Aviation Investigation Final Report

Location:	Greenville, South Carolina	**Accident Number:**	ERA18FA264
Date & Time:	September 27, 2018, 13:46 Local	**Registration:**	N114TD
Aircraft:	Dassault FALCON 50	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	2 Fatal, 2 Serious
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The flight crew was operating the business jet on an on-demand air taxi flight with passengers onboard. During landing at the destination airport, the cockpit voice recorder (CVR) recorded the sound of the airplane touching down followed by the pilot's and copilot's comments that the brakes were not operating. Air traffic controllers reported, and airport surveillance video confirmed, that the airplane touched down "normally" and the airplane's thrust reverser deployed but that the airplane continued down the runway without decelerating before overrunning the runway and impacting terrain. Post-accident examination of the airplane's brake system revealed discrepancies of the antiskid system that included a broken solder joint on the left-side inboard transducer and a reversal of the wiring on the right-side outboard transducer. It is likely that these discrepancies resulted in the normal braking system's failure to function during the landing.

Before the accident flight, the airplane had been in long-term storage for several years and was in the process of undergoing maintenance to bring the airplane back to a serviceable condition, which in-part required the completion of several inspections, an overhaul of the landing gear, and the resolution of over 100 other unresolved discrepancies. The accident flight and four previous flights were all made with only a portion of this required maintenance having been completed and properly documented in the airplane's maintenance logs. A pilot, who had flown the airplane on four previous flights along with the accident pilot (who was acting as second-in-command during them), identified during those flights that the airplane's normal braking system was not operating when the airplane was traveling faster than 20 knots. He remedied the situation by configuring the airplane to use the emergency, rather than normal, braking system. That pilot reported this discrepancy to the operator's director of maintenance, and it is likely that maintenance personnel from the company subsequently added an "INOP" placard near the switch on the date of the accident. The label on the placard referenced the antiskid system, and the airplane's flight manual described that with the normal brake (or antiskid) system inoperative, the brake selector switch must be positioned to use the emergency braking system. Following the accident, the switch was found positioned with the normal braking system activated, and it is likely that the accident flight crew attempted to utilize the malfunctioning normal braking system during the landing. Additionally, the flight crew failed to properly recognize the failure and configure the airplane to utilize

the emergency braking system, or utilize the parking brake, as described in the airplane's flight manual, in order to stop the airplane within the available runway.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:
The operator's decision to allow a flight in an airplane with known, unresolved maintenance discrepancies, and the flight crew's failure to properly configure the airplane in a way that would have allowed the emergency or parking brake systems to stop the airplane during landing.

Findings

Aircraft	Brake - Failure
Aircraft	Scheduled maint checks - Not serviced/maintained
Organizational issues	Maintenance records - Operator
Personnel issues	Decision making/judgment - Flt operations/dispatcher
Personnel issues	Use of policy/procedure - Flight crew

Factual Information

History of Flight

Prior to flight	Aircraft inspection event
Landing-landing roll	Sys/Comp malf/fail (non-power) (Defining event)
Landing-landing roll	Runway excursion
After landing	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On September 27, 2018, about 1346 eastern daylight time, a Dassault Falcon 50, N114TD, was substantially damaged when it was involved in an accident at Greenville Downtown Airport (GMU), Greenville, South Carolina. The two pilots were fatally injured, and the two passengers were seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 135 on-demand air taxi flight.

The airplane departed from St. Pete-Clearwater International Airport (PIE), Clearwater, Florida, at 1230. According to the cockpit voice recorder (CVR), during the approach to GMU, the flight crew had difficulties understanding the navigation fixes that air traffic control had provided. The CVR also showed that the flight crew did not use any prelanding checklist or discuss that no braking was available with the brake system in the "#1-ON" position (the pilot was the copilot for the previous four flights in the airplane, during which this condition was present). At 1345:34, the CVR recorded the sound of the airplane touching down. At 1345:38, the pilot stated that the brakes were not operating. He and the copilot commented about the lack of brakes several more times before the airplane went over an embankment and came to a stop.

