FILE NO. 3-0001

AIRCRAFT ACCIDENT REPORT

Sun Valley Airlines, Inc.
Beech 65B-80, N1027C
Fairfield, Idaho
February 20, 1972

Adopted: August 30, 1972

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20591
Report Number: NTSB-AAR-72-25

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15. Supplementary Notes

16. Abstract

Sun Valley Airlines, Inc., Flight 115, a Beech 65B-80, N1027C, departed Hailey, Idaho, at 1017 m.s.t., on February 20, 1972, for a scheduled air taxi flight to Boise, Idaho. The pilot, one nonrevenue and three revenue passengers were fatally injured. The aircraft was destroyed.

Four minutes after takeoff, the pilot contacted the Salt Lake City ARTCC and requested an *IFR* clearance, VFR on top, direct to Boise. The flight was cleared as requested and the pilot acknowledged the clearance. This was the flight's last transmission.

Witnesses located in the vicinity of Fairfield, Idaho, heard unusual engine sounds and then observed the in-flight separation of the left wing and powerplant assembly.

The National Transportation Safety Board determines that the probable cause of this accident was an uncontrolled fire in the left wheelwell which resulted in loss of structural integrity of the left wing spars. The wheel-well fire resulted from an uncontained fire in the engine compartment which, in turn, was initiated by separation of one of the engine cylinders due to the use of improper maintenance procedures. Excessive working hours may have contributed to the oversight by the maintenance personnel involved.

The Board made specific recommendations to the Federal Aviation Administration as a result of this accident.

17. Key Words	18. Distribution Statement		
Aircraft accident, scheduled air taxi, in-flight fire, in-flight structural failure, improper maintenance procedures.	Released to Public. Unlimited Distribution.		
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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20591
AIRCRAFT ACCIDENT REPORT

Adopted: August 30, 1972

SUN VALLEY AIRLINES, INCORPORATED
BEECH 65B-80, N1027C
FAIRFIELD, IDAHO
FEBRUARY 20,1972

SYNOPSIS

At approximately 1030, mountain standard time, February 20, 1972, a Beech 65B-80, N1027C, operated as a scheduled air taxi between Hailey and Boise, Idaho, by Sun Valley Airlines, Incorporated, crashed near Fairfield, Idaho, following an in-flight fire and separation of the left wing and engine. All five occupants were fatally injured.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was an uncontrolled fire in the left wheel well which resulted in loss of structural integrity of the left wingspars. The wheelwell fire resulted from an uncontained fire in the engine compartment which, in turn, was initiated by separation of one of the engine cylinders due to the use of improper maintenance procedures. Excessive working hours may have contributed to the oversight by the maintenance personnel involved.

RECOMMENDATIONS

This accident, as well as a similar one in Australia, a month earlier, demonstrates a serious deviation from the design premise that an aircraft should be able to tolerate an engine failure, and even an engine fire, without immediately affecting the aircraft's structural integrity. The Board's Safety Recommendations A-72-21 through 24, dated March 3, 1972, addressed to the Federal Aviation Administrator, expressed that concern. The Administrator responded to these safety recommendations on July 5, 1972. The response indicated full compliance with the Board's recommendations. (See Appendix E.)

1. INVESTIGATION

1.1 History of Flight

Sun Valley Airlines, Inc., Flight 115, a Beech 65B-80, N1027C, departed Friedman Memorial Airport, Hailey, Idaho, at 1017 m.s.t.,[1] on February 20, 1972, with one pilot and four passengers, one nonrevenue and three revenue, for a scheduled air taxi flight to Boise, Idaho. The pilot was also the company's President. The nonrevenue passenger was the company's Director of Maintenance, and occupied the right cockpit seat. The purpose of his travel was to perform maintenance on one of the company's aircraft in Boise. At takeoff, the aircraft carried about 160 gallons of fuel; its gross weight and center of gravity were within authorized limits.

