness Directive action by the Federal Aviation Administration (FAA) was ruled out earlier in the investigation related to this NTSB recommendation. The investigation showed that on Gates Learjet airplanes the stall warning stick pusher system is preflight tested prior to each flight,

which verifies the integrity of the magnetic clutches. In addition, should the magnetic clutch "freeze" and lock the continuously running autopilot/stick pusher servo motor to the elevator cable drum, a mechanical slip clutch is provided in the cable drum to permit the pilot to override the malfunction. Power can then be removed from the servo motor by turning off the autopilot and stall warning systems. The Airplane Flight Manual provides emergency procedures for operation of the airplane with the stall warning systems off. Based on the above, the FAA could not identify any unsafe condition that would result from a magnetic clutch becoming frozen and, therefore, could not justify mandatory corrective action under the requirements of 14 CFR 39 "Airworthiness Directives."

A-79-22. If defining and implementing the corrective action described above will require prolonged effort, restrict the operation of all Learjet aircraft equipped with this servo drive unit.

Comment. In our initial report, we stated that we did not consider it necessary to restrict operations in this case, and that a Temporary Airplane Flight Manual Supplement had been issued, specifying emergency procedures in the event of autopilot pitch axis malfunction or complete stall warning failures. These identified temporary revisions are being incorporated into permanent revisions as they are made to the various flight manuals.

We believe these actions have fulfilled the intent of Safety Recommendations A-79-21 and 22.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

4 Enclosures

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

December 5, 1979

Honorable Langhorne Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of November 13, 1979, in which you advised the National Transportation Safety Board of further action taken by the Federal Aviation Administration (FAA) to meet the intent of safety recommendation A-79-23. This recommendation was one of four recommendations that stemmed from the Safety Board's investigation of an incident involving a Learjet Model 24B, while en route between Greensboro, North Carolina and Nashville, Tennessee, on March 9, 1979.

The Safety Board is pleased to note that the FAA has issued Change 17 to Order 8440.5A containing General Aviation Operations Bulletin No. 79-2, "Servo Drive Unit - Installed on Learjet Aircraft," and Change 33 to Order 8430.1A which transmits new Part 135 Operations Bulletin No. 79-3, "Malfunction of Servo Drive Unit Installed on Learjet Aircraft." Therefore, we have classified A-79-23 as "CLOSED--ACCEPTABLE ACTION."

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

November 13, 1979

Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is to further advise you of Federal Aviation Administration (FAA) action with respect to NTSB Safety Recommendation A-79-23 which recommended that the FAA:

> "Issue immediately an Operations Alert Bulletin to FAA inspectors and notify operators of Learjet aircraft equipped with this type of servo drive unit to advise the pilots of these aircraft of the possible control difficulties which can be encountered as a result of clutch malfunction."

Change 17 to Order 8440.5A containing General Aviation Operations Bulletin No. 79-2, "Servo Drive Unit - Installed on Learjet Aircraft," was issued on June 28, 1979. We have also issued Change 33 to Order 8430.1A which transmits new Part 135 Operations Bulletin No. 79-3, "Malfunction of Servo Drive Unit Installed on Learjet Aircraft," dated September 10, 1979. We have enclosed a copy of each of these changes for your information.

We believe these actions meet the intent of the recommendation.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

2 Enclosures

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

July 16, 1979

Honorable James B. King
Chairman, National Transportation Safety Board
800 Independence Avenue, S. W.
Washington, D. C. 20594

Dear Mr. Chairman:

This is in response to National Transportation Safety Board (NTSB) Safety Recommendations A-79-21 through 24.

A-79-21. Initiate a program immediately to expedite the determination of cause for the clutch malfunction in JET Electronic part No. 2380066, servo drive unit, devise a means to detect potential problems, and define corrective action.

Comment. The clutch malfunction in JET Electronic part Number 2380066 was caused by the magnetic powder in the clutch packing to the extent that it essentially locked the continuous operating servo motor to the cable drum. It has been determined by Gates Learjet that the powder packs because the individual particles are worn smooth from constant agitation by the continuous running motor and an excessive amount of unlubricated powder in the clutches.

Gates Learjet is testing an improved magnetic clutch which they plan to certify as a replacement clutch and is preparing the necessary information for a retrofit program.

The Federal Aviation Administration (FAA) is considering airworthiness directive action for the retrofit program. We will further advise the NTSB of this action in 30 days.

A-79-22. If defining and implementing the corrective action described above will require prolonged effort, restrict the operation of all Learjet aircraft equipped with this servo drive unit.

