



National Transportation Safety Board Aviation Accident Final Report

Location:	Houston, TX	Accident Number:	DFW06FA019
Date & Time:	11/05/2005, 0958 CST	Registration:	N505K
Aircraft:	Cessna 500	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The 4,100-hour commercial pilot lost directional control of the single-pilot twin-engine turbojet while taking off from runway 22 (7,602-feet long by 150-feet wide), and impacted the ground about 3,750 feet from the point of departure. Several witnesses reported that the airplane climbed to approximately 150 feet, rolled to the right, descended, and then struck the ground inverted. The weather was day VFR and the wind was reported from 170 degrees at 10 knots. Examination of the wreckage revealed that none of the main-entry door latching pins were in their fully locked position. The airplane's flight controls and engines did not disclose any mechanical discrepancies. The flaps were in the takeoff position and the control lock was unlocked. The pilot had not flown the airplane for over nine months because of extensive maintenance; the accident occurred on its first test flight out of maintenance. Since the pilot's flight records were not found, it is unknown how much flight time the pilot had flown in the last nine months. The other airplane that the pilot owned was a Cessna 650, but witnesses stated that the pilot was only qualified as a co-pilot. Most of the maintenance records that were located were not completed; an approval for return-to-service was not found. Another airplane that had declared an emergency was on a 10-mile final when the tower cleared the accident airplane for takeoff, with no delay on the takeoff roll. No additional communication or distress calls were reported from the accident airplane. The airplane was not equipped with either a flight data recorder or a cockpit voice recorder. No anomalies were found on either engine that could have prevented normal engine operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain directional control of the airplane resulting in an inadvertent stall/mush. Contributing factors were the unsecured passenger door and the pilot's diverted attention.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (F) DOOR,PASSENGER - NOT SECURED
2. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND
3. (F) DIVERTED ATTENTION - PILOT IN COMMAND
4. STALL/MUSH - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings

5. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On November 5, 2005, at 0958 central standard time (CST), a twin-engine Cessna 500 airplane, N505K, was destroyed upon impact with terrain following a loss of control during takeoff from the William P. Hobby Airport (HOU), near Houston, Texas. The instrument rated commercial pilot and one passenger were fatally injured. The airplane was owned and operated by the pilot. Visual meteorological conditions prevailed, and an instrument flight plan was filed for the 14 Code of Federal Regulations Part 91 personal flight. The local maintenance test flight was originating at the time of the accident, with Corpus Christi, Texas, as the intended destination.

Airport personnel reported that the owner of the airplane rented an office and hangar from a fixed base operator (FBO) on the east side of runway (RW) 22. Records indicate that 377 gallons of jet fuel was purchased on November 5, 2005, from the FBO's fueling vehicle about 0800; the fueling technician stated that the airplane was "topped off." Witnesses reported that the airplane had not been flown in over nine months, and was on its first flight since heavy maintenance was accomplished. Maintenance records confirmed that the airplane had not flown since January 31, 2006.

Several eyewitnesses observed the mishap. The three statements below recount their observations:

"A Citation C-500 was taking off on runway 22. The aircraft lifted off and climbed to approximately 200 to 300 feet. The aircraft appeared to have stalled during the ascent, banked to the right, crashing onto runway 12L/30R. It then tumbled for approximately 500 feet, coming to rest on taxiway Hotel and Mike."

"As the aircraft came more into my field of vision, it was 100 to 150 feet off the runway. I observed it roll hard to the right, become inverted, and crash into the ground. A large fireball followed the impact."

"I remember seeing the belly of the airplane, it was lime green color, then it winged-over to its right and went down."

PERSONNEL INFORMATION

The 55-year old pilot held a commercial pilot certificate with a rating for multiengine land and instrument airplane. In addition, he was also typed-rated in the Cessna 500 and 650 models. On February 20, 2005, the pilot satisfactorily completed the annual single-pilot training program and the single-pilot proficiency check in the CE-S550 airplane, as required by FAA exemption 405 and amended on June 27, 1984. The training included authorization for circling approaches.