Four minutes after takeoff, the pilot contacted the Salt Lake City Air Route Traffic Control Center and requested an IFR[2] clearance, VFR[3] on top direct to Boise. The flight

[1] All times herein are mountain standard, based on the 24-hour clock.
[2] Instrument Flight Rules.
[3] Visual Flight Rules.

was cleared as requested, and the pilot acknowledged the clearance. This was the flight's last recorded transmission.

At approximately 1030, the attention of several persons located 1 to 3 miles north and northeast of Fairfield, Idaho, was attracted by unusual engine sounds. They observed an aircraft in level flight, traveling in a westerly direction. One of the witnesses who was working outside described it as follows: "I heard an airplane about 800 to 1,000 feet in the air, that sounded terrible. It sounded like one engine was running rough. It was going east to west." The same witness added that shortly thereafter the aircraft "changed its flight pattern and made a gradual turn to the left and headed to the airport to land." Subsequently, the witness saw a wing and an engine separate from the fuselage. Most witnesses did not observe fire or smoke until the in-flight breakup started, with what was described as a "small explosion." Ground impact of the fuselage was followed by a postcrash fire. There were no survivors.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	1	4	0
Nonfatal	0	0	0
None	0	0	0

1.3 Damage to Aircraft

The aircraft crashed in a near vertical attitude 1.5 miles northeast of Fairfield on flat, open farmland at an elevation of approximately 5,000 feet AMSL[4].

Except for the parts that separated in flight, all aircraft components were accounted for in the main impact crater which had a diameter of about 40 feet. The right engine was buried, nose first, into the ground. The right wing was compressed chordwise along its entire length. The cockpit/cabin section was destroyed by impact and the postcrash fire. The empennage came to rest near the edge of the crater; the left horizontal stabilizer showed very little heat damage.

14. Other Damage
None.

1.5 Crew Information

The pilot was certificated and qualified to conduct this flight. (See Appendix B for details.)

1.6 Aircraft Information

The aircraft was certificated in accordance with existing regulations. (See Appendix C for details.)

1.7 Meteorological Information

The weather in the Fairfield area was reported by witnesses as: high ceiling, good visibility, no precipitation. The 1007 Burley, Idaho, weather was officially reported as: 7,500 scattered, 12,000 scattered, 20,000 broken, visibility 30 miles. At the time of the accident, the ground was covered with a 2-foot layer of snow; the 3,100-foot runway of the Fairfield Airport, 2 miles south west of the crash site, was snow-free.

1.8 Aids to Navigation

Navigational aids were not involved in this accident.

1.9 Communications

There were no communications difficulties associated with this accident.

1.10 Aerodrome & Ground Facilities

Aerodrome and ground facilities were not involved in this accident.

[4] AMSL – Above mean sea level.

1.11 Flight Recorders

No flight recorders were installed or required on this aircraft.

1.12 Wreckage

The centerline of the in-flight wreckage scatter was oriented along a heading of 210° magnetic. (See wreckage distribution diagram, Appendix D.) The estimated distance from the main crash site to the separated components was as follows: left wing - 750 yards, left landing gear - 500 yards, left engine - 250 yards. Farther back along the debris path, the undamaged pushrod housing of the No. 5 cylinder of the left engine was found. About 2 miles east-northeast of the main impact area, flakes of burned paint and aluminum were found in the snow.

Examination of the left wing showed that its two spars had fractured in the wheel-well area and that this area had been subjected to an in-flight fire. Heat discoloration of the white paint on the upper wingskin panels of the left wing was evident from the inboard fracture to the wingtip rib. The paint on the left aileron and adjustable tab was blistered. No indication was found that the fuel cells in this portion of the left wing lost their structural integrity as a result of fire; an undetermined amount of fuel was drained from the left wing.