Comment. We do not believe that it is necessary to restrict operations of Learjet airplanes equipped with the Jet Electronic Part Number 2380066 servo drive unit to assure safe operation. A Temporary Airplane Flight Manual Supplement for all Learjet airplanes equipped with the above servo drive units has been issued. It contains emergency procedures in the event of an autopilot pitch axis malfunction or complete stall warning failures.

A-79-23. Issue immediately an Operations Alert Bulletin to FAA inspectors and notify operators of Learjet aircraft equipped with this type of servo drive unit to advise the pilots of these aircraft of the possible control difficulties which can be encountered as a result of clutch malfunction.

Comment. Copies of this recommendation have been sent to all FAA Flight Standards Offices as an initial notification of the problem. Two operations bulletins dealing with the problems are being prepared. We expect to issue one by June 30 and the other by July 15.

A-79-24. Determine whether other model aircraft use the same servo drive unit clutches and take appropriate action to advise the operators of those aircraft of the potential problem.

Comment. The same stick pusher/puller/autopilot pitch servo, P/N 2380066, is used on all Learjet Model 23 airplanes, S/N 23-003 through 23-009; Model 24 airplanes, S/N 24-100 through 24-229 except 24-218; and Model 25 airplanes, S/N 25-002 through 25-067 except 25-061. The service information being prepared by Gates Learjet Corporation will be applicable to all of the above affected models. Similarly, any operations alert bulletin that might be issued will be applicable to the above model airplanes. This servo drive clutch unit is used only in Gates Learjet aircraft.

A copy of a typical Temporary Flight Manual Supplement Change is enclosed.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 18, 1979

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-79-21 through -24

The National Transportation Safety Board has recently investigated an incident which caused concern about the continued safe operation of certain Learjet aircraft.

The pilot of a Learjet Model 24B, N14BC, reported longitudinal control problems on March 9, 1979, while en route from Greensboro, North Carolina, to Nashville, Tennessee. While cruising at altitude, the aircraft abruptly pitched nosedown. The pilot regained control and deactivated the aircraft's stall warning system and automatic flight control system. After the aircraft was configured for landing, during an instrument approach to Nashville, it became longitudinally unstable. The pilot, who was unable to control the pitching oscillation, aborted the approach. As airspeed was increased, the aircraft became controllable. The pilot declared an emergency and returned to Greensboro where better weather existed. Similar problems were encountered while attempting to land at Greensboro. Three approaches were aborted before the aircraft was landed. The fourth approach was conducted without flaps, at a higher-than-normal airspeed, and with stabilizer trim for pitch control.

Postflight examination of the aircraft disclosed a resistance to motion of the longitudinal control system which was traced to the pitch axis servo drive unit. The unit was replaced and the aircraft was test flown without the control problems.

The National Transportation Safety Board took custody of the malfunctioning servo drive unit, and it was examined at the Gates Learjet plant in Wichita, Kansas. This unit consists of an electric motor which runs continuously in one direction when either the automatic pilot or the stall warning stickpusher system is energized. The output shaft of the motor drives a pair of electromagnetic friction drive clutches. These clutches rotate in opposite directions and their output shafts are connected to a common output, which in turn drives the elevator control surface. The clutches contain ferrous powder. Normally, this ferrous powder coagulates into a solid mass only when a magnetic field is introduced electrically by inputs from the autopilot or stall warning stickpusher system. The clutch, which is energized, will transmit torque to the elevator control system in the appropriate direction. The powder normally decoagulates and the clutch rotates freely when electrical power is removed.

Examination of the servo drive unit removed from N14BC revealed that the ferrous powder in the clutch which transmitted motion in the elevator trailing edge down direction was solid, although there was no electrical input. With the aircraft's autopilot or stall warning system activated, this condition would produce a nosedown pitching moment which could require as much as 80 pounds force on the control wheel to counter. With power removed from the servo motor, the jammed clutch would still affect the breakout force and force gradient of the longitudinal control system.

The other clutch of the servo was examined and it was free to rotate.

Gates Learjet personnel theorized that the powder coagulated and caused the clutch to jam because of moisture contamination. Reportedly, various degrees of moisture contamination and clutch engagement have been found on other servos that have been overhauled at Gates Learjet in the past.

The ferrous material of both clutches of the servo was later examined at the Safety Board's metallurgical laboratories; no foreign substance was found. The material in both clutches was determined to be of the same approximate chemical composition. However, some of the particles of the ferrous powder from the jammed clutch continued to coagulate into small hard lumps. The reason for this is unknown and indicates that some undetermined property of the ferrous clutch material is causing the clutch to jam without the magnetic field.

