



National Transportation Safety Board Aviation Accident Final Report

Location:	Fort Lauderdale, FL	Accident Number:	MIA05LA066
Date & Time:	03/02/2005, 1833 EST	Registration:	N88TN
Aircraft:	Cessna 402C	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 None

Flight Conducted Under: Part 91: General Aviation - Ferry

Analysis

The pilot stated the airplane was about 5 miles north of Fort Lauderdale Executive Airport (FXE) and at approximately 4,000 feet mean sea level, when the airplane pitched sharply nose down, with an uncontrollable back and forth oscillation of the control yoke, lasting about 5 seconds. A loud shearing noise was heard from the right rear of the aircraft before pitch control was regained. He looked toward the right rear of the airplane to see sheet metal flapping in the wind near the elevator section. He declared an emergency and he was cleared for immediate landing at FXE; the landing was uneventful. An examination by NTSB revealed a section of about 16 inches was missing from the right elevator's outboard area; which was later recovered about 5 miles north of FXE in a residential area. The remaining outboard of the elevator up to the inboard attaching hinge was peeled up and aft. The attaching hardware connecting the elevator trim tab horn to the elevator trim actuator push-rod was missing. No abnormality was observed to the areas and surfaces of the trim tab horn and the push-rod attaching area. The pilot was asked to demonstrate all the steps accomplished during the preflight prior to the accident flight and what type of nut was securing the trim tab horn to the trim tab push rod, a self locking nut or one that has a cotter pin? He did recall a nut however could not recall observing a cotter pin. The accident airplane had undergone inspections and maintenance on February 21, 2005, which included the overhaul of the elevator trim tab actuator. The mechanic, whom performed the tasks, stated that after the installation of the elevator trim tab actuator, he attached the elevator trim tab actuator push-rod to the elevator trim horn using a new bolt, washer, nut and cotter pin from the shop stock in accordance with the maintenance manual. Another mechanic stated that he was present and actually handed the cotter pin to the mechanic who performed the installation. An FAA inspector examined the maintenance facility and interviewed the mechanics that were involved in the tasks and stated that he did not observe any discrepancy with the bins of cotter pins. During the interview with the mechanic, the one mechanic stated that he remembers installing the cotter pin however he could not remember the exact cotter pin he installed and added the cotter pin was given to him by another mechanic. The FAA inspector instructed the other mechanic, who retrieved the cotter pin, to demonstrate where he got the cotter pin from. The mechanic went to the bin area and opened two bins. One of the bins had the proper cotter pin. The mechanic said he believed that he took the proper cotter pin. The pilot who test flew the accident airplane after maintenance

stated that a preflight was accomplished and no irregularities were noted. The pilot added that he personally completed two test flights. The airplane owner's pilot completed a preflight of the accident airplane in the facility's hanger prior to signing the delivery receipt and a least two more times, prior to and during his en route flight to Florida.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The improper installation and securing of the elevator trim tab push-rod attaching hardware by maintenance personal resulting in the rod disconnecting and a partial separation of the right elevator in flight.

Findings

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

Findings

1. FLT CONTROL SYST,ELEVATOR TRIM/TAB CONTROL - NOT SECURED
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. FLT CONTROL SYST,ELEVATOR TRIM/TAB CONTROL - DISCONNECTED
4. FLIGHT CONTROL,ELEVATOR - FAILURE,PARTIAL

Factual Information

On March 02, 2005, about 1833 eastern standard time, a Cessna 402C, N88TN, registered to and operated by a private individual, as a Title 14 CFR Part 91 ferry flight, lost a section of the right elevator during descent and made an emergency landing at the Fort Lauderdale Executive Airport, Fort Lauderdale, Florida. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed. The airline transport-rated pilot received no injuries, and the airplane incurred substantial damage. The flight originated from Suffolk Executive Airport, Suffolk, Virginia, earlier that day, about 1430.

The pilot stated the flight was a ferry flight from Waterville Robert LaFleur Airport, Waterville, Maine to Fort Lauderdale/ Hollywood International Airport (FLL), Florida, with one stop at Suffolk for fuel. He started a descent to the FLL about 70 nautical miles north of the airport. The airplane was descending at a rate 500 feet per minute, normal cruise engine power setting and an indicated airspeed of 185 knots. The airplane was about 5 miles north of Fort Lauderdale Executive Airport (FXE) and at approximately 4,000 feet mean sea level, when the airplane pitched sharply nose down, with an uncontrollable back and forth oscillation of the control yoke. A loud shearing noise was heard from the right rear of the aircraft before pitch control was regained. The oscillation lasted for about 5 seconds. He looked toward the right rear of the airplane to see sheet metal flapping in the wind near the elevator section. An emergency was declared to Miami approach and he was cleared for immediate landing at FXE. He lowered the landing gear, extended the flap and reduced indicated airspeed to 109 knots and landed on runway 26.