The left engine and engine support structure were buried nose-first in the ground. One propeller blade had broken away from the hub at ground impact. The two other blades showed dissimilar pitch angles; one of them was in a near-feathered position. Upon recovery of the engine, it was noted that the No. 5 cylinder assembly (the rearmost cylinder on the right) was missing; this assembly was subsequently found buried in the snow, about 40 feet from the corresponding side of that engine. The right cowling door of this engine was dented and punctured from the inside outward in the area which would have been adjacent to the No. 5 piston; its lower aft corner was burned and torn away for a total area of about 2 square feet.

1.13 Fire

Fire damage to the left engine extended from the lower cowling edge forward to the second cowling latch from the front. The right-side exhaust stacks were displaced to the right, away from the engine, and bent upward. Nos. 1 and 3 remained attached to their respective cylinders; No. 5 was still clamped to the other stacks but had torn away from its cylinder attaching flange. Molten aluminum brackets, burned and charred flexible fuel and oil lines, and burned electrical wiring insulation showed that a fire had occurred in the lower right section of the engine compartment adjacent to the firewall and augmenter tube.

The entire left wheel-well area exhibited evidence of an intense fire. The aluminum fuel lines had been burned away below the fuel-selector valve, the fuel-return line to the outboard wing tank was burned away, and the side-walls were burned and sooted. The deflated left main landing gear tire was sooted and scorched in its entirety. The overall fire pattern showed that the fire entered the wheel well in the forward lower right side and was most intense in a path from that point diagonally aft to the left rear area where the lower spar cap was burned away.

1.14 Survival Aspects

This was a nonsurvivable accident.

1.15 Tests and Research

The left engine crankcase, No. 5 piston, No. 5 cylinder, and the fractured sections of the left wingspar caps were taken to the NTSB metallurgical laboratory in Washington, D. C., for detailed examination.

The No. 5 cylinder base pad was battered and gouged. Three of the four lower holddown studs were broken off in the tapped hole; the remaining studs were bent slightly outward from the cylinder bore. The shape of the gouges on the pad matched the shape of the lower edge of the piston. Aluminum fragments, later identified as

pieces of the piston, were jammed between the threads of the studs and the tapped holes in the pad. The threads of the unbroken studs were generally in good condition, except for some flattening due to local impact, and the aluminum debris previously noted. The threads were not stripped, nor was there evidence of cross-threading. Subsequent laboratory examination of the broken studs and the cylinder pad showed that the studs failed under alternating bending overloads. The eight cylinder holddown nuts and two cylinder holddown plates were not recovered.

Two pieces, comprising slightly more than half the piston, were recovered. The piston pin and all four piston rings were missing. Piston ring fragments were recovered from the engine oil sump. The piston fragments were severely scraped and gouged, and the fracture surfaces showed evidence of peening and rubbing before final separation.

The No. 5 cylinder skirt was flared outward, cracked and chipped, and a piece was missing from the lower side. The cylinder flange holes were undamaged.

All of the wingspar cap fractures were overload type separations. The lower rear spar cap was silvery in appearance along and near its fractured surfaces, which were extremely fibrous and splintered along the longitudinal grain direction. These characteristics are indicative of intense fire damage to aluminum alloys. The front bottom spar cap along and near its lower flange was necked down, indicating that it was deformed at an elevated temperature while subjected to tensile loads.

The top rear spar cap contained residuals of molten aluminum on the forward surface. The webbing and wingskin attached to this spar had fractured at temperatures near the melting points of the materials. The forward upper spar cap was heavily sooted but did not show as much evidence of exposure to heat as the other spar caps.

1.16 Other

(a) Aircraft Maintenance and Certification Data

A 100-hour inspection of the aircraft was performed prior to the fatal flight. During this inspection a top overhaul of the left engine, a Lycoming IGSO-540-AID was accomplished because of a history of high oil consumption and oil-fouled spark plugs. The work was accomplished by the Director of Maintenance and another Sun Valley Airline's mechanic. Both held valid FAA airframe and powerplant mechanic certificates. In addition, the Director of Maintenance held a valid FAA inspection authorization.