Air traffic controllers at GMU reported that the airplane touched down "normally" at a standard touchdown point on the runway. They saw the airplane's thrust reverser deploy and watched as the airplane continued down the runway without decelerating. An airport security video captured the airplane's touchdown and showed that the thrust reverser and the airbrakes were deployed. The video also showed the airplane as it continued to the end of the runway and went over the embankment.

PERSONNEL INFORMATION

The pilot held an airline transport pilot certificate and a type rating for the Dassault Falcon 50 with a limitation for second-in-command privileges only. He also held type ratings for Learjet and Westwind business jets.

The co-pilot held a private pilot certificate with ratings for airplane single and multiengine land. He did not hold any type ratings nor did he hold an instrument rating.

AIRCRAFT INFORMATION

The Dassault Falcon 50 was a midsize long-range business jet. The three engines were mounted at the rear of the airplane with the left engine identified as No. 1, the center engine identified as No. 2, and the right engine identified as No. 3. A thrust reverser was located on the No. 2 engine. The airplane was equipped with two independent hydraulic systems, which provided hydraulic power to several onboard systems including the airplane's brakes. System 1 provided hydraulic pressure for normal braking (with antiskid), while system 2 provided hydraulic pressure for emergency braking and parking brake. Selection of normal or emergency braking was done via a switch labeled "BRAKE" that was located on the instrument panel. The "#1-ON" position of the switch selected normal braking utilizing system 1, and provided antiskid protection, while the "2-OFF" position selected emergency braking and did not provide antiskid.

Review of the airplane maintenance records revealed that, on August 13, 2018, a 12-month avionics check was completed, at which time the airplane had accumulated 14,003 total hours and 7,541 total cycles.

According to the operator's director of maintenance, the airplane had been kept in storage in a hangar for about 4 years. In June 2018, a work order was generated to return the airplane to a serviceable status. The work order included a 12-month inspection, a 12-month or 500-hour inspection, a 24-month inspection, and a 36-month inspection. The work order also indicated that 1C, 3C, and 5C checks were to be completed and that a total of 103 discrepancies found during the ongoing inspections needed to be addressed. The work order was about 60% complete at the time of the accident, and there were no maintenance log entries made indicating that the airplane was airworthy and returned to service.

The work order did not include removal of the landing gear for overhaul. The last overhaul of the landing gear (main and nose) was completed on July 23, 2002. During the overhaul, the electrical harness for the landing gear position sensors and antiskid transducers was removed and replaced. The overhaul interval was 12 years (plus a grace period of 5 months) or 6,000 landings, whichever came first. As a result, a landing gear overhaul should have been performed no later than December 23, 2014.

METEOROLOGICAL INFORMATION

WRECKAGE AND IMPACT INFORMATION

Examination of the accident site as well as runway and tire track evidence showed that the airplane departed the left edge of the runway near the departure end, traveled across the flat grassy area at the end of the runway, continued down a 50-foot embankment, and came to rest on the airport perimeter road about 425 ft from the runway. The wreckage was oriented on a heading of about 160°. There was no fire. Fuel was observed leaking from the wings at the accident site. The nose landing gear was separated and found about midway down the embankment. The fuselage was separated immediately aft of the cockpit area. The slats and flaps were extended. Both the right and left airbrakes (spoilers) were extended. Both main landing gear were fractured at the trunnion and displaced aft into the flaps.

A review of the airplane braking system components at the scene of the accident showed that the parking brake handle was in the stowed position and the brake switch was found in the "#1-ON" position. Next to the brake switch was a sticker indicating, "ATA# 32-5 'INOP' DATE: 9/27/18" (ATA code 32-5 involves the antiskid system). Detailed examination of the wheel speed transducers that the

antiskid system used showed signs of field splices on the right-side inboard and outboard transducers and no signs of field splices on the left-side inboard and outboard transducers.