The pilot was issued a second-class medical certificate on February 4, 2005, with the limitation that "airman must wear corrective lenses." Pilot flight records were not found; however, at the time of the medical application, the pilot reported having accumulated a total of 4,100-flight hours, with 110 hours in the last 6 months. The pilot also owned and operated a 1991-model Cessna 650 twin-engine business jet that was certified for two-pilot operation. Witnesses stated that the pilot had never flown this airplane as pilot-in-command, only as a co-pilot. From January 2005 until the accident, the pilot had flown the Cessna 650 as a co-pilot for

approximately 60 hours, and had accumulated 25 hours in the last 90 days, with October 15, 2005, being his last logged flight.

It was reported to the FAA that the passenger was employed by the pilot as a maintenance technician, and had been performing maintenance on the airplane. Records reveal that the 37-year passenger was issued an airframe/powerplant mechanic certification on June 8, 1999. Previously, he had been issued a student pilots certificate (FF242243) on May 31, 2002, that expired on May 31, 2004. A first-class medical certificate was issued on May 3, 2002, with the restriction of "must wear corrective lenses." No additional records were located.

AIRCRAFT INFORMATION

The 1972-model airplane, serial number 004, was a twin-engine business turbojet, configured for a maximum of eight occupants, with a retractable landing gear. The airplane was certified for two-pilot operation, but this particular model could have been flown with only one pilot if an exempted FAA endorsement was approved. This exemption requires an FAA approved single-pilot training program, which is not controlled or approved by Cessna Aircraft Company. The airplane was powered by two 1971 Pratt & Whitney JT-15D1A engines, S/N 76177 and S/N 76633. According to Cessna owner/operator records, the initial delivery date was April 14, 1972. FAA records indicated that the airplane had been operated by 11 different owners since the airplane came off the assembly plant in 1972.

After the accident, incomplete airplane and engine records were located at different locations, and it was not determined if other records were aboard the airplane before being consumed by fire. However, the available information is as follows:

The last recorded inspections accomplished on the airplane were: phase 1 and phase 2 on August 15, 2002; phase 3 and phase 4 on June 5, 2002; and phase 5 on March 30, 2003. Phase 1-4 inspections have 2-year or 400-hour requirements. Phase 5 is a 3-year or 1,200-hour requirement.

The aircraft flight log records indicate January 31, 2005, as its last previous flight. Total aircraft time indicated 6,229.9 hours and 6,195 landings. At that time, engine 1 indicated 2,506.1 hours and 2,246 cycles, and engine 2 indicated 2,473.2 hours and 2,353 cycles.

Records that were found indicated that the accident flight was the first flight since the latest phase 1-5 inspections had been initiated; however, no completed documentation was found indicating that the inspections had been accomplished, or that the airplane maintenance was approved for the return-to-service flight.

Airframe inspection phases 1 through 5 from the maintenance manual were initialed by various mechanics, but no complete signoffs, completion dates, or component times were noted. Inspection phases 41 and 50 was signed on February 25, 2005, with total time of 6,229.9 hours and 6,195 landings.

53 pages of discrepancy worksheets (4 discrepancies to the page) were listed for the airframe, and some of the worksheets indicated corrective actions were taken, including replacing parts/components. The dates from the worksheets start on February 25, 2005, and extend to October 27, 2005. Some of the written discrepancies include: "corrosion on left and right gear axles, removed all flight controls per phase 5 inspection, right hand aft wing fairing cracked with loose rivets, repair wing fuel leaks as required, removed landing gear for repairs, replaced left and right speedbrake hydraulic lines, left and right upper outboard trailing edge of

horizontal stabilizer suspected of corrosion between skin and hinge, and main entry door linkage work (reference item 155, which states that the crew door locking linkage has play)."

11 pages of discrepancy worksheets (4 discrepancies to the page) were listed for the phase 4 and 8 engine inspections. Some of the worksheets indicated corrective actions were taken, including replacing parts/components. The dates from the worksheets start on January 19, 2005, and extend to May 30, 2005. Some of the written discrepancies include: "remove left and right hand engine inlets for repair, removed right and left thrust reverser for inspection, left engine start sequence inoperative, replace all engine cowl fasteners, right pylon aft lower section has rivets pulled through, engine sync system inoperative, right and left engine fire loops improperly routed, left pylon aft trailing edge needs repair, left engine has wrong class exhaust nozzle."

On February 18, 2004, an emergency locator transmitter and antenna were installed on N505K, which changed the weight and balance status. The revision change showed the new empty weight to be 7,264.39 pounds, with the new center of gravity being 261.61 and the new moment as 1,900,429.7.