All pistons, rings, piston pins and cylinder assemblies were replaced with like parts removed from a spare "zero time since overhaul" engine. The work was started at approximately 0800 on the Friday preceding the accident. The two men worked approximately 11 hours that day. The following day, they began work at approximately 0800 and completed the job shortly after midnight, working approximately 16 hours that day in order to ready the airplane for the scheduled Sunday flight.

The mechanic who assisted the Director of Maintenance stated that the old cylinder holddown plates and nuts were reused. He further stated that the cylinder nuts were tightened in a random manner as they were installed. Engine overhaul manuals and service bulletins were available, but were not used for reference. The Lycoming IGSO-540 overhaul manual and Lycoming Service Bulletin 1029B list in detail a specific sequence for tightening cylinder holddown nuts when all cylinders have been removed and replaced. The torque wrench which, reportedly, had been used for the tightening of the nuts was checked for calibration; it read about 36 inch-pounds high throughout the range from 240 to 720 inch-pounds.

After the work was completed, a ground run, of approximately 15 to 20 minutes was made,

during which the engine was power checked at 38 inches of manifold pressure. Following this run, a visual inspection for leaks was made, and no discrepancies were noted.

The last entry in the left engine logbook was dated February 20, 1972, and listed the parts that were replaced, in conjunction with a 100-hour inspection; the entry was signed by the Director of Maintenance.

The company's Operations Manual required a "complete flight test following any maintenance operation that could change the flight characteristics of the aircraft."

With regard to the carrying of persons other than crewmembers after repairs or alterations, Part 91 of the Federal Aviation Regulations (14 CFR 91.167) does not require that the aircraft be flown "if ground tests or inspections, or both, show conclusively that the repair or alteration has not appreciably changed the flight characteristics."

The certification regulations applicable to the shutoff means for flammable fluids and the lines and fittings in the engine compartment for this airplane model were contained in sections 3.637 and 3.638 of Part 3 of the Civil Air Regulations, effective August 12, 1957.

2. ANALYSIS AND CONCLUSIONS

2.1 Andysis

According to the available evidence, the accident sequence was initiated by the separation of the No. 5 cylinder assembly from the left engine crankcase. The relatively intact condition of the threads of the four upper cylinder holddown studs indicates that the four top cylinder base nuts were not on the studs when the cylinder came off the crankcase. This could occur only if the nuts were not installed, or if they were installed but not tightened. The engine manufacturer reported that untorqued nuts have been observed to back off the studs in approximately 10 minutes engine operating time. The three recovered lower studs failed as a result of alternating bending overloads produced by the cylinder pivoting about these studs with the nuts probably still in place. When these studs eventually failed, the cylinder was released and moved away from the crankcase, at the same time displacing the exhaust stacks away from the augmenter tube and probably against the cowl door.

It is apparent that the engine manufacturer's cylinder replacement procedures were not followed. Had the prescribed tightening sequence been followed, it is highly unlikely that any nuts would have been omitted or left untightened. It should be noted, however, that there are convincing reasons which attribute the improper maintenance procedures in this case to fatigue of the mechanics involved, rather than to their carelessness or incompetence. In order to have the aircraft ready for the Sunday morning departure, the two mechanics worked approximately 27 hours on the preceding Friday and Saturday. They finished their task around midnight, Saturday. The error potential implied in such a situation is a direct reflection on the quality control of the airline's management maintenance program.