Computed tomography performed on the antiskid system components revealed a broken solder joint on the left-side inboard transducer and a bent pin connection on the right-side inboard transducer. Functional tests of the antiskid wheel speed transducers revealed a failure in the operation of the left-side inboard wheel speed transducer; the other three transducers passed their respective functional tests. Visual inspection of the wiring for the right-side wheel speed transducers found that the wiring to the right outboard transducer was reversed.

MEDICAL AND PATHOLOGICAL INFORMAITON

Autopsies of the pilot and copilot were performed by the Office of the Medical Examiner, County of Greenville, South Carolina. Their cause of death was multiple blunt force injuries.

Toxicology testing of the pilot was performed at the FAA Forensic Sciences Laboratory. The results for the pilot were negative for carbon monoxide, ethanol, and drugs. The results for the copilot were negative for carbon monoxide and ethanol; ketamine, an anesthetic that is often used during attempted resuscitation, was detected in the copilot's specimens.

ADDITIONAL INFORMATION

According to the pilot who conducted four flights in the airplane before the accident flight, upon application of the brakes with the brake switch in the "#1-ON" position, braking was normal at low speeds (estimated to be 15-20 knots) but at faster speeds, no braking was available. Braking was restored when the brake switch was placed in the "#2-OFF" position. This pilot stated that he reported the brake system failure to the company's director of maintenance after the first two flights (in late August and early September 2018) and indicated his belief that the source of the problem was the antiskid system. This pilot also stated that the last two flights occurred 7 and 8 days before the accident flight and that the accident pilot was the copilot for all four flights.

None of the available maintenance records indicated the brake system issue or showed maintenance actions that were performed to resolve the issue.

According to the abnormal procedures section of the airplane's flight manual, a failure of the (normal) brake system or an inoperative antiskid system in-part required the flight crew to move the brake switch to the "#2 / OFF" position. The manual also stated that if both normal and emergency braking was inoperative, that the thrust reverser and parking brake could be used to bring the airplane to a stop.

Pilot Information

Certificate:	Airline transport	**Age:**	49,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	None
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 1 With waivers/limitations	**Last FAA Medical Exam:**	August 7, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	11650 hours (Total, all aircraft)		

Co-pilot Information

Certificate:	Private	**Age:**	66,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	None
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 22, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	5500 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Dassault	**Registration:**	N114TD
Model/Series:	FALCON 50 Undesignat	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	17
Landing Gear Type:	Retractable - Tricycle	**Seats:**	12
Date/Type of Last Inspection:	August 27, 2014 Continuous airworthiness	**Certified Max Gross Wt.:**	40780 lbs
Time Since Last Inspection:	0 Hrs	**Engines:**	3 Turbo fan
Airframe Total Time:	14002.8 Hrs as of last inspection	**Engine Manufacturer:**	Honeywell
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	TFE-731
Registered Owner:		**Rated Power:**	
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KGMU,1048 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	13:53 Local	**Direction from Accident Site:**	18°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.02 inches Hg	**Temperature/Dew Point:**	27°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	St Petersburg-Clearwater, FL (PIE)	**Type of Flight Plan Filed:**	IFR
Destination:	Greenville, SC (GMU)	**Type of Clearance:**	IFR
Departure Time:	12:30 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Greenville Downtown GMU	**Runway Surface Type:**	Asphalt
Airport Elevation:	1048 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	19	**IFR Approach:**	RNAV
Runway Length/Width:	5393 ft / 100 ft	**VFR Approach/Landing:**	Full stop

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal, 2 Serious	**Latitude, Longitude:**	34.839443,-82.348609(est)

Administrative Information

Investigator In Charge (IIC):	Boggs, Daniel
Additional Participating Persons:	Dwayne Morrison; FAA/FSDO; Columbia, SC David Studmann; Honeywell; Phoenix, AZ Jay Sigmann; Dassault Falcon Jet Corp.; New Castle, DE Nicolas Courjaud; BEA Matthew Baranyk; Meggitt Kevin Kurko; Meggitt
Original Publish Date:	June 3, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98361

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