METEOROLOGICAL INFORMATION

At 0953, the automated surface observing system at HOU reported wind from 170 degrees at 10 knots, visibility 10 statute miles, scattered clouds at 2,500 feet, broken clouds at 3,000 feet, broken clouds at 25,000 feet, temperature 27 degrees Celsius, dew point 21 degrees Celsius, and a barometric pressure at 29.93 inches of Mercury. The Investigator-in-Charge calculated the density altitude at 1,472 feet.

COMMUNICATIONS

According to Air Traffic Control (ATC), Southwest Airlines (SWA) flight 422 departed HOU a few minutes earlier and was returning to the airport. The Southwest flight, a Boeing 737, declared an emergency with HOU tower while on a 10-mile final for runway 22. The flight crew of SWA flight 422 performed a precautionary engine shutdown of the right engine due to an excessive oil temperature indication, thus the reason for the emergency.

While approaching the approach end of runway 22, the pilot of N505K called the tower and reported he was ready for departure. The controller instructed the pilot to hold short. A second airplane, SWA flight 1274, also called ready for takeoff. The tower controller then instructed N505K "cleared for takeoff, fly heading 210 degrees, no delay on the roll." Citation N505K replied "roger" as he initiated its takeoff roll. SWA 1274 was then instructed to taxi into position and hold "aircraft on 8-mile final, be ready." Neither the flight crew for SWA 1274 or SWA 422 reported witnessing the accident.

The tower controller stated that she turned to look at the airplane on final, and when she turned back, she observed N505K impacting the runway in the inverted position while in a pronounced nose low attitude. The point of impact was about 4,000 feet from the takeoff end of the runway. Subsequently, SWA 1274 taxied from the takeoff position, and HOU tower closed the runway.

AERODROME INFORMATION

Runway 22/4 at the William P. Hobby Airport (HOU) is 7,602-feet long and 150-feet wide with

a concrete surface. Elevation at the approach end of runway 22 is 39 feet. Runway 12L/30R (5,148-feet long and 100-feet wide, with a concrete surface) is the first runway crossing runway 22, about 3,750 feet from the takeoff end. According to ATC services at the time of the accident, runway 22 was in use, and all others were closed for construction/maintenance reasons.

FLIGHT RECORDERS

The airplane was not equipped with a flight data recorder (FDR) or cockpit voice recorder (CVR), and neither was required by the FAA.

WRECKAGE AND IMPACT INFORMATION

The airplane initially impacted the runway near its centerline, about 354 feet northwest from the centerline of runway 22. The Global Positioning System (GPS) coordinates for the initial impact point using a hand-held unit were latitude 29 degrees 38.843 minutes North and longitude 95 degrees 16.664 minutes West. The distance from the takeoff end of runway 22 to the initial point of contact on runway 12L was approximately 3,900 feet. Witnesses stated "the airplane exploded in flames as it cart-wheeled" and slid westerly across a grassy area (200 feet wide) to its final resting location at the intersection of taxiway Mike and taxiway Hotel, approximately 520 feet from the first point of impact on runway 12L. The 520-foot debris path field was approximately 64 feet wide.

The nose of the airplane and forward cabin area of the fuselage were observed folded under the right wing. All of the flight control surfaces and major airframe components were accounted for at the accident site. The aft cabin fuselage area and aft fuselage empennage section were observed separated on the aft side of the aft pressure bulkhead. The empennage flight control cables, with the electrical cables and bleed air plumbing, connected the two sections together. The flaps and flap selector handle were both observed in the takeoff and approach position. A mechanical detent is installed at the takeoff (T.O.) and approach (APPR) 15 degree position of the flap lever. The control lock, which engages the ailerons, elevators, and rudder in the neutral position, was observed in the "unlocked position." Several control cables were observed separated in tension overload. Control cable continuity could not be established on-site; however, all of the flight control cables in the aft fuselage remained in place. They were marked and cut to facilitate recovery from the runway.

The main cabin door handle was observed in the stowed position; however, none of the cabin door locking pins were observed engaged in their fully locked position. The lower aft pin was observed extended 3/8 inches; the forward pin was extended 1/8 inches. The forward door pins were extended 3/8 inches and the aft door pins were extended 1/2 inches.