The reason for the left-engine fire was directly related to separation of the No. 5 cylinder. This separation allowed engine oil to be pumped and spilled into the engine compartment in the immediate vicinity of the right augmenter tube. In addition, the No. 5 intake manifold pipe probably separated from the central induction system, thereby releasing a combustible fuel-air mixture. Ignition could easily have been caused by the exhaust stacks of the Nos. 1 and 3 cylinders or by a broken ignition wire from the No. 5 cylindcr. The melting of the aft bracket that attaches the first stage of the augmcnter assembly to the engine support, as well as the burning of the adjacent cowling, the fuel lines to the fuel-flow transmitter, and the generator harness, indicated that a severe fire was burning in the right, lower section of the engine nacelle. Although the pilot would have been aware of an engine problem when the No. 5 cylinder ceased to operate or caused vibration, it is unlikely that he would have been aware of the initial engine

fire. Most of the smoke and flames would have been forced outside, under the wing, through the exhaust augmenter tubes. These indications of fire would not have been readily apparent from the cockpit until the right side of the left engine cowl or the upper wingskin above the wheel well burned through.

Based on witnesses' report of unusual engine sounds, and the mutilated condition of the No. 5 piston, it appears that the pilot did not immediately secure the left engine when the No. 5 cylinder became inactive. Despite vibrations, some power would still have been available, which might have prompted the pilot to attempt a landing on the cleared, hard-surface runway at Fairfield. The left turn described by the witnesses seems to support this speculation, although this also happened to be the direction of predominant asymmetrical thrust.

It could not be determined to what extent the pilot followed the recommended procedures for an engine failure or fire in-flight. The indication that the left propeller was feathered at impact was not necessarily the result of the manipulation of cockpit controls; in case of loss of engine oil pressure the propeller would feather regardless of pilot action, if the loss occurred at sufficient r.p.m. The fuel and oil shutoff valves behind the firewall were cable controlled; due to the stretching and separation of these cables during the airframe breakup, the postcrash position of these valves would be an unreliable indicator of pilot actions. The switch that controls the boost pump in the left inboard fuel cell was not recovered. A fire-induced failure in the pressure line to the fuel selector would result in fuel spillage regardless of selector position.

With regard to the propagation of the fire from the engine compartment into the wheel well, the available evidence suggests that the fire burned through the left engine cowling, and progressed around the firewall, and then burned through the wheel-well skin immediately below the right augmenter tube. In this manner the fire would have entered the wheel well, below the fuel selector valve installed on the rear of the firewall. The burning of one or more of the aluminum fuel lines in this area would lead to an intense, uncontrollable wheel-well fire. The direct exposure of the unprotected wingspar caps to the fire in the wheel well led quickly to heat-weakening of these load-carrying structures. The most intense fire occurred at the rear spar location: this spar was probably the first to lose its structural integrity. The subsequent increase in the tensile loads on the heated lower forward spar cap resulted in an upward overload failure of the left wing.

2.2 Conclusions

(a) Findings

1. The aircraft was certificated in accordance with existing regulations.
2. Improper maintenance procedures were utilized during the installation of the cylinders on the left engine.
3. The pilot was certificated and qualified for the flight.
4. Fire in the left engine commenced with the separation of No. 5 cylinder assembly.
5. Uncontrolled fire progressed from the engine nacelle into the wheel well.
6. The left wingspar cap was weakened by heat and eventually caused the in-flight separation of the left wing.
7. The aircraft structure of the Beech Model 65 lacks adequate fire protection.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was an uncontrolled fire in the left wheel well which resulted in loss of structural integrity of the left wingspars. The wheel-well fire resulted from an uncontained fire in the engine

compartment which, in turn, was initiated by separation of one of the engine cylinders due to the **use** of improper maintenance procedures. Excessive working hours may have contributed to the oversight by the maintenance personnel involved.

3. RECOMMENDATIONS

This accident, as well as a similar one in Australia, a month earlier, demonstrates a serious deviation from the design premise that an aircraft should be able to tolerate an engine failure, and even an engine fire, without immediately affecting the aircraft's structural integrity. The Board's Safety Recommendation A-72-21 through 24, issued March ***3,*** 1972, and addressed to the FAA Administrator was an expression of that concern. The Administrator responded to these safety recommendations on July 5, 1972. The response indicated full compliance with the Board's recommendations. (See Appendix E.)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

Louis M. Thayer, Member, was absent, not voting.

August **30,** 1972.