The Safety Board was informed by the operator that the same aircraft experienced a lateral control problem on March 29, 1979. This time the aileron servo drive unit, identical to the pitch servo, was found to have a defective clutch. This unit has not yet been disassembled for detailed examination.

The Safety Board is aware that Gates Learjet has discontinued the use of this JET Electronic's part No. 2380066 in new aircraft. However, we have been informed that there are approximately 220 Learjet aircraft equipped with these servo drive units in operation. Furthermore, the pitch servo drive unit is a mandatory item for flight since it is an integral part of the stall warning stick pusher system which was required by the certification of the aircraft.

Two recent fatal accidents involved loss of control of Learjet model 25 aircraft which were equipped with the same type of servo drive units. These accidents are still under investigation. Additionally, a review of our accident files indicates to us that 10 other accidents since 1964 involving Learjet aircraft, which we believe were equipped with these servo drive units, may have been caused by control problems. However, the lack of postaccident evidence precluded identification of such a problem. Our investigation into this matter is continuing.

In view of the potential catastrophic results of control difficulties caused by jammed servo drive unit clutches, the Safety Board is extremely concerned and believes expedited action is justified. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Initiate a program immediately to expedite the determination of cause for the clutch malfunction in JET Electronic part No. 2380066, servo drive unit, devise a means to detect potential problems, and define corrective action. (Class I--Urgent Action) (A-79-21)
>
> If defining and implementing the corrective action described above will require prolonged effort, restrict the operation of all Learjet aircraft equipped with this servo drive unit. (Class I--Urgent Action) (A-79-22)

Issue immediately an Operations Alert Bulletin to FAA inspectors and notify operators of Learjet aircraft equipped with this type of servo drive unit to advise the pilots of these aircraft of the possible control difficulties which can be encountered as a result of clutch malfunction. (Class I--Urgent Action) (A-79-23)

Determine whether other model aircraft use the same servo drive unit clutches and take appropriate action to advise the operators of those aircraft of the potential problem. (Class I--Urgent Action) (A-79-24)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, and HOGUE, Members, concurred in the above recommendations.

Paul Driver VC

By: James B. King
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

Honorable J. Lynn Helms
Administrator Designate
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Helms:

This is to acknowledge Federal Aviation Administration (FAA) letter dated March 11, 1981, further responding to National Transportation Safety Board Safety Recommendation A-80-31 issued April 23, 1980. We asked the FAA to expedite approval of the improved tail rotor blade, Part No. 47-642-117, for installation on all Bell 47 model helicopters equipped with Franklin engines.

We have reviewed the basis of our recommendation and since there has been an absence of blade failures on Model 47 helicopters equipped with Franklin engines, we agree that no further action should be taken on this recommendation unless accident history should indicate otherwise.

We appreciate the FAA's reexamination of this recommendation which we now classify "Closed--Reconsidered."

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

March 11, 1981

OFFICE OF
THE ADMINISTRATOR

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Safety Recommendations A-80-30 and A-80-31 issued on April 23, 1980, and supplements our letter of June 20, 1980. This also responds to your letter of August 27, 1980. In this letter, we were informed that the status of Safety Recommendation A-80-30 was classified as "Closed--Acceptable Action."

A-80-31.

Expedite the approval of the improved tail rotor blades for installation on all Bell 47 model helicopters equipped with Franklin engines and expedite action to require the installation of the improved blades on those aircraft.

FAA Comment.

In our June 20, 1980, letter, the Federal Aviation Administration (FAA) rejected Safety Recommendation A-80-31 because of the absence of reports of tail rotor blade fatigue failures on Bell 47 helicopters powered with the Franklin engine. We attribute this to the helicopter's lower gross weight and the use of less power when the Franklin engine is installed.

On August 27, 1980, the NTSB informed us that this recommendation is being maintained in an "Open--Unacceptable Action" status, and requested that FAA reconsider this recommendation. The Board based this request on the contention that these failures have been typical of a high-cycle, low-stress fatigue mode and, therefore, the type of engine powering the helicopter is not pertinent. The Board concluded that the P/N 47-642-102 rotor blade is structurally inadequate and prone to fatigue cracking and that it should be removed from service. We have now reevaluated our findings and completed our review of comments contained in your letter of August 27, 1980.

Enclosed for your information is a copy of a letter dated July 2, 1980, to Bell Helicopter Textron concerning procedures for approval of the improved tail rotor for the Models 47D1, 47D, 47B, 47B3, 47E, 47H-1, 47J, and 47K helicopters. The Models 47J and 47K are equipped with Lycoming engines and are affected by AD-80-10-4, Amdt. 39-3770, but FAA approval of Bell modification data has not yet been issued. This approval program will entail "field approvals" for most helicopters and will be time consuming.