An examination by NTSB of the airplane revealed the empennage section of the airplane was distorted. The left elevator was bent and deformed at the elevator attaching hinge points. A section of about 16 inches was missing from the right elevator's outboard area. A section of the missing area was later recovered about 5 miles north of FXE in front of a residential home. The remaining outboard of the elevator up to the inboard attaching hinge was peeled up and aft. The hardware (nut, bolt, washer, and cotter pin) attaching the trim tab actuator screw assembly to the push-rod was observed to be new. The attaching hardware connecting the elevator trim tab horn to the elevator trim actuator push-rod was missing. No abnormality was observed to the areas and surfaces of the trim tab horn and the push-rod attaching area.

The pilot was asked during an interview to demonstrate all the steps he accomplished when he did the preflight to the airplane before the accident flight. The question was asked to the pilot during the elevator trim tab check, what type of nut was securing the trim tab horn to the trim tab push rod, a self locking nut or one that has a cotter pin? He did recall a nut however could not recall observing a cotter pin.

The accident airplane had undergone schedule inspections on February 21, 2005 and had maintenance accomplished to it. One of the maintenance tasks completed to the accident airplane was the overhaul of the elevator trim tab actuator. The overhaul requires the component to be removed from the airplane and installed after the overhaul. The mechanic, whom performed the tasks, stated that after the installation of the elevator trim tab actuator, he attached the elevator trim tab actuator push-rod to the elevator trim horn using a new bolt, washer, nut and cotter pin from the shop stock in accordance with the maintenance manual.

Another mechanic stated that he was present and actually handed the cotter pin to the mechanic who installed the bolt that attaches the push-rod from the elevator trim tab actuator

to the elevator trim tab horn. He recalled the installing mechanic telling him, watch the eyes, as he trimmed the end of the cotter pin after installation.

An FAA inspector examined the facility where the maintenance was accomplished and interviewed the mechanics that were involved in the tasks. The FAA inspector stated that he checked several parts bin of different sizes of cotter pins including for the proper cotter pin required for that task. He did not find any mixed sizes or any incorrect numbering for any of the cotter pins in the individual bins and each bin was labeled with the proper number to the cotter pin contained in the bin. During the interview with the mechanic who installed the cotter pin, the mechanic stated that he remembers installing the cotter pin however he could not remember the exact cotter pin he installed and added the cotter pin was given to him by another mechanic. The FAA inspector instructed the mechanic, who retrieved the cotter pin, to demonstrate where he got the cotter pin from. The mechanic went to the bin area and opened two bins. One of the bins had the proper cotter pin. The mechanic said he believed that he took the proper cotter pin.

The facility where the maintenance was performed has a policy to test fly airplanes after all maintenance is completed; to ensure the facility has not missed any items. The pilot who test flew the accident airplane stated that the preflight was accomplished including all flight controls stops, bonding straps, attachments points and control actuation, trim tab movements on the ground, freedom of actuator and direction of travel and proper connectivity. The trim tab actuator elevator, aileron and rudder had hardware in place (cotter keys in place and tabs bent to prevent its falling out). No irregularities were noted. The pilot added that he personally completed two test flights prior to the accident airplane's delivery. The airplane owner's pilot completed a preflight of the accident airplane in the facility's hanger prior to signing the delivery receipt and a least two more times, prior to and during his en route flight to Florida.

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	40, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 1 Without Waivers/Limitations	Last Medical Exam:	01/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	01/01/2005
Flight Time:	1980 hours (Total, all aircraft), 350 hours (Total, this make and model), 300 hours (Last 90 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Cessna	Registration:	N88TN
Model/Series:	402C	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	402C-0621
Landing Gear Type:	Retractable - Tricycle	Seats:	10
Date/Type of Last Inspection:	02/01/2005, Annual	Certified Max Gross Wt.:	7210 lbs
Time Since Last Inspection:	8 Hours	Engines:	2 Reciprocating
Airframe Total Time:	8753 Hours	Engine Manufacturer:	Continental
ELT:	Installed, not activated	Engine Model/Series:	TSIO520VB
Registered Owner:	Karl W. Doane III	Rated Power:	325 hp
Operator:	Karl W. Doane III	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	FXE, 13 ft msl	Observation Time:	1853 EST
Distance from Accident Site:	5 Nautical Miles	Condition of Light:	Night
Direction from Accident Site:	180°	Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	17° C / -12° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	16 knots, 300°	Visibility (RVR):	
Altimeter Setting:	30.08 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Suffolk, VA (KSFQ)	Type of Flight Plan Filed:	IFR
Destination:	Fort Lauderdale, FL (FLL)	Type of Clearance:	IFR
Departure Time:	1430 EST	Type of Airspace:	

Airport Information

Airport:	Fort Lauderdale Executive (FXE)	Runway Surface Type:	
Airport Elevation:	13 ft	Runway Surface Condition:	
Runway Used:	NA	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None		

Administrative Information

Investigator In Charge (IIC):	Jose L Obregon	Adopted Date:	04/25/2006
Additional Participating Persons:	Steven J Petrossian; Fort Lauderdale FSDO-17; Fort Lauderdale, FL		
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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