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Board received notification of the accident at approximately 1115 on February 20, 1972, from the Federal Aviation Administration. Investigators from the Board's Seattle, Washington, and Denver, Colorado, field offices were immediately dispatched to the scene of the accident and were later assisted by a Washington-based specialist.

Interested parties included the Federal Aviation Administration, Beech Aircraft Corporation, and the Lycoming Division of the AVCO Corporation.

2. Hearing

No public hearing was held in connection with the investigation of this accident.

3. Preliminary Reports

A report containing preliminary information regarding this accident was placed in the Board's public docket on February 28, 1972.

APPENDIX B

PILOT INFORMATION

Mr. Rolland H. Smith, aged 55, held Commercial Pilot Certificate No. 437095, with airplane, single- and multiengine land, and instrument ratings. His latest first-class medical certificate was dated September 29, 1971, with the limitation that he wear corrective glasses while exercising the privileges of his certificate.

He had accumulated approximately 12,180 hours, of which 612 hours were in this make and model aircraft. During the preceding 24-hour period, he had flown about 5.3 hours. His last proficiency check was conducted on February 9,1972.

APPENDIX C

AIRCRAFT HISTORY

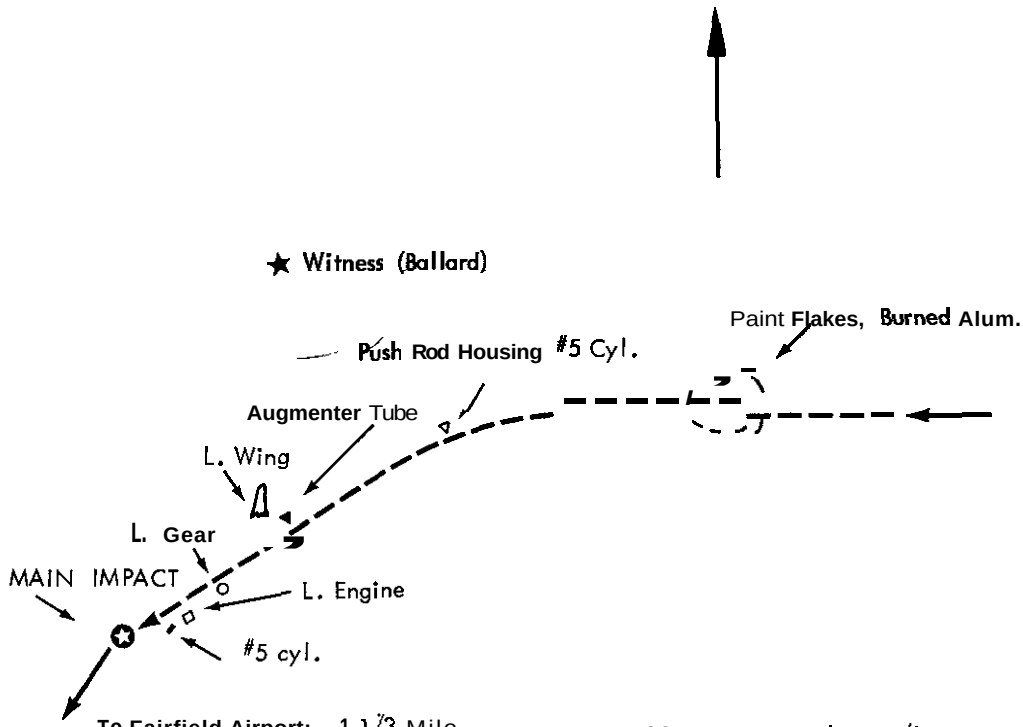
N1027C was a Beech 65B-80 model aircraft, Serial No. LD-309. Manufacture was completed in September 1966.

The aircraft had been flown a total of about 4,100 hours since manufacture and had flown 98 hours since the last inspection.

The aircraft was equipped with two AVCO Lycoming IGSO-540 engines.

