Aviation Investigation Final Report

Location:	Hilton Head, South Carolina	**Accident Number:**	MIA01FA206
Date & Time:	August 1, 2001, 07:51 Local	**Registration:**	N1VY
Aircraft:	Mitsubishi MU-2B-35	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The airplane was on final approach to land at Hilton Head Airport, when according to witnesses, it suddenly rolled to the right, and descended, initially impacting trees at about the 70-foot level, and then impacting the ground. A fire then ensued upon ground impact, and the debris field spanned about 370 feet along an azimuth of about 082 degrees. Examination of the airplane wreckage revealed that left wing flap actuator and jack nut measurements were consistent with the wing flaps being extended to 40 degrees, and on the right wing the flap jack nut and actuator measurements were consistent with the right flap being extended to about a 20-degrees. In addition, the right flap torque tube assembly between the flap motor and the flap stop assembly had disconnected, and the flap torque tube assembly's female coupler which attaches to the male spline end of the flap motor and flap stop assembly was found with a cotter pin installed through the female coupler of the flap stop assembly. The cotter pin, had not been placed through the spline and the coupler consistent with normal installation as per Mitsubishi's maintenance manual, or as specified in Airworthiness Directive 88-23-01. Instead, the cotter pin had missed the male spline on the flap motor. In addition, the flap coupler on the opposite side of the flap motor was found to also found to not have a cotter pin installed. Company maintenance records showed that on April 3, 2001, about 87 flight hours before the accident, the airplane was inspected per Airworthiness Directive (AD) 88-23-01, which required the disassembly, inspection, and reassembly of the flap torque tube joints. In addition, on July 9, 2001, the airplane was given a phase 1 inspection, and Bankair records showed that a company authorized maintenance person performed the applicable maintenance items, and certified the airplane for return to service.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Improper maintenance/installation and and inadequate inspection of the airplane's flap torque tube joints during routine maintenance by company maintenance personnel, which resulted in the right flap torque tube assembly coupler becoming detached and the flaps developing asymmetrical lift when extended, which resulted in an uncontrolled roll, a descent, and an impact with a tree during approach to land.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
1. MAINTENANCE,COMPLIANCE WITH AD - ATTEMPTED - COMPANY MAINTENANCE PERSONNEL
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - COMPANY MAINTENANCE PERSONNEL
3. (C) FLT CONTROL SYST,WING FLAP CONTROL CABLE/ROD - LOOSE PART/BOLT/NUT/CLAMP/ETC
4. (C) MAINTENANCE,INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
5. AIRCRAFT CONTROL - NOT POSSIBLE - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. OBJECT - TREE(S)

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On August 1, 2001, about 0751 eastern daylight time, a Mitsubishi, MU-2B-35, N1VY, registered to MU-2 LLC, and operated by Bankair Inc., as a Title 14 CFR part 91 positioning flight, crashed in Hilton Head, South Carolina. Visual meteorological conditions prevailed, and an instrument flight rules flight plan had been filed. The commercial-rated pilot, sole occupant of the aircraft, received fatal injuries, and the aircraft was destroyed. The flight originated from Savannah, Georgia, the same day, about 0741.

The chief pilot of Bankair Inc. stated that the pilot had just flown the aircraft from Columbia, South Carolina, to Savannah, Georgia, as Bankair flight 170, a Title 14 CFR part 135 flight, and had dropped off his cargo. The chief pilot further stated that the pilot was positioning the aircraft to Hilton Head to pick up additional cargo, when the accident occurred.

An FAA Savannah Air Traffic Control Tower North Radar Controller said that the pilot had been on an IFR flight plan from Savannah, to Hilton Head, had reported the airport in sight, and had been given approval to make a frequency change, and told to squawk 1200. According to the controller, at 0750, he noticed on radar that N1VY had initiated a gradual descent from 2,000 feet to 1,000 feet, and at 0751, the altitude rose slightly to 1,300 feet and then N1VY disappeared from the radar screen.

According to a person at the Hilton Head Airport who was monitoring the unicom frequency, the pilot of the accident airplane called on the unicom frequency, and asked for a traffic advisory, and he had responded to the pilot saying that traffic was landing and departing from runway 3. The witness further stated that the pilot responded saying, "thank you, traffic landing and departing runway 3", and that was the only communication he had with the pilot.

Witnesses reported seeing the aircraft in a right wing down, nose-low flight attitude as it initially impacted trees, and then impacted the ground on a golf course in the Leamington section of the Palmetto Dunes Plantation. Upon impact, a postcrash fire ensued, and the aircraft was destroyed.

PERSONNEL INFORMATION

Information obtained from Bankair Inc., showed that the pilot held an FAA commercial pilot certificate, with airplane single and multiengine land and instrument airplane ratings, issued by the FAA on January 11, 1998. The information also showed that he held a commercial helicopter certificate with an instrument rotorcraft rating, as well as a FAA Airframe and Powerplant mechanic's license that had been issued March 21, 1996. The pilot held an FAA

second class medical certificate issued on January 22, 2001, with the stated limitation that "holder shall wear correcting lenses while exercising the privileges of this certificate."