The FAA acknowledges the Board's conclusion that (blade) failures have been typical of a high cycle, low stress fatigue mode. However, the FAA must conclude that absence of blade failures on Model 47 helicopters equipped with Franklin engines is adequate evidence to exclude those models from further mandatory action. Our airworthiness docket files contain many letters contending that the requirements of AD's 68-2-3, 70-10-8, and 80-10-4 were unjustified and arbitrary, even though the adverse service history of blades P/N 47-642-102 was addressed in the preamble to the notices and rules. The FAA, in view of the excellent service history of tail rotor blades P/N 47-642-102 on Model 47 helicopters with Franklin engines, needs to have specific adverse data from real-world operations before we can impose on the public the additional requirements set forth in Safety Recommendation A-80-31. Accordingly, we intend to take no further action on this recommendation unless future reports should clearly indicate the existence of a safety problem in this area.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington, D.C. 20594

Office of
Chairman

AUG 27 1980

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter of June 20, 1980, responding to National Transportation Safety Board Safety Recommendations A-80-30 and 31 issued April 23, 1980. These recommendations pertain to several failures of tail rotor blades in Bell Model 47 helicopters.

In A-80-30, we recommended that the Federal Aviation Administration (FAA) issue an Airworthiness Directive (AD) to require the installation of the improved tail rotor blades, Part No. 47-642-117, on all Bell Model 47 helicopters. We are pleased to note that the FAA issued AD 80-10-04, Amendment 39-3770, to fulfill the recommendation. The status of this recommendation is now classified as "Closed--Acceptable Action."

In A-80-31, we recommended that the FAA expedite the approval of the improved tail rotor blades for installation on all Bell Model 47 helicopters equipped with Franklin engines. We note that the FAA has rejected this recommendation, basing its decision on accident history. We are informed that there are no reports of tail rotor blade fatigue failures on Bell 47 helicopters powered with the Franklin engine. The FAA attributes this to the helicopters lower gross weight and the use of less power when the Franklin engine is installed.

Our metallurgical examination indicates that the failures have been typical of a high-cycle, low-stress fatigue mode; therefore, the type of engine powering the helicopter is not pertinent. We conclude that the

P/N 47-642-102 rotor blade is structurally inadequate and prone to fatigue cracking and that it should be removed from service. We, therefore, request the FAA to reconsider recommendation A-80-31, which we are maintaining in an "Open--Unacceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

June 20, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendations A-80-30 and 31, issued on April 23, calling on the Federal Aviation Administration (FAA) to require the installation of improved tail rotor blades on all Bell Model 47 helicopters. FAA's comments and actions in response to these recommendations follow.

A-80-30. Issue an Airworthiness Directive to require the installation of the improved tail rotor blades, part No. 47-642-117 on all Bell 47 model helicopters for which the installation has been approved as soon as possible after receipt of the directive.

A-80-31. Expedite the approval of the improved tail rotor blades for installation on all Bell 47 model helicopters equipped with Franklin engines and expedite action to require the installation of the improved blades on those aircraft.

Comment. On January 30, our Southwest Region issued a Notice of Proposed Rule Making (NPRM) calling for replacement of tail rotor blades, P/N 47-642-102, with improved blades, P/N 47-642-117, on all Bell Model 47, H-13, and TH-13T series helicopters, except those equipped with Franklin Engine Company (Aircooled Motors) engines. The NPRM also provides for reducing the retirement time of the blades, P/N 47-642-102, on those helicopter models requiring the blade replacement. This NPRM action was initiated by the FAA based on the service history of tail rotor blade, P/N 47-642-102, fatigue failures. The closing date for comments to the docket was March 18.

The FAA issued Airworthiness Directive (AD) 68-02-03 in January 1968 because of several Bell Model 47 helicopter tail rotor blade failures. AD 68-02-03 reduced the retirement time of tail rotor blades, P/N 47-642-102, from 2,500 to 600 hours' time-in-service and required frequent inspections of three critical areas of this blade on all Bell Model 47 helicopters and on any other helicopters equipped with these blades. In 1970, AD 70-10-08 was issued to amend, clarify, and supersede AD 68-02-03. The essential provisions of AD 68-02-03 were carried over to AD 70-10-08.