	Engines	
	No. 1 IGSO-540-A1D	No. 2 IGSO-540-A1A
Serial Number	L-1640-50	L-1488-50
Total Time (hours)	1,819	2,271

APPENDIX D



NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

WRECKAGE DISTRIBUTION CHART
SUN VALLEY AIRLINES, INC.
BEECH AIRCRAFT MODEL 65B-80, N1027C

FAIRFIELD, IDAHO
FEBRUARY 20 , 1972

APPENDIX E

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

ISSUED: March 3, 1972

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 25th day of February 1972.

FORWARDED TO:
Honorable John H. Shaffer
Administrator
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20591

SAFETY RECOMMENDATION A-72.21 thru 24

The National Transportation Safety Board is currently investigating a fatal accident which occurred near Fairfield, Idaho, on February 20, 1972, involving a Beech Model 65B-80 airplane.

Preliminary investigation of the accident has disclosed that a separation of the aircraft's left outer wing panel occurred in flight and that the separation was associated with an intense fire in the left engine. The fire had progressed from the engine nacelle through the wheel well and subsequently resulted in sufficient heat impingement upon the wing spars to weaken them to the point of failure.

The Board has also been advised of a similar fatal accident which occurred near Alice Springs, Australia, on January 20, 1972, involving a Beech Model 65B-80 airplane. Information received by the Board from the Civil Aviation Authority of Australia indicates that there was an engine nacelle fire preceding the in-flight separation of the airplane's wing.

The Board is concerned that flammable fluids which can he ignited in the engine compartments can result in uncontrolled fires causing extensive damage to the aircraft structure.

In order to preclude the recurrence of similar accidents the Board recommends that the Federal Aviation Administration:

1. Initiate a review of the certification and design criteria of Beech Model 65 and similar models, as applicable to powerplant installation fire prutection provisions.

2. If it is found that these criteria are inadequate, initiate corrective action to ensure adequate fire protection of the powerplant installation and the adjacent airplane structure.

3. Review the design and certification criteria of Part 23 of the Federal Aviation Regulations applicable to the fire protection of powerplant installations for adequacy and effect appropriate regulatory changes if deemed appropriate.

4. Advise all owners and operators of Beech Model 65 airplanes of the occurrence of two accidents wherein an engine fire resulted in separation of the airplanes' wings within 2 to 3 minutes. Operators should further be advised to take all possible measures to insure integrity and airworthiness of the powerplant installation to reduce the probability of an in-flight fire.

This matter has been discussed with personnel of your Flight Standards Service.

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

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.

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

/s/ John H. Reed
By John H. Reed
Chairman

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AERONAUTICAL CENTER
P.O. BOX 25082
OKLAHOMA CITY. OKLAHOMA 73125

5 June 1972

Dear Sir:

Our records show you are the owner and/or operator of a light twin engine airplane which is powered by mechanically supercharged or turbo-supercharged engines. It is extremely important that these kinds of airplanes, which are powered by a sophisticated type of reciprocating engine, be properly maintained and operated to reduce powerplant fire hazards. The purpose of this letter is to obtain the highest possible level of safety by reminding you of the necessity to observe good maintenance and operating procedures as prescribed by the airplane and engine manufacturers.

Two recent fatal accidents occurred on light twin engine airplanes with mechanically supercharged engines. Preliminary investigations show an engine failure initiated these fires. The fires progressed into the wheel wells and resulted in wing separation. In one instance, wing separation occurred within two to three minutes after takeoff, and in the other instance, ten to twelve minutes after takeoff. In the latter case, the number five cylinder came off at the base. Four of the cylinder base stud nuts were missing. The engine had just been top overhauled and had accumulated only **30** minutes operating time prior to the accident. In both instances, oil and/or a supercharged air-fuel mixture was released into the engine compartment. The flammable mixtures ignited and the fire progressed into the wheel wells, burning through the fuel lines in this area. The extreme heat of the fire destroyed the structural integrity of the wing spars in the wheel well resulting in wing separation.