Bankair records showed that after initially working as a mechanic for Bankair, commencing on July 16, 1996, on March 26, 1998, the pilot became a Bankair pilot. At the time of the accident, he had accumulated a total of about 4,100 flight hours, with about 500 flight hours in the same type airplane as the accident airplane, and about 114 flight hours during the past 90 days, of which about 77 was in the Mitsubishi MU-2. He also had received recurrent training on the MU-2 at Howell Enterprises in November 2000, and had last been given a flight competency check on April 18, 2001.

AIRCRAFT INFORMATION

N1VY was a 1972 Mitsubishi MU2B-35, serial number 567. It was equipped with two 665-shaft horsepower Garrett TPE-331-6-252M turbo-propeller engines, and the serial number of the No. 1 engine, was P20543C, and that of the No. 2 engine was P20432C. N1VY was also equipped with two Hartzell constant speed, controllable pitch, reversible, full automatic and manual feathering 3-bladed metal propellers. The left propeller hub's serial number was BVA6652. the serial number of the right hub was BVA6643.

The airplane was being maintained under an FAA Approved Aircraft Inspection Program, and according to maintenance records obtained from Bankair, on April 3, 2001, about 87 flight hours before the accident, N1VY was inspected per Airworthiness Directive (AD) 88-23-01, which required the dissassembly, inspection, and reassembly of the flap torque tube joints.

The airplane received an inspection on July 9, 2001, and at the time of that Phase 1 inspection, it had accumulated a total time of 11,594.1 hours. The No. 1 engine had accumulated 2010 cycles, a time of 1946.7 hours since overhaul, and a total time on the engine of 6735.6. The No. 2 engine had accumulated 2010 cycles, 1946.7 hours since overhaul, and a total of 7919.8 hours. At the time of the accident the airplane had accumulated a total of 11,612.7 hours.

METEOROLOGICAL INFORMATION

Visual meteorological conditions prevailed at the time of the accident. The Savannah International Airport 0750 surface weather observation was few clouds at 2,500 feet, visibility 10 statute miles, winds from 050 degrees at 8 knots, temperature 23 degrees C, dewpoint temperature 20 degrees C, altimeter setting 30.24 inHg. Savannah is located about 27 nautical miles west of the accident site.

WRECKAGE AND IMPACT INFORMATION

N1VY was on final approach for landing at Hilton Head Airport, Hilton Head, South Carolina when it impacted trees and the ground the ground on the Palmetto Dunes Plantation golf course in the Leamington Plantation complex. The airplane came to rest in the in the vicinity of

54 Leamington Court, about 3.5 miles southwest of the Hilton Head Airport in position 32 degrees, 09 minutes 53.5 seconds N, 080 degrees, 44 minutes 15.1 seconds west.

The main wreckage was located on a small rise in a predominantly level portion of the fairway. The airplane had initially impacted a tree at about the 70-foot level, and then impacted the ground, with the main wreckage coming to rest on the knoll at the edge of the tree-line, just prior to the fairway. The debris field with the majority of the airplane parts, spanned a distance of about 110 feet from the initial impact point with the tree, to the area where the main wreckage lay at the edge of the fairway. The debris field then continued along the same general direction, but with fewer airplane parts being present, for about an additional 160 feet, near the far end of the fairway. The azimuth from the initial impact point to the main wreckage along the centerline of the debris field was 082 degrees, and the descent angle, as indicated by impact signature on trees, with respect to the initial ground impact point, was about 40 degrees.

The accident airplane sustained extensive fire and impact damage, consistent with a high energy, high velocity impact. Postcrash examination of the airplane revealed that control surfaces, necessary to sustain flight, were in the vicinity of the main wreckage/debris field. The cabin/cockpit lay on the right side, and it had opened up during the impact sequence. In addition, the cabin/cockpit had been consumed by fire with instruments and gages having been destroyed. Flight control continuity was established from the areas where the control surfaces are normally attached, to fracture zones in the main fuselage. All separations of the airplane's control cabling were consistent with overstress.

The empennage had separated from the remainder of the fuselage, but the rudder remained attached to the empennage via the rudder torque tube. The rudder trim actuator measured 7 9/16 inches, which equates to 21 degrees nose right trim, and the trim indication at the pedestel showed neutral. The right elevator trim tab actuator was extended 3 1/4 inches, which was beyond normal travel, and the left elevator trim tab actuator measured 1 3/8 inches, which equates to 18 degrees nose up trim.

The left wing separated from the main fuselage, and it sustained impact as well as fire damage. The left wing spoiler was fully retracted. The left main flap actuator's block assembly was at maximum aft travel with the block driven against the stop nut, and the jacknut measurement was zero. The outboard flap actuator was extended 12 inches, corresponding to flaps being fully extended to the 40-degree position.