FAA's records of service history of the Model 47 tail rotor blades since AD 68-02-03 was issued do not contain any reports of tail rotor blade fatigue failures on Franklin engine-powered Model 47 helicopters. These particular helicopters are the early models, having a lower gross

weight and using less power than the Lycoming engine-powered helicopters. As FAA stated in the preamble to the NPRM issued on January 30, the service history information of U.S.-registered Model 47 helicopters indicates that neither a mandatory reduction in the retirement time for blades, P/N 47-642-102, installed on Franklin engine-powered helicopters, nor mandatory installation of the improved tail rotor blades on these particular Model 47's, is warranted.

Since January 1976, ten additional reports have been received by FAA, indicating an inflight failure of tail rotor blade, P/N 47-642-102, on six Model 47G-2 and one each on Models 47-G-2A-1, 47 J-2, 47-D, and 47G-3 helicopters. These helicopters were all equipped with Lycoming (AVCO) engines.

As a result of inflight blade failures, Bell Helicopter Textron issued Alert Service Bulletin Nos. 47-79-3 and 47-79-4 and OSN 47-79-2. These directives specify removal of the tail rotor blade, P/N 47-642-102, and installation of the improved tail rotor blade, P/N 47-642-117. The directives also require a reduction in retirement time from 600 to 300 hours for blades P/N 47-642-102. Included are blades installed on all Model 47 series helicopters regardless of the engine used.

The FAA acknowledges that improved blade P/N 47-642-117 is more durable than blade P/N 47-642-102 and recommends the installation of the improved blades on Model 47 series helicopters equipped with Franklin engines. The agency does not believe, however, that the service history on these models warrants mandatory installation of the improved tail rotor blades on these particular helicopters.

The Board's Recommendations A-80-30 and 31 are substantially the same as its March 18 comments submitted for inclusion in the NPRM docket. These recommendations call for immediate issuance of an AD, requiring installation of the improved blades on all models for which they are currently approved. Improved blade installation is also required on all other Model 47's, including those equipped with Franklin engines, as soon as installation can be approved.

On May 2, FAA issued its final rule, effective June 9, after carefully weighing all comments to the docket and other considerations described above. In our judgment, FAA's action provides an effective solution to this safety issue, and I am enclosing a copy of the final rule for the Board's review and records.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

Enclosure

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: April 23, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-30 and -31

During several recent accident investigations, the Safety Board has identified recurring failures of tail rotor blades on Bell model 47 helicopters. Two recent accidents in California are typical of several previous accidents.

On March 8, 1980, a Bell 47G helicopter crashed during a crop dusting operation in Brentwood. The pilot was seriously injured. The investigation is continuing; however, preliminary reports indicate that a tail rotor blade separated in flight.

On September 14, 1979, a Bell 47J-2 helicopter lifted off the Queen Mary helicopter pad with four passengers and a pilot on board for a sightseeing tour of Long Beach Harbor. Witnesses saw the tail rotor blade separate from the aircraft at 200 feet above ground level and in level flight over Queensway Bay. The helicopter descended out of control, crashed, and sank in 35 feet of water. All five occupants were killed.

Upon examination, the tail rotor blade, P/N 47-642-102, was found to have separated through the grip in the grease seal radius retention area. This area is covered by Airworthiness Directive 70-10-08. The Airworthiness Directive requires a detail daily inspection of the exterior surface of the blades for the presence of cracks, dents, and nicks, and a 150-hour periodic inspection of the interior surface of the blade in the grip area for cracks, corrosion, and tool marks. The inspection is to be conducted using dye penetrant techniques, or a light and a magnification device.

A metallurgical examination of the failed blade disclosed that the failure stemmed from a fatigue crack that began on the inside diameter of the grip. The fatigue had begun at small corrosion pits less than 0.002-inch deep. The service life of the blade is 600 hours; however, this blade failed within a total time of only 536.4 hours.

Additional recent accidents involving tail rotor blade failures on Bell 47 series helicopters include the following:

2921

(1) A Bell 47G-2A-1 helicopter, N1158W, crashed 3 miles NW of Laughmar, Florida, on July 15, 1978. There was one fatality. The tail rotor blade, P/N 47-642-102, separated because of a fatigue crack that had begun on the trailing edge of the airfoil. The total time on the blade was 77.5 hours.

(2) A Bell 47G-2 helicopter, N47WV, crashed at Pigeon Forge, Tennessee, on July 16, 1978, resulting in four fatalities. The tail rotor blade, P/N 47-642-102, separated because of a fatigue crack that started in the grip. The total time on the blade was 468 hours.

(3) A Bell 47G-2 helicopter, N68367, crashed in Solodad, California, on August 12, 1978. The tail rotor blade, P/N 47-642-102, separated because of a fatigue crack that began in the grip. The total time on the blade was 400 hours.

