



National Transportation Safety Board Aviation Accident Final Report

Location:	ZWINGLE, IA	Accident Number:	DCA93GA042
Date & Time:	04/19/1993, 1552 CDT	Registration:	N86SD
Aircraft:	MITSUBISHI MU-2B-60	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	8 Fatal
Flight Conducted Under:	Public Aircraft		

Analysis

WHILE CRUISING AT FL 240, A PROPELLER (PROP) HUB ARM ON THE LEFT PROP FAILED, RELEASING THE PROP BLADE, WHICH STRUCK A 2ND BLADE, BREAKING OFF ITS TIP. THIS RESULTED IN A SEVERE ENGINE VIBRATION & SHUTDOWN OF THE LEFT ENGINE. THE LEFT ENGINE WAS FORCED DOWNWARD & INBOARD ON ITS MOUNTS. THE CABIN DEPRESSURIZED, POSSIBLY FROM BLADE CONTACT. THE FLIGHT CREW MADE AN EMERGENCY DESCENT & RECEIVED A VECTOR TO DIVERT FOR AN ILS APPROACH TO DUBUQUE. THE AIRPLANE WAS INCAPABLE OF MAINTAINING ALTITUDE & DESCENDED IN INSTRUMENT CONDITIONS. SUBSEQUENTLY, IT COLLIDED WITH A SILO & CRASHED ABOUT 8 MILES SOUTH OF DUBUQUE. AN INVESTIGATION REVEALED THE LEFT PROP HUB FAILED FROM FATIGUE THAT INITIATED FROM MULTIPLE INITIATION SITES ON THE INSIDE DIAMETER SURFACE OF THE HOLE FOR THE PILOT TUBE. THERE WAS EVIDENCE THAT THE FATIGUE PROPERTIES OF THE HUB WERE REDUCED BY A COMBINATION OF FACTORS, INCLUDING MACHINING MARKS OR SCRATCHES, MIXED MICROSTRUCTURE, CORROSION, DECARBURIZATION, AND RESIDUAL STRESSES. (FOR FURTHER INFO, SEE BLUE COVER RPRT: NTSB/ARR-93/08.)

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE FATIGUE CRACKING AND FRACTURE OF THE PROPELLER HUB ARM. THE RESULTANT SEPARATION OF THE HUB ARM AND THE PROPELLER BLADE DAMAGED THE ENGINE, NACELLE, WING, AND FUSELAGE, THEREBY CAUSING SIGNIFICANT DEGRADATION TO AIRCRAFT PERFORMANCE AND CONTROL THAT MADE A SUCCESSFUL LANDING PROBLEMATIC. THE CAUSE OF THE PROPELLER HUB ARM FRACTURE WAS A REDUCTION IN THE FATIGUE STRENGTH OF THE MATERIAL BECAUSE OF MANUFACTURING AND TIME-RELATED FACTORS (DECARBURIZATION, RESIDUAL STRESS, CORROSION, MIXED MICROSTRUCTURE, AND MACHINING/SCORING MARKS) THAT REDUCED THE FATIGUE RESISTANCE OF THE MATERIAL, PROBABLY COMBINED WITH EXPOSURE TO HIGHER-THAN-NORMAL

CYCLIC LOADS DURING OPERATION OF THE PROPELLER AT A CRITICAL VIBRATION FREQUENCY (REACTIONLESS MODE), WHICH WAS NOT APPROPRIATELY CONSIDERED DURING THE AIRPLANE/PROPELLER CERTIFICATION PROCESS.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings

1. (C) PROPELLER SYSTEM/ACCESSORIES,HUB - FATIGUE
2. PROPELLER SYSTEM/ACCESSORIES,BLADE - SEPARATION
3. POWERPLANT - VIBRATION

Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CRUISE - NORMAL

Findings

4. 1 ENGINE

Occurrence #3: DECOMPRESSION
Phase of Operation: CRUISE

Occurrence #4: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #5: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: APPROACH

Findings

5. (F) WEATHER CONDITION - LOW CEILING
6. (F) WEATHER CONDITION - FOG
7. (F) WEATHER CONDITION - RAIN

Factual Information

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	52, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	12/10/1992
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	10607 hours (Total, all aircraft), 1922 hours (Total, this make and model), 26 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MITSUBISHI	Registration:	N86SD
Model/Series:	MU-2B-60 MU-2B-60	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	765 S.A.
Landing Gear Type:	Retractable - Tricycle	Seats:	10
Date/Type of Last Inspection:	04/12/1993, Continuous Airworthiness	Certified Max Gross Wt.:	11575 lbs
Time Since Last Inspection:	10 Hours	Engines:	2 Turbo Prop
Airframe Total Time:	4580 Hours	Engine Manufacturer:	GARRETT
ELT:		Engine Model/Series:	TPE-331-10
Registered Owner:	STATE OF SOUTH DAKOTA	Rated Power:	940 hp
Operator:	STATE OF SOUTH DAKOTA	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	DBQ, 1076 ft msl	Distance from Accident Site:	9 Nautical Miles
Observation Time:	1555 CDT	Direction from Accident Site:	360°
Lowest Cloud Condition:	Unknown / 200 ft agl	Visibility	1 Miles
Lowest Ceiling:	Overcast / 200 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	16 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	40°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.4 inches Hg	Temperature/Dew Point:	8° C / 7° C
Precipitation and Obscuration:			
Departure Point:	CINCINNATI, OH (LUK)	Type of Flight Plan Filed:	IFR
Destination:	PIERRE, SD (PIR)	Type of Clearance:	IFR
Departure Time:	1400 EDT	Type of Airspace:	Class G

Airport Information

Airport:	DUBUQUE REGIONAL (DBQ)	Runway Surface Type:	Asphalt
Airport Elevation:	1076 ft	Runway Surface Condition:	Wet
Runway Used:	31	IFR Approach:	ILS
Runway Length/Width:	6498 ft / 150 ft	VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	6 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	8 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	ROBERT BENZON	Report Date:	05/10/1994
Additional Participating Persons:			
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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