Besides these **two** recent fire accidents, service history records for light twin engine airplanes with supercharged engines show other accidents have occurred involving aileron separation and fire spreading into the wing and fuselage. In addition, there have been a large number of fires of a less severe nature on both sides of the firewall. Many of the fires were caused by loose or disconnected fuel line and hose end fittings, leaking fuel strainer gaskets, chafing between electric wires or terminals and fuel lines or flexible hoses, leaking engine fuel pumps, broken augmentor drains, leaking primer solenoid valves, leaking oil filter adapters, cracked fuel lines, and porous flexible hoses. It can be seen that these kind of leaks on either side of the firewall are potential fire hazards. Airworthiness Directives, FAA Inspection Aids, and manufacturers' service information have been issued concerning corrective action to reduce fires from these causes. Nevertheless, it it still necessary for owners and operators to inspect for leaks during routine and daily inspections and correct them when found.

In most cases, fires can be prevented or safely controlled by closely observing good maintenance and operating procedures as recommended by the airplane and engine manufacturer. At least the following procedures should be observed:

1. At the first indication of an engine fire or failure, the pilot should immediately shutdown the engine in accordance with the engine fire procedure in the Airplane Flight **Manual.** A landing should be made at the earliest opportunity.

It is of utmost importance in controlling engines fires that as soon as a fire is observed, the propeller should be feathered first, then fuel and oil valves closed, followed by turning off electric fuel boost pumps.

2. The engine manufacturer's prescribed overhaul times, practices, and techniques for properly maintaining the engine should be followed. After engine top overhaul, or cylinder change, the engine should be ground run and test flown as outlined in the engine operators manual or maintenance manual. After any work on the engine, a careful visual examination should be accomplished to assure the work is satisfactory.

3. Every 100 hours, or any time a fuel system component, line, or hose is replaced or disturbed, the fuel system should be tested for leaks under pressure, using the fuel boost pump or engine driven pump as applicable. Special attention should be directed to fuel strainer gaskets, fuel line and hose end fittings, cracked and porous lines and hoses, cracks in fuel system component housings, and condition of drains.

4. Similar attention should be given to oil systems as applicable.

5. The firewall should be inspected and maintained to assure there are no openings which would permit an engine compartment fire to progress through the firewall.

Your close attention to the above procedures will result in improved airplane safety.

NOTE: Address inquiries regarding this letter to:

DOT, Federal Aviation Administration
Propulsion Branch, FS-140
800 Independence Ave., S.W.
Washington, D. C. 20590

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20590

OFFICE OF THE ADMINISTRATOR

7 JUL 1972

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

Dear Mr. Chairman:

This is in regard to your Safety Recommendations A-72.21 through 24 issued 3 March 1972 concerning the Beech Model 65 airplane. Our reply to you dated 8 March 1972 advised that we were studying the areas covered by these recommendations and would inform you of the results of our study.

The following actions have been initiated with respect to your recommendations:

Recommendation A-72-21: A review of the design criteria of the Beech Model 65 series airplanes has confirmed that these models comply with the powerplant installation fire protection requirements of the pertinent Federal Aviation Regulations.

Recommendation A-72-22: In view of the serious nature of the recent powerplant fires, development of modifications to the Beech Model 65 series airplanes to improve the powerplant fire integrity has been initiated.

Recommendation A-72-23: As a result of our study of the present rules pertaining to engine fire protection for light twin-engine-powered airplanes such as the Beech Model 65, we are developing a regulatory proposal to upgrade these requirements.

Recommendation A-72-24: A letter was mailed to all owners and operators of the Beech and other similar light twin-engined airplanes to inform them of the occurrence of two serious engine fires and to encourage the observance of good maintenance and operating procedures to prevent or safely control engine fires. A copy of the letter is enclosed for your information.

Sincerely,

/s/ John H. Shaffer
John H. Shaffer
Administrator

Enclosure