(4) A Bell 47G-2, N6729D, crashed near Crossland, Georgia, on August 12, 1978. The tail rotor blade, P/N 47-642-102, separated because of a fatigue crack that began in the grip. The total time on the blade was 365 hours.

In most of the failures examined by the Safety Board's Metallurgical Laboratory, the fatigue cracks had begun from extremely small stress raisers such as knicks, corrosion pits, tool marks, and scratches. Most of these defects could have been overlooked by a visual inspection.

The long history of fatigue failures in tail rotor blade P/N 47-642-102 reflects a low fatigue margin and an obvious need to replace the blade with a design more resistant to fatigue cracking.

In December 1979, Bell issued Alert Service Bulletins Nos. 47-79-3 and 47-79-4, which recommended that the service life of the tail rotor blades be reduced immediately from 600 hours to 300 hours, and that all blades with more than 300 hours be scrapped. The Bulletins further recommended that the current model blades be replaced with the new model blades by July 1980. The new model blades have been shown to have a higher margin for fatigue and have a higher recommended service life of 2,400 hours.

The FAA's Southwest Region has issued a Notice of Proposed Rulemaking (NPRM) for adoption of an Airworthiness Directive on this matter, which essentially is the same as the Bell Service Bulletins except that the NPRM excludes those Bell 47 helicopters equipped with Franklin (Aircooled Motors) engines. In the text of the NPRM, the FAA recognizes the need for the improved tail rotor blades to be installed on these models and recommends that this be accomplished later. The Safety Board does not agree that the Bell 47 helicopters equipped with these engines should be excluded from the provisions of the proposed Airworthiness Directive. Further, the Safety Board believes that removal of all blades with part No. 47-642-102 should be expedited.

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

> Issue an Airworthiness Directive to require the installation of the improved tail rotor blades, part No. 47-642-117 on all Bell 47 model helicopters for which the installation has been approved as soon as possible after receipt of the directive. (Class I, Urgent Action) (A-80-30)

Expedite the approval of the improved tail rotor blades for installation on all Bell 47 model helicopters equipped with Franklin engines and expedite action to require the installation of the improved blades on those aircraft. (Class I, Urgent Action) (A-80-31)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and GOLDMAN, Members, concurred in these recommendations. BURSLEY, Member, did not participate.

By: James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF
THE ADMINISTRATOR

February 26, 1981

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in further response to NTSB Recommendation A-80-35 issued May 7, 1980, and supplements our letter of August 6, 1980.

A-80-35. Amend Airworthiness Directive 78-12-06 to require periodic nondestructive inspections of Cleveland P/N 40-76B and P/N 40-120A nose wheels on Piper model PA-31 aircraft.

FAA Comment. In our August 6, 1980, letter, we advised the Board that our initial analysis of Service Difficulty Reports indicated a variety of causes of failures experienced, such that additional investigation was required to determine whether some specific corrective action(s) was required. Our investigation has revealed the following:

Discussion of the PA-31T and AD 78-12-06. In 1977, the PA-31T was using the Cleveland P/N 40-76B wheel as an optional high flotation wheel with a 10-ply rating 17.5 by 6.25-6 tire. This wheel has TSO approval and had been tested at 55 psi maximum tire pressure. Piper, however, established the tire pressure at 80 psi. Failures were reported and Piper attributed them to the 3-bolt design used in holding the two-wheel halves together. Therefore, Piper chose a 6-bolt wheel, P/N 40-120A, and maintained the 80 psi tire pressure. Piper Service Bulletin No. 568 was issued on April 26, 1977, calling for a no-cost replacement of the P/N 40-76B with the P/N 40-120A wheel within the next 25 hours of operation. The tire used on both was the 17.5 x 6.25-6 10-ply rating size. The FAA did not issue an AD.

Following this, failures have been reported with the P/N 40-120A wheel. Cleveland Company advised that this wheel had been TSO-tested with a 6.00-6 tire at 54 psi maximum pressure.

Apparently, at Piper's request, Cleveland Company attempted to requalify the wheel using the larger 10-ply rating tire with the tire pressure increased to 80 psi, but was unable to do so.

Piper then issued Service Bulletin No. 599 by Telex on April 21, 1978, calling for a preflight inspection of the P/N 40-120A wheel. Airworthiness Directive 78-12-06 was issued on June 22, 1978, by the Eastern Region which called for a preflight inspection of PA-31T aircraft having the P/N 40-120A nose wheel (as in Piper Bulletin 599).

On October 4, 1978, Piper issued Service Bulletin No. 599-A making available a Goodrich P/N 3-1076 wheel, Piper P/N 551-782, as an option to the Cleveland P/N 40-120A. It was noted that with this optional Goodrich wheel installed, compliance with the preflight inspection was no longer required.

On May 9, 1979, the FAA amended AD 78-12-06 to add the optional Goodrich P/N 3-1076 wheel, as noted in Piper Bulletin 599-A and an additional optional Goodrich P/N 3-1331 wheel, Piper P/N 551-758.

A review of the FAA Maintenance Analysis Center records from June 1974 to July 1980 indicated only six failures were reported on the PA-31T's in a 6-year period. All of these failures occurred between March 14, 1978, and April 27, 1979, and no failures have been reported since the May 9, 1979, amendment date of the AD providing for the optional Goodrich wheels. These statistics strongly indicate that this problem no longer exists. Additionally, the fact that only 30 aircraft were ever equipped with this optional high flotation wheel/tire combination, further supports our contention that no change to AD 78-12-06 affecting PA-31T aircraft is necessary.

Discussion of the PA-31 series with Cleveland P/N 40-76B wheel. The NTSB recommendation is to amend AD 78-12-06 to include Cleveland P/N 40-76B wheel used on the PA-31 series aircraft and to require periodic nondestructive inspections, presumably instead of the preflight inspection.

The basis for this recommendation was the occurrence on September 19, 1978, of a nose wheel failure on a PA-31-350 during taxiing which, for reasons now unknown, was reported to result in the collapse of the nose landing gear. In addition, a survey of the FAA Maintenance Analysis Center records indicated that 36 cracked or failed nose wheel assemblies have been reported over the last 5 years. Six of the reported cases involved the Cleveland P/N 40-120A wheel installed on Piper PA-31T model aircraft; the remaining reports involved the Cleveland P/N 40-76B wheel installed on various models of the PA-31 series aircraft.

A further review has been made of FAA records dating from June 1974, the beginning of the computerized storage system, through July 24, 1980. These records show 33 failures on the PA-31-350, 1 on the PA-31-325, and 10 on the PA-31, for a total of 44 certain failures. In addition,

there were 5 possible failures resulting in a probable total of 49 during this 6-year period. The failures are identified as cracked or broken rims or flanges.

The number of PA-31 series aircraft delivered for service is slightly over 3,000. The number of failures is relatively small and amounts to slightly over 1 percent, but the failures per year are as follows:

1975	1976	1977	1978	1979	1980 (Jan-June)
3	2	6	10	10	18

Seven of the ten in 1979 occurred the last half of the year and this increase is probably caused by the accelerated use of the PA-31-350 in air taxi and commuter service as a result of deregulation. In view of this adverse trend, the FAA concurs in this portion of the recommendation and has initiated a Notice of Proposed Rule Making (NPRM) to adopt an AD which will require the inspection of the nose wheel and replacement of wheels found with cracks on certain Piper models PA-31, PA-31-325, and PA-31-350 airplanes. A copy of this NPRM (Docket No. 80-SO-78) is enclosed.

We have also recommended to Piper Lakeland that a production change be instituted so as to make available a preferred spare Cleveland Nose Wheel P/N 40-140 or an equivalent wheel supplied by any other wheel manufacturer. The P/N 40-140 wheel is more rugged and should provide longer life.

This wheel was developed as a replacement for the P/N 40-120A covered by the AD and has been approved by Piper Lock Haven for the PA-31T. The P/N 40-140 wheel has also been selected by Piper Lakeland for use on the PA-42 (Cheyenne III). This wheel exceeds the TSO minimum standards according to the manufacturer; specifically, it has been towed under load more than twice the 1,000 mile distance required by the TSO.

We believe the preceding actions will correct the concerns identified in NTSB Safety Recommendation A-80-35. Accordingly, FAA considers action on this recommendation completed.

Sincerely,

Charles E. Weithoner
Acting Administrator

Enclosure

National Transportation Safety Board

Washington D.C. 20594

Office of
Chairman

SEP 12 1984

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Bond:

Thank you for your letter responding to National Transportation Safety Board Safety Recommendation A-80-35 issued May 7, 1980. This recommendation stemmed from our investigation of an incident involving a Piper aircraft, Model PA-31-350, at Washington National Airport, Washington, D.C., on September 19, 1978. While the aircraft was being taxied, the nose gear assembly collapsed. We recommended that the Federal Aviation Administration (FAA):

> "Amend Airworthiness Directive 78-12-06 to require periodic nondestructive inspections of Cleveland P/N 40-76B and P/N 40-120A nose wheels on Piper Model PA-31 aircraft."

We note that after conducting a review and analysis of the problem the FAA will advise the Safety Board of its decision, which we can expect shortly. Pending the FAA's further response, Safety Recommendation A-80-35 is being maintained in an "Open--Acceptable Action" status.

Sincerely yours,

James B. King
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

OFFICE OF THE ADMINISTRATOR

August 6, 1980

The Honorable James B. King
Chairman, National Transportation
Safety Board
800 Independence Avenue, SW.
Washington, D.C. 20594

Dear Mr. Chairman:

This is in response to NTSB Safety Recommendation A-80-35 issued by the Board on May 7, 1980. This recommendation resulted from the Board's investigation of an incident involving a Piper Model PA-31-350, at Washington National Airport, Washington, D.C., on September 19, 1978. The incident occurred when the pilot taxied forward a short distance for a brake check. Upon brake application, the nose wheel failed and then cocked against the gear fork assembly, resulting in damage to the gear retract mechanism and subsequent collapse of the nose gear assembly.

A-80-35. Amend Airworthiness Directive 72-12-06 to require periodic nondestructive inspections of Cleveland P/N 40-76B and P/N 40-120A nose wheels on Piper model PA-31 aircraft.

Comment. Airworthiness Directive 78-12-06, which was issued May 9, 1979, required only a visual inspection of Piper Model PA-31T aircraft nose wheel assemblies, Cleveland P/N 40-120A, before each flight. This is in contrast to the Board's recommendation that the Airworthiness Directive be amended to require periodic nondestructive inspections of both Cleveland P/N 40-120A and P/N 40-76B nose wheels on all Piper Model PA-31 aircraft.

The Federal Aviation Administration's (FAA) initial analysis of Service Difficulty Reports related to these parts indicates a variety of causes of the failures experienced, such that additional investigation is required to determine whether some specific corrective action(s) is required and what, if any, that action should be. It might involve an action as recommended by the Board or some alternative action.

We anticipate completing this review and analysis so that a decision as to FAA's course of action can be made within the next 30 days and shall advise the Board of our decision at that time.

Sincerely,

Langhorne Bond

Langhorne Bond
Administrator

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 7, 1980

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-80-35

The National Transportation Safety Board's investigation of an incident involving a Piper model PA-31-350, N59911, at Washington National Airport, Washington, D.C., on September 19, 1978, and subsequent monitoring of pertinent Service Difficulty Reports indicate that corrective action is necessary to reduce the possibility of similar occurrences.

Immediately after receiving clearance to taxi out for a scheduled flight to Elmira, New York, the captain of Commuter Airlines Flight 551 taxied forward a short distance for a brake check. Upon brake application, the nose wheel failed and then cocked against the gear fork assembly. This resulted in damage to the gear retract mechanism and subsequent collapse of the nose gear assembly.

Investigation revealed that the nose wheel, Cleveland P/N 40-76B, had failed in fatigue. The fatigue began from multiple origins adjacent to the holes of three bolts which hold the rim to the wheel. The fatigue area covered about 50 percent of the fracture surface and propagated circumferentially from the multiple origins. Maintenance records indicated that the nose wheel had been disassembled and visually inspected 8.9 operating hours before the failure.

A survey of the FAA Maintenance Analysis Center Records indicated that 36 cracked or failed nose wheel assemblies have been reported over the last 5 years. Six of the reported cases involved the Cleveland P/N 40-120A wheel installed on Piper PA-31T model aircraft; the remaining reports involved the Cleveland P/N 40-76B wheel installed on various models of the PA-31 series aircraft.

We recognize that the Federal Aviation Administration has been active in alerting owners and operators of cracks in Cleveland P/N 40-76B wheels installed on Piper PA-31-300 model aircraft and that the information was discussed in the August 1977 issue of FAA's General Aviation Inspection Aids Summary.

On May 9, 1979, Airworthiness Directive 78-12-06 was issued which required a visual inspection of Piper Model PA-31T aircraft nose wheel assemblies, Cleveland P/N 40-120A (Piper P/N 551-778), before each flight. This inspection may be accomplished by the pilot. However, the possibility of a nose wheel failure on other Piper PA-31 series aircraft equipped with the P/N 40-76B nose wheel continues to exist. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend Airworthiness Directive 78-12-06 to require periodic nondestructive inspections of Cleveland P/N 40-76B and P/N 40-120A nose wheels on Piper model PA-31 aircraft. (Class II, Priority Action) (A-80-35)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, GOLDMAN, and BURSLEY, Members, concurred in this recommendation.

By: James B. King
Chairman