Note: The cabin door locking system operates to the open position by moving the inside cabin door handle counter-clockwise from the stowed position to retract the door locking pins and then moving it back to the center stowed position. The cabin door may then be opened by pushing outward on the door. The door is closed and the door handle is moved clockwise from the center stowed position to extend the door locking pins to lock the door. The handle is then returned to the center stowed position. Full extension of the locking pins is 1 inch. When the door handle is operated to the locked position, the handle drives the bellcrank to an over-center position and prevents the mechanism from inadvertently opening.

The entire cabin area was torn open. Most of the cockpit instrumentation was damaged and burned. All of the engine indication instruments are of the vertical tape indicating style. The

pilot's seat base remained attached to the seat tracks, but the copilot's seat base was observed separated from the seat track.

The airframe fuel system was compromised, but fuel was observed on the ground and on various airplane components during the recovery process.

Both engines remained attached to the airplane and exhibited power signatures. The right engine fan blades were observed separated from the hub, but the hub remained attached to the engine. The left engine fan blades remained attached to the hub.

On November 7, 2005, the wreckage was recovered to Air Salvage of Dallas (ASOD), near Lancaster, Texas, for further examination.

MEDICAL AND PATHOLOGICAL

An autopsy was performed on the pilot on November 6, 2005, in the Joseph A. Jachimczyk Forensic Center of Harris County, Houston, Texas, by a medical examiner from the center, with the cause of death as multiple blunt force injuries.

Toxicological testing on the pilot was performed by the FAA's Civil Aeromedical Institute (CAMI) Forensic Center, Oklahoma City, Oklahoma, for carbon monoxide, cyanide, volatiles, and tested drugs. Test results were reported as negative.

FIRE

Southwest Airlines flight 422 had just taken off from HOU before reporting the shutdown of the right engine by the flightcrew. The flight then declared an emergency and was returning on downwind to RW 22. The Houston Fire Department (HFD) vehicles at Hobby Airport were standing-by on alert-2 status alongside the runway awaiting the Southwest flight when the Citation accident occurred; they were thus able to respond immediately.

TESTS AND RESEARCH

On February 28, 2006, at the facilities of ASOD, representatives from the Cessna Aircraft Company and Pratt & Whitney Canada Engines Services examined the engines and airframe under the supervision of the NTSB investigator-in-charge (IIC). The results are as follows:

All of the control cables, which had been previously marked, were verified to have been connected to their appropriate input and output devices. The upper and lower left wing aileron control cables were attached to both the aileron bellcrank and the center fuselage aileron bellcrank. The left aileron remained attached to the wing structure, and had movement when actuated. The upper and lower outboard right aileron control cables were observed separated in a tension overload separation near the outboard bellcrank. The right aileron was attached to the rear wing spar, which was separated from the inboard section of the wing. The rudder control cables were connected to their appropriate attach points and continuity was established. Continuity was established to the elevator control cables. The flap bellcranks were measured from the rear spar to center of bellcrank bolt and compared to an exemplar airplane on May 16, 2006 by Cessna Aircraft for comparison. The results were:

N505K (measurement from rear spar to center of bellcrank bolt)

Left wing outboard 5.6 inches

Left wing center	6.2 inches	
Left wing inboard	9.35 inches	
Right wing outboard	4.8 inches	
Right wing center	5.5 inches	
Right wing inboard	8.75 inches	
Exemplar Airplane (measurement from rear spar to center of bellcrank bolt)		
Left wing outboard	8.35 inches	Flaps full down
Right wing outboard	8.45 inches	Flaps full down
Left wing outboard	2.0 inches	Flaps up
Right wing outboard	2.2 inches	Flaps up
Left wing outboard	5.4 inches	Flaps at 14.5 degrees
Right wing outboard	5.2 inches	Flaps at 14.4 degrees
Right wing outboard	4.75 inches	Flaps at 10.3 degrees

The left engine displayed impact and fire deformation. The inlet was flattened around the upper circumference, and the thrust reverser was in the stowed and locked position. All engine to airframe connections were continuous to their airframe pedestal connections. The low pressure fan (LPF) blade airfoils were in place, with deformation at the outer spans. The fan shroud was circumferentially scored by contact with blade tips. The intermediate case displayed fracturing around the upper circumference and the rear flange. The accessory gearbox (AGB) was mounted and controls/accessories in place. The right engine also displayed impact and fire deformation. The inlet was flattened and deformed sharply around the upper right circumference, and the thrust reverser was in the stowed and locked position with minimal impact damage. All engine to airframe connections were continuous to their airframe pedestal connections. The LPF blade airfoils were fractured at the roots, with deformation to the recovered blades. The fan shroud was circumferential scored. The intermediate case displayed fracturing around the upper circumference to the forward flange. The AGB was mounted and controls/accessories were in place.