The right wing had remained attached to the fuselage and it was destroyed by the impact and by postcrash fire. The right wing spoiler was fully retracted and the right aileron trim was set to 5 degrees. The right main flap jacknut measured 2 3/4 inches, and the right outboard flap actuator was extended 5 3/4 inches, corresponding to a 20-degree flap deflection. The flap torque tube assembly, between the flap motor, and the flap stop assembly, had disconnected. The flap torque tube assembly's female coupler, which attaches to the male spline end of the flap motor and flap stop assembly, was found with a cotter pin installed through the female

coupler of the flap stop assembly. The cotter pin had not been placed through the spline and the coupler, consistent with normal installation, as per Mitsubishi's maintenance manual, and as specified in Service Bulletin 189, but had missed the male spline on the flap motor. In addition, the flap coupler on the opposite side of the flap motor did not have a cotter pin installed.

The left engine remained attached to the left wing and the propeller was detached at the hub, and it laying inverted in a small crater. The left propeller displayed characteristic twisting and bending consistent with an engine operating at a high energy setting at impact.

The right engine was detached from the right wing, and had incurred extensive fire damage. Two of the three propeller blades were attached, but one blade had broken off and it was found in the first impact crater. All propeller blades on the right engine showed the characteristic twisting and bending, consistent with the engine operating at a high energy setting upon impact.

Witnesses had stated that the landing gear had been deployed, and the examination also confirmed that the gear had been down. The gear mechanism and tires had also incurred extensive fire damage.

On October 9 and 10, 2001, the NTSB conducted a detailed examination of the accident airplane's engines at Honeywell Corporation's Product Integrity Investigation Laboratory, Phoenix, Arizona. The examination/teardown on both the No. 1 and No. 2 engines revealed no preaccident anomalies to either of the accident airplane's engines. The damage observed on both engines were consistent with both engines having been operating normally at the time of impact.

On October 9, 2001, the NTSB conducted a detailed examination on the accident airplane's propellers, with the aid of a representative from Hartzell Propeller Inc, at Honeywell Corporation, Phoenix, Arizona. The examination revealed no preaccident anomalies, and the damage to both propellers were consistent with that of both propellers rotating with power applied, at impact.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was authorized by the Beaufort County Coroner, and pathologists at the Medical University of South Carolina performed the autopsy on August 1, 2001. According to the coroner, the cause of death was attributed to full body blunt force trauma. No findings which could be considered causal to this accident were reported.

The FAA Toxicology Laboratory, Oklahoma City Oklahoma, conducted toxicological studies on specimens obtained from the pilot. Tests were conducted for carbon monoxide, cyanide, volatiles, and drugs, and the results for each were negative.

ADDITIONAL INFORMATION

On August 3, 2001, the NTSB released the wreckage of N1VY to Mr. Chris Cartwright, General Manager, Atlanta Air Salvage, Griffin, Georgia, however, the NTSB retained the propeller assemblies, Nos. 1 and 2 engines, as well as the flap torque tube joints for further evaluation. Both engines were returned to Bankair on December 14, 2001, and all other parts were returned to Atlanta Air Salvage.

Pilot Information

Certificate:	Commercial	**Age:**	50,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	January 22, 2001
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 2, 2001
Flight Time:	4184 hours (Total, all aircraft), 483 hours (Total, this make and model), 114 hours (Last 90 days, all aircraft), 46 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mitsubishi	**Registration:**	N1VY
Model/Series:	MU-2B-35	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	567
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	July 9, 2001 AAIP	**Certified Max Gross Wt.:**	10800 lbs
Time Since Last Inspection:	21.3 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	11612.7 Hrs at time of accident	**Engine Manufacturer:**	Garrett
ELT:	Installed	**Engine Model/Series:**	TPE331-6-252M
Registered Owner:	BANKAIR INC	**Rated Power:**	665 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	BKAA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SAV,50 ft msl	**Distance from Accident Site:**	26 Nautical Miles
Observation Time:	07:53 Local	**Direction from Accident Site:**	80°
Lowest Cloud Condition:	Few / 2500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots / 0 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.23 inches Hg	**Temperature/Dew Point:**	23°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Savannah, GA (SAV)	**Type of Flight Plan Filed:**	IFR
Destination:	Hilton Head, SC (HXD)	**Type of Clearance:**	IFR
Departure Time:	07:41 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Hilton Head HXD	**Runway Surface Type:**	Asphalt
Airport Elevation:	19 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	3	**IFR Approach:**	None
Runway Length/Width:	4300 ft / 75 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	32.164722,-80.733612

Administrative Information

Investigator In Charge (IIC):	Lovell, John
Additional Participating Persons:	Lewis W Blackwell; FAA FSDO; West Columbia, SC Mike A Cummings; Honeywell Corporation; Phoenix, AZ Ralph Sorrells; Mitsubishi Heavy Industries America, Inc.; Addison , TX Jeanne Cook; Bankair Inc.; West Columbia, SC
Original Publish Date:	December 30, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=52945