The two engines were shipped to Pratt & Whitney's component repairs division in Bridgeport, West Virginia, for further examination.

The engines were examined under the supervision of the NTSB IIC on April 27-28, 2006, at the facilities of the Pratt & Whitney Engine Services in Bridgeport, West Virginia. The results are as follows:

The left engine (JT15D-1A, S/N 76177) exhibited external deformation and fire damage. The low-pressure compressor (LPC) case exhibited scarring from contact with the low-pressure fan (LPF), which showed tip curling of the airfoils. The number 4 bearing was wet with oil and did not show distress. The low-pressure turbine (LPT) was removed, and the 1st stage stator did not show evidence of foreign object debris or damage. The high-pressure turbine (HPT) was capable of smooth manual rotation, and mechanical continuity was established with the high-pressure compressor (HPC) and the accessory gearbox (AGB). The number 3 bearing was wet

with oil and did not show distress. The HPC was borescoped and showed light impact damage with rough edges on the vanes; normal rotation was achieved. The starter generator was removed, and the AGB was rotated through the drive gear. No anomalies were noted during the examination that would have preclude the engine from producing power prior to impact.

The right engine (JT15D-1A, S/N 76633) exhibited fire damage, including heavy crushing on the outer bypass duct and low-pressure fan case. The LPC case was crushed from the 3 to 9 o'clock position. All of the LPF blades had fractured at the blade root and were submitted with the engine. The LPC shaft was removed and was unremarkable. The number 1 bearing was wet with oil. The LPT was removed, and no loose or shifted blades were evident. The HPT was not initially capable of manual rotation until the LPC shaft was removed, which then allowed the HPT to rotate freely. Mechanical continuity was established among the HPT, HPC, and AGB. The number 3 bearing was wet with oil and did not show distress. The HPC was borescoped and showed light impact damage on the vanes; normal rotation was achieved. The starter generator was removed, and the AGB was rotated through the drive gear. No anomalies were noted during the examination that would have preclude the engine from producing power prior to impact.

ADDITIONAL INFORMATION

The wreckage was released to the owner's representative on October 12, 2006.

Pilot Information

Certificate:	Commercial; Private	Age:	55, 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:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 With Waivers/Limitations	Last FAA Medical Exam:	02/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	02/01/2005
Flight Time:	4100 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N505K
Model/Series:	500	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	500-0004
Landing Gear Type:	Retractable - Tricycle	Seats:	8
Date/Type of Last Inspection:	03/01/2003, AAIP	Certified Max Gross Wt.:	11850 lbs
Time Since Last Inspection:	220.9 Hours	Engines:	2 Turbo Jet
Airframe Total Time:	6229.9 Hours at time of accident	Engine Manufacturer:	Pratt & Whitney Canada
ELT:	Installed, not activated	Engine Model/Series:	JT15D-1A
Registered Owner:	On file	Rated Power:	2200 lbs
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	Hou, 46 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	0953 CST	Direction from Accident Site:	
Lowest Cloud Condition:	Scattered / 2500 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 3000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	170°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.93 inches Hg	Temperature/Dew Point:	27°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Houston, TX (HOU)	Type of Flight Plan Filed:	IFR
Destination:	Corpus Christi, TX (CRP)	Type of Clearance:	IFR
Departure Time:	0958 CST	Type of Airspace:	

Airport Information

Airport:	William P. Hobby (HOU)	Runway Surface Type:	Concrete
Airport Elevation:	46 ft	Runway Surface Condition:	Dry
Runway Used:	22	IFR Approach:	None
Runway Length/Width:	7602 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	29.645556, -95.278889

Administrative Information

Investigator In Charge (IIC):	Frank McGill	Report Date:	02/26/2007
Additional Participating Persons:	Tom Munkhaugen; Federal Aviation Administration; Houston, TX Andrew L Hall; Cessna Aircraft Company; Wichita, KS Thomas A Berthe; Pratt & Whitney Canada; South Burlington, VT Denis Rivard; Transportation Safety Board of Canada; Quebec, Canada,